

IMAS: 1997 Standards Chapter 1

Section One: Safety

INTRODUCTION

1.1 The safety standards outlined in this document deal with mine detection, marking, clearance, survey, and explosive ordnance disposal operations all of which demand safety considerations. These standards address the minimum requirements for humanitarian mine and UXO clearance. It should be recognised, however, that there are no comprehensive safety regulations and equipment for mine and UXO removal that can adequately cover all situations. Where conditions merit, the use of more stringent safety instructions should be encouraged. Deviations, if any, from these standards should be conveyed to the UN and should be documented, including the reasons for non-compliance.

SCOPE

1.2 This document addresses the minimum safety standards for protective equipment, safety distances, procedures for survey, mine clearance and EOD operations, site requirements and layouts and standards for the construction of field stores, storage and transportation of explosives.

PURPOSE

1.3 The purpose of this document is to establish minimum safety standards and procedures for all personnel involved in humanitarian mine and UXO clearance operations.

MANAGEMENT AND SUPERVISION

1.4 The management and supervision of personnel involved in all aspects of the clearance activities must be undertaken using the relevant SOPs and guideline documents. Variations to the procedures detailed in the SOPs must be implemented only after permission has been given from the originator of the SOPs.

1.5 All personnel involved in clearance operations must receive the proper training, must be qualified, experienced and medically fit.

PERSONAL PROTECTIVE EQUIPMENT

1.6 All personnel involved in mine clearance activities must wear adequate protective equipment when appropriate. The minimum equipment requirement is normally eye protection and a protective jacket. The following are standards for this equipment:

a) **Eye Protection and Helmet.** Eye and face protection is to be provided by the use of a fragmentation visor. This visor must meet the minimum standard of personal protection which is to be capable of withstanding a v50 rating (dry) of 450m/s for a 1.102 g fragments (refer to STANAG 2920) and be tested in accordance with US NIJ 0101.03 standards. Visors are recommended. The visor should be long enough to cover the protective jacket collar. A helmet should be worn unless it compromises the safety of the operator. It must conform to the same protection standards as the visor.

b) **Safety Glasses.** When used, safety glasses must be able to meet the minimum standards of personal protection and be capable of withstanding a v50 rating of 450m/s for a 1.102 g fragments (refer to STANAG 2920) and be tested in accordance with US NIJ 0101.03 standards.

c) **Protective Jackets.** Protective jackets should be worn but are optional when operating (demining) in the prone position. The jacket and visor should be designed to protect as well as deflect blast and fragmentation from the operator. Sleeves are not mandatory, but the jacket must have groin protection. The jacket must be capable of withstanding a v50 rating (dry) of 450m/s for a 1.102 g fragments (refer to STANAG 2920) and be tested in accordance with US NIJ 0101.03 standards.

1.7 Other safety equipment available includes:

a) **Coveralls or special clothing.** Special protective clothing will be necessary when the removal and destruction of certain items is involved, such as those containing toxic elements. Clothing material must be non-melting and fire resistant. The SOPs should stipulate the special protective clothing required.

b) **Footwear.** Footwear should be comfortable and should offer protection from the normal environmental elements, such as abrasive stones, sharp grass stalks, twigs etc.

MINE CLEARANCE SAFETY DISTANCES AND PROCEDURES

1.8 Minimum safety distances must be applied to personnel undertaking mine clearance activities. Distances should be modified based on the known danger areas of individual mines and munitions, and the terrain or where the presence of tripwires or booby traps is suspected. The following are the minimum safety distances, for an AP blast mine:

| | Metres apart |
|---|--------------|
| a) More than one working section | 25 |
| b) Deminers working in the same lane | 25 |
| c) Access route and safety areas | 25 |
| d) Vehicle park, medical teams and active mine clearance sites | 100 |
| e) On-site explosives storage point, containing no more than 20 kgs | 100 |
| f) Bulk storage and any occupied building or works site | 200 |

(See also Storage Standards Annex C to Section One)

PROBING PROCEDURES

1.9 The maximum probing angle is 30 degrees from the horizontal. The spacing between probes is to be 5 cms unless objects are present that are smaller in size, in which case the spacing is to be reduced accordingly. The angle and spacing of the probing is to be detailed in the SOPs.

