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Principles and procedures for open burning and open detonation operations

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Foreword

International standards for humanitarian demining programmes were first proposed by working groups at an international technical conference in Denmark, in July 1996. Criteria were prescribed for all aspects of demining, 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) with the first edition produced in October 2001.

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 destruction of explosive ordnance (EO), and in particular Anti-Personnel Mine (APM) stockpiles, can be logistically complex due to the quantities involved. The physical destruction techniques available range from the relatively simple Open Burning and Open Detonation (OBOD) techniques to highly sophisticated industrial processes. In many cases, OBOD will be the only practical, viable or affordable technique available. Therefore, this IMAS seeks to establish the principles and procedures for the safe conduct of large-scale destruction operations using OBOD techniques.

This IMAS replicates the contents of Annex D to IATG 10.10 Destruction and demilitarization and is included within the IMAS series for ease of reference.

Principles and procedures for open burning and open detonation operations

1. Scope

The purpose of this IMAS is to explain the principles and procedures for the conduct of large-scale Open Burning and Open Detonation (OBOD) operations. It includes recommendations for the layout of disposal sites and the contents of Standard Operating Procedures (SOPs) in order to ensure a safe system of work.

This IMAS provides guidance for the destruction of stockpiles of explosive ordnance (EO) including Anti-Personnel Mines (APM) by OBOD, it does not cover the destruction of nuclear, biological or chemical weapons, and the destruction of field stocks of APM that have arisen as a direct result of demining operations. However, the principles and procedures contained in this IMAS are equally as applicable for field destruction operations and can be adapted by national authorities and demining organisations for use during such operations.

This IMAS should be read in conjunction with IATG 10.10, IMAS 04.10, 09.30, 10.10, 10.20, 10.50, 10.70 and 11.10:

- a) IATG 10.10 Destruction and demilitarization provides guidance on the destruction and demilitarization of all types of conventional ammunition, including APM and cluster munitions. The contents of this IMAS are based on Annex D to IATG 10.10;
- b) IMAS 04.10 provides a complete glossary of all the terms, definitions and abbreviations used in the IMAS series of standards;
- c) IMAS 09.30 provides specifications and guidelines for the safe conduct of Explosive Ordnance Disposal (EOD) operations as part of a mine action programme;
- d) IMAS 10.10 covers the general requirements of Safety and Occupational Health (S&OH). These apply as equally to destruction operations as they do to demining operations;
- e) IMAS 10.20 provides specifications and guidance on the development and implementation of policy and documented procedures and practices, which aim to establish and maintain a safe demining worksite. This is equally applicable to destruction worksites;
- f) IMAS 10.50 provides specifications and guidance for the storage, transportation and handling of explosives;
- g) IMAS 10.70 provides guidance for the protection of the environment during mine action operations; and
- h) IMAS 11.10 provides a guide to the technical factors to be considered and available technologies for the destruction of stockpiled APM.

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

The subject of stockpile destruction can be technically complex and it is important to understand the terminology in current use. Often terms are used interchangeably, which leads to confusion.

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

4. Priorities and principles

4.1. General

The destruction of munitions is a potentially hazardous task. The risks are minimised if the correct procedures are followed. If they are not, the possibility of a serious accident becomes very high.

4.2. Priorities

The priorities that shall always be observed are:

- i) safety - the safety of both personnel and property is paramount. If a method is not safe it shall not be used;
- j) security - both the items destroyed and the explosives used to destroy them are attractive to terrorists and criminals. The security of the EO and the donor explosives shall be ensured at all times;
- k) accounting - this links with security. Any loss of EO or explosives shall be promptly reported and investigated; and
- l) speed of work - the first three priorities shall never be compromised in order to speed up the work.
- m) Protection of the environment – activities should plan in a manner that minimises the impact to the environment.

