

# IMAS 09.42

First Edition

2003-01-01

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## Operational accreditation of mine dogs

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## Foreword

In July 1996, international standards for humanitarian mine clearance programmes were proposed by working groups at a conference in Denmark. Criteria were prescribed for all aspects of mine clearance, standards were recommended and a new universal definition of 'clearance' was agreed. In late 1996 the principles proposed in Denmark were developed by a UN-led working group into *International Standards for Humanitarian Mine Clearance Operations*. A first edition of these standards was issued by the UN Mine Action Service (UNMAS) in March 1997.

This IMAS reflects changes to operational procedures, practices and norms which have occurred over the past three years. The scope of these standards has been expanded to include the other components of mine action, in particular those of mine risk education and victim assistance.

The United Nations has a general responsibility for enabling and encouraging the effective management of mine action programmes, including the development and maintenance of standards. UNMAS is the office within the United Nations Secretariat responsible for the development and maintenance of international mine action standards (IMAS).

The work of preparing, reviewing and revising these standards is conducted by technical committees, with the support of international, governmental and non-governmental organisations. The latest version of each standard, together with information on the work of the technical committees, can be found at [www.actionstandards.org](http://www.actionstandards.org). IMAS will be reviewed at least every three years to reflect developing mine action norms and practices, and to incorporate changes to international regulations and requirements.

## Introduction

Mine dog detection differs from other demining methods in that each individual dog has its own distinct set of qualities, which often varies significantly from day to day. A dog's ability to detect mines is dependent on a series of factors. The most prominent ones are how the dog is trained, and the genetic qualities of the dog. Whilst it is internationally recognised that dogs are indeed capable of detecting mines and UXO, the difficulty in assessing a dog's capability and reliability often negates the opportunity to undertake independent quality assurance based on visual inspections. A dog may appear to work well to inspectors but its nose sensor may not be "tuned" correctly.

Independent testing of mine dogs did not start until 1999 in Bosnia. The initial tests there revealed significant shortfalls in the way that the dogs were tested, but also in the capability of the dogs and handlers under test. As a result, some organisations were sceptical about the independent testing of their dogs, and claimed that there was no need for such tests, bearing in mind that manual deminers and mechanical equipments did not require testing on an individual basis. Experience from the few independent and national tests, however, suggests that the overall quality of mine dog detection increases significantly in the theatres where tests are undertaken.

The greatest challenge to independent testing of dogs is to replicate a realistic scenario to the extent that the test represents the dog's real capabilities in the field. A test will always be slightly artificial. The chemical signature emanating from buried landmines is a fundamental property that is poorly understood. Although advances have been made in the understanding of the fundamental transport process that allow the chemical signature to migrate from the buried source to the ground surface, much remains to be done to fully understand this process. Chemical vapours emanate from a buried landmine by permeation through plastic case materials or through seals and seams, and from initial surface contamination of the case during the laying process. Although it would be desirable to have a sensor, which is tuned to the principal explosive chemicals found in landmines (TNT, DNT and RDX) it is unlikely that the dog recognises a mine based on detection of a single substance. It is more likely that it detects a mixture of scents, or "bouquet" formed by several substances. The complete process of discrimination and bouquet detection also remains to be understood. The dominant effects of environmental conditions on mine dogs and the process of general scent detection will need further exploration to be fully understood. It is, however, possible to make some assumptions based on empirical experience and limited scientific research material.

The human factor also plays a significant role. It is well known that mine dog detection is highly dependent on good dog/handler communication and collaboration. The extra mental pressure to which the dog handler is exposed during an Operational accreditation test may cause crucial miss-readings of the dog's signals. Unfortunately there are no obvious ways of eliminating all these problems. The challenge is therefore to establish ways of testing dogs, which are fair, unambiguous and easily conducted and managed.

Although this standard is being drafted as one of the IMAS group, it is considerably more specific than most, more detailed, and longer. This is due entirely to the lack of accepted procedures in this area, and the consequent need for more guidance. This standard, therefore, provides national mine action authorities and demining organisations with guidance on how to prepare a test site, lay out the test field, handle test items and accessories, manage the test site/process and make/manage the records. Since there are still many unresolved scientific questions related to mine dog detection, some of the elements that are addressed in this standard may later prove to be redundant when sufficient research has been done. By contrast, some elements may prove to play an even more important role in the future than currently known. In the absence of proven scientific research, it is therefore necessary to incorporate and address as many known factors as possible, to ensure that a test becomes impartial, unambiguous and realistic.

# Operational accreditation of mine dogs

## 1 Scope

This standard provides specifications and guidelines for the establishment of operational accreditation procedures and test fields for mine detection dogs. It includes the selection and preparation of different operational accreditation tests, and the conduct and management of these tests. Three different test scenarios have been proposed;

- a) Operational accreditation test 1 - Primary area and road clearance;
- b) Operational accreditation test 2 - Tripwire detection; and
- c) Operational accreditation test 3 - Secondary clearance, verification after mechanical mine clearance.

The standard offers general and specific elements of importance before and during preparation of test fields, such as: assessment of test areas, handling of test items, tools and accessories, ground preparation, marking/guarding and management/maintenance of test fields and test records. It also offers specifications and guidance for the establishment and management of a test regime and proposes pass/fail criteria for each test.

This standard does not apply to internal daily testing or "tuning" of mine dogs, which is part of internal quality assurance undertaken by each individual demining organisation. Many of the same principles, however, should be considered when testing dogs as part of internal quality control.

## 2 References

A list of normative references is given in Annex A. Normative references are important documents to which reference is made in this standard and which form part of the provisions of this standard.

## 3 Terms and definitions

A list of terms and definitions used in this standard is given in Annex B. A complete glossary of all the terms and definitions used in the IMAS series of standards is given in IMAS 04.10.

In the IMAS series of standards, the verbs 'shall' and 'should' are used to indicate the intended degree of compliance. This use is consistent with the language used in ISO standards and guidelines.

- a) 'shall' is used to indicate requirements, methods or specifications which are to be applied in order to conform to the standard; and
- b) 'should' is used to indicate the preferred requirements, methods or specifications.

The term 'national mine action authority or authorities' refers to the government department(s), organisation(s) or institution(s) in each mine-affected country charged with the regulation, management and co-ordination of mine action. In some cases the national mine action centre (MAC) or its equivalent will act as, or on behalf of, the 'national mine action authority'.

The term 'demining organisation' or 'mine dog organisation' refers to any organisation (government, NGO or commercial entity) responsible for implementing demining projects or tasks. The demining organisation may be a prime contractor, subcontractor, consultant or agent.

The term 'target object' is used to describe the object which the dog is supposed to detect during live mine/UXO detection. The target may be a mine of a type typically found in that area, or a certain type of UXO which is commonly found during live operations.

The term 'target substance' is used to describe a substance or scent from the target object. It may be pure TNT or 2,4 DNT molecule scent or a bouquet from a mixture of substances emanating from the target object

The term 'test item' is used for mines, pieces of mines, UXO, tripwire or objects that are laid out in the test field for detection by the dogs

The term 'recognition piece' is used for a metal piece, which is placed under test items to make them recognisable by metal detectors

## **4 Test site, initial assessment and preparations**

### **4.1 General**

The establishment of a test site for independent confidence or operational accreditation of mine dogs requires careful consideration of a series of factors. A test lane or test box must be considered as contaminated with undesired scent as soon as it has been used once. This undesired contamination must be allowed to diminish sufficiently before the box or lane can be used again. This places a significant requirement for space. Moreover, it is not known which compound or components of explosives or the object casing is being used by the dog to discriminate target odours from the background. Nor can we assume that all dogs use the same components. It would, however, be unlikely that the target detection depends on a single ingredient but stems instead from the dog's ability to distinguish an "odour" picture. It is therefore currently necessary to use representative examples of the most common target objects (complete or fractions of mines, UXO and tripwires) during tests rather than pure explosive substance or artificially prepared scents from the target object. Consequently it is necessary to use mines that are likely to appear in the theatre as test items. Ideally these mines should come from live minefields that have been in the ground for a long time. It may, however, be unfeasible to satisfy this desire since many demining organisations and national mine action authorities have recognised the potential danger of lifting and disarming live mines. The alternative is then to use mines and UXO from stocks or similar. This places new requirements in regards to decontamination and soak time since mines that have been stored long-term may emanate different scent substances than mines that have been in the ground.

Test boxes or lanes should only be used once every 1-2 months for reasons described under paragraph 4.7. The required number of test boxes and consequently the number of test items (mines or UXO) increase as the expected number of dogs increase. It is therefore necessary to undertake careful planning prior to the establishment of a test site. The following elements should be taken into consideration:

- a) how many dogs will be tested, immediately and during a given time period;
- b) how many of the dogs are anticipated to fail the test and consequently must be re-tested by the demining organisation;
- c) for what purpose are the dogs to be used operationally and which operational accreditation tests should be undertaken. How many dogs are expected to apply for the different operational accreditation tests;
- d) what is the national mine action authority's policy on re-testing in regards to required period between the first to the second and third test;
- e) at what time of the year it is thought that the dogs will be tested (based on information provided by the national mine action authority and the demining organisations);
- f) what is the length of the demining season, and consequently the test season;
- g) what is the policy of the national mine action authority in regards to length and frequency of accreditation. When a dog has passed a test, when will it require re-testing; and
- h) whether there is a requirement to establish additional boxes for training and tuning of the dogs prior to testing.

