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## Safety & occupational health - Personal protective equipment

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## Foreword

International standards for humanitarian mine clearance programmes were first proposed by working groups at an international technical conference in Denmark, in July 1996. 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 and the *International Standards for Humanitarian Mine Clearance Operations* were developed. A first edition was issued by the UN Mine Action Service (UNMAS) in March 1997.

The scope of these original standards has since been expanded to include the other components of mine action and to reflect changes to operational procedures, practices and norms. The standards were re-developed and renamed as *International Mine Action Standards* (IMAS).

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, therefore, is the office within the United Nations responsible for the development and maintenance of IMAS. IMAS are produced with the assistance of the Geneva International Centre for Humanitarian Demining.

The work of preparing, reviewing and revising IMAS 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 <http://www.mineactionstandards.org/>. Individual IMAS are reviewed at least every three years to reflect developing mine action norms and practices and to incorporate changes to international regulations and requirements.

## Introduction

The needs to reduce risk and to provide a safe working environment are fundamental principles of mine action management (see IMAS 10.10). Risk reduction involves a combination of safe working practices and operating procedures, effective supervision and control, appropriate education and training, equipment of inherently safe design, and the provision of effective Personal Protective Equipment (PPE) and clothing.

As a minimum, all employees involved in demining should be provided with comfortable and serviceable clothing and footwear appropriate to the task and local conditions.

PPE should be regarded as a 'last resort' to protect against the effects of mine and Unexploded Ordnance (UXO) hazards. It should be the final protective measure after all planning, training and procedural efforts to reduce risk have been taken. There are a number of reasons for this approach. First, PPE protects only the person wearing it, whereas measures controlling the risk at source can protect everyone at the demining workplace. Second, theoretical maximum levels of protection are seldom achieved with PPE in practice, and the actual level of protection is difficult to assess; effective protection is only achieved by suitable PPE, correctly fitted, and properly maintained and used. And third, PPE may restrict the wearer to some extent by limiting mobility or visibility, or by requiring additional weight to be carried.

The risk to deminers comes principally from Anti Personnel (AP) blast mines, AP fragmentation mines, Anti Tank (AT) mines and UXO. AP blast mines are the most abundant mines encountered in humanitarian demining and cause the greatest number of injuries. At close quarters, AP fragmentation mines and AT mines overmatch PPE currently available. Due to the area effect of such mines they also have the potential to cause 'secondary victims'. In general, when UXO munitions are encountered in humanitarian demining, they have already malfunctioned. They are usually high in metal content, on or near the surface, and constitute less of a hazard than mines. The varied nature of UXO means that the hazard is best dealt with procedurally rather than relying on PPE designed primarily for humanitarian demining.

## **Safety & occupational health - Personal protective equipment**

### **1. Scope**

This IMAS provides specifications and guidance to National Mine Action Authorities (NMAA) and demining organisations on the minimum requirements of Personal Protective Equipment (PPE), including protective clothing, for use in mine action.

It does not provide guidance on the design characteristics of PPE garments, or on test and evaluation procedures. General requirements for PPE are included in ISO/DIS14876-1: 1999(E).

### **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, definitions and abbreviations**

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

In the IMAS series of standards, the words 'shall', 'should' and 'may' 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 that are to be applied in order to conform to the standard;
- b) 'should' is used to indicate the preferred requirements, methods or specifications; and
- c) 'may' is used to indicate a possible method or course of action.

The term 'National Mine Action Authority (NMAA)' 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 most cases the national Mine Action Centre (MAC) or its equivalent will act as, or on behalf of, the 'NMAA'.

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

The term 'employee' refers to people who work for an employer. Employees may be involved in management, operational or support activities.

The term 'Personal Protective Equipment (PPE)' refers to all equipment and clothing designed to provide protection, which is intended to be worn or held by a employee at work and which protects him/her against one or more risks to his/her safety or health.

## **4. Personal Protective Equipment (PPE) requirements**

### **4.1. General**

The levels of PPE provided for use in hazardous areas shall be based on a number of factors including: the local risk(s), operational procedures and practices, and local environmental conditions. (Guidelines on the process of risk assessment and risk reduction are given in ISO Guide 51.)