4.3. Principles

There are many different and detailed munition destruction procedures but certain principles apply to all destruction tasks. These are:

- a) know the munition - know in detail both the item being destroyed and the explosives used to destroy it. Unless the design characteristics of both are known, it will not be possible to determine a safe and effective means of destruction;
- b) plan the task carefully - do not leave the planning until arrival at the disposal site. Work out the programme and procedures in detail well in advance;
- c) create a safe working environment - create and maintain a safe working environment for the destruction party, other personnel, property, livestock, vehicles and equipment;
- d) give and follow directions precisely – a disposal site is no place for ambiguity or misunderstanding. Directives shall be clearly given and understood by all personnel;
- e) use only approved methods and observe all safety precautions - do not take short cuts, they cause accidents; and
- f) clear the disposal site prior to departure - no munition destruction task is complete until the disposal site has been cleared of all hazards, contamination and rubbish.

4.4. Summary

Of all the known accidents that have occurred during EO destruction operations, many could have been avoided had the priorities and principles given above been followed. The supervisor in charge of stockpile destruction operations shall be responsible for ensuring that these priorities and principles are followed and the safe conduct of destruction activities.

5. Authority for Explosive Ordnance stockpile destruction

The EO stockpile destruction, including APM, is vested in the national authority. No bulk EO destruction should take place without the prior approval of the national authority. Authorisation is provided by the accreditation of destruction organisations in accordance with IMAS 07.30.

No ammunition disposal should take place without the prior approval of the national authority. The exceptions to this rule are:

- a) ammunition identified during surveillance or repair tasks which the local Ammunition Officer considers to be dangerous; and
- b) blinds and stray ammunition - which by definition are potentially dangerous. (See IMAS 09.30 *EOD* for further details).

Foreign ammunition should be destroyed using the appropriate procedure based on sound first principles. Should no procedure exist, then instructions for its disposal must be requested from the national authority. Foreign ammunition is not to be broken down without the specific authority and instructions from the national authority.

EO should only be destroyed using the appropriate procedures based on sound first principles. If no procedures exist, then instructions for destruction should be requested from the national authority. EO should not be broken down without the specific authority and instructions from the national authority.

6. Methods of destruction

6.1. Methods

There are three simple methods of destruction:

- a) detonation;
- b) burning; and
- c) incineration.

The method used in the disposal of a particular EO depends upon its type of explosive filling and design, therefore knowing the explosive filling is the first step towards determining the best method for its destruction.

6.2. Detonation

This method is used with High Explosive (HE) filled EO. Small quantities of other natures - smoke, pyrotechnics, lachrymatory can also be destroyed by inclusion in mixed stacks during large-scale demolitions. The quantities of such items included in a mixed stack have to be kept down to a small percentage of the overall stack.

6.3. Burning

This is generally used with propellant (bagged or loose), smoke, pyrotechnic and lachrymatory munitions but is suitable for certain plastic-bodied APM. It can also be used as an alternative to detonation for certain explosives, i.e. Composition Exploding (CE), Tri Nitro Toluene (TNT), Nitro Glycerine (NG) based explosives and Gun Powder (GP), but detonation is the cleaner method.

6.4. Incineration

This is a specialised form of burning that may be authorised for certain EO and small APM with minimal explosive content.

7. Siting of disposal sites

7.1. Disposal Sites

A disposal site is an area authorised for the destruction of munitions and explosives by detonation and burning. These in turn are referred to as demolition grounds and burning grounds and may be co-located on a disposal site.

The national authority shall approve and formally licence disposal sites within ammunition depots only after professional ammunition technical advice. Field disposal sites may be developed by the appropriate demining organization.

Disposal sites shall be sited to ensure that the hazards associated with destruction operations are reduced to a tolerable level and the environment should be protected. See IMAS 10.70 for the protection of the environment.

