NATO GUIDELINES FOR THE STORAGE, MAINTENANCE AND TRANSPORT OF AMMUNITION ON DEPLOYED MISSIONS OR OPERATIONS

AASTP-5

March 2009
Allied Ammunition Storage and Transport Publication

NATO Guidelines for the Storage, Maintenance and Transport of Ammunition on Deployed Missions or Operations (AASTP)-5

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March 2009
NORTH ATLANTIC TREATY ORGANIZATION

NATO STANDARDIZATION AGENCY (NSA)

NATO LETTER OF PROMULGATION

30 March 2009

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3. AASTP-5 (Edition 1) contains only factual information. Changes to these are not subject to the ratification procedures; they will be promulgated on receipt from the nations concerned.

Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency
## RECORD OF CHANGES

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Allied Ammunition Storage and Transport Publication

NATO Guidelines for the Storage, Maintenance and Transport of Ammunition on Deployed Missions or Operations (AASTP)-5

Part I

“AWARENESS GUIDE FOR THE OPERATIONAL COMMANDER”
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1. General

a. These guidelines apply in a deployed environment and establishes the minimum safety requirements for deployed NATO forces. Compliance with these guidelines is recommended except where compelling operational necessity requires relaxation.

b. Where the requirements of the AASTP-5 cannot be met, a risk analysis methodology described in paragraph 5 should be applied.

c. AASTP-5 will assist the planning, transport, reconnaissance, establishment and management of ammunition in the deployed environment.

d. AASTP-5, Part I, is intended to serve as a awareness guideline for commanders in the field.

e. AASTP-5 is effective upon receipt. AASTP-5, like other AC/326 AASTPs and AOPs, will be revised every three years. Comments from users of this publication are invited. Comments should be directed to the Secretary of the AC/326 at NATO HQ; Brussels, Belgium.

2. Management

a. The Force Commander has overall responsibility for all ammunition and explosives safety.

b. The Commander is accountable for striking a balance between safety and operational requirements using the information available. The Commander must be informed when the minimum standards cannot be met and understand the possible consequences of any reduction in safety criteria.

c. It is recommended that during the planning process, provision should be made to involve those personnel responsible for the storage and management of ammunition. It follows that (a) competent person(s) of an appropriate rank/grade should be appointed in writing on orders, as the Explosives Safety Officer (ESO), to be responsible to for all explosives matters.

d. The ESO cannot approve deviation from the standards identified in this Publication. Any request for deviation must be approved by the appropriate authority.

e. A Risk Analysis/Assessment should be performed in accordance with AASTP-5 Part II for all requests to deviate from approved safety standards.

f. Personnel access to ammunition areas is the Commanders responsibility. An access roster should be developed and updated on a regular basis to permit only mission essential personnel access. Decisions should be based upon J3 advice.
3. Explosives Safety Program

a. The Commander is responsible for initiating and maintaining an Explosives Safety Program (ESP). ESP is a functional program combining occupational safety training with operational and support activities of the Force. The aim of the program is to prevent accidental bodily harm, and damage or loss of materiel or facilities (i.e. military and civilian) from the hazardous effects of accidental explosions.

b. The primary effects to be considered are blast overpressure, ammunition fragments, debris from the storage facility, crater ejecta, ground shock, and thermal effects. Each of the explosion effects can cause injuries to personnel and damage to assets. The level of injuries or damage is dependent on the Potential Explosion Site (PES) involved Net Explosive Quantity (NEQ, type of storage facility and its orientation towards the ES) and the stand-off distance of the ES.

c. Generally, increasing the NEQ of a PES has a direct effect on the consequences, and therefore the risk(s) of accidents.
4. Reconnaissance

a. Site selection should be based on a reconnaissance which examines all relevant ammunition safety factors. Annex I-A provides a Reconnaissance checklist for the Operational Commander.

b. The aim of the reconnaissance is to find an appropriate site for the storage of the unit’s ammunition. Main factors include:

   (1) The size of the storage area;
   (2) Safety distances to accommodation and maintenance area of the camp and neighbouring camps;
   (3) Safety distances to civilian buildings and roads;
   (4) General suitability (ground quality, gradient, etc.);
   (5) Availability of technical utilities.

   See also Annex II-B-1 for more details.

c. The results of the reconnaissance process is to be documented, checked for compliance with the provisions in this document and submitted to the appropriate channels, such as G3, G4 of the operating nation as well as the host nation. The appropriate authority must approve the reconnaissance report.

d. Storage sites must be part of the logistic system. No more than 4,000 kg NEQ of ammunition can be stored at any one basic module.

e. The minimum Field Distances (FD’s) that have to be met from a PES to an ES are based upon the NEQ of the ammunition concerned and the type of explosive (see Part II).

f. Aggregation and mixing rules for Hazard Divisions and Compatibility Groups for storage and transport should be applied where applicable.
5. Operational guidelines

a. The principle objective of the Field Storage concept is the dispersion of ammunition to minimize the loss in the event of fire, accidental explosion, or enemy action. Separate areas must be established for storing, marshalling and examining ammunition, for parking ammunition vehicles and for storing returned/found/captured ammunition.

b. An ammunition storage site may be used to store containers, flat racks or stacks separately or in combination. The minimum distance requirements specified in AASTP-5 must be met for both interior (inside the storage site) and exterior (off-post).

c. Ammunition should be stored in accordance with the FD’s outlined in Part II. The use of effective barriers between storage modules will reduce the amount of space needed for storing ammunition.

d. Captured ammunition must be isolated from own ammunition (see Part II for details).

e. Roads in, and leading to, explosive facilities are to be maintained in a good state of repair to reduce the risk of vehicle accidents. All streams, ditches and culverts are to be kept clear and free of obstruction.