WORKING PERIODS

1.10 Mine and UXO clearance operations should be undertaken in daylight and in dry conditions. The working period will depend on the working conditions and the ability to maintain concentration. Adequate rest periods are to be taken and all details of the working conditions are to be included in the SOPs.

Mine Clearance and EOD Site Standards and Procedures

MARKING REQUIREMENTS

1.11 All mine and EOD clearance sites must be clearly marked. For details see Section Five.

MINIMUM SIZE OF A DEMINING OR EOD TEAM

1.12 The minimum recommended size of a mine clearance or EOD team is to be two qualified specialists one of whom is to be the team leader/supervisor. The minimum support for communications and medical are detailed in the relevant sections of these standards.

MINE AND DEMOLITION SAFETY DISTANCES

1.13 Demolition tasks consist of items ranging from a few grams of explosives to several tonnes. Safety distances will vary according to the actual or perceived threat factors. Distances can be reduced

depending on the terrain and the use of protective works. Reference should be made to Section Six: Explosive Ordnance Disposal and the table in Annex A to Section One.

SAFETY PROCEDURES - EQUIPMENT

1.4 The management and supervision of personnel involved in all aspects of the clearance activities must be undertaken using the relevant SOPs and guideline documents. Variations to the procedures detailed in the SOPs must be implemented only after permission has been given from the originator of the SOPs.

1.15 All mine and UXO clearance sites are to have equipment and procedures in place to allow quick access to mined areas in the event of an emergency.

SAFETY PROCEDURES DURING DEMOLITION TASKS

1.16 Where practical, electrical initiation should be used. The rules that are to be applied for all demolition tasks are detailed in Annex B Section One.

MISFIRES - ACTION

1.17 Should a misfire occur during disposal tasks the SOP must state the action to be taken and the duration of delay before the investigation of equipment, material, site and targets is undertaken. See Annex B (para. 17) to Section One.

STORAGE, CONSTRUCTION, AND TRANSPORTATION OF EXPLOSIVES

STORAGE OF EXPLOSIVES

1.18 If a national authority has suitable storage regulations these are to be utilized as a minimum. Where there is no national body, the standards detailed in Annex C to Section One are to be used.

EXPLOSIVES STORE CONSTRUCTION

1.19 In many cases semi-permanent explosives stores have to be constructed. The standards detailed in Annex D to Section One are to be used if no suitable national regulations are available.

TRANSPORTATION OF EXPLOSIVES

1.20 Mine clearance and EOD work requires the frequent movement of explosives and explosive accessories. The standards detailed at Annex E to Section One are to be used if no suitable national regulations are available.

VISITORS

VISITORS - SAFETY FACTORS

1.21 Personnel who are not part of the regular work force who visit the site are classed as visitors and must receive a formal briefing immediately upon arrival. This is to consist of an explanation of the site layout, a safety briefing and details of action to be taken in the event of an incident or accident. Visitors should not enter hazardous areas.

1.22 If visitors must enter hazardous areas, certain rules must apply, which include but are not limited to:

- a) The visitor should not interfere with the demining or UXO clearance operation;
- b) As soon as a visitor is on the base line/start line, all operations should be stopped;

c) Visitors should wear the same measure of protection as the supervisor and deminer;

d) Groups of visitors should not exceed four in number and each group is to have an escort.

ANNEX A TO SECTION 1

Mine and Demolition Safety Distances

Minimum Safety Distances

| Type of Munition | Open area - metres |
|--|--------------------|
| AP Mine Blast | 100 |
| AP Mine Fragmentation/Bounding/Directional | 300/500 |
| AT Mine Blast | 500/1000 |
| AT Mine Shaped Charge | 1000 |
| Off Route Mine | 1000 |
| Mortar up to 82 mm | 500 |
| Shell up to 80 mm | 500 |
| Shell up to 160 mm | 800 |
| Shell above 160 mm | 1000 |
| Rocket up to 88 mm | 500 |
| Hand and Rifle Grenade | 300 |

Note 1: Buried boosted charges estimated at 10 kilograms have a safety distance of 500 metres. 100 metres should be added for each additional 10 kilogram charge.