## 4.2 Initial survey

Prior to the preparation of a test site, a survey should be carried out to determine potentially suitable test sites. The survey should consider the following factors:

- a) what size of test site is needed;
- b) current use of the area and potential unauthorised use or entry after establishment of the test site;
- c) security issues and the need for fencing and guarding;
- d) ownership of land;
- e) landscape and vegetation requirements needed to match field conditions, and site limitations in this respect;
- f) soil analysis, to determine whether the soil type is representative and if changes in weather will significantly affect the consistency of the soil;
- g) rain and flooding to determine whether the area will flood during heavy rain, and whether puddles and swampy spots will appear during and after rainfall;
- h) potentially undesired contamination. It is necessary to know whether the area has been a previous mine- or battlefield with potential explosive contamination. Is the area polluted by other means (exhaust gas from traffic and factories, spill of oil, inorganic fertiliser or other chemical substance). Is the area scattered with metal pieces, bullets, garbage and shrapnel?;
- i) whether the area is sufficiently remote and calm or will it be necessary to shield it; and
- j) whether the area is currently used by animals and whether these animals will continue to use the area.

It is important to pay extra attention to potential swamping or flooding during the wet season. The location of the test items will typically be unaffected by wet soil but if the area is swamped or flooded, mines may move closer to the surface or to the sides.

The process of establishing a test site is time and resource consuming. The test site suitability increases with age and thus it is desirable to maintain and use the same area for longer periods. This can typically be more than 10 years. When investigating the ownership of land and negotiating the right to use it, it is important to ensure the right to use the land and to negotiate possible rental fees for the overall usage period in beforehand.

## 4.3 Specific environmental considerations and recommendations

There are three basic types of operational accreditation test. Operational accreditation test 1 applies to dogs detecting mines on roads or open land; this is described in detail in paragraph 8. Operational accreditation test 2 applies to the detection of tripwires; this is described in paragraph 9. Operational accreditation test 3 applies to conditions where dogs will be following mechanical ground preparation- or clearance machinery. Each operational accreditation requires slightly different conditions and attributes from the search test area.

If Operational accreditation test 1 and 2 are to be applied the following considerations shall be taken into account:

- a) Landscape - Although dogs may be used in steep terrain, the test site should not be sited in steep areas. This may cause mines, or scent-contaminated soil, to move during rain periods;
- b) Vegetation - The vegetation should be limited to a minimum. Dense vegetation will prevent the dog from moving freely when on a leash during the search. Vegetation will also impede monitoring of the search. The accuracy of each dog indication may also be reduced;

- c) Soil type - The soil type should represent a typical but favourable soil type in the area of demining operation. Clayey areas should, however, be avoided since the explosive vapour molecule transportation in clay is very unpredictable. Clayey soil also facilitates movement of mines during heavy rainfall;
- d) Undesired explosive contamination – The test site shall be as free as possible from undesired explosive contamination. Recently demined mine- or UXO-fields shall be avoided since the probability of undesired explosive contamination is high. The word “recently” is defined as less than two years. If the area was demined further back in time, it may be found suitable. However, if mines and/or UXO were blown in situ in the area and the exact location of the demolition spots is unknown, the area should be considered unsuitable as a test field due to spread explosive and case fragments. If the area is in other ways thought to be contaminated with the target substance, it should be disqualified as a test field;
- e) Metal and shrapnel contamination – The test site shall be as free as possible from metal and shrapnel contamination since pieces of metal, metallic rubbish and shrapnel may be recognised as the target object by some dogs. All artificial objects should initially be removed after visual inspection. It is also desirable to search the area with a metal detector and remove all major metal pieces. This process may involve excavation and it is necessary to follow the principles described in paragraph.4.5 to prevent undesired contamination of the excavation points. If the area is severely contaminated by metal pieces and shrapnel, it should not be qualified for use as an operational accreditation test field;
- f) Other undesired contamination – The test site shall be as free as possible of any contamination that may affect the results of the tests negatively. If petroleum products, inorganic fertilizer or other chemicals have been spilled in the area, or if the soil is contaminated with gun powder, a proper investigation shall be undertaken to determine the extent of the pollution and potential effects on the tests. If the area is considered as badly contaminated by such products, the area shall not be qualified as a test site. Moreover, if the area is considerably polluted by traffic, or factory exhaust gases, it shall also not qualify as a test site. If there is any doubt as to the level of undesired contamination, the area shall not be used as a test site;
- g) Wind – If the proposed test area is regularly exposed to strong winds it should be disqualified as a test site. Dogs shall not be tested if the breeze is too high since the scent from neighbouring mines may affect the accuracy of the indication by a dog. If a test site is frequently exposed to strong breezes, this will limit the potential use of the field and delay the test and operational accreditation process. Research is to be undertaken to establish the upper limit of wind speed permissible for detection; and
- h) Noise and other disturbance – The test site should be protected against loud noises, traffic, and other activity that may disturb or distract the dog and the handler during search. The ideal location is a remote and calm area with minimum disturbance from the surroundings. If this is not possible It may be necessary to shield the test site physically.

#### **4.4 Removal and replacement of soil**

Operational accreditation tests 1 and 3 require that test items be buried in the ground. When burying test items, the following principles shall apply:

- a) double plastic bags should be used to cover the hands during the excavation and other contact with the soil. The plastic bags should be standard freezer or carrier bags or similar. Plastic bags that are made from oil products should under no circumstances be used as they will have a very distinctive scent. Care must also be taken to prevent the bags from splitting during excavation;
- b) the soil should be removed at least one day prior to the preparation of the test field;
- c) the soil disturbance should be kept to a minimum. The soil top layer should be kept in one piece if possible;
- d) superfluous soil, due to the added volume of the test item, shall be permanently removed from the test site and not spread around inside the box or neighbouring boxes;

- e) upon placing the test item in the ground, the original soil shall be filled around the mine. The topsoil shall be placed on the top of the mine, again using wrapped or shielded hands; and
- f) only de-contaminated equipment shall be used during the test site preparation and during handling of the mines and test items.

Note: It is possible to contaminate the soil artificially with target scent by mixing the soil around the mine with the test item in a moist glass container. This will cause an immediate soil contamination and possibly reduce the requirements for soak time. This may be desirable if time does not allow for a long soak time.

#### **4.5 Decontamination of test items and accessories**

Accurate and painstaking decontamination is vital because tiny amounts of contaminant transferred to test items may negate the function of the whole test area. All test items, tools, accessories and recognition pieces shall be decontaminated prior to use. There are several ways to de-contaminate equipment and accessories. The following procedures are, however, recommended:

- a) wash and scrub tools, accessories, recognition pieces, test items (including tripwires) in clean pre-boiled water (30-37° C);
- b) boil all washed items minus the test items containing explosives in clean water for a minimum of 2 x 10 minute with one water change between;
- c) dry and expose the boiled items and the test items containing explosives to fresh air for a minimum period of 4-8 hours, preferably in sunlight and with a breeze outdoors;
- d) wash and scrub all aerated and dried items with clean pre-boiled water one more time (30-37° C);
- e) dry all items in the sun or outdoors a second time; and
- f) when the test items are dry, spray them regularly with water, to allow them to dry up at least 3-4 times over an 8 hours period. Turn all test items several times to allow all sides to dry completely between each spraying. The test items should ideally be allowed to dry in sunlight and with an outdoor breeze.

#### **4.6 Storage of mines prior to use**

If mines are stored next to paint, chemicals, or oil based products for several days or weeks, these mines may give out a "false" odour since these types of chemicals are difficult to eliminate from the mine casing. Thus, mines should not be stored in close proximity to these products or any other product that may add "false" odour to the mines. Moreover, some mines, such as the Wooden PMD-6 mine or similar, will absorb the scent of other mines and not give out the "true" odour of a PMD-6. There is also a difference between mines that have been exposed to nature rather than being stored in a bunker. Old mines being collected should therefore be stored alone or in sealed containers (separately) and not be allowed to come in close proximity to new mines or explosives.

#### **4.7 Initial soak time requirements**

When a test field has been prepared, a soak time is required. During the soak time the field shall remain unused for the following reasons:

- a) the target substance needs time to permeate to the soil surface, contaminate the top soil layer and start to vaporise into the air in the same way as old buried mines; and
- b) the dog is sometimes able to detect ground disturbance and other scent caused during the preparation of the test field. This disturbance will gradually diminish over time, depending on environmental factors, such as sun, rain, snow and wind.

A prepared Operational accreditation 1 test site shall have a minimum soak time of 3 months before it can be used. A longer soak time is desirable and it should ideally be 8 months or longer. The required soak time greatly depends on the burial depth of the test items. Deep buried test items require a significantly longer soak time than shallow buried ones. The minimum soak time shall, however, be applied to satisfy the requirement to allow any disturbance from the field preparation to settle down.

A prepared Operational accreditation 2 test site (for tripwire detection) should have a minimum of 1 month's initial soak time before it can be used. A longer soak time is desirable; it should ideally be 3 months or longer.

Rain and/or artificial moistening of the test field may, however, reduce the soak time requirements, as they appear to accelerate permeation of the vapour through to the surface. In areas with typical winters, the test items should ideally be allowed to rest in the ground during the winter period.

The effect of the soak time is greatly dependent on rainfall and moisture of the soil. In areas with little or no rain therefore, the test boxes should be sprayed and soaked with clean water several times during the soak time. This removes some undesired contamination and facilitates a more natural transportation of target scent from the test item to the surface.

#### **4.8 Soak time between each use of a test box**

Since dogs typically are used in pairs, they may develop the habit of detecting the scent from a previous dog's indication of the target spot rather than the target substance itself. Consequently the dog handler may believe that the dog detects target objects. To ensure that a test box is not contaminated by scent from previous dog searches, a soak time of 1 month should be applied as a general rule between each time a box or lane is used. A longer soak period is, however, desired. Rain and/or artificial moistening of the test field may reduce the soak time requirements (paragraph 4.7). During periods with heavy rain combined with some sunshine, boxes may be re-used after a minimum soak time of 2 weeks. In areas with typical winters, the test items should ideally be allowed to rest in the ground during the winter period.

### **5 Maintenance of a test field**

#### **5.1 Verifying the location and state of the test items**

The test site should be regularly inspected by staff from the test and accreditation organisation to ensure that it is marked, guarded and/or fenced in accordance with the policy established for that particular test field. All the mines in the test boxes shall be identified at least once every year and preferably after the period with the heaviest rain or snowfall. If recognition pieces have been placed beneath the mines, the use of a metal detector is the preferred way of locating the mines, since the ground will not be disturbed. If the area has been subjected to unwanted intruders, the area shall be re-inspected and assessed, to determine whether the test site is still suitable for further use.