6. Implementation

a. Personnel controlling or supervising the handling of ammunition at ammunition field depots must be appointed by the Commander. The person designated must be thoroughly familiar with the operation, and clearly understand the hazards and risks.

b. Any relaxation in safety standards requires a risk analysis. The analysis is a systematic procedure that will determine if an acceptable level of protection is provided. Acceptance of risk is to be made with the authority of the Commander, after considered judgment of the balance of risk after development, implementation and enforcement of control measures to mitigate whilst maintaining operational efficiency.

c. The acceptance will be a documented waiver signed by the appropriate level per AASTP-5, Part II.
7. Threats and Protection

7.1 Fire Protection

a. Fire represents the greatest threat to an ammunition storage area and every effort should be taken to reduce the threat of fire.

b. Fire protection plans must be prepared for each facility used to store ammunition and explosives.

c. An emergency water supply (EWS) must be provided for fire fighting purposes.

d. All fire in the vicinity of ammunition should be fought until stacks of explosives or ammunition become involved in the fire.

Caution: Ammunition fires of Hazard Divisions, HD, 1.1, 1.2, 1.3, 1.5 and 1.6 must not be fought!

e. Potential explosion sites with ammunition should always be identified by the prescribed fire division symbols of the most hazardous material present. An updated and central key plan of the PES with all fire division symbols, chemical Hazards panels, mandatory and prohibition signs within the access area of ammunition storage sites in an ammunition field depot is an alternative to posting symbols when the Commander, for security purposes chooses to remove the symbols.

f. Ammunition which has been exposed to fire is considered unsafe to handle and transport. Suitable qualified personnel must be consulted in deciding on future action.

7.2 Distance to Transmitting Stations

Minimum distances must be maintained from transmitting stations, dependant on the transmission power, see AASTP-5 Part II.
7.3 Security
a. Security is the responsibility of the Commander.

b. The presence/movement of the stocks should be advertised as little as possible (by signing, placarding etc), whilst safety practices, and the expectations of the host nation and visiting troops. The number of personnel with access to the storage, both in the physical sense and to the stock register should be limited to the minimum.

c. Possible security measures:
   (1) A personnel access list;
   (2) Surveillance system;
   (3) Intrusion barricades;
   (4) Physical and electronic security measurements;
   (5) Emergency response plans.

7.4 Barricades and approved structures
a. Barricades function by stopping ammunition fragments, and protecting stored ammunition against external threats, such as enemy fire.

b. Effective barricades between ammunition modules prevent sympathetic detonations. Barricades around PESs protect personnel and material from horizontal high velocity fragments.

c. Barricades can be provided by sloped terrain, sandbags, concertainers (e.g. Hesco-Bastion), mounds for earth-covered buildings and elevations (see Part II for more details).

7.5 Weather and lightning protection
a. Ammunition should not be exposed unnecessarily to inclement weather or direct sunlight and should be protected from sand, mud and water which can all have a serious impact on reliability as well as safety. Ammunition should not be unpacked except for operational necessity.

b. Storage of ammunition under cover is preferred. Ammunition must not touch the walls or ceiling of a structure in order to to allow proper ventilation.

c. If ammunition is stored in closed and properly grounded ISO containers it can be considered protected from lightning.
8. Field Distances and Risk Analysis

a. Standard Field Distances are detailed in AASTP-5, Part II.

b. The risk(s) to personnel and assets must be assessed (see AASTP-5, Part II) in situations where the standard Field Distances can not be followed, e.g. due to:

1. Mission requirements;
2. Lack of available area;
3. Lack of structural measures (e.g. barricades);
4. Lack of personnel;
5. Security reasons.

Item Checked □

9. Transport

a. The guidelines in AASTP-2 should be followed. If for operational reasons this is not possible, the table 6.2 in Part II para. 6 details where these guidelines may be relaxed. Before such a decision, the Commander should consult with the ESO for the consequences of an event. The results should be documented as the basis for his/her decision.

b. The following may be relaxed under conditions spelled out in Part II:

1. Remove and / or change plates / placards
2. Escort
3. Risk minimisation
4. Upload vehicles
5. Load capacity
6. Packaging
7. Complete round (AUR)
8. Load security

Item Checked □
Checklist for the Operational Commander, OPCO

1. What are the threats for the mission.

2. Is there an up-to-date reconnaissance report available?

3. Is there sufficient knowledge available in the reconnaissance party concerning ammunition safety and ammunition risk management (storage, handling & maintenance)?