Note 2: Qualified EOD specialists must stipulate safety distances for all munitions other than those detailed above. Details should be contained in the SOPs.

Note 3: Where possible, protective systems should be used to allow distances to be reduced.

ANNEX B TO SECTION 1

Safety Procedures During Demolition Tasks

The following rules are to be applied to all demolition tasks:

GENERAL

- 1) Smoking is prohibited on the demolition site.
- 2) Standards for the storage and transportation of explosives are explained in paragraph 1.18 and 1.20.
- 3) All demolition sites must have fire fighting equipment available.

- 4) Guards, and cordons where necessary, are to be posted at relevant locations with danger warning signs.
- 5) Minimum safety distances are to be applied for the safety of all personnel. Examples are detailed in paragraph 1.8 and Annex A to Section One.

DEMOLITION SITE COMMANDER

- 6) A qualified and authorised person is to be nominated as the demolition site commander.

DETONATORS - SAFETY PROCEDURES

- 7) Detonators are to be kept separate from all other types of explosive material in a special box, where possible the original shipping and transportation container is to be utilized and must be attended at all times.
- 8) Detonators (electrical or non-electrical) should never be buried.

ELECTRICAL - SAFETY PROCEDURES

- 9) All electrical firing cable is to be well maintained. Both the cable and the detonators are to be checked for continuity and discontinuity prior to being used.
- 10) Electrical cable must not be laid over other strands of cable.
- 11) Electrical firing systems are not to be used if there is a known Radio Frequency threat or in the event of weather conditions which may create static electrical conditions.
- 12) The keys/firing device and/or the exploder/blasting machines are to be held by the person in charge of the site until such time as the equipment is to be used.

SAFETY FUZE - SAFETY

- 13) Safety fuze must be tested before use. The first 30 cms is to be cut off and discarded. The second 30 cms is to be tested to ensure it performs to the designed burning rate. The last 30 cms of all reels must be discarded. The minimum length of safety fuze is to be of sufficient length to allow the specialist to walk from the demolition site to a safe location before detonation occurs.

CONTROL OF DEMOLITION TASKS

- 14) A minimum number of personnel should be employed to place the charges.
- 15) Only qualified personnel are to supervise the placement of charges and to have charge of the explosives and accessories store.
- 16) Two people must count the number of explosions when firing multiple shots.
- 17) If a misfire occurs there must be a waiting period of 10 minutes for an electrically fired system and 30 minutes for a non-electric system before the area, equipment or targets are inspected.
- 18) On completion of the demolition task the senior supervisor (supervisor in charge of the demolition site) is to check all charge locations to confirm that all charges have fired correctly. If any misfires or partially fired munitions/charges are found, the appropriate disposal action is to be undertaken before the site is declared 'all clear'.

ANNEX C TO SECTION 1

Storage of Explosives

There are fixed rules and regulations for the handling and storage of explosives long term. All SOPs are to conform to suitable national rules and regulations where they exist.

GENERAL SAFETY RULES

- a) Avoid heat in excess of 40° Celsius, dampness or rough handling.
- b) Protect all explosives from direct sunlight.
- c) Keep explosives in their transportation and storage packaging.
- d) The store must be clean and free of all other materials. Under no circumstances should paint, oil, petroleum, rags, packing waste and other flammable materials be stored with explosives.
- e) Explosives must not be stored with radioactive materials.
- f) An area of at least 50 metres around the store must be cleared of all vegetation. This area must be frequently maintained to ensure no overgrowth in the immediate area of the store.
- g) No smoking or open fires should be permitted within a safety area of 100 metres.

h) Fire fighting equipment (extinguishers, fire blankets and bush brooms if required) are to be positioned outside all explosives stores.

STORAGE BUILDINGS

- i) Explosives should be stored in a cool, dry place with good ventilation and sheltered from the elements.
- j) Explosives store must be a minimum of 200 metres from any building except when there are overriding security requirements.

PLACEMENT OF EXPLOSIVES

- k) Explosives should be raised off the floor by use of 'duck boards' or shelving.
- l) Separate explosives by type.
- m) Detonators and accessories must be separated from other explosive types.
- n) Mines, munitions and UXOs should never be stored with bulk explosives.
- o) Explosives must be stored away from the walls to allow air flow and should not exceed the maximum allowable amount of each explosive type for the store. If storage regulations are not available then an EOD trained specialist, with the relevant experience, must decide how the explosives are to be stacked and the total explosive content.
- p) Explosives must be stored by compatibility group as defined in IATA dangerous goods regulations.