#### **5.2 Disqualification of boxes**

If some of the mines are found to be dislocated as a result of flooding or other means, the box in which the dislocated mines were found shall be disqualified. In such cases the mines from this box may be lifted and placed in a new box, which shall be subjected to another initial soak time in accordance with paragraph 8.1. The original box will probably be severely contaminated, and should not be used as a test box for the next two years.

### **5.3 Vegetation cutting**

If vegetation is considered to be an obstacle, it may be cut prior to the test (Operational accreditation test 1 and 2). It should, however, not be cut immediately before an operational accreditation test. The minimum soak time between vegetation cutting and operational accreditation testing is 1 month. Only manual cutting equipment shall be used. Motorised vegetation cutters shall not be used since fuel spill and exhaust fumes may cause undesired contamination. During cutting, caution must be taken to prevent any distortion of the soil. The vegetation should be removed immediately after it has been cut. Equipment and accessories used to cut and remove the vegetation should be decontaminated according to the principles described in paragraph 4.5

## **6 Security and protection of the test field**

### **6.1 Fencing**

It may be necessary to fence a test field to prevent undesired use and vandalism of the area. The fence requirements will, however, depend on an individual evaluation of the situation in the test area. The aim may be to keep people away from walking through the test field or domestic animals from grazing. A 1 m fence is then probably sufficient. It has, however, often been necessary to prevent the local population, staff from demining organisations and other intruders from entering the area physically. A higher fence is then required.

It is recommended to protect all test sites for Operational accreditation tests 1 and 2 with at least 2 m high fences. This facilitates a better management and control of the test field, and ensures that the field is not contaminated by undesired scent caused by intruders.

### **6.2 Guarding**

In some areas fencing alone may not be enough to prevent unintentional or malicious use of the area. It may then be necessary to establish a guarding system. Guarding may occasionally be required to prevent the local population from stealing the fencing or box marking material due to its intrinsic value.

## **7 General management and control of operational accreditation tests**

### **7.1 General**

The national mine action authority is responsible for appointing a qualified test manager, whose responsibility is to prepare the test site, plan and prepare operational accreditation tests, monitor and manage the tests and evaluate the handlers and dogs during the test. Moreover, the test manager has the ultimate responsibility for issuing positive and negative operational accreditation recommendations to the national mine action authority based on the results from the tests and on the pass/failure criteria established by the national mine action authority. The test manager must possess the necessary skills in order to professionally evaluate and understand mine dog detection including all procedures and in particular the communication between the handler and the dog. It is also essential that the test manager is considered impartial by the demining organisations. The national mine action authority may delegate the overall operational accreditation responsibility to the test manager.

The test manager shall always enter the test site first during a test. The demining organisation shall not be allowed to use the site for assigned training or "internal" testing before it has obtained an approval from the test manager.

## **7.2 Individual testing of each dog**

The aim of the operational accreditation tests is to enable operational accreditation of each individual dog (the handler and the dog). It is not a process of accrediting a system containing a number of dogs used in combination. Although the latter may be desirable, a more comprehensive test effort is required, which is beyond the scope of this standard. Each dog/handler “equipment” shall therefore have to be tested and evaluated individually.

The operational accreditation and failure to obtain a one should follow the dog and not the handler. Consequently if a handler has failed to pass a test with one dog, he/she may well be tested immediately and obtain an operational accreditation with another dog. A dog failing to pass a test, however, cannot immediately be tested again with a different handler. Failure sanctions shall then be applied to the dog only, and not the handler, according to regulations established by the national mine action authority. If a handler and a dog have passed the operational accreditation test and obtained operational accreditation, another handler cannot handle the dog under the same operational accreditation.

Ideally, the performance of the handler should be assessed during the test. The dog may work well while the handler fails to perform. Thus, the dog is not to blame for failing the test. It is, however, anticipated that few mine action centres or test regimes have sufficiently qualified staff to evaluate the performance of the dog handler during testing. This evaluation would also be subjective and subject to disputes. This standard therefore has no restrictions in regard to potential handler errors and sanctions on them. National mine action authorities may, however, decide to incorporate handler evaluation/sanctions as part of national standards and regulations.

## **7.3 Initial preparations by the test manager**

The test manager shall inspect the test site at least one day prior to the test, to ensure that the test field is suitable and that test and training boxes are adequately marked. Moreover, the test manager shall examine the demining organisation’s SOPs and familiarise himself with all aspects of the SOP that may be relevant during the test.

## **7.4 Initial test brief prior to the test**

The test manager shall brief the demining organisation about rules and regulations to be applied during the test. The aim of the brief is to agree on the suitability of the weather and to provide the demining organisation with information about test procedures, observation points, rest areas for dogs and handlers, movement restrictions inside the test site, marking of the test boxes and other information that may be relevant for the demining organisation. The test manager and the dog handler should jointly assess the weather. In this process, it is strongly recommended that use is made of a weather station, which will facilitate a better permanent documentation of the test conditions. It may also prove useful if the test manager or the demining organisation wish to analyse causes of potential failures during the test in order to suggest improvements. The demining organisation may reject a test if it considers the weather conditions unsuitable for mine dog detection. The test can only be rejected, however, if the weather conditions are outside the scope of operational activity as described in the demining organisation’s SOP.

It is recommended that a weather station be used to assess the suitability of the weather and the general conditions at the test site. Research into weather limitation criteria and weather stations is part of a current study.

## **7.5 Training requirements**

The demining organisation may wish to train their dogs in a similar environment to the test field. If this is the case, the test manager shall ensure that the demining organisation is provided with a training or “warm-up” area prior to the test. A training area can be a number of boxes or lanes with test items of the same type as found in the national authority's test boxes. It is recommended that the national mine action authority and the test manager prepare a number of training boxes with test items as part of the overall test site preparation.

## **7.6 Assignment of test boxes**

The test manager shall assign all the test boxes to the demining organisation and the dog handler prior to the test. The dog handler shall have the right to inspect the test boxes in any way he/she may desire prior to the test, provided that the test boxes are not physically entered or disturbed during the inspection.

## **7.7 Visitors and observers**

Representatives of the demining organisation may wish to observe the test. This is acceptable provided that they obey the rules and regulations provided by the test manager and under no circumstances disturb or influence the test and the work of the test manager. Other observers may also be present during the test provided that this is agreed by the tested organisation and that they follow the same rules.

If the test manager feels that some or all of the observers are disturbing the test, he/she may ask the observers to move to another observation point or to leave the entire area.

## **7.8 Photos and video**

Photos and video should only be taken during the tests if this has been agreed with the tested organisation and if it does not interfere with the test or in other ways disturb the handler and his dog, or the test manager and his/her staff.

## **7.9 Monitoring requirements**

When a dog equipage (dog plus handler) is tested the search shall at all times be monitored by the test manager or a qualified evaluator appointed by the test manager. The aim of the monitoring is to observe whether the equipage searches according to the demining organisation's SOP. The monitoring shall be undertaken in such way that it doesn't disturb or distract the handler and the dog during search. The manager/evaluator should, if possible, be familiar with earlier indications given by dogs that have previously been tested in the same box. This will aid verification of false or unknown positive responses by other dogs.

## **7.10 Management of records**

The test manager shall ensure that the test box records are kept away from visitors and any of the members of the demining organisation until the tests have been completed. The test manager may then show the records to the dog handler and other representatives from the demining organisation as part of the debrief.

## **7.11 Debrief**

The test manager shall debrief the dog handler(s) and other members of the demining organisation upon completion of the test. The debrief shall include information about the results of the test and a review of the box records. Moreover, it should address aspects related to the way the search was undertaken. The dog handler should be encouraged to express his/her view of the test during the discussion.

It may be necessary to debrief the management of the demining organisation separately about the results of the tests. This should be considered if the test manager or some of his/her staff has observed severe weaknesses with all or some of the dog equipages. The test manager should express his/her views objectively and suggest what corrective action may be necessary. The demining organisation is, however, not bound by these recommendations. The brief should be seen as a means of making the management of a demining organisation aware of potential faults and weaknesses in the opinion of the test authority.

## 7.12 Approval of test protocol

Upon completion of the test, the test manager shall ask the dog handler to sign a test protocol as a confirmation on agreement to the way that the test was undertaken and the results of the test. The test protocol should include space for comments by the test manager and the dog handler. If the dog handler objects to the test procedures or other aspects of the test, his/her personal views and reservations may be written on the test protocol form.

## 8 Operational accreditation test 1 – Landmine test, primary clearance of land/roads

### 8.1 General

Taking into account the elements described under point 5, two principal test layouts appear suitable:

- a) dogs to be tested against buried test items in lanes that are oriented diagonally or in parallel with a base lane; and
- b) dogs to be tested against buried test items in boxes of various sizes.

Whilst the two test principles may be equally suitable, a majority of the international community has adapted the box system for three main reasons;

- a) it is derived from the most common way of using dogs operationally, and thus it is easy to use the same operational concept during the test;
- b) it is easier to establish, monitor and control by a test regime. Especially when several dogs are to be tested at the same time at the same site; and
- c) It allows a search from 4 different directions, thus making the test less reliant on a favourable wind direction.

This standard acknowledges the common and successful use of the box system. It is therefore recommended that Operational accreditation test 1 is applied as a blind test when the requirement is to determine the capability of dog equipages to detect buried mines and UXO during primary clearance. There may, however, be circumstances when other systems will have a greater application. Most of the general preparation and management principles should, however, be applied for all systems of testing.

There may be some differences between operational procedures used for area and road clearance. The test site requirements proposed in this standard are, however, considered suitable as an operational accreditation test for both categories of work.