Training shall be provided on the proper use, maintenance and storage of the PPE in use within the demining organisation. Facilities should be provided for its proper storage, carriage, cleaning and maintenance. Equipment shall be examined on a regular basis to ensure that it is suitable for use.

### **4.2. Blast protection**

PPE should be capable of protecting against the blast effects of 240 gm of TNT at stand-off distances, for each item of PPE, appropriate to the activity performed in accordance with SOPs. Equipment provided to reduce the risk from such a hazard shall include, as a minimum:

- a) frontal protection, appropriate to the activity, capable of protecting against the blast effects of 240 gm of TNT at 30 cm from the closest part of the body; and
- b) eye protection capable of retaining integrity against the blast effects of 240 gm of TNT at 60 cm, providing full frontal coverage of face and throat as part of the specified frontal protection ensemble.

Note: A Technical Note for Mine Action (TNMA) will be developed to lay down the Test and Evaluation (T&E) protocols to be followed during the test regime of PPE.

Note: Although this standard lays down distances at which the PPE must be effective it must be emphasised that this does NOT imply to deminers that they will be safe at such distances. Distance itself is an excellent attenuator of blast effects and the further away from an undesired explosive event the better!

The frontal protection ensemble provided to employees, whether required to kneel, sit or squat shall be designed to cover the eyes, throat (frontal neck), chest, abdomen and genitals. Where SOPs permit employees to work in the kneeling or squatting position, the frontal protection ensemble should cover the front of the thighs.

Note: There should be no gaps between separate items of PPE. This specifically concerns visors that project below the face and overlap the upper body PPE but still leave a vertical gap where blast debris can enter and cause damage to the face and eyes.

Hand tools should be constructed in such a way that their separation or fragmentation resulting from the detonation of an AP blast-mine incident is reduced to a minimum. They should be used with appropriate hand protection such as a hand-shield or gloves. Hand tools should be designed to be used at a low angle to the ground and should provide adequate stand-off from an anticipated point of detonation.

During the risk reduction process, demining organisations may consider providing blast proof boots for the protection of feet and lower limbs, where there is a significant risk that cannot be reduced by SOPs alone, provided that the blast boots being considered are proven to be effective in reducing that risk.

Note: The effectiveness and operational benefits of mine boots is still a contentious issue within the mine clearance community, and there are wide ranging views and opinions on their use. Nevertheless mine boots do exist, and therefore demining organizations may wish to evaluate their suitability for their particular operational scenario during the planning phase of a clearance operation. To date, only one independent trial (US State Department sponsored) has been conducted, which identified that the cost of provision and replacement is high, whilst the benefits are unproven. There is currently a danger that they offer 'false security'. The situation will be monitored and reviewed during the ongoing review process for IMAS, and any updates will be distributed through TNMA.

#### **4.3. Fragmentation protection**

Fragmentation mines currently overmatch all but specialist EOD ensembles, which emphasises the initial need to minimise risk procedurally via appropriate SOPs. Protection should nevertheless be provided against non-designed fragmentation from other mines, (such as that from plastic-bodied blast mines), and to potential secondary victims where such a threat cannot be removed procedurally. PPE provided to reduce the risk from such a hazard should include, as a minimum:

- a) ballistic body armour with a STANAG 2920  $V_{50}$  rating (dry) of 450m/s for 1.102g fragments. (Such tests for ballistic protection do not realistically replicate mine effects, but will continue to be used until an accepted alternative is developed as an international standard); and
- b) a full face visor as described in clause 4.2(b) above. However, if an analysis of the threat using the criteria set out in these guidelines and IMAS 10.10 indicates that a full face visor would provide inadequate protection across a full 360° threat spectrum, then a helmet should be worn. The helmet should have a ballistic rating similar to the ballistic body armour selected by the demining organization.

Note: Eye protection should be no less than that offered by 5mm of untreated polycarbonate. It should provide full frontal coverage of face and throat as part of the specified frontal protection ensemble. (If the body protection is fitted with an 'overlap', then the visor should be capable of fitting behind this 'overlap' when in use).

Note: A TNMA will be developed to lay down the T&E protocols to be followed during the test regime of PPE.

#### **4.4. Explosive Ordnance Disposal (EOD) clearance sites**

When engaged in the clearance of UXO or other hazardous ordnance, an enhanced level of protection may be necessary. This should be defined in Standard Operating Procedures (SOPs), and may include conventional body armour or other specialist PPE ensembles.