CONTROL AND SECURITY

- q) The store must have the appropriate signs warning of the contents, the hazard and the restrictions. Signs should be in one of the six major recognised UN languages (English, French, Russian, Arabic, Chinese or Spanish) and the local language.
- r) Radio transmission is not permitted within 100 metres of the store.
- s) Entry to the store is limited to authorised personnel only.
- t) All transactions of explosives, receipts and issues, are to be recorded and should be checked by the appropriate authorised person at a minimum of once monthly.
- u) A regular accounting system with frequent stock checks and routine inspections is to be conducted by the higher authority in the organization.
- v) Explosives stores must be secure and guarded.
- w) Frequent inspections are required for all explosives especially dynamite and nitroglycerine (NG) based explosives. When these explosives are time-expired they must be destroyed. Inspection frequencies are to be indicated by the senior EOD technician.
- x) A qualified person is to be nominated and responsible for the management of the store and explosives.

ANNEX D TO SECTION 1

Explosive Store Construction

It is essential that a common sense, secure and safe approach is made for any field storage design criterion which is effective and easily achievable. All SOPs are to be written in conjunction with any suitable national rules and regulations. The following points should be addressed:

THE BUILDING

- a) The building must be secure.
- b) The roof should be of low density material.
- c) The roof should have a thermal shield to assist in preventing interior temperatures from rising above 40 Celsius. This shield should permit the free circulation of air.
- d) Air vents, with due regard to security, are required.
- e) The inside of the store should have at least two rooms, one for bulk explosives the other for detonators. If only one room is available, a blast wall is to be constructed utilizing some suitable blast proof material, such as sandbags, to a thickness of at least 0.3 metres.
- f) The inside of the store should be covered in a suitable material to assist in cooling and avoid the danger of friction, e.g. timber cladding inside a shipping container.

- g) The store must have solid and secure door/s.
- h) Pallets or a similar material should be used to keep explosives off the floor surface and assist the ventilation process.

SECURITY AND OUTER AREA WORKS

- i) Additional field works (for containers or similar stores) in the form of soil or sandbags should be placed along the sides of the container to roof height. This forms the first blast protective wall and assists in directing any internal blast upwards.
- j) Bund walls should be built around the entire store to a minimum of the height of the store.
- k) The outer bund walls should also have a security fence. Security lights are recommended. A security guard or patrol may be necessary.

ANNEX E TO SECTION 1

Transportation of Explosives

All SOPs are to be written in conjunction with national rules and regulations. The following are the key factors for the transportation of explosives:

VEHICLES

- a) Vehicles should have an adequate capacity, security and suitability for the intended use.
- b) Vehicles should be mechanically reliable with good tires.
- c) Vehicles should be clean and carry no other cargo.
- d) Vehicles are to have adequate fire fighting equipment.
- e) All vehicles must have the proper hazard warning signs and have red flags positioned at the front and rear of the vehicle.

DRIVER, DRIVING AND SECURITY

- f) The driver, supervisor and security guard (if required) are to be the only personnel in the vehicle.
- g) Drivers, supervisors and guards must have had adequate training in both hazardous load handling and emergency procedures. The relevant section of the SOPs relating to this should be in the driver's possession.
- h) Vehicles should travel with a minimum safety distance of 100 metres between them when in convoy and at a speed not exceeding 60 kms per hour.
- i) Where possible, routes should be selected to avoid built-up or heavily populated areas.
- j) The commander and driver must have written instructions on procedures to be undertaken in the event of an accident.

SAFETY

- k) Bulk explosives and detonators should not be transported in the same vehicle.
- l) Explosives should be in transportation packaging where possible. Where this is not possible detonators, electric or non-electric, must be placed into special detonator boxes. The box should be painted red, as a hazard indicator and for ease of identification.
- m) Explosives boxes are to be stored away from the vehicle exhaust pipes.
- n) Smoking is not allowed within 100 metres of the transport.