### 8.2 Aim of the test

While testing of dogs that are intended to be used for regular mine/UXO detection can be undertaken in many different ways, the test should be founded on a few general principles:

- a) the aim is to build confidence in a dog's capability to detect target objects with a minimum of false indications;
- b) the test is not determining a dog's reliability in detecting a high number of mines during a longer time period. Much more comprehensive test procedures would then be required.;
- c) the test is not addressing the capability and reliability of a complete clearance system. It should be seen as a confidence test of an individual demining tool, which in this case is the handler and his dog; and
- d) although the test should replicate realistic scenarios to the extent possible, the test must be manageable and unambiguous. Thus it should be designed and undertaken in such way that the handler and his/her dog is tested under significantly better conditions than the demining organisation would tolerate during live operations.

### 8.3 Measures and marking

The size of each box may differ dependent on the operational search system used by the demining organisations. The most common search length (distance that the dog moves from the handler) for a dog is, however, 10 m and the test boxes used in the majority of the countries also measure 10 x 10 m. It is often impractical to establish and manage a test field with different sizes of boxes. Thus, all demining organisations in a country should be encouraged to use the same search length to facilitate easier testing. The recommended search length is 7-10 m but there may be circumstances where different search lengths have a greater application. The following measuring rules shall apply when preparing a test site with test boxes (Operational accreditation test 1):

- a) each box shall be recorded on a map with exact location references;
- b) all corners shall be marked with a metal recognition pole, which is driven into the soil until the top of the pole is at surface level. At least one corner marker shall be accurately recorded on the box map;
- c) all sides of a box shall be marked with tape or similar material prior to the emplacement of the test items;
- d) the temporary side marking shall be removed during the soak time. The boxes may, however, be marked with tape or similar during the actual testing. This is sometimes done to facilitate monitoring of the test;
- e) the accurate location of all test items and recognition pieces shall be recorded. The location of test items and recognition pieces shall, however, not be visible for the tested dog handler before and during search. There are several ways of measuring the exact location of the test pieces. Although all the test boxes should ideally be square, this may not always be the case. A measuring system, which allows some degree of inaccuracy in the box shape, is therefore preferable. One such system is proposed in Annex F; and
- f) the test field should have one or several clearly recognisable benchmarks. Distance and compass bearings should be taken from at least one corner marker for each box to a benchmark. This will ease the preparation and orientation of test field maps and facilitate the location of the corner markers, as this can prove difficult after the rainy or winter season.

### 8.4 Minimum distances

- a) the minimum distance between each box shall be 3 m but the preferred distance is 5 m or greater. This will allow the handler and the dog to move freely around the circumferences of the box with little risk of the dog running into neighbouring boxes during rewarding, or the handler stepping into an adjacent box by mistake; and
- b) the minimum distance between each mine in a test box shall be 3 m.

### 8.5 Burial depth

The test items shall be buried to varying depths, from surface laid (but camouflaged) to a maximum of 10 cm.

### 8.6 Recognition pieces

It is desirable to verify the exact location of the test items without disturbing the ground physically. Some of the test items may not contain metal or their metal content is limited. It may then be difficult to distinguish between the reading from a mine and potential metal fragments in the ground. Adding a piece of metal beneath the mine will artificially increase the metal content of the test items. A piece of metal is indeed theoretically detectable for dogs but this is not considered to have a significant impact on the results of the test. If recognition pieces are to be used, the following principles shall apply:

- a) the recognition piece should be made of cut reinforcement rods or similar material;
- b) each metal piece should not exceed 15 g;

- c) each metal piece shall be decontaminated according to the principles described under paragraph 4.5;
- d) the metal pieces should be placed centrally under the test items in the ground; and
- e) care must be taken not to contaminate the mine or metal piece during attachment.

If metal recognition pieces are used during the training of a dog, this may lead the dog to believe that it should detect metal pieces and not the target substance. Consequently it is necessary during the test to ensure that the dogs are detecting the test items and not the recognition pieces. If all the test items are equipped with recognition pieces, additional recognition pieces should be buried at other additional locations inside the box. If a dog also indicates these locations during the test, the test manager may terminate the test and prepare for new test in an area where recognition pieces have not been used.

### **8.7 Primary and secondary verification of a box**

Dogs are typically used for primary and secondary search due to the requirement for a minimum of two dogs in a search. The first search of an area is considered the primary search while the second search is the secondary search. IMAS 09.41 explains potential problems that may occur with the secondary search dog detecting the scent from the primary search dog. For the purpose of this test all dogs that are used as both secondary and primary search dogs should be tested as primary search dogs. Consequently each dog should be given boxes that have not previously been searched by another dog or have been subjected to a minimum soak time of 1 month.

If, however, a dog has been specifically trained for secondary search only, the test should be modified slightly. The dog should then be tested in an environment where the scent from the primary search dog is present. Artificial dog scent contamination should be established by taking the first search dog into the box prior to the test of the secondary search dog. The dog should be ordered to sit randomly 3-4 times at different locations in the box. It should not be allowed to search for mines in the box.

There may be circumstances where space and box limitations prevent the test manager from assigning only unused boxes to each of the dogs. Although not recommended, two dogs can be tested in the same boxes provided that the following conditions are applied:

- a) only the two dogs that work in pairs should be tested in the same boxes;
- b) each of the dogs should be tested as primary search dogs in at least one box but preferably two boxes. If a dog is to be tested in three boxes, the first dog should search as a primary search dog in box 1 and 2 and as a secondary search dog in box 3. The second search dog then searches as a primary search dog in box 3 and as a secondary search dog in box 1 and 2. The use of four boxes will allow the two dogs to undertake primary search in two boxes each, which is recommended; and
- c) the first search dog should be ordered to sit randomly 3-4 times at spots in the box after completion of the search and before the second search dog is allowed to search the box.

### **8.8 SOP regulations**

The dog equipment shall undertake the search according to procedures described in the demining organisation's SOPs. There may, however, be circumstances where search procedures must deviate from the SOP. Some demining organisations have established a system of withdrawing the dog upon indication of a mine. If manual inspection of the spot proves the presence of a mine or UXO, mine dogs are considered unsuitable for further work in that area. The dog may therefore be trained not to continue a search in a box after the discovery of the first mine. This habit may cause some confusion during testing when a dog is asked to continue the search in the same box. Experience has, however, shown that that this problem can easily be overcome with minor changes in the training procedures and that these changes will not be a delaying factor. It is impractical to use only one mine in each test box and thus the test authority shall have the right to ask for certain changes in the operational procedures to facilitate the accomplishment of the test. Such demands should be communicated to the demining organisation well in advance of the test to allow re-training of the dogs if necessary.

### **8.9 Wind direction**

The dog handler shall evaluate the wind direction and other environmental factors prior to the test and use own judgement when deciding the search direction. He/she may at any time during the search change the search direction if the wind direction changes.

### **8.10 Search break**

The dog handler may ask for a search break at any time during a search. A break may be required because of a provisional concentration lapse, or the dog or the handler needs to drink water. If the dog handler uses two dogs, he may let the first dog rest and start the search with the second dog in another box as assigned by the test manager. A dog equipage may not be able to complete the search of all the assigned boxes during one day. The search may then be continued the next day provided that the given time limitations specified in the test have not been exceeded.

### **8.11 Size requirement**

Each dog equipage shall search a minimum area of 300 m<sup>2</sup> (equal to three 10x10m boxes) during Operational accreditation test 1. The national mine action authorities may, however, decide that a larger area should be cleared. Between 300m<sup>2</sup> and 500m<sup>2</sup> is recommended as suitable for the testing of one dog equipage.

### **8.12 Required number of test items**

Each dog equipage shall be presented with a minimum of 5 test items during the test. It is, however, desirable to use a higher number of test items provided that the required minimum space between the test items (3 m) is maintained. The test items can be placed anywhere in the test boxes and not all of the test boxes need to contain test items.

### **8.13 Location of test items in the box**

Within each box, the location at which each test item is to be laid should be chosen completely randomly. Each box should contain a unique disbursement of test items, thus making the location of test items unpredictable for the dog handler.

### **8.14 Time restrictions**

The mine action authority should establish a policy on time restrictions during operational accreditation testing. This policy should reflect the normal time it would take for a dog equipage to search a similar area during live operations when the search is undertaken according with the demining organisation's own SOPs.

### **8.15 Termination of the test**

The dog handler may terminate the test if at any time he/she believes that the dog is suffering from a lapse in concentration or for some reason is not working properly. The dog handler can ask for a termination of the test for one dog, and still complete the test with a second dog if desired.

A termination of the test is not considered a failure to pass the test and the demining organisation may ask for a new test at any time. Frequent terminations by the same demining organisation, however, may place an intolerable burden on the test authority and on the test field. In such situations the test manager should inform the demining organisation, and if necessary apply sanctions. Such sanctions could be a delay before the demining organisation is allowed to test their dogs again.

## 8.16 Pass and fail criteria

The national mine action authority is responsible for establishing a policy on criteria for passing and failing operational accreditation tests. In this process, the following minimum requirements shall be applied:

- a) due to the limited number of test items used in the operational accreditation test, the dog should find 100% of all the test items during the test and have 2 or fewer false indications per box;
- b) if the dog handler believes strongly that a false indication was in fact a correct one, he/she shall have the right to complain to the test manager and ask for an inspection of the spot where the dog indicated. If the test manager upon inspecting the spot agrees that the false indication could possibly be caused by the presence of target substance (explosive, metal, plastic etc), he shall disregard the false indication;
- c) dogs have proven to be capable of detecting mine/UJO accurately (+/-30 cm) provided that the wind speed is limited and the soil conditions are favourable (limited clay content). The accuracy does, however, depend on the way a dog has been trained. Some dogs may not have been trained for accurate detection of mines. It is considered essential that dogs are capable of detecting mines accurately and thus dogs that are incapable of indicating accurately should be re-trained rather than applying changes to test requirements. Some national test and accreditation regimes have established an accuracy requirement of 50 cm or less from the indication to the location of the test item. This standard recommends the maximum tolerable distance between a test item and the indication given by the dog to be 1 m;
- d) if a dog scratches repeatedly at the ground when sniffing for test items, it should be considered to have failed the test;
- e) if the handler and his/her dog do not apply the search pattern and procedures as described in the demining organisation's SOP, the test manager may fail the dog and the handler; and
- f) if the search has not been completed within the given time frame, the test manager may fail the dog and the handler. This decision should, however, be taken based on an individual evaluation of each situation. It may be that the dog has suffered from a temporary concentration lapse with the result that it was taken out of the search for a period. If the dog equipment has followed a normal search speed during the effective search, the test manager may decide to issue an operational accreditation even if the dog equipment failed to clear the area within the given time frames.

