1. INTRODUCTION

1.1 This chapter provides details of the minimum specifications and guidelines for the safe storage, transportation and handling of explosives and where applicable and/or appropriate for ammunition, ordnance and UXO\(^1\).

1.2 Whenever and/or wherever possible and/or practicable, these specifications and guidelines are to be followed, adhered to and implemented by mine action organisations.

1.3 When used within this chapter, the term \textit{explosives} refers to all items of an explosive nature including but not restricted to bulk explosives, detonators, detonating cord, safety-fuse, all types of igniters, ammunition, ordnance, UXO.

1.4 These specifications and guidelines do not exclude application of future national rules and regulations concerning storage, transporting and handling explosives.

2. GENERAL REQUIREMENTS OF RESPONSIBLE PERSONS

2.1 All persons charged with, responsible for or involved in the storage, transportation and handling of explosives are to have received appropriate training, are to be suitably qualified and experienced and are to be familiar with the details and guidelines of this chapter.

2.2 Persons responsible in whatever capacity for the storage, transportation and/or handling explosives are to be in good health.

2.3 Persons not qualified to store, transport or handle explosives may carry, load and unload dangerous material into vehicles or storage under supervision of a qualified person, provided they are verbally briefed on safety measures prior to handling explosives.

2.4 All transportation and storage of explosives, temporarily or permanent must be recorded in a log book showing the amount of explosives transported or stored and the amount of explosives being used.

\(^{1}\) The detail within this Chapter also applies throughout to the safe handling, transportation and storage of ammunition, ordnance and UXO. However, for purposes of brevity these terms are not used again and the term \textit{explosives} whilst being specific also applies to these natures when appropriate.
2.5 A person responsible and accountable for the storage, transportation and handling of explosives must always be appointed by mine action organisations.

3. ENVIRONMENTAL REQUIREMENTS

3.1 The environmental requirements (temperature, humidity and vibration) of explosives vary, and are dependent on their intended storage conditions (including shelf life), transportation, handling and use.

3.2 The performance of explosives will be unpredictable and the safety will be reduced if the manufacturers’ environmental conditions are not met.

3.3 In general, explosives should be:
   a. Kept dry and well ventilated.
   b. Kept as cool as possible and free from excessive or frequent changes of temperature.
   c. Protected from direct sunlight
   d. Kept free from excessive and constant vibration.

4. STORAGE REQUIREMENTS

4.1 Storage Design: If mine action organisations construct their own explosive stores than the general requirements for the design of magazines and containers used for the storage and transport of explosives given in IMAS 10.50 are to be applied. In summary:

   a. All storage facilities require adequate ventilation to prevent dampening and heating of stored explosives. Climatic conditions, size of magazine and location will determine the amount of ventilation required.
   b. No indoor storage facility shall be located in a residence or dwelling or office building.
   c. Permanent and/or main storage facilities shall be fire-resistant, theft resistant, weather resistant and ventilated. Consideration should be given to ground and local features during the design and siting of such structures.
   d. Portable storage facilities, such as a skid-mounted container, trailer or semi-trailer shall be theft-resistant, fire-resistant and weather-resistant. The magazine should be constructed of steel with an interior lining of timber. Magazines of less than one cubic metre in size should be fixed to the ground to prevent theft of the entire magazine.
   e. A day box is used for the on-site storage of explosives required for daily mine/UXO clearance operations. It shall be:
      (1) Weather resistant and able to be locked.
      (2) Wherever possible or practical it should be of steel construction but can be wooden boxes or other appropriate containers.
      (3) They shall contain no more than 10 kg of explosives and or (including) appropriate quantity of initiating means to fire the given quantity of explosives.
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(4) Detonators and/or other means of initiation are to be stored and carried in a separate box from explosives.

f. A detonator box shall be metal or wooden. It may also be used to store detonators in when at the mine/UXO clearance worksite. Detonators carried shall not be carried lose within the detonator box but are to be packaged. Electric detonators should be stored and carried in closed metal containers to shield them from EED’s (Electro Explosive Devices).

g. Mine action organisations are responsible for maintaining storage facilities and a protection zone around it according to the prescribed technical norms. They are also to provide physical protection of the facility.

h. Vehicles are not to be left loaded with explosives at any time unless they are under continuous security guard and are not to be used as overnight storage facilities.

4.2 Storing Explosives: The following are the minimum general rules and guidelines for the storage of explosives

a. Permanent and/or main storage facilities are to have ventilation, installed in such a way that it cannot be closed, blocked or allow water to penetrate.

b. Permanent and/or main storage facilities are to be fitted with lightning conductors.

c. Permanent and/or main storage facilities are to have separate rooms or a substantial barrier for separating explosives and detonators/blasting caps.

d. In all circumstances, where possible explosives shall be stored in their original packaging.

e. All boxes are to be placed at least 100mm above the floor, e.g. on wooden pallets.

f. When boxes are stacked the height will not exceed 1.5 metres. The space between the top of the boxes and the ceiling will not be less than 600mm.

g. When stacked on shelves boxes are to be at least 100mm away from the upper shelf, and 500mm away from the walls of the room.

h. When stacking boxes the width of the base is to be bigger than the height of stacked boxes.

i. Blasting caps and electric detonators may be stacked only if packed in boxes and on wooden shelves maximum two layers on a shelf. Total height of stacked boxes will not exceed 1.4 metres.

j. If portable lanterns or pocket torches of any description are required they will be switched on before entering the store. The person holding the torch will not handle explosives or detonators or blasting caps.

k. Materials used for packaging explosives are to be destroyed and not discarded after use.

l. Fire extinguishers shall be available in storage facility.
5. ADDITIONAL SAFETY MEASURES FOR STORING AND HANDLING OF EXPLOSIVES

5.1 These following shall be implemented and adhered to by mine action organisations:

a. A trained and qualified person is to be responsible for managing the receipt, storage, guarding and issuing explosives at all levels
b. Only authorised persons are to enter the any storage facility and where appropriate and relevant are to be escorted at all times.
c. All smoking materials, including cigarettes, matches, lighters etc. and any object or item that might cause fire are prohibited from the storage facility. At the entrance to the facility there is to be a warning sign stating NO SMOKING OR SMOKING MATERIALS ALLOWED BEYOND THIS POINT.
d. Clothing and shoes of all workers in a warehouse are to be in accordance with rules on storage of explosives. Shoes are to be manufactured in such a manner as not to cause sparks.
e. The storage facility is not to be used for anything other than storing explosives. It should be kept free from any other tools, equipment of items and should at all times be kept as clean and tidy as is practicable.
f. The facility is to secured at all times except when it is being ventilated when it should be guarded.
g. Facilities are to be constructed in such a way as to provide protection from static electricity.
h. If thunderstorms are predicted all work in and around the facility is to stop and personnel are to go to a safe place.
i. In the event that the facility repair, all explosives and explosive accessories are to be removed before repairs are started.

6. REQUIREMENTS WHEN PREPARING TO TRANSPORT EXPLOSIVES

6.1 The following is to implemented and/or adhered to when preparing to transport explosives by vehicle:

a. Persons responsible for the transportation of explosives are to ensure:
   (1) That suitable communications systems are available that will allow for communication from the vehicle to the organisation throughout the complete journey.
   (2) That an appropriate communication plan (covering as a minimum a radio check prior to leaving the start location and informing on arrival at destination) is in place for the journey.
   (3) That a route card is prepared covering the complete journey.
   (4) That the driver and drivers assistant are aware of all actions to be taken covering all possible eventualities during the journey i.e. breakdown, accident, robbery, etc.
b. Explosives will not be transported unless securely packed in appropriate boxes. Boxes or individual packages are to have specific identification marks on them.
c. Each box is to be marked with the applicable hazardous classification code.
d. Boxes are to be closed and made waterproof in order to prevent any loss or spilling and moisture ingress during transport. If the vehicle is not a covered vehicle, boxes are to be covered with a waterproof cover.
e. Detonators are to be securely packed in a separate metal box from explosives. Boxes containing detonators are to be carried in a separate compartment of the vehicle from boxes containing explosives. UNDER NO CIRCUMSTANCES ARE DETONATORS TO BE CARRIED IN THE SAME BOX AS EXPLOSIVES.
f. Detonators and explosives are to be loaded on to the vehicle in such a way that they do not move about during transportation.
g. Boxes, pallets and other packaging for transport of explosives are to be evenly distributed over the whole deck area, and can be loaded up to the height of the sides of the truck. All individual packaging and boxes with explosives are to be loaded and fixed to prevent spillage from boxes and turning over or impact inside boxes.

7. REQUIREMENTS OF VEHICLES USED FOR THE TRANSPORT OF EXPLOSIVES

7.1 Vehicles employed to transport explosives are to be roadworthy, well maintained, and in good working order. Persons in charge of the transport of explosives will check the following prior to any movement of vehicles carrying explosives.

a. The vehicle is marked appropriately.
b. The driver and driver’s assistant are briefed about the type of explosives to be transported as well as their destination and the route they are to take.
c. The type and quantity of explosives and conditions of roads to be travelled on are to be considered when deciding the type of vehicle to be used.
d. If vehicles carrying explosives are travelling in convoy, then the distance between vehicles is to be a minimum of 100 metres.
e. All vehicles that are employed for the transport of explosives should also carry the following equipment:
   (1) At least two appropriate fire extinguishers, one for the vehicle engine and one for the load, extinguishers are to be charged with a content that will efficiently extinguish an explosives fire.
   (2) Two hand-torches.
   (3) Two warning triangles for marking the vehicle when stationary on the road.
f. Vehicles transporting explosives shall be fitted with an earthing-strap to take away static electricity from the vehicle to the ground.
8. PROCEDURES IN CASE OF TRAFFIC ACCIDENT

8.1 In case of an accident that does not allow for the transport to continue, the crew is to immediately inform their organisation’s headquarters.

8.2 In case of an accident, the duties of the driver and drivers assistant are to:
   a. Extinguish any fires on or in the vehicle.
   b. Take necessary measures to prevent any danger to other vehicles or people in the area.
   c. Place warning triangles to the front and to the rear of the vehicle to indicate the vehicle is stationary on the road. This is to apply both night and day.
   d. In daytime the driver should send his assistant a distance of 100 metres with a flag to warn oncoming traffic. At night use lights to warn other vehicles using the same carriageway as the stopped vehicle, ensuring traffic slows down, stops or overtakes safely.
   e. Signs and lamps are placed a minimum of 50 metres behind the vehicle so that they are visible to other drivers from a distance of at least 150 metres from the stationary vehicle.

8.3 After suitably marking the vehicle, and before any officials arrive to make an investigation; the crew should carry out the following:
   a. Remove from the vehicle all documentation relating to the transport of explosives.
   b. Prevent spillage of explosives.
   c. Prevent the approach of bystanders and warn them of the danger.
   d. Inform the closest local police station, and suggest the necessary action required of the police.

8.4 When investigating officials arrive, inform them of the content and potential danger the cargo could pose to people, property and environment.

9. ADDITIONAL SAFETY MEASURES WHEN TRANSPORTING EXPLOSIVES

9.1 The following are additional safety measures for the transport of explosives:
   a. No passengers are to be carried in vehicles transporting explosives. Vehicle crews are to consist only of a driver and a driver’s assistant.
   b. No material that may cause a fire may be carried in vehicles transporting explosives.
   c. No repairs that might cause fire by sparking due to impact or violent contact may be carried out.
   d. No smoking is allowed in the driver’s cabin or any other part of the vehicle.
e. The vehicle is not to be left unattended.
f. The driver will drive with care and at an appropriate speed for the roads and conditions which in all cases shall never exceed 70 KPH or 80% of the highest speed determined for the road whichever is less.
g. If the explosives are stolen, the organisation or persons transporting the explosives are to take measures to find it and to report the incident to the person in charge of the transport and also inform the local authorities and the UNRMAO.
h. Explosives and the means to initiate explosives may be transported together only when the quantity of explosives does not exceed 50 kg, and 100 detonators. This will only be allowed provided that the detonators are in their originally packed boxes, and that the explosives is packed and loaded separately from the detonators.

10. SAFE STORAGE OF EXPLOSIVES

10.1 Those storage facilities under the control of UNMAO will be licensed to store explosives in accordance with IMAS 10.50. Full details of the licensing procedures are detailed at Annex A to this Chapter. A table detailing the Quantity (Safety) Distances that are to be used when licensing Explosive Storage Facilities are detailed at Annex B to this Chapter.

10.2 When storing explosives the following applies:

a. Ammunition Compatibility Groups: Ammunition and explosives have been grouped into twelve Compatibility Groups (CGs) A to H, J, K, L and S. Group I is omitted to avoid possible confusion between the letter I and the Roman numeral 1. Group S is given a distinctive letter since it corresponds to a unique possibility for mixing in storage and transport. Definitions of compatibility groupings are;
   (1) Group A - Primary explosive.
   (2) Group B - Ammunition containing primary explosive.
   (3) Group C - Propellant, explosive or other secondary deflagrating explosive or ammunition containing such explosive.
   (4) Group D - Secondary detonating explosive or black powder or ammunition containing secondary detonating explosive, in each case without its own means of initiation and without a propulsive charge.
   (5) Group E - Ammunition containing secondary detonating explosive, without its own means of initiation, with a propulsive charge.
   (6) Group F - Ammunition containing secondary detonating explosive, with its own means of initiation, with or without a propulsive charge.
   (7) Group G - Pyrotechnic substance, or ammunition containing pyrotechnic substance, or ammunition containing both an explosive and an illuminating, incendiary, lachrymatory or smoke producing substance (other than a water-activated article or one containing WP, phosphide or flammable liquid or gel).
   (8) Group H - Ammunition containing both an explosive and WP.
(9) Group J - Ammunition containing both an explosive and a flammable liquid or gel.
(10) Group K - Ammunition containing both an explosive and a toxic chemical agent.
(11) Group L - Ammunition containing explosive and presenting a special risk needing isolation of each type.
(12) Group S - Ammunition so packaged or designed that any explosive effect during storage or transport is confined within the package except when an external fire has degraded the packaging.

**WARNING:** CG D applies only when secondary detonating explosive (high explosive) or black powder is properly packed in a dust-tight container. OTHERWISE, CG L applies.

**WARNING:** CG D or E may apply to ammunition that is fused or packed together with fuses.

**WARNING:** CG F does not necessarily apply to ammunition that is fused or packed together with fuses.

(b) **Compatibility groups which may be stored together:**

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**WARNING:** Detonators may be stored or transported with other materials, provided they are adequately segregated.

**WARNING:** Exception: Detonators that are not mass detonating may be stored with safety fuse, electric squibs, igniters, or igniter cord and as specified in IMAS 10.50.

**WARNING:** Compatibility group F CAN are stored in the same magazine as C, D and E, but it must be well segregated and the entire quantity must be considered as Compatibility Group F.

**WARNING:** Fuses in B with D or E of which fuses are components. The load is treated as Compatibility Group F.

**WARNING:** Compatibility Group G MUST be stored in its standard service packaging for it to be allowed to be stored with C, D or E. Otherwise it MUST be stored separately.
10.3 The storage specifications provided in these Guidelines are specifications that apply to the storage of explosives normally used for the destruction of UXO hazards. EOD Units should not presume that these specifications are safe for the storage of munitions awaiting EOD procedures for destruction in a central disposal site or other requirements.

11. INERT, DRILL, INSTRUCTIONAL OR REPLICA MINE AND AMMUNITION

11.1 General: Inert, drill, instructional or replicas of mines and ammunition shall be handled, stored and accounted for accurately, in order to:

   a. Avoid accidents.
   b. Avoid incidents of mistaken identification leading to unnecessary clearance operations or render safe procedures.
   c. Ensure the security of drill and inert mines and ammunition.
   d. Ensure that drill and inert mines and ammunition are not subjected to unnecessary damage, which can be expensive.

11.2 Modification: All authorised breakdown or modification of live mines and ammunition into inert, drill, instructional or replica items shall be carried out by appropriately qualified and authorised EOD personnel. As such operations carry a high degree of inherent risk, the authorisation for such activities shall be the responsibility of the senior in-country representative of the mine action organisation. Such operations should only be carried out by a Level 4 EOD technician.

   WARNING:

Drill and replica mines and ammunition are readily available on the commercial market. They are made up from empty components, either obtained direct from the original manufacturer or specifically made for the purpose. These should be used as the first choice. Locally manufactured drill and instructional mines and ammunition should only be used as a last resort.

Demining organisations shall not indulge in the production of Free From Explosives (FFE) ammunition and explosives as souvenirs.
11.3 **Storage:** The following applies when storing inert, training or other non-live/FFE items:

a. Inert, drill, instructional and other replicas of mines and ammunition shall not be stored with live ammunition. They shall be stored in a separate location.
b. Mines and ammunition that have been subjected to render safe procedures, and have been certified as FFE, shall be stored in the same manner as drill and inert ammunition.
c. Inert, drill, instructional and other replicas of mines and ammunition shall not be stored in the same containers as live ammunition. They shall be stored in a separate container, which shall be clearly marked INERT or DRILL in English and Arabic. All other markings shall be eradicated from the container to ensure that there is no possibility that it could mistakenly be identified as containing live ammunition.

11.4 **Movement:** The following applies when moving and/or transporting inert, training or other non-live/FFE items:

a. Inert, drill, instructional and inert replicas of mines and ammunition shall not be moved in the same containers as live ammunition. They shall be moved in a separate container, which shall be clearly marked INERT or DRILL in English and Arabic. All other markings shall be eradicated from the container to ensure that there is no possibility that it could be mistakenly identified as containing live ammunition.
b. It is recommended that inert, drill, instructional and other replicas of mines and ammunition are not moved on the same vehicle as live ammunition wherever possible, but it is accepted that local circumstances may not allow for this.

11.5 **Marking:** The following applies when marking inert, training or other non-live/FFE items:

a. All shall be clearly marked on all sides as either ‘INERT’ or ‘DRILL’ as appropriate in English and Arabic. This ensures that they can be clearly identified from all angles, and therefore do not inadvertently or accidentally become the focus of a clearance operation or render safe procedure.
b. All shall also be marked with a unique serial number. This unique serial number should be in the following format:

11.6 **Safety:** If an individual is in any doubt as to the explosive status of a mine or item of ordnance, then it shall be treated as live, and technical demining or EOD advice shall be immediately requested. The following also applies:
a. Mine action organisations should not breakdown, modify or tamper with mines and ammunition, unless it is done in the course of inspection, modification or disposal in accordance with the appropriate technical procedures.
b. Technical procedures for the breakdown or modification of live mines and ammunition into inert, drill, instructional or replica items shall be developed by appropriately qualified EOD personnel.

12. REGISTRATION AND ACCOUNTING FOR INERT OR DRILL MINES AND AMMUNITION

12.1 The demining organisation shall maintain a master register of all inert, drill, instructional or other replica mines and ammunition that it has responsibility for. This register shall include the following information:

a. Serial number
b. Type of mine/UXO
c. Current location.
d. FFE

12.2 The mine action organisation shall operate an appropriate accounting system to ensure accountability and traceability for all inert, drill, instructional or replica mines and ammunition in its possession. It is recommended that this is based on their live ammunition accounting system.

13. FREE FROM EXPLOSIVE (FFE) CERTIFICATE

13.1 All inert, drill, instructional or replica mines and ammunition shall be visually inspected and physically examined by an appropriately qualified EOD technician to ensure that the item contains no explosive, pyrotechnic, lachrymatory, radioactive, chemical, biological or other toxic components or substances.

13.2 The EOD technician shall also ensure that all ammunition markings, (designation, hazard division, hazard compatibility code, previous serial numbers, UN symbols etc), that refer to the previous live condition of the item have been removed or obliterated.

13.3 The EOD technician shall then issue a FFE certificate for the item. This certificate shall contain the following information:

a. Unique serial number.
b. Date
c. Name of inspecting EOD technician
d. Brief description of item
e. An FFE certification statement

13.4 The following is a recommended statement and should be written in English and Arabic:
I certify that I have visually inspected and physically examined the item referred to on this FFE certificate and confirm that this item contains no explosive, pyrotechnic, lachrymatory, radioactive, chemical, biological or other toxic components or substances. I also certify that I have ensured that all previous ammunition markings have been removed and that the item as been remarked as either DRILL and/or INERT. I am satisfied that it is safe to use for drill, display or instructional purposes.

Signature of inspecting EOD technician.

13.5 The demining organisation shall maintain a register of all FFE certificates issued.