4. Is there an officer responsible for ammunition safety and risk management during this operation?

5. Are there enough qualified soldiers for the safe handling of ammunition?

6. Is there enough handling equipment for the different types of ammunition?

7. Is there enough space for the safe storage, handling and maintenance of the ammunition i.a.w. the recommendations of AASTP-5? If not what are the effects and the risks for the own troops and material?

8. Are the risks known for operations or storage that do not meet the minimum standards?

9. Are the effects known if a storage module explodes?

10. Is it necessary to get a waiver for the use of smaller field distances (FD) than the FD recommended in the AASTP-5?

11. Is it necessary to store ammunition in conditioned containers / storage locations?

12. Is it necessary to make use of the BLAHA principle. (Total new max 4000 kg, no storage rules)?

13. Is there a location available for the safe storage of damaged ammunition?

14. If it’s necessary to have ammunition directly available for use on the camp:
   (a) Where is this ammunition stored?
   (b) How is this ammunition stored?
   (c) What are the risks of this kind of storage for the own troops?
   (d) Is there a lightning protection system applied for the explosive storage and operating location?
   (e) Is there protection against electrostatic charges available in the maintenance location?
15. Is there enough material to provide the appropriate protection for:

(a) The safe storage of the ammunition (no simultaneous reactions)?
(b) The protection of mission critical weapons/ammunition?
(c) The protection of own troops?
   (d) The protection of civilians? Is there enough time to provide the appropriate protection before the ammunition is brought in?

16. Are the storage modules appropriately marked (i.a.w. the threat level)?

17. Are the storage modules marked in the appropriate way (i.a.w. the threat level)?

18. What fire fighting arrangements are made in place?

19. Is there a surveillance plan available, which deals with:

   (a) Responsibilities (handling storage and maintenance)
   (b) Access procedures for the storage location
   (c) Physical security of the storage location
   (d) Fire & lightning protection of the storage location
   (e) Storage & maintenance rules
   (f) Inspection of ammunition
   (g) Transport of ammunition
   (h) Explosive safety program

Refuge (ARP shelter)
Allied Ammunition Storage and Transport
Publication AASTP-5

NATO Guidelines for the Storage, Maintenance
and Transport of Ammunition on Deployed
Missions or Operations

Part II

“GUIDELINES FOR THE SPECIALISTS”
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1.1 Scope

a. AASTP-5 Part II, establishes North Atlantic Treaty Organisation (NATO) guidelines for the storage, maintenance and transport of ammunition during deployed missions and operations. It assists in the planning, reconnaissance, and establishment of an Ammunition Area in a deployed environment and then for the management of the ammunition. AASTP-5 Part II is designed for use by the Operational Commander’s specialist (see Annex II-A).

b. AASTP-5 Part II establishes minimum requirements that are based on reducing the maximum credible event (MCE) to no greater than 4,000 kg net explosive quantity (NEQ), to avoid/reduce loss of personnel and material, minimize the effects of unintended detonations/reactions during storage, transportation and handling or as a result of enemy action.

c. AASTP-5 applies when AASTP-1 and AASTP-2, and rules described in international and national regulations, cannot be applied. Compliance with AASTP-1, AASTP-2, and rules described in international regulations (IMDG, IATA, ADR, RID) are recommended except where compelling operational necessity requires relaxation.

d. It should be emphasized that even with adherence to the Field Distances (FD) in the Table 5.1 damages to structures and injuries (even lethality) to personnel may occur in case of an event in an explosive storage facility. Asset protection is not considered in this document.

e. AASTP-5 is effective upon receipt. AASTP-5, like other AC/326 AASTP’s and Allied Ordnance Publications (AOP) will be revised every three years. Comments from users of this publication are invited and these should be directed to the Secretary of the AC/326 at NATO HQ, Brussels, Belgium.

1.2 Deviations

a. Before the Operational Commander makes any decision to deviate from AASTP-5 and applicable international rules, it is advisable that specialists are consulted (for example fire fighting, ammunition safety, security, transport) and asked to highlight any possible consequence of relaxation of certain rules. Any advice provided to the Operational Commander must be documented and properly recorded.

b. Where the requirements of this document cannot be met, a consequence and/or risk analysis must be conducted before making a decision to deviate from these guidelines. This analysis is a systematic procedure that will determine if an acceptable level of protection is provided. Acceptance of risk must be made only after considered judgment of the balance of risk after development, implementation and enforcement of control measures to mitigate negative effects whilst maintaining operational effectiveness. Any request for deviation must be approved by the appropriate authority.
c. Prior to an Operational Commander authorizing a deviation to this manual, it must be recognized that it may have a follow on effect to other nations in the event that they take over the compound. Further, prior to approving a deviation, the Operational Commander must recognize that they may not only be putting own nation’s personnel at risk but potentially also other nations personnel.