## 9 Operational accreditation test 2 – Tripwire test

### 9.1 General

Dogs are sometimes trained to detect tripwires. Scent detection plays a major role in tripwire detection but there may also be yet unknown ways for a dog to recognise a tripwire. If dogs are to be used in areas where tripwires may exist, they should be tested against tripwires as part of the operational accreditation process and provided with a separate accreditation for this activity. Testing against tripwires creates some additional challenges compared to Operational accreditation test 1. The size and shape of a tripwire does not allow a direct adoption of all the principles described under Operational accreditation test 1. Although there is a need to undertake some modifications to the test, it is seen as desirable to keep the layout of Operational accreditation test 1 and 2 as similar as possible, which will enable easier preparation and management of the overall operational accreditation process.

Since it is assumed that primary detection method of a tripwire is scent detection, it is necessary to remove all pieces of metal and other shrapnel in the test boxes prior to the preparation of the test. This is best done by using a metal detector combined with a visual inspection.

## 9.2 Aim of the test

The aim is to determine a dog's capability to detect a small number of tripwires that are invisible to the dog and the handler and that are at a state similar to that encountered during live clearance operations in the area.

A tripwire test can be designed in many ways. The following basic principles should, however, apply:

- a) the tripwire test should be undertaken separately and not as part of Operational accreditation test 1. If mines and tripwires were mixed in the same test lanes or boxes, the test would run the risk of becoming ambiguous and unjust. Separate tests will also simplify the test procedures and make the test more manageable; and
- b) most tripwires are initially set up above ground level. During the years, however, many of the tripwires may have fallen to the ground and have become covered by soil, foliage or branches. Although tripwires may be found in different states, only camouflaged tripwires should be used for the purpose of the operational accreditation test. By camouflage is meant that the tripwire is covered with leaves, grass, soil or other natural material at the ground surface.

## 9.3 Layout of the test box

The use of a 10 x 10 m box system with crossing tripwires may prove practical to establish since similar box preparations will take place for Operational accreditation test 1. The proposed box system is divided into 2 x 2 m squares, which will ease the measuring. Tripwires are stretched diagonally in some of these squares. The dogs should be tested in one to three separate lanes in the test box (depending on the wind direction and the tripwire system in the box). Prior to the search the test manager should mark the start point of each search lane. The search lane should be 1 m wide and it should be located centrally in the 2 m squares (see figure 1).

## 9.4 Measures and marking

Whilst the size of the test box can easily be changed without any practical consequences when undertaking Operational accreditation test 1, this is not the case with Operational accreditation test 2. A reduction in the box size will require a total change in the layout of the box and the tripwires due to the minimum distances between each tripwire. It is therefore recommended that 10 x 10 m boxes are used consistently for Operational accreditation test 2. The following additional measuring rules shall apply when preparing a test site with Operational accreditation 2 test boxes:

- a) each box shall be recorded on a map with exact location references;
- b) all corners of a box shall be marked with tape or similar prior to the placement of test items;
- c) The location of the tripwires shall not be marked physically, to prevent a dog handler from deducing the location of tripwires;
- d) the temporary side marking shall be removed during the soak time. Two or all sides of the test boxes may, however, be marked with tape or similar during the actual testing. This is sometimes done to ease the monitoring of the test;
- e) the accurate location of all tripwires and recognition pieces shall be recorded. There are several ways of measuring the exact location of the tripwires. If the box initially is divided into 2 x 2 m squares (Figure 1) this will ease the measuring, provided that the box has been measured with a high degree of accuracy; and
- f) the test tripwires should always be placed diagonally in the 2 x 2 m squares and in such way that a maximum distance between the tripwires in two squares is established. Parallel placement of the tripwires in squares that are located near each other is considered the best.

Figure 1

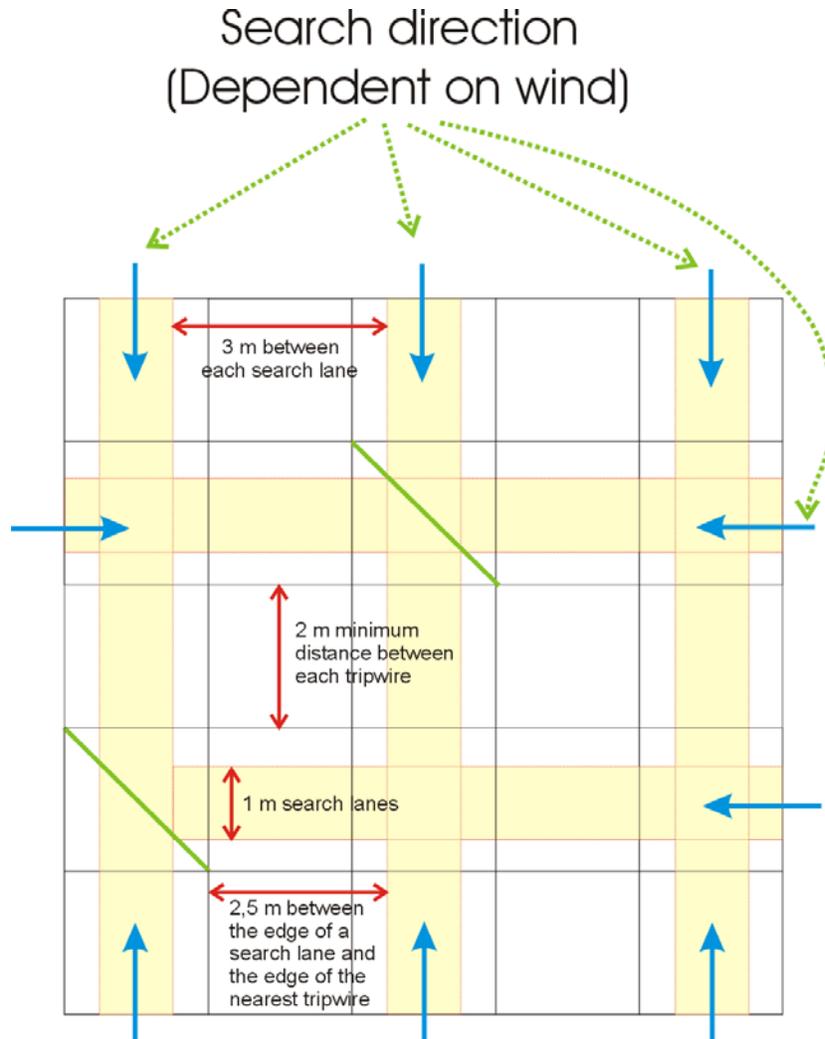


Figure 1 illustrates the layout of a tripwire test box with the required measurements. With southward wind, the search should be undertaken from the north, which allows the search in 3 lanes. With south-east- or north-westward wind, the search should not be undertaken in this box since the wind is parallel with the tripwire. If the wind comes from the north-east, the search should be undertaken from the west or south. A westward search will, however, only allow search in one lane. A southward search will allow 3 lanes to be searched.

### **9.5 Required distance between tripwires**

The distance between any point of one tripwire to the nearest point of another tripwire in the box should be minimum 3 m but preferably greater (Figure 1).

### **9.6 Size, number of search lanes and tripwires in a box**

Each box should have no more than 3 search lanes from any direction to ensure that adequate distance is established between each tripwire and the distance from the search lane to neighbouring tripwires. The number and location of the tripwires will determine how many search lanes can be established from each direction. No more than 3 tripwires should be laid placed out in each test box. Too many tripwires may cause disturbing scents and confuse the dog in its search (Figure 1).

A dog will be asked to search a maximum 3 lanes in a box and this will effectively give a maximum search area of 60 m<sup>2</sup> if no tripwire were encountered. If a total of 6 search lanes are cleared during a test, the maximum search area is 120m<sup>2</sup>. Many false indications may, however, result in an increased number of lanes to be searched. The test is nevertheless considerably smaller and quicker to undertake than Operational accreditation test 1.

The dog should be tested in a minimum of 6 lanes of which at least 4 should contain a crossing tripwire. The lanes may be selected from 2 or more boxes.

Annex D proposes the establishment of 32 different box systems where all the requirements to distance between tripwires, direction of tripwires and the number of tripwires in each box have been taken into account. A test site may, however, have many equally laid boxes.

### **9.7 Length and state of test items**

Each tripwire in a box should be at least 2,5 m long. If they are stretched diagonally in 2 x 2 m squares, they will be approximately 2,8 m long (Figure 1). The state of the trip wires should be similar to how they are found during operations. If old and rusty tripwires are expected, old and rusty tripwires should also be used during the test. The tripwires should be placed on the ground and camouflaged at least 1 month prior to the testing. A longer soak time is, however, desired.

### **9.8 Wind speed and direction**

Unlike Operational accreditation Test 1, the dog handler cannot search a box from any side he/she wants. The test manager shall therefore indicate the side of the box from which the dog handler shall start the search. Different search lanes may be assigned dependent on the wind direction. The tripwire test should not be undertaken if the wind speed is greater than 4 m/s.

### **9.9 Primary and secondary verification of a box**

The same principles shall apply as described under clause 6.7 for Operational accreditation test 1.