### **5. Responsibilities**

#### **5.1. General requirements**

NMAA and employers (governments, NGOs and commercial entities) shall establish and maintain policy, standards and guidelines on the minimum requirements of PPE for use in national mine action programmes. This should distinguish between the obligations and responsibilities at the national level, and those of the employer and employee as set out below.

#### **5.2. National responsibilities**

The NMAA shall:

- a) establish and maintain national standards to be applied for PPE;
- b) monitor the application of standards; and

- c) undertake periodic reviews of the national standards for PPE and the technologies available to reduce risks.

### **5.3. Employers' responsibilities**

Demining organisations shall:

- a) apply the documented NMAA standards for PPE;
- b) meet, or exceed, the minimum requirements for the provision of PPE. In this regard, provide PPE to employees which is serviceable and appropriate to the risk, local operational procedures and environmental conditions;
- c) provide training and supervision in the correct use and maintenance of PPE;
- d) establish and maintain SOPs that specify care and maintenance requirements;
- e) provide suitable facilities for the storage, carriage, cleaning and maintenance of PPE; and
- f) establish and maintain documented SOPs to undertake periodic reviews of PPE.

In the absence of a NMAA or authorities, the demining organisation should assume additional responsibilities. These include, but are not restricted to:

- a) issue, maintain and update their own standards to be applied for PPE;
- b) cooperate with other employers in the same country to ensure consistency of standards of use and maintenance of PPE; and
- c) assist the host nation, during the establishment of a NMAA, in framing national standards for PPE.

### **5.4. Employees' obligations**

Employees of demining organisations shall:

- a) use PPE in accordance with the requirements specified by their employers and the manufacturer's specification for the PPE, including the use of facilities provided for storage and carriage of PPE;
- b) clean and maintain the PPE in accordance with the demining organisation's SOPs and/or the manufacturer's specifications or guidelines; and
- c) report to the employer, problems with the equipment or suggested improvements to SOP, which may reduce the requirement for PPE, or improvements in the design or application of PPE.

## **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) ISO Guide 51 Safety aspects – Guidelines for their inclusion in standards;
- b) ISO/DIS 14876-1:1999 (E) Protective clothing – Body armour – Part 1: General requirements;
- c) IMAS 10.10 S&OH - General requirements; and
- d) STANAG 2920.

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

## **Annex B** (Informative) **Terms, definitions and abbreviations**

**B.1.**  
**accident**

an undesired event which results in harm.

Note: Modified from definition in OHSAS 18001:1999.

**B.2.**  
**demining accident**

an accident at a demining workplace involving a mine or UXO hazard (c.f. mine accident).

**B.3.**  
**demining incident**

an incident at a demining workplace involving a mine or UXO hazard (c.f. mine incident).

**B.4.**  
**demining worker**

all employees who work at a demining worksite.

**B.5.**  
**demining worksite**

any workplace where demining activities are undertaken.

Note: Demining worksites includes workplaces where survey, clearance and EOD activities are undertaken including centralised disposal sites used for the destruction of mines and UXO identified and removed during clearance operations.

Note: Survey, in relation to a demining worksite includes general survey undertaken to identify mine and UXO hazards and hazardous areas.

**B.6.**  
**ensemble**

the group of protective clothing designed to be worn as a protective measure.

**B.7.**  
**incident**

an event that gives rise to an accident or has the potential to lead to an accident.

**B.8.**  
**mine accident**

an accident away from the demining workplace involving a mine or UXO hazard (c.f. demining accident).

**B.9.**  
**mine incident**

an incident away from the demining workplace involving a mine or UXO hazard (c.f. demining incident).

**B.10.**  
**Personal Protective Equipment (PPE)**

all equipment and clothing designed to provide protection, which is intended to be worn or held by an employee at work and which protects him/her against one or more risks to his/her safety or health.

**B.11.**

**protective measure**

means used to reduce risk. [ISO Guide 51:1999(E)]

**B.12.**

**risk**

combination of the probability of occurrence of harm and the severity of that harm. [ISO Guide 51:1999(E)]

**B.13.**

**workplace**

all places where workers need to be or to go by reason of their work and which are under the direct or indirect control of the employer. [ILO R164]