1.3 Responsibilities

a. The Operational Commander is accountable for striking a balance between safety and operational requirements using the information available and must therefore be made aware of the consequences of any deviation from safety criteria.

b. It is recommended that during the planning, reconnaissance and construction processes, provision should be made to involve those personnel responsible for the storage and management of ammunition. During the operational phase, an Explosives Safety Officer (ESO) should be appointed. The ESO is responsible for advising the Operational Commander on all explosives safety matters. The competencies required by an ESO are detailed at Annex II-A together with a checklist for inspections by an ESO.

c. Access to an Ammunition Area is the Operational Commander’s responsibility. Access decisions should be based upon J2/J3 advice.

d. The Operational Commander is responsible for initiating and maintaining an Explosives Safety Program (ESP). The ESP is a functional concept combining occupational safety training with operational and support activities of the Force. The aim of the program is to prevent accidental bodily harm and damage or loss of materiel or facilities (i.e. military and civilian) from the hazardous effects of accidental explosions. See the Checklist in Annex II-A for conducting (unscheduled and) scheduled inspections.

e. The primary effects addressed in an ESP are air blast, ammunition fragments and debris from the potential explosion site (PES). Each of the explosion effects may cause injuries to personnel and damage to assets. The level of injuries or damage is dependent on a number of factors (e.g. the PES involved, its Net Explosive Quantity (NEQ), its orientation towards the Exposed Site (ES) and the type and stand-off distance of the ES).

f. Generally, changing the NEQ of a PES has a direct effect on the FD required, and the consequences associated with an accident.
1.4 *Acronyms and Definitions*

1.4.1 Key terminology

**MUST** Indicates a technical requirement which is vital for the safety of a depot and the avoidance of a catastrophe.

**SHOULD** Indicates a safety requirement which is important but not essential.

**MAY/CAN** Indicates optional courses of action and possibilities.

**IS/ARE** Indicates a fact or a valid technique. (from AASTP-1)
1.4.2 Acronyms

AASTP  Allied Ammunition Storage and Transport Publication
ADR  European Agreement on the International Carriage of Dangerous Goods
AE  Ammunition and Explosives
AIS  Accident Information Sheet
AMOV P  Allied Movement Procedure
AOP  Allied Ordnance Publication
BLAHA  Basic Load Ammunition Holding Area
BLSA  Basic Load Storage Area
CALA  Combat Aircraft Loading Area
CAPA  Combat Aircraft Parking Area
CEA  Captured Enemy Ammunition
CG  Compatibility Group
ECM  Earth Covered Magazine
EM  Electro-Magnetic
EOD  Explosive Ordnance Disposal
ES  Exposed Site(s)
ESO  Explosives Safety Officer
ESP  Explosives Safety Program
EWD  Emergency Withdrawal Distances
FARP  Forward Ammunition and Refueling Point
FD  Field Distance
FEP  Fire and Emergency Plan
FPO  Fire Protection Officer
HD  Hazard Division
IATA  International Air Transport Association
IBD  Inhabited Building Distance
IMDG  International Maritime Dangerous Goods Code
ISO  International Standardization Organization
MOU  Memorandum of Understanding
MCE  Maximum Credible Event
NEQ  Net Explosive Quantity
OHP  Overhead Protection
PES  Potential Explosion Site
POD  Point of Debarkation
POE  Point of Embarkation
QD  Quantity Distance
RID  Regulations on the Carriage of Dangerous Goods by Rail
RP  Rearming Pads
SG  Sensitivity Groups
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<tr>
<td>SsD</td>
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<td>SOP</td>
<td>Standard Operating Procedure</td>
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<td>WP</td>
<td>White Phosphorus</td>
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1.4.3 Definitions

Ammunition Area  A group of PES at a minimum of FD from each other.

Cargo Aircraft  An aircraft, other than a passenger or a passenger/cargo carrying aircraft, carrying freight or cargo. (from AASTP-2)

Combat Aircraft  A military aircraft designated to carry combat-configured munitions.

Combat Aircraft Parking Area  Any area specifically designated for:
  a. Aircraft loading or unloading of combat-configured munitions.
  b. Parking aircraft loaded with combat-configured munitions.

Compound  An area that incorporates functions, facilities, and operations necessary for the accomplishment of a mission.

Concertainer  A cage within which can be placed various fill materials (e.g. gravel, sand, rock), and which is used for building walls, barricades and protective barriers.

External Safety Distance  Distance applied from PES in a compound to ES located outside the compound.

Field Distance  Distances applied from a PES to other PES or ES located within a compound.

Forward Arming and Refuel Point  A temporary arming and refueling location that is organized, equipped, and deployed by an aviation unit.

Heavy Armoured Combat Vehicles  Vehicles constructed so that they protect the crew against the hazards of the main guns, anti-tank weapons and artillery ammunition.

Hot Refueling  Refueling of an aircraft whilst engines are still running.

Light Armoured Combat Vehicles  Vehicles constructed so that they protect the crew against the hazards of small arm ammunition, machine guns and fragments.

Non-Armoured Combat Vehicles  Vehicles constructed without armour protection.

Non-Robust Munitions  A munition that does not meet criteria as a Robust Munition, see below.

Outside Compound  An object influenced by the explosive effects from a PES. An ES containing explosives, in this publication, is considered to be a PES.

Personnel  People within the compound.

Prompt Sympathetic Detonation  Propagation of an explosion (e.g. munition to munition or stack to stack), without sufficient time delay between reactions, with the result being coalescence (e.g. joining) of the two or more blast pressure waves into a single pressure wave similar to one that would have been generated by a single explosion involving the combined NEQ at all the reacting munitions. FD in such situations is based on the combined NEQ.