### **9.10 SOP Requirements**

The dog handler shall undertake the search according to principles and procedures described in the demining organisation's SOP, but possibly with some minor changes to facilitate the accomplishment of the test. If a demining organisation uses operational procedures that deviate significantly from those required to accomplish the test, the national mine action authority should consider modifying the test to accommodate the requirements of the demining organisation. If only minor operational deviations exist, however, the mine action authority may ask the demining organisation for certain procedural modifications to allow the test to be used as it is. Such requests should be communicated to the demining organisation well in advance of the test, to allow some re-training of the dogs if necessary.

### **9.11 Specific search procedures**

When a dog has detected a tripwire in a lane, it shall be taken out of the lane with no further search requirement in that lane.

If a dog has detected a tripwire falsely, the test manager should inform the dog handler that the indication was false. The dog should then be allowed to continue the search in the same lane. Alternatively the dog may be taken out of the lane to check an extra lane in another box. This is necessary because the dog may not have had the opportunity to detect the tripwire in the first lane since it was taken out of search before it reached the tripwire.

### **9.12 Handling of test items and accessories**

The same principles shall apply with regards to the handling of the tripwires and accessories during preparation of the test site as described in paragraph 4.5.

### **9.13 Time restrictions**

Due to the limited size of the overall area and the complexity of the test, the test scenario can hardly be compared to that of normal operational activity. Thus Operational accreditation test 2 should not set any specific time restrictions for the accomplishment of the test.

### **9.14 Termination of the test**

If the dog handler wishes to terminate the test, the same principle shall apply as described in paragraph 8.11.

### **9.15 Pass and fail criteria**

The national mine action authority is responsible for establishing a policy on criteria for passing and failing operational accreditation tests. For Operational accreditation test 2, it is recommended that the following minimum requirements shall be applied:

- a) due to the limited number of tripwires used in the operational accreditation test, the dog should find all tripwires during the test and have two or less wrong indications per three search lanes. The dog shall be tested in a minimum of six search lanes with a minimum of four crossing tripwires;
- b) if a dog handler believes strongly that a false indication in fact was a correct one, he/she shall have the right to complain to the test manager and ask for an inspection of the spot where the dog indicated, perhaps in the light of the near location of the tripwire, and the wind direction. If the test manager upon assessing the situation agrees that the false indication could possibly be caused by the presence of target scent at the false indication spot, he/she shall disregard the false indication;
- c) due to the extended length of the tripwire target, compared with mines, it may be more difficult to measure the distance from the indication spot to the tripwire. The distance should be measured from the indication spot to the nearest point of any tripwire. This standard recommends a maximum tolerable distance between the indication spot and the nearest point of a tripwire to be 1 m;
- d) if a dog scratches repeatedly at the ground during the search, it should be considered to have failed the test;
- e) if the dog equipment does not apply the correct search patterns and procedures as described in the demining organisations SOP, the test manager may fail the dog equipment; and

- f) if the search has not been completed within the given time, the test manager may fail the dog equipment. This decision should, however, be taken based on an individual evaluation of each situation. It may be that the dog has suffered from a contemporary concentration lapse with the result that it was taken out of the search by the handler for a period. If the dog equipment has proven to follow a normal search speed during the effective search, the test manager may decide to recommend or issue operational accreditation even if the dog equipment failed to clear the search lanes within given time frames.

## **10 Operational accreditation test 3 – landmine test, clearance behind machines**

### **10.1 General**

During clearance or quality control behind machines a dog's role is not considered as primary. The situation differs from regular mine dog clearance since the machine has disturbed the ground and the vegetation has been cut or removed. Thus the requirements to the handler and his/her dog are different.

A dog, which has proven to detect mines well in undisturbed ground, may not detect mines in processed ground if this has not been particularly targeted during the training. Thus if dogs are to be used in processed ground they should be tested in processed ground. The ideal test should be undertaken with test items or mines placed in the ground before the processing takes place. This is, however, not feasible since the exact location of the test items will no longer be known to the test regime after the processing of the soil. A compromise is therefore to artificially contaminate the ground prior to processing by emplacing mines or explosive in the ground, moisten the spots, removing the mines again, processing the ground and subsequently insert the test items at their original locations. The drawback is that there will be limited natural contamination of the surroundings from detonations and fragment scattering.

### **10.2 Aim of the test**

The aim of the test is to determine the dog's capability to detect target objects in machine-processed ground with a minimum of false indications. Typically machine-processed minefields will have some degree of scattered target scent contamination as a result of detonations and scattering of mine fragments. Operational accreditation test 3 will, however, not replicate realistic scenarios completely since it is currently not possible to design a manageable and unambiguous test with a realistic scent contamination from detonations and scatter/crushed mine fragments. The test does, however, provide a limited level of scattered target scent contamination to the surroundings.

### **10.3 Preparation of the test site**

Operational accreditation test 3 is similar to Operational accreditation test 1 in layout but the initial preparations prior to the testing differ significantly. The following principles should apply when preparing Operational accreditation test 3:

- a) dogs are typically used to verify areas behind one specific machine type. Consequently the equipment should be tested in an area previously processed by this type of machine;
- b) the test may be undertaken in the area where the machine is located. A not yet processed area should be identified. If this is not possible, an already processed area can be used, where no mines and/or UXO were encountered during the processing;
- c) there are two methods of applying targets to the soil. In the first, mines or fragments from the target objects should be placed in the ground. The same requirements shall apply in regards to distance between the test items as described in paragraph 6.4 under Operational accreditation test 1. The location of the test items shall be accurately recorded;

- d) in the second, the spots in which the test items will later be placed can be accurately recorded. Soil from these spots should be collected, moistened and mixed with the target items in separate glass containers. Equal mine types may be mixed with soil in one large glass container. The purpose of this process is to artificially contaminate the soil. If this alternative is preferred, the first method described at paragraph d (below) does not apply;
- e) the locations of the test items from the first method shall be moistened extensively. Other spots in the test area should also be moistened equally. The test items should remain in the ground for at least two hours after moistening, to ensure that the test items have contaminated the soil;
- f) after 2 hours or more, the test items should be removed and the machine shall process the area with the contaminated spots. If, in accordance with method two, the soil was mixed with target objects in glass containers, the contaminated soil should be put back to its original spots before the area is processed;
- g) after the processing, the test items should be buried in the contaminated spots. All test items should be shallow buried and not deeper than 2 cm below the soil surface. When burying the test items, the principles described in paragraph 5.4 shall be applied in regards to de-contamination of equipment and accessories;
- h) the test item spots and random spots in the test boxes shall be moistened again, to ensure that vapour from the test items migrates to the surface. The moistening should be moderate and applied in such way that the moistened spots are not easily recognisable by the dog handler after drying up;
- i) a soak time of 2 hours or more shall be applied; and
- j) after the soak time the test can be undertaken. The search shall be undertaken as described in the demining organisation's SOP and according to procedures provided by the national mine action authority.

#### **10.4 Measuring and marking**

The test site differs from that of Operational accreditation test 1 and 2 in that the site and the test boxes need not be permanently laid and that they cannot be physically marked prior to the test due to the ground processing. It is, however, essential to determine the exact location of planned test target spots before the area is processed mechanically. The challenge is to establish an accurate marking system. One way of measuring accurately is to establish a large square box with corner markings outside area to be processed. A cross-measuring system with tapeline can then be used following the same principles as described in Annex F. Visual marking of test items shall be avoided, to prevent the dog handler from deducing the location of these.

#### **10.5 Minimum distances**

The minimum distances between each box shall be 3 m but the preferred distance is 5 m or greater. This will allow the handler and the dog to move freely around the circumferences of the box with little risk of the dog running into neighbouring boxes during rewarding.

#### **10.6 Burial depth**

All test items shall be shallow buried, from 0 to 2 cm below surface level. If the test items are buried deeper, the test boxes will need to undergo a longer soak time prior to the test.

#### **10.7 Primary/secondary verification, SOP, wind and search break regulations**

The same principles shall be applied as described in clauses 6.7, 6.8, 6.9 and 6.10 under Operational accreditation test 1.

## **10.8 Requirement to size and number of test items**

The same principles shall apply as described in clauses 6.11 and 6.12 under Operational accreditation test 1.

## **10.9 Time restrictions and termination of the test**

The same principles shall be applied as described in paragraphs 6.13 and 6.14 under Operational accreditation test 1.

## **10.10 Pass and fail criteria**

The national mine action authority is responsible for establishing a policy on criteria for passing and failing to pass operational accreditation tests. In this process, the following minimum requirements shall be applied:

- a) due to the limited number of test items used in the operational accreditation test, the dog should find 100% of all the test items during the test and have four or less wrong indications per box;
- b) if the dog handler believes strongly that a false indication in fact was a correct one, he/she shall have the right to complain to the test manager and ask for an inspection of the spot where the dog indicated. If the test manager upon inspecting the spot agrees that the false indication could possibly be caused by the presence of target substance (explosive, metal, plastic etc), he shall disregard the false indication;
- c) the maximum tolerable distance between a test item and the indication given by the dog should be less than 1 m;
- d) if the handler and his/her dog do not apply the search pattern and procedures as described in the demining organisation's SOPs, the test manager may fail the dog and the handler;
- e) if a dog scratches repeatedly at the ground when sniffing for test items, it should be considered to have failed the test; and
- f) if the search has not been completed within the given time frame, the test manager may fail the complete equipage. This decision should, however, be taken based on an individual evaluation of each situation. It may be that the dog has suffered from a contemporary concentration lapse with the result that it was taken out of the search for a period. If the equipage has followed a normal search speed during the effective search, the test manager may decide to issue an operational accreditation even if the equipage failed to clear the area within the given time frame.