7.2. Hazards of detonation

The hazards of detonation are:

- a) flash and heat. These effects are localised but still significant. Flash could injure the eyes, but the reddish flash produced by most detonations is unlikely to do so. Heat will start fires if combustible materials are present for example dry grass, undergrowth, trees or peaty soil;
- b) blast and noise. Blast can cause injury or damage but persons and equipment would have to be unprotected and reasonably close to a detonation to be affected by blast. Injury and damage are far more likely to be caused by fragments. Noise presents a greater problem. At close range it can cause ear damage and at a greater range it will have a nuisance effect that may generate complaints from local communities;
- c) ground shock. The main effect will be on persons and equipment relatively close to the detonation although rock strata can sometimes transmit the effect for considerable distances. It is another potential source of nuisance to local communities and complaint;
- d) fragmentation. This poses the greatest danger. In practice the size of the 'danger area' is determined by the maximum range fragments will travel following a detonation. All personnel, property and equipment that are within this range and are not adequately protected are in danger; and
- e) toxic smoke and fumes.

7.3. Properties of demolition grounds

To overcome the above hazards, demolition grounds require the following properties:

- a) isolation. This is the most important requirement. Demolition grounds should be as remote as possible from personnel and property;
- b) deep soil. Soil should be relatively free of rocks and stones with no peat, which could burn underground. While deep soil is desirable it is not a requirement for a demolition ground;
- c) no secondary fire hazards. Demolition grounds should not be located near pipelines, power cables or fuel storage areas;
- d) no radio/radar transmitters. Major demolitions are normally initiated using electric cable or Radio Control (RC) systems, and as such, are vulnerable to external Electro-Magnetic Force (EMF) influence. Consequently, demolition grounds should not be situated near radar installations, radio transmitters or near high-voltage power lines; and
- e) high ground. High ground reduces the effects of blast and ground shock and is also well drained, which aids digging. However, high ground also tends to increase fragmentation range. While high ground is desirable it is not a requirement for a demolition ground.

7.4. Hazards of burning

The hazards created by burning are:

- a) intense heat;
- b) intense light; and
- c) toxic fumes (occasionally).

There is minimal blast, ground shock or fragmentation hazard unless the munitions burn to detonation.

7.5. Properties of burning grounds

To counter these hazards burning grounds require the following properties:

- a) no secondary fire hazards;
- b) an adequate water supply;
- c) sufficient isolation to prevent heat or fume casualties; and
- d) sandy soil with no peat.

An isolated, sandy, barren area is the most suitable site, but sites near high cliffs should be avoided as rising hot air currents can carry burning debris considerable distances.

8. Approval of disposal sites and Standard Operating Procedures (SOPs)

8.1. Approval

Formal approval, (commonly referred to as licensing), of a disposal site and its associated SOPs, or the ability of a demining organization to allow its suitably qualified personnel to approve disposal sites, shall be given by the national authority prior to the commencement of destruction activities on the site. Such approval shall be based on professional ammunition technical advice and consideration of the following factors:

8.2. Reference to publications

All SOPs are in effect the local interpretation of regulations issued by a higher authority. The SOPs should open by listing all such regulations and any related national standards.

SOPs should not reproduce large sections of information contained in other publications. Rather they should concentrate on detailing how these regulations are to be applied under local conditions.

8.3. Maps and grid references

Maps shall be sent to the national authority with the draft SOPs. These shall include:

- a) a map of the general area upon which the name and area of the disposal site are shown along with the boundary grid references. This information should be repeated in the body of the SOPs; and
- b) a larger scale sketch map of the disposal site showing its layout. (An example of a schematic layout is shown at Annex B). This sketch map shall be included as an Annex to the SOPs. The layout of the disposal site shall be worked out with careful regard to safety and once approved by the national authority shall not be changed without the approval of the national authority.

8.4. Locations of sentries and observation posts

Sentries shall be sited so that they control all possible access routes into the disposal site. Sentries will normally be located on the edge of the disposal site in Splinter/Fragment Proof Shelters (SPS). When SPS are not available the sentries shall be located outside the danger area.

8.5. Marking of the site

Disposal sites shall be marked with notice boards positioned outside the danger area on all possible approaches into the site. Notice boards shall provide notice to the local communities of the purpose of the site, the warning systems in place (sentries and other warning systems), the hazards associated with the site (both during destruction operations and afterwards) and the possible consequences of ignoring warnings. Notices shall be written in the local language(s) and use symbols for those who cannot read.

8.6. Location of the firing point

This shall be close enough to the point of any detonation for the destruction supervisor to be able to hear partial explosions. The firing point is normally inside the danger area within an SPS.

8.7. Communications

Good communications are essential to safety. The following communication links shall be established prior to destruction operations commencing:

- a) between the firing point and any emergency services, for example fire, medical or police, Communication links may be through a higher headquarters; and
- b) between the firing point and the sentries. There shall also be a back up system for example horns, sirens or whistles.

The SOPs shall list all the emergency callsigns/telephone numbers and lay down accident reporting requirements.

8.8. Explosive limits

Explosive limits shall be established for each disposal site. Explosive limits are determined by two main limiting factors:

- a) maximum fragmentation range. This determines the danger area and all persons and equipment shall be either outside this area or under shelter in SPS. The perimeter of the disposal site shall contain the danger area. TN 10-20-01/2001 provides guidance on the calculation of estimation of explosion danger areas. The size of the disposal site will therefore provide the explosive limit. No open detonation shall be permitted with a Net Explosive Content (NEC) above the limit where fragments may travel further than the perimeter of the disposal site; and
- b) ground shock and noise effect. The 'tolerance' level of the local communities to the effect of shock and noise on themselves and their property has to be determined. This may impose lower explosive limits than the maximum fragmentation range.

Methods of determining the explosive limit for a new disposal site are:

- c) from EOD or ammunition technical advice; and
- d) by conducting demolition trials to determine fragmentation danger areas and ground shock and noise tolerance levels. *Position observers in communication with the firing point, under suitable cover at the perimeter of the disposal site and other sensitive points and carry out a series of trial detonations, gradually increasing in NEC each time. Check with the observers after each detonation and stop when the observers report fragmentation falling in front of them or when the local 'tolerance' level has been reached.*

Note: The IMAS danger area support tool, included on the IMAS website and IMAS CDs may also be used to determine the fragmentation danger radius.

The end result of the trial shall be an explosive limit, which will ensure that:

- e) a person standing unprotected at the disposal site perimeter is safe from blast and fragmentation. They should also be safe from toxic fumes regardless of the wind direction;
- f) there is no possibility of injury to persons or damage to property outside the perimeter of the disposal site; and
- g) the effect of noise and ground shock is kept to a tolerable level.

Where it is intended that more than one disposal activity will be carried out on a disposal site for example burning, open demolitions, White Phosphorus (WP) destruction or pyrotechnic burning, then a location for each activity shall be specified, and separate explosive limits shall be laid down for each location.

8.9. Personnel limits

The number of persons present shall be the minimum required to ensure safety and efficiency. Certain tasks are subject to mandatory minimum personnel limits, which should be included in the detailed procedures for these tasks.

8.10. Spectators

Spectators shall be allowed at official demonstrations only. Spectators (or their organisations) shall be required to sign a standard indemnity form before the demonstration commences. Annex C to IMAS 10.20 has procedures for dealing with visitors to demining worksites, which may be adapted for visitors to disposal sites.

8.11. Orders for sentries

These are normally contained in an Annex to the disposal site SOPs and shall cover the following points:

- a) communication requirements;
- b) sentries' responsibilities; and
- c) briefing requirements.

8.12. Fire prevention

All fire making and smoking materials (commonly called contraband) shall be kept under control in a locked container by the destruction operations supervisor. Smoking shall only take place in a designated smoking area remote from all explosives and at times decided by the destruction operations supervisor.

Destruction organisations shall establish and maintain fire prevention policies and SOPs, which should be based on the general principles given in Annex D to IMAS 10.50.

8.13. Eating and drinking

Eating and drinking may need to be controlled to prevent the ingestion of explosive particles or contaminated materials. Where necessary the destruction operations supervisor should ensure that personnel wash and scrub their hands before meal and refreshment breaks.

8.14. Transport discipline

The points to be covered are:

- a) designated vehicle routes shall be prepared (preferably with a hard surface) and shall not cross firing or telephone cables unless these cables are adequately buried and protected;
- b) no vehicle shall approach to within 30 metres of the disposal pits or munitions being unpacked and prepared for destruction;
- c) engines shall be switched off when vehicles are loaded or unloaded;
- d) vehicles shall be parked in a designated parking area outside the danger area whilst destruction operations are being carried out; and
- e) segregation of loads. Separate vehicles shall be required for serviceable explosives or explosive materials, and stockpiled munitions for destruction. A person in charge of loading/unloading shall be nominated.

8.15. Dress

Special dress is required for certain destruction tasks and this shall be detailed in SOPs. In all other cases the dress should be appropriate to the weather, local culture, and conditions. In particular, sentries require adequate protection from the weather.

8.16. Safety precautions specific to the disposal site

These may include:

- a) mandatory use of ear protectors by the firing party if the size of the charges and the proximity of the firing point to the point of detonation warrants it; and

- b) limitations on WP disposal and burning when the wind strength and direction may carry fumes towards a sensitive area.

8.17. Accident preparation and response procedures

All the preparation requirements for an accident on a disposal site shall be carried out in accordance with the requirements of IMAS 10.40 Medical support to demining operations. This includes the documentation of medical support procedures in disposal site SOPs.

Following an accident the following procedure shall be implemented:

- a) carry out the accident emergency response plan, stop destruction operations and make safe any prepared demolitions;
- b) report the incident to the next higher authority, preserve the accident site and note all details pertinent to the eventual inquiry (refer to IMAS 10.60); and
- c) render safe and repack all munitions and explosives that have been unpacked and prepared for destruction. Keep those involved in the accident segregated pending the investigation.

8.18. Records and reports

A permanent destruction operations diary shall be kept. This shall be completed daily and signed by the destruction operations supervisor.

9. Planning and preparation

The first step should be to prepare a list of items for destruction. Confine the list to those items where destruction has been approved by the national authority. Do not anticipate approval.

Select the most suitable destruction method and location:

- a) if the list is confined to small quantities of items with low NEC use a local disposal site (with a small explosive limit);
- b) if the list contains larger quantities of items with NEC in excess of the explosive limit of the local disposal site, the destruction operations will have to take place at a more remote disposal site with a larger explosive limit. These normally have to be selected well in advance;
- c) determine the best method of disposal for each item type to achieve the complete destruction of the item and its filling(s) in a safe manner. This will necessitate knowing the make-up of each item;
- d) determine the types and quantities of serviceable explosive required to effect destruction;
- e) breakdown the list of items for destruction into individual serials;
- f) ensure that the total NEC per serial (including serviceable demolition explosives) does not exceed the explosive limit for the disposal site; and
- g) distribute any high capacity items (i.e. those with a high ratio of HE to munition weight for example Anti-Tank (AT) mines) between the serials to enhance the effect of the serviceable demolition explosives. The combination of items within serials will influence the method of destruction chosen.

Produce a demolition order and destruction programme which details:

- a) dates, times and locations;
- b) nominal roll of personnel in the destruction party;
- c) list of APM and other EO to be destroyed;
- d) list of serviceable explosives and explosive materials required;
- e) breakdown of the destruction operation by serials and locations on the disposal site;
- f) communication arrangements;
- g) safety and emergency support arrangements;
- h) administration arrangements, (accommodation, food, transport);
- i) route(s), if applicable; and
- j) list of stores required. Duplicate any essential items.

Provide notice of the destruction operation as required to national authorities, local authorities, local communities and any supporting facilities (hospitals for example).

Check stores and equipment for serviceability check explosives and if possible check munitions to be destroyed.

Brief personnel who are involved in the destruction operation.

10. Conduct of destruction tasks

Detailed instructions should be given in local technical instructions for particular destruction tasks.

Procedures for the control of destruction activities at the disposal site are given at Annex C.

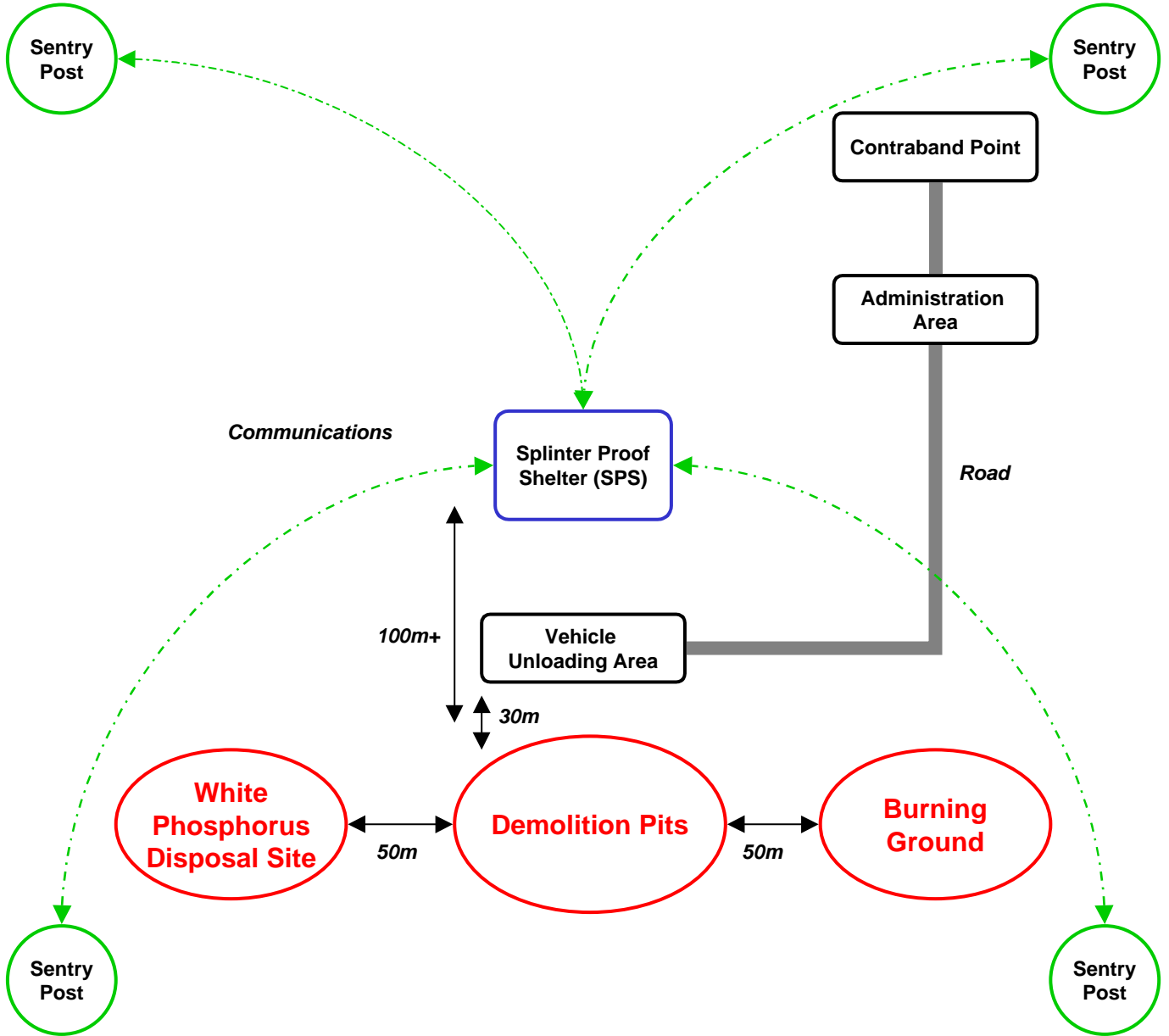
Annex A (Normative) References

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) IATG 10.10 Destruction and demilitarization;
- b) IMAS 04.10 Glossary of mine action terms, definitions and abbreviations;
- c) IMAS 07.30 Accreditation of demining organisations and operations;
- d) IMAS 09.30 Explosive ordnance disposal;
- e) IMAS 10.10 S&OH - General requirements;
- f) IMAS 10.20 S&OH - Demining work-site safety;
- g) IMAS 10.40 S&OH - Medical support to demining operations;
- h) IMAS 10.50 S&OH - Storage, transportation and handling of explosives;
- i) IMAS 10.60 S&OH – Reporting and investigation of demining incidents;
- j) IMAS 10.70 S&OH – Protection of the environment;
- k) IMAS 11.10 Guide for the destruction of stockpiled anti-personnel landmines; and
- l) TN 10.20-01/2001 Estimation of explosion danger areas.

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). National authorities, employers and other interested bodies and organisations should obtain copies before commencing mine action programmes.

Annex B
(Informative)
Schematic layout of a disposal site



Annex C (Normative) **Control of destruction operations**

C.1. On arrival before destruction operations commence

C.1.1. Fire making and smoking materials

The destruction operations supervisor shall apply the fire making and smoking materials restrictions and advise all personnel of smoking break arrangements.

C.1.2. Briefings and nominal roll

The destruction operations supervisor shall:

- a) check the nominal roll and brief all personnel on the task. This shall include a safety and emergency support brief;
- b) establish the medical point for the medic and all medical equipment. This shall be in an SPS if inside the danger area;
- c) brief the sentries on their duties and the communication requirements. Post the sentries and position any warning signs or symbols;
- d) detail the routes for vehicles and personnel; and
- e) detail the parking area. All vehicles shall be parked outside the danger area while destruction operations are in progress.

C.1.3. Safety checks

The destruction operations supervisor shall:

- a) check the communication links to any higher authorities, external support agencies and to the sentries;
- b) check that vehicle routes are clear of any hazardous items and if any are present arrange for their disposal. This shall be checked before destruction operations commence and after each serial;
- c) ensure that vehicle routes do not cross firing cables unless the cables are adequately buried;
- d) nominate a safety vehicle. This is to be equipped with a stretcher and blankets. It is to remain available for the evacuation of casualties throughout the destruction operation;
- e) if the destruction operation involves burning or there is the risk of fire ensure that adequate fire fighting cover (personnel and equipment) is available on site;
- f) check the demolition pits (where applicable) for any hazardous items and if any are present arrange for their disposal. The destruction operations supervisor shall check for hazardous items before destruction operations commence and after each serial He/she shall establish a safe route into the pits (using sandbag steps as necessary) and ensure that working areas are stable and safe;
- g) Ensure that personnel do not walk or stand over undercuts into the sides of pits; and

- h) where appropriate for example with NG based explosives, establish hand washing facilities and give instructions that all persons who handle such explosives shall wash and scrub their hands before they eat or drink.

C.1.4. Unloading of munitions

The destruction operations supervisor shall:

- a) order the unloading of munitions. Serviceable and unserviceable items shall be kept separated. A nominated individual shall control the accounting and issues for each serial;
- b) ensure that vehicles keep to hard standing surfaces or tracks. Create sandbag 'stepping stones' for personnel as necessary;
- c) ensure vehicles do not approach within 30 metres of the demolition pits or of unpacked munitions or explosives; and
- d) ensure engines are switched off during loading and unloading.

C.2. During disposals

C.2.1. Supervision and control

The destruction operations supervisor shall remain free to supervise all activities. He/she shall not become responsible for the activities of one group or area to the exclusion of others.

The person nominated to control the accounting and issues for each serial shall remain free to guard the munitions for destruction, and explosives.

C.2.2. Safety

C.2.2.1. General

Observe all safety precautions.

C.2.2.2. Preparation of the demolition or burn

Safe areas away from the edge of the pits shall be selected for the unpacking and preparation of munitions and explosives. Serviceable and unserviceable items shall be prepared in separate areas:

- a) protect sensitive items when unpacked. Do not step on or over munitions or explosives, this includes detonating cord;
- b) do not contaminate explosive preparation areas with explosive residue during preparation;
- c) safely dispose of all explosive contaminated material; and
- d) avoid the inclusion of packaging materials in stacks as much as possible. Check all surplus packaging as Free From Explosives (FFE) and remove to a central empty package point.

Position undercuts and stacks positions in the pits so that the blast and fragmentation/debris effects are minimised and directed away from sensitive areas.

Test the firing cables before each serial.

C.2.2.3. Stack configuration

In terms of the stack configuration, the destruction operations supervisor should aim for:

- a) the minimum use of serviceable explosive to ensure the complete destruction of the item(s) being destroyed;
- b) making the best use of the explosive fillings of items to effect their destruction;
- c) the correct mixture of high capacity and low capacity items in mixed stacks;
- d) no air gaps between separate items and the minimum amount of metal/material between explosive fillings;
- e) stacks and their explosive chains to be stable enough and sufficiently shielded so as not to be affected by detonations in other pits; and
- f) avoiding placing unbagged earth directly onto stacks. Tamp with sandbags as this facilitates digging out partial explosions.

C.2.2.4. Preparation of the detonating cord

Ensure that detonating cord:

- a) is as straight as possible and not crossed over;
- b) has taped junctions of at least 100 mm and spare ends of at least 300 mm. The cut ends should be taped over to prevent moisture ingress, prevent spillage of loose explosive and thereby reduce the risk of a misfire due to detonating cord failure; and
- c) all junctions should be outside the pit and the main lead should extend at least two metres out of the pit. This facilitates dealing with misfires.

C.2.2.5. Tools and explosives

Tools and explosives shall be carried in separate marked boxes. Loose items shall not be carried on the person. Detonators shall be carried in totally enclosed, marked metal boxes.

C.3. At close of work

The destruction operations supervisor shall:

- a) search the disposal area, ensure that it is free from any hazardous components and free of all litter contamination;
- b) ensure that empty packages are re-inspected, sealed and marked as FFE;
- c) reconcile the closing stocks of munitions and explosives with the record of what has been destroyed. Do not allow personnel to leave the disposal site until all discrepancies have been satisfactorily investigated and explained;
- d) take a declaration from each person in the destruction party that they have no explosives, munitions or accessories in their possession before they leave the disposal site; and
- e) complete and sign the destruction operations diary.

Amendment record

Management of IMAS amendments

The IMAS series of standards are subject to formal review on a three-yearly basis, however this does not preclude amendments being made within these three-year periods for reasons of operational safety and efficiency or for editorial purposes.

As amendments are made to this IMAS they will be given a number, and the date and general details of the amendment shown in the table below. The amendment will also be shown on the cover page of the IMAS by the inclusion under the edition date of the phrase *'incorporating amendment number(s) 1 etc.'*

As the formal reviews of each IMAS are completed new editions may be issued. Amendments up to the date of the new edition will be incorporated into the new edition and the amendment record table cleared. Recording of amendments will then start again until a further review is carried out.

The most recently amended IMAS will be the versions that are posted on the IMAS website at www.mineactionstandards.org.

Number	Date	Amendment Details
1	01 Dec 2004	1. Formatting changes. 2. Major text editing changes. 3. Changes to terms, definitions and abbreviations where necessary to ensure that this IMAS is consistent with IMAS 04.10.
2	23 Jul 2005	1. Annex B, changes to the definitions of 'Explosive Ordnance Disposal (EOD)' and 'burning ground' to be consistent with IMAS 04.10.
3	01 Aug 2006	1. Minor changes/additions to the first and second paragraph of the foreword.
4	03 Dec 2009	1. UNMAS address updated. 2. Minor changes clause 6.9 to ensure gender issues. 3. Minor changes throughout to ensure cluster munitions issues. 4. Inclusion of reference to IMAS 10.70. 5. Numbering clauses 6.1, 7.1 and 8.1. 6. Inclusion of explosive ordnance along with APM where relevant to ensure the IMAS is generic for all EO including cluster munitions. 7. Removal of Annex B terms and Definitions and its references. 8. Changing Annex C to B and D to C. Reference to the Annexes updated.
5	20 Sep 2012	1. Addition of IATG 10.10 as a normative reference. 2. Minor changes Clause 5 on authority for disposal. 3. Minor typographical changes.