Sympathetic Detonation  Propagation of an explosion (e.g. munition to munition or stack to stack), with sufficient time delay between reactions, with the result being that coalescence (e.g. joining) of blast pressure waves does not occur. The result is that each explosion is viewed as a separate
event, with its own FD. Using appropriate FD should assure that prompt sympathetic detonation does not occur, though use of FD cannot rule out that subsequent sympathetic reactions might occur.

Rearming Pads
Element of the FARP.

Robust Munitions.
AE that meet two of the following criteria:

1. Have a ratio of the explosive weight to empty case weight less than 1.
2. Have a nominal wall thickness of at least 10 mm.
3. Have a case thickness/NEQ1/3 >0.165 cm/kg1/3.

Examples of Robust Munitions include 20 mm, 25 mm, and 30 mm cartridges, GP bombs, artillery projectiles, and penetrator warheads.
2. Planning, Reconnaissance, and Design for a Compound

2.1 Introduction

a. Consideration shall be given to different functions needed within a compound to accomplish a mission (e.g. administrative buildings, fuel storage, sleeping accommodation, ammunition storage, maintenance facilities, ammunition truck holding locations, inspection stations, airfield, port, demolition grounds and other similar areas/operations). Each PES within a compound must be defined considering that different ammunition Hazard Division (HD) and Storage sub-Divisions (SsD) react differently when initiated.

b. FD are provided for the separation of ES from PES and between different PES.

c. An output from the planning, reconnaissance and design phase will be a site plan document, which must be approved by the appropriate authority. This document forms the basis for the compound layout and design and will be transferred as the user of the compound changes.

2.2 Planning

a. The aim of the planning phase is to find an appropriate area of the right size for the storage of the unit’s ammunition. The following information is necessary before starting the reconnaissance operation:

- (1) Maps of the area.
- (2) Environmental and weather information of the area. It must be remembered that high temperatures and high humidity can effect the lifetime, quality and safety of some kinds of ammunition, such as rocket systems, flares, White Phosphorus (WP), etc. Further details can be found in Chapter 4.
- (3) Type of mission and operation (e.g. peace keeping, peace enforcing), both present and future, and acceptable losses of materiel.
- (4) Ammunition type, NEQ and HD.
- (5) For flexibility in the use of the storage, all planning should be based upon HD 1.1 material only.
- (6) Required activities in the Ammunition Area such as maintenance, handling of captured ammunition, package, etc.
- (7) Any Memorandum of Understanding (MOU) between partners and the host nation.
- (8) Designation of the lead nation. The lead nation may be different during different phases.
- (9) People in the area and possible threats.
- (10) Important infrastructure including military structures.
- (11) General suitability of terrain (e.g. flood-prone, swampy, vegetation, ground quality, gradient).
- (12) Requirement for specialized buildings (i.e. workshops, receipt & issues, salvage and office buildings).
- (13) Availability of utilities (e.g. power, water).
(14) Any Ammunition Area should be at least 100 m from a switching station (i.e. Power station, RF station or large transformer station) since these stations can introduce high uncontrollable currents.

Given the information above, the main considerations for defining the layout of an Ammunition Area will be the required FD and Inhabited Building Distance (IBD).

b. During the planning of operational ammunition storage facilities, decisions are made that may be difficult to rectify at a later date. It is therefore of prime importance that the planning is focused and conducted by highly qualified personnel. It is recommended that during the planning process, provision should be made to involve those personnel responsible for the storage and management of the ammunition that will be stored in the site. The ESO, engineers and troops from other arms and services should cooperate closely in the planning phase.

c. High priority must always be given to the safety associated with the storage, maintenance and transport of ammunition and explosives during deployment. During deployment, allowance must be made for varying logistic procedures in the planning process (pallets, containers). The planning should also include the handling equipment required.

d. It is important to remember that the IBDs applicable in the country of deployment must be observed whenever they are more stringent than the IBDs applicable in the country of origin.

e. The total NEQ of ammunition in each PES should be determined by adding the sum of the NEQ of all energetic compositions contained in all the ammunition excluding HD 1.4 which may be disregarded, see paragraph 2.2.a (5). The NEQ in any PES should never exceed a loading capacity of 4,000 kg.

f. Since building debris can contribute to additional hazards in case of an accident, building type must be taken into consideration prior to use as a storage building. Ammunition may only be stored on the lowest floor of a building and only if no personnel occupy floors above the designated storage floor.

g. The following should be considered for ammunition storage:

(1) Total gross weight.
(2) Total NEQ.
(3) HD and Compatibility Group (CG).
(4) Sensitivity Group (SG).
(5) Storage limitations of the individual items to be stored (e.g. temperature limitations for missiles, WP).
(6) Size of the package(s).

With this information the number of PES can be calculated. The required footprint for the Ammunition Area can then be determined by taking into account the required separation distances, as provided in Chapter 5, from all PES to all ES.
2.3 Reconnaissance

a. A well performed reconnaissance mission is the basis of a successful layout of an Ammunition Area. Missing or inaccurate information may lead to an unsafe situation. In the reconnaissance phase, technical specialists (e.g. engineers, ESO) should visit the area to determine if it meets mission requirements. Annex II-B, the Site Survey Check List, lists subjects and topics that should be evaluated to help determine the size of an Ammunition Area and compound. Annex II-D also provides example templates for an Ammunition Area. Some key points to consider when evaluating the Ammunition Area are:

1. The adequacy of existing roads and bridges. These may need to be upgraded.
2. Distances to infrastructure from the planned Ammunition Area must be calculated. Considerations of infrastructure must also take into account civilian use of facilities such as hospitals, schools, airfields, etc.
3. Cultural facilities: An awareness of cultural sites such as graveyards, religious buildings or other cultural sites must be maintained.
4. Availability of local materials (e.g. fill for barricades and Overhead Protection (OHP)).
5. Availability and capacity of existing utilities.
6. Lightning protection (see paragraph 4.3.3).

b. The results of the reconnaissance process must be documented, checked for compliance with the provisions in this document and submitted to the appropriate authority. The approved reconnaissance report will become the basis for the preparation and establishment of the planned compound.

2.4 Design Phase

a. A number of factors should be assessed as part of the design phase, including:

1. The number of ammunition containers to be stored at the Ammunition Area.
2. The types and numbers of PES needed (e.g. ammunition process buildings, ammunition truck holding locations, inspection stations, ammunition loading and unloading sites, disposal and detonation grounds, and other area/operations).
3. The NEQ for each PES.
4. The configuration lay-outs for the various HD and CG in the Ammunition Area.
5. The requirements for and types of OHP construction needed.
6. The types/thicknesses, to include fill material, of barricades and OHP.
7. The required FD between different PES.
8. The effects of a PES MCE and implication on construction inside the compound.
9. When applicable, the orientation of an Ammunition Area and individual PES with respect to ES (e.g. adjacent Ammunition Areas, mission critical assets, the public, hospitals, schools) and from external threats.
10. The required FD of PES to ES (e.g. Ammunition Areas, mission critical assets, etc.).
11. The required IBD of PES to ES (e.g. the public, hospitals, schools).
12. Window use.
   1. In Ammunition Area. Windows must not be used in the Ammunition Area because of the dangers from glass shards injury/lethality in the event of an explosion.
   2. In the compound but outside of the Ammunition Area. Windows use is not encouraged, but if used should be limited. To minimize injuries/lethality due to glass breakage,
3. Taping of and placement of specially designed plastic film on windows can improve their performance when exposed to explosive effects and should be used when possible. Special attachment techniques may also be required to keep the window glazing from presenting a blunt trauma risk to occupants of the building.

2.4.1 Barricades

a. The proper use of barricades can decrease the magnitude of a detonation event and increase the explosives capacity of limited areas. A barricade at a PES will stop low angle high velocity fragments, which are the primary mechanism for prompt detonation propagation. They also may protect the PES from enemy fire. The use of proper barricades at PES and/or ES is necessary for the implementation of the FD contained in this document.

b. The barricade should be thick enough and the material must have enough penetration resistance to stop high-velocity fragments. The barricade must be stable over time and should not be susceptible to environmental factors.

c. The fill material of a barricade should not be hazardous to personnel or other ammunition modules when it is launched by an explosion. The preferred type of fill material is free of organic and hazardous materials and should consist of sand or gravel with a maximum diameter of 20 mm.

(1) A proper barricade between PES will allow the use of reduced FD. Concertainer configurations of 1, 2+1, 2+2 or 2+2+1 (see Figure 4.1) (or equivalent) between adjacent storage containers should be used as the standard for Ammunition Areas in theatres of operations. Note that in the event of an explosion, the barricade may impact on an adjacent PES. Concertainer configurations of 3+2 or 3+2+1 do not provide more protection than the 2+2 or 2+2+1 mentioned previously, but can produce more mass movement onto the adjacent storage container, which may not be necessarily advantageous. For this reason, these larger barricades are not recommended between PES located at FD but are more suitable in front of the container opening.
Figure 4.1 Concertainer (for each min width 1 m) arrangements, 1 (up to 100 kg NEQ), 2+1 (up to 1000 kg NEQ) and 2+2, 2+2+1, 3+2, 3+2+1 (up to 4000 kg NEQ). (Note height of barrier, see paragraph 2.4.1)

(2) A proper barricade with a configuration of 2+2+1 or 3+2+1 (or equivalent) placed no more than 10 m in front of a PES opening should be used in theatres of operations. The closer the barricade is to the PES the better it will be for stopping/collecting fragments.

(3) The barricade between PES should be made a minimum of 0.3 m higher than the tallest of the adjacent stacks, see Figure 4.2.

It should be noted, however, that a barricade does not necessarily prevent subsequent propagation or damage caused by blast, lobbed items, debris or secondary fires.

OHP for barricaded PES construction can, under certain circumstances, be utilized to reduce explosion effects, protect the stocks from enemy fire and maintain a constant temperature. Suggestions for construction, and an example design follow:

(1) In a row of PES separated by concertainer barricades with OHP, each PES should have its own independent roof.
(2) Combustible materials should not be used to construct the OHP.
(3) The fill material for OHP should not be hazardous to surrounding ES when it is launched. The preferred type of fill material is free of organic material and should consist of sand or
(4) The fill material must be at least 60 cm deep and must cover the entire roof area of each PES.

(5) Columns used as support for the sectional roof may be inserted within the concertainer. Also, a minimum 60 cm ventilation gap may be provided between the top of the concertainer and the OHP to allow for rapid venting of blast overpressure. A secondary benefit is ventilation.

See Figure 4.3 for an example of a barricaded PES with OHP.

Figure 4.3 Example design of a barricaded PES with OHP.

2.5 Site Plan Document Preparation and Approval

a. A Site Plan is required prior to construction of the compound. The Site Plan document, which must be approved by the appropriate authority, should consist of:

(1) Layout drawings of the proposed compound.
(2) A description of use and occupancy of each facility within the compound.
(3) The NEQ and HD at each PES and its associated FD and IBD.
(4) Anticipated number of personnel in each facility on the compound.
(5) Approved construction drawings to include: materials used, barricades, structural hardening, OHP, lightning protection system, static grounding systems, windows.
(6) Standard Operating Procedures (SOP).
(7) A topography map, with contours (when terrain features are considered to provide natural barricading) or topography that otherwise influences the layout of facilities on the compound.
(8) Identified deviations from safety standards caused by local conditions.
3. Operational Ammunition Safety Procedures

3.1 Documentation Requirements

a. Once a site has been selected, the following documentation (where required) should be prepared and approved by the appropriate authority:

(1) MOU.
(2) Site plan document.
(3) Explosives licence. Annex II-D.
(4) Deviations.

3.2 Storage CG

a. Ammunition should be stored per Table 3.1 based on its assigned CG. To preserve operational capability and to reduce the risk of loss of the total stockpile of an item in the event of a fire or explosion, it is recommended that not more than 50% of any CG, and associated non-explosives components, are stored in any one PES. Where reasonably practicable, this stock is to be further dispersed.

Mixing of Compatibility Groups.

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LEGEND: X = Mixing permitted

Table 3.1 Rules for mixing of CGs in storage.(Notes on next page).
NOTES

1. Compatibility Group B fuzes may be stored with the articles to which they will be assembled, but the NEQ must be aggregated and treated as Compatibility Group F.
2. Storage in the same building is permitted if effectively segregated to prevent propagation.
3. Compatibility Group L articles must always be stored separately from all articles of other compatibility groups as well as from all other articles of different types of Compatibility Group L.
4. Articles of compatibility N should not in general be stored with articles of other Compatibility Groups except S. However if such articles are stored with articles of Compatibility Groups C, D and E, the articles of Compatibility Group N should be considered as having the characteristics of Compatibility Group D and the compatibility groups mixing rules apply accordingly.
5. A mixed set of munitions HD 1.6N and HD 1.4S may be considered as having the characteristics of Compatibility Group N.
6. It is allowed to mix HD 1.6N ammunition. The Compatibility Group of the mixed set remains N if the ammunition belongs to the same family or if it has been demonstrated that, in case of a detonation of one munition, there is no instant transmission to the munitions of another family (the families are then called “compatible”). If it is not the case the whole set of ammunition should be considered as having the characteristics of Compatibility Group D and the compatibility groups mixing rules apply accordingly.

3.2.1 Determining NEQ at a PES

a. The NEQ of all ammunition (except HD 1.4) at a PES, regardless of HD, should be added together for determining the NEQ at a PES.

3.3 Transport and Storage of Captured Enemy Ammunition (CEA)

The following rules apply to CEA:

1. Before transporting CEA into the Ammunition Area, it must have been certified as safe for transport and storage by a qualified individual (e.g. Explosives Ordnance Disposal (EOD) specialist).
2. Because of uncertainties of its safety status (i.e. increased risk of fire and accidents), CEA must be isolated from own ammunition by the greatest distance possible, but no less than FD.
3. CEA storage in a PES should not exceed an NEQ greater than 500 kg.
4. If positive identification is not possible, CEA must be treated as HD 1.1. When its NEQ is unknown the total weight of the CEA (less package) must be used.
5. CEA should be stored by CG mixing rules.
6. An inventory list, to include NEQ, should be kept of CEA in each PES. Copies of the list must be kept at the PES, with the EOD team on duty (if available), and the fire-fighting unit.
3.4 **Destruction of Ammunition (including Emergency Destruction)**

a. A destruction ground may be required for disposing of ammunition that is in a dangerous and/or unserviceable condition. The location chosen must be a sufficient distance away from all surrounding ES so that it presents no additional danger. Destruction is to be carried out according to the regulations governing such operations. During operations, it is essential that any dangerous and/or unserviceable ammunition is destroyed as soon as possible as accumulations of this ammunition presents an unnecessary and additional danger.

3.5 **Ammunition Personnel Qualifications**

a. Personnel controlling or supervising the handling of ammunition at an Ammunition Area must be identified/appointed by the Operational Commander. The designated personnel, normally the ESO, must be thoroughly familiar with ammunition operations being conducted and must clearly understand the hazards and risks involved. The competencies required by an ESO are detailed in Annex II-A.

3.6 **Surveillance**

a. An ammunition surveillance program should be maintained to ensure user-safety, functional reliability, and serviceability of ammunition, particularly in situations where the impact of environmental conditions (high and low temperatures, high and low humidity, etc.) could have serious consequences on the operational safety and capabilities of the ammunition. It is a responsibility of the Operational Commander to ensure that an adequate surveillance program is being carried out. All deviations to ammunition serviceability, that affect operational capability, must be immediately reported to the Operational Commander.
4. Protection

4.1 Fire Protection

a. Protecting against fires involves three important principles:
   (1) Prevention.
   (2) Hazard identification.
   (3) Fire fighting.

4.1.1 Responsibilities and Organization.

a. The Operational Commander is responsible for the protection of ammunition against fire, as well as for the protection of personnel from fire hazards involving ammunition. The Operational Commander along with his designated specialists (i.e. ESO, Fire Protection Officer (FPO)) will develop necessary plans as described below. All personnel working at the Ammunition Area must be aware of their responsibilities/expected actions in the event of an emergency.

b. A Fire and Emergency Plan (FEP) should be developed at each compound. Emergency response and evacuation provisions must be developed for each PES located in the Ammunition Area.

c. The FEP shall require that the fire department knows the hazards associated with each ammunition fire division. In addition, the fire department must know what Fire Division is associated with every PES (see paragraph 4.1.3 below). The fire department should be notified each time a Fire Division symbol is changed.

d. Layout plans for the Ammunition Area including content/type/Fire Division plans and evacuation plans are to be prepared and kept accessible outside the Ammunition Area at all times.

e. Emergency Withdrawal Distance (EWD) for non-essential personnel (those not directly involved in fire fighting) are intended for use in emergency situations only and are not to be used for facility siting purposes. In the event of a fire no personnel other than those directly involved in fire fighting shall be permitted entrance to the Ammunition Area.

f. The same EWD applies to the local population.

g. The EWD is governed by the HD involved in the fire. The EWD for essential personnel at accidents shall be determined by on-site emergency authorities. Emergency authorities shall also determine who are considered as essential personnel.
h. At a minimum, FEP shall address the following:

1. Specific sections and guidance that address emergency preparedness, contingency planning and safety. For safety, those plans shall limit access to trained and authorized personnel. These plans shall identify the number and location of specific locations (i.e. protective structure(s), or other safe location(s)), for personnel to take shelter.

2. Procedures that minimize the possibility of an unintentional detonation, release, discharge or migration of military munitions or explosives out of any storage unit when such release, discharge or migration may endanger human health or the environment.

3. Provisions for prompt notification to emergency response and environmental agencies and the potentially affected public for an actual or potential detonation or uncontrolled release, discharge or migration (that may endanger human health or the environment).

4. First aid instruction and use of fire fighting equipment.

5. Emergency map.

The Operational Commander along with the designated specialists (i.e. ESO, FPO) is responsible to produce the necessary plans. He/she also has to ensure that all plans and emergency plans are accessible to the Emergency Authorities and Rescue Forces.

4.1.2 Prevention

a. Fire prevention plans should be included in the SOP for the compound.

b. Fire prevention measures are to be organized within the scope of general fire prevention taking into account the following areas:

1. Order and cleanliness as well as strict observance of safety precautions count among the most effective fire prevention measures, equal to the prohibition of smoking and the use of open flames, fire and naked lights.

2. Handling of flammable substances.

3. Prevention of the accumulation of additional fire hazards such as stacking material, packaging material and the like.

4. Fire hazards associated with machines, equipment and tools used during ammunition operations or the overloading of electrical cables.

5. The use of oil or gas filled lighting, heating or burning appliances and all flame, spark or fire producing appliances should be minimized.

6. Remove flammable undergrowth and lay out fire lanes.

7. Clear zones around PES, trimming of branches, etc.
4.1.3 Hazard Identification

a. The four Fire Divisions symbols are shown below. The number and shape of each symbol serves to identify its fire hazard for fire fighting personnel approaching a scene of a fire. These are:

- Fire Division 1 - Mass explosion
- Fire Division 2 - Explosion with fragment hazard
- Fire Division 3 - Mass fire
- Fire Division 4 - Moderate fire.

![Fire Division Symbols](image)

Figure 4.3. Fire Division Symbols. (From AASTP-1).

b. Supplementary symbols are used to identify which locations contain specific types of pyrotechnic material as these munitions give supplementary hazards. For this reason, the ESO should advise the FPO of any supplementary hazards and the specific emergency measures for such ammunition.

Supplementary symbols shown below can be displayed at a PES to indicate the following precautions that must be taken if fighting fires:

a. Wear full protective suit.

![Protective Suit](image)

b. Wear respirator face piece.

![Respirator](image)

c. Apply no water.

![No Water](image)
c. The Operational Commander may, for security purposes, permit the removal of the Fire Division symbols or a change in the colours used. In these situations, the Operational Commander should give prompt and precise information to the