## **11 Sanctions**

### **11.1 General**

The national mine action authority shall establish a policy of pass/failure criteria including sanctions to be applied against the equipage and the demining organisation if one or several of its equipages fail to pass the test. It is assumed that when a demining organisation applies for testing, it has already undertaken internal quality control on the performance of its equipages with positive results. Repeated failures to pass the test by some equipages, or the failure by a large percentage of the equipages of weak quality management within the demining organisation. It is recommended that if 30% or more of the equipages tested fail to pass the initial test, the national mine action authority should consider withdrawing the overall demining accreditation for given period. If more than 50% of the demining organisation's dog equipages fail to pass the test, the national mine action authority should consider withdrawing the demining accreditation for longer periods.

The following recommendations should be taken into consideration when establishing a policy for appropriate sanctions to be applied against individual equipages and organisations:

- a) if an equipage fails to pass the operational accreditation test, it should not receive operational accreditation. The dog handler may, however, immediately obtain operational accreditation with another dog;
- b) the demining organisation may apply for a re-testing of the equipage. There should, however, be a minimum time delay between the first and the second test, to allow the equipage to undergo re-training. It will also be a reward for the equipages that manage to pass the test during first attempt. It is recommended that an equipage failing to pass a test the first time should be denied the right to be re-tested for a minimum period of 1 week;
- c) if the equipage fails to pass the second test, the demining organisation may apply for a second re-test. An increased time delay between the second and third test should, however, be applied. It is assumed that an equipage failing to pass a test twice will need a longer period of re-training. It is recommended that an equipage failing to pass a test two times should be denied the right to be re-tested for a minimum period of 1 month; and
- d) if an equipage fails to pass the test three times, it can not be expected to detect mines consistently and thus it should not be allowed to apply for re-testing for a significant period of time. It is recommended that a dog equipage that fails to pass a test three times should be denied the right to be re-tested for a minimum period of 1 year.

## **12 Management of records**

### **12.1 Record preparations**

The test field shall be thoroughly recorded and mapped. The records shall include but are not limited to the following elements:

- a) a map of the test site, which clearly shows the exact boundaries of the test field and all of the test boxes as well as relevant supplementary information about the test field, such as prevailing wind direction, fencing, entrance, safe lanes, marking system etc;
- b) a map with supplementary records of each test box. The map and the supplementary records shall contain the exact location of the test box, the test items, the depth, type and state of each test item, any recognition pieces located under the test items and elsewhere in the boxes and permanent box markers. The map and the records should also include other relevant information about the test box, such as the names of the people responsible for the preparation of the box, location of spots where soil has been moistened and the date when the box was prepared; and
- c) it may not be necessary to prepare a map with supplementary information for each of the boxes separately. Several boxes with supplementary information may be incorporated into one map or record sheet. An example of a box map incorporating 4 different boxes is shown in Annex E; and
- d) after a test, false indications and, if possible, environmental data should also be recorded. This information may prove useful when considering that a test box may be used for many years.

### **12.2 Confidentiality requirements**

The credibility of the test is dependent on a restricted access to the records, as well as confidentiality about the location and number of test items in the test boxes. Thus only a few trusted people should be involved in the preparation of the test boxes. None of them should be directly or indirectly affiliated to any of the demining organisations. Two examples of the records and the maps should be prepared, preferably by the test manager alone. Both examples should be stored separately at secure locations notified by the national mine action authority. The test manager should be the only person with access to the copy of the records. The original records should be stored at a secure location in such way that no-one can access them permission from the test manager, or without prior written confirmation from the mine action authority.

## **13 Responsibilities and obligations**

### **13.1 National mine action authority**

The national mine action authority shall be responsible for defining national standards for dog detection operations, and for identifying and preparing and using suitable test sites according to and principles described in this standard. The national mine action authority shall appoint a well-qualified test manager, who should be given the overall responsibility for the planning and preparation of the test site and the management of the test field and the tests.

The mine action authority shall ensure that a policy is established for the preparation of maps and records of the test field and that these records are stored in such way that only authorised people can have access to them.

The national mine action authority shall ensure that the test field is secured in such way that undesired intruders are prevented from entering the area, as this may seriously discredit the test.

The national mine action authority shall be responsible for the development of an impartial and just policy on operational accreditation testing of equipages including regulations for establishing the criteria for pass and failure, length of an operational accreditation and failure sanctions to be applied against an equipage and demining organisation that owns it. This policy shall also include regulations on how a demining organisation can appeal results of operational accreditation tests.

### **13.2 Demining organisation**

The demining organisation shall ensure that it trains its equipages to standards required by the national mine action authority. The organisation shall also ensure that none of its staff or affiliates contaminate the test site before and during testing, by such acts as the spillage of petroleum products, or the unauthorised use of the test boxes before and during testing.

The demining organisation shall obey regulations provided by the national mine action authority and the test manager about general access restrictions to the test field during periods when the demining organisation is not being tested.

In the absence of a national demining authority, or when such an authority is in the process of formation, the demining authority should where possible test its own equipages in accordance with this and other standards. It should also make every effort to assist the national mine action authority in the creation and operation of test facilities, and the establishment of a high quality dog mine and UXO detection programme.

## **Annex A (Normative) References**

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid ISO or EN:

- a) IMAS 04.10; Glossary of terms of definitions; and
- b) IMAS 09.41; Operational procedures for mine detection dogs.

The latest version/edition of these references should be used. UNMAS hold copies of all references used in this standard. A register of the latest version/edition of the IMAS standards and references is maintained by UNMAS, and can be read on the IMAS website: ([www.mineactionstandards.org](http://www.mineactionstandards.org)). National mine action authorities, employers and other interested bodies and organisations should obtain copies before commencing mine action programmes.

## Annex B (Informative) Terms and definitions

### **B.1.1**

#### **box**

A squared area that is developed for the purpose of being searched by mine dogs during the operational accreditation test. A box typically measures 10 x 10 m but other sizes may be preferred

### **B.1.2**

#### **scent**

A distinctive, often agreeable odor.

### **B.1.3**

#### **decontamination**

A process of removing undesired contamination from test items, tools and accessories that are used when preparing a test field

### **B.1.4**

#### **environmental factors**

Factors related to the environment and that influence the transportation of scent from the mine, the detection of the target scent or the capability of people and dogs to work safely and effectively (i.e. wind, temperature, humidity, rain, altitude, sun and vegetation)

### **B.1.5**

#### **test site**

The site at which a series of test boxes or lanes are prepared for the purpose of operational accreditation testing

### **B.1.6**

#### **recognition piece**

A metal piece, which is placed under test items to make them recognisable with a metal detector

### **B.1.7**

#### **undesirable scent**

Factors related to the environment and that influence the transportation of scent from the mine, the detection of the target scent or the capability of people and dogs to work safely and effectively. Such factors can be, wind strength, temperature, humidity, rain, altitude, sun and vegetation

### **B.1.8**

#### **TNT (2, 4, 6 Trinitrotoluene)**

One of the most widely used military high explosives. TNT is very stable, non-hygroscopic and relatively insensitive to impact, friction, shock and electrostatic energy. TNT is the most widespread type of explosive used in mines and munitions.

### **B.1.9**

#### **DNT (Dinitrotolulene)**

An impurity product of TNT. As the vapour pressure of DNT is much higher than that of TNT itself, it may prove easier to characterize a mine by detecting the vapour from DNT rather than TNT.

### **B.1.10**

#### **RDX (1, 3, 5-triazacyclohexane)**

RDX is another military explosive which is used extensively as a booster charge in many munitions formulations, especially in artillery shells. RDX is relatively insensitive; it has a high chemical stability, although lower than that of TNT. RDX is never handled pure and dry because

of the danger of accidental explosion. It is used as a component in explosive mixtures, especially plastic explosives.

## **Annex C**

### **(Informative)**

## **Bibliography**

The following documents when referred to in the text of this standard, form part of the provisions of this standard.

- a) DERA (1996); How does a dog smell? – 'A brief review of canine olfaction' (Helen Almey and Stephen Nicklin)
- b) BH MAC, Bosnia (1999); Standards for mine dog detection
- c) UNMIC, Kosovo (1999); Standards for mine dog detection
- d) NPA Mozambique (2000); Procedures for the testing of min detection dogs
- e) Sandia National Laboratories (1998); Simulation of the environmental fate and transport of chemical signatures from buried landmines (James M. Phelan and Stephen W. Webb)
- f) Sandia National Laboratories (1998); Prediction of TNT signature from buried landmines (S.W. Webb, J. Phelan, K. Pruess and S.A. Finsterle)
- g) Sandia National Laboratories (2000); Explosive fate and transport, FARPA Dog's Nose Program – 'Progress report' (J. Phelan, J.L. Barnet and P.J. Rodacy)
- h) Sandia National Laboratories (2000); Post-Blast Residue from Antipersonnel Landmines (J.M. Phelan, J.L. Barnett and P.J. Rodacy)

## Annex D (Informative) Tripwire test

### Example of a box system for tripwire licence testing

(32 box system)

<del>1</del>	2	3	4	5	<del>1</del>	2	3	4	<del>5</del>	<del>1</del>	2	<del>3</del>	4	5	<del>1</del>	2	<del>3</del>	4	5
6	7	8	9	10	6	7	8	9	10	6	7	8	9	10	6	7	8	9	10
11	12	13	14	<del>15</del>	<del>11</del>	12	13	14	15	11	12	13	14	<del>15</del>	<del>11</del>	12	13	14	15
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21	22	<del>23</del>	24	25	21	22	<del>23</del>	24	25	<del>21</del>	22	23	24	25	21	22	23	24	<del>25</del>
Box 1					Box 2					Box 3					Box 4				
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E = 2 x T		S = 2 x T			E = 2 x T		S = 2 x T			E = 2 x T		S = 2 x T			E = 2 x T		S = 2 x T		
<del>1</del>	2	3	4	5	<del>1</del>	2	3	4	<del>5</del>	<del>1</del>	2	<del>3</del>	4	5	<del>1</del>	2	<del>3</del>	4	5
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11	12	<del>13</del>	14	15	11	12	<del>13</del>	14	15	11	12	13	14	15	11	12	13	14	15
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Box 5					Box 6					Box 7					Box 8				
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E = 2 x T		S = 2 x T			E = 2 x T		S = 2 x T			E = 2 x T		S = 2 x T			E = 1 x T		S = 2 x T		
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Box 9					Box 10					Box 11					Box 12				
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E = 2 x T		S = 1 x T 1 x B			E = 1 x T		S = 2 x T 1 x B			E = 2 x T		S = 2 x T 1 x B			E = 1 x T		S = 2 x T 1 x B		
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E = 1 x T 1 x B		S = 1 x T			E = 2 x T 1 x B		S = 1 x T			E = 2 x T 1 x B		S = 2 x T			E = 2 x T 1 x B		S = 1 x T		

W = search from West, E = search from East, N = search from North, S = search from South  
T = Tripwires in searchable lanes, B = Blank searchable lanes. Each small square measures 2 x 2 m

1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6	7	8	9	10	6	7	8	9	10	6	7	8	9	10	6	7	8	9	10
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Box 17					Box 18					Box 19					Box 20				
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E = 1 x T		S = 1 x T 1 x B			E = 2 x T		S = 1 x T 1 x B			E = 1 x T		S = 2 x T 1 x B			E = 2 x T		S = 2 x T 1 x B		

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Box 21					Box 22					Box 23					Box 24				
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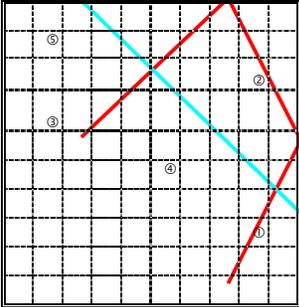
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E = 2 x T 1 x B		S = 2 x T			E = 2 x T		S = 2 x T 1 x B			E = 3 x T		S = 2 x B			E = 2 x B		S = 3 x T		

W = search from West, E = search from East, N = search from North, S = search from South  
T = Tripwires in searchable lanes, B = Blank searchable lanes. Each small square measures 2 x 2 m

## Annex E

### Example of a box recording sheet with 4 boxes

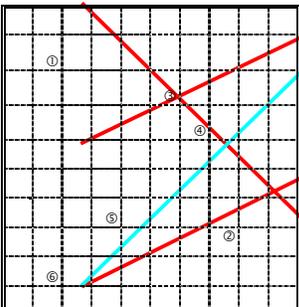
C D E



A H G

BOX NUMBER:			PREPARATION DATE:		
BOX PREPARED BY:					
TEST ITEM LOCATION			NUMBER OF RECOGNITION PIECES:		
	REF POINT	LENGTH	ITEM TYPE	BURIAL DEPTH	BURIAL CONDITIONS
①	DG	8,0 M	R2M2	3 CM	WITH RECOGN. PIECE
②	BE	2,0 M	T-72A	2 CM	WITH RECOGN. PIECE
③	HE	7,8 M	PMN-2	5 CM	NO RECOGN. PIECE
④	CG	7,0 M	REC. PIECE	5 CM	-
⑤	CG	1,8 M	REC. PIECE	5 CM	-
⑥					
⑦					
NOTES:					

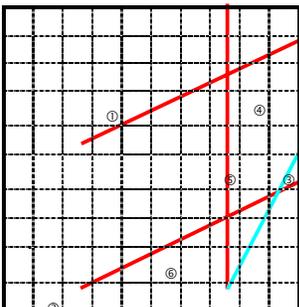
C D E



A H G

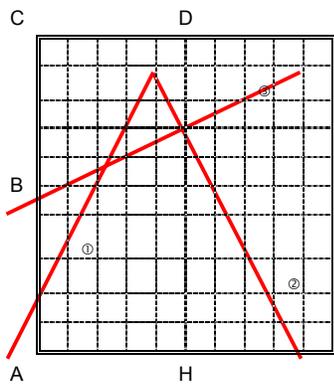
BOX NUMBER:			PREPARATION DATE:		
BOX PREPARED BY:					
TEST ITEM LOCATION			NUMBER OF RECOGNITION PIECES:		
	REF POINT	LENGTH	ITEM TYPE	BURIAL DEPTH	BURIAL CONDITIONS
①	CG	2,0 M	PMN	5 CM	NO RECOGN. PIECE
②	CG	9,8 M	PMN	5 CM	NO RECOGN. PIECE
③	BE	6,2 M	R2M2	3 CM	WITH RECOGN. PIECE
④	AE	8,2 M	REC. PIECE	5 CM	
⑤	AE	5,0 M	REC. PIECE	5 CM	
⑥	AE	2,3 M	REC. PIECE	5 CM	
⑦					
NOTES:					

C D E



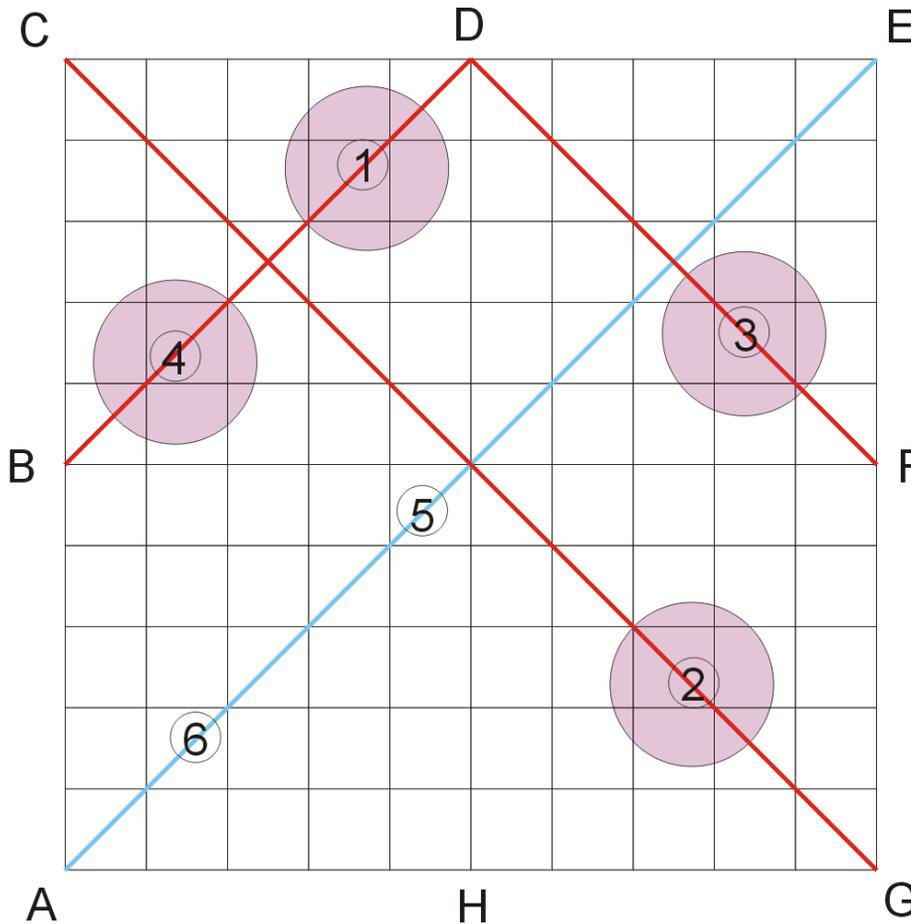
A H G

BOX NUMBER:			PREPARATION DATE:		
BOX PREPARED BY:					
TEST ITEM LOCATION			NUMBER OF RECOGNITION PIECES:		
	REF POINT	LENGTH	ITEM TYPE	BURIAL DEPTH	BURIAL CONDITIONS
①	BE	4,0 M	PPM-2	6 CM	NO RECOGN. PIECE
②	AF	1,5 M	T-72A	5 CM	WITH RECOGN. PIECE
③	AF	11,2 M	GYATA-64	4 CM	NO RECOGN. PIECE
④	HE	7,5 M	REC. PIECE	5 CM	
⑤	HE	5,2 M	REC. PIECE	5 CM	
⑥	HE	1,8 M	REC. PIECE	5 CM	
⑦					
NOTES:					



BOX NUMBER:			PREPARATION DATE:		
BOX PREPARED BY:					
TEST ITEM LOCATION			NUMBER OF RECOGNITION PIECES:		
	REF POINT	LENGTH	ITEM TYPE	BURIAL DEPTH	BURIAL CONDITIONS
①	AD	3,8 M	PMN	2 CM	NO RECOGN. PIECE
②	BE	8,9 M	T-72A	2 CM	WITH RECOGN. PIECE
③	DG	8,5 M	PMN-2	4 CM	NO RECOGN. PIECE
④					
⑤					
⑥					
⑦					
NOTES:					

### Annex F Example of a measuring system for Operational accreditation test 1



BOX NUMBER:			PREPARATION DATE:		
BOX PREPARED BY:					
TEST ITEM LOCATION			NUMBER OF RECOGNITION PIECES:		
	REF POINT	LENGTH	ITEM TYPE	BURIAL DEPTH	BURIAL CONDITIONS
①	BD	5,0 M	PMN	2 CM	NO RECOGN. PIECE
②	CG	10,8 M	T-72A	2 CM	WITH RECOGN. PIECE
③	DF	5,0 M	PMN-2	4 CM	NO RECOGN. PIECE

④	BD	1,8 M	R2M2	2 CM	WITH RECOGNITION PIECE
⑤	AE	6,2 M	RECOGN- PIECE	5 CM	
⑥	AE	2,1 M	RECOGN- PIECE	5 CM	
NOTES:					

**Note:** A measuring tape with pre-marked lengths is recommended. The measuring string should be made of an un-stretchable and static material to prevent inaccurate measures. Maximum required length of the measuring string is 14,15 m. The medium points (B, D, F and H) are found half way between the corner sticks. The system will remain accurate even with inaccurately measured test boxes

**Note:** The red lines indicate lines used to measure test items. The blue line indicates the line used to measured recognition pieces. The grey are indicates tolerable distance from the test item to the indication point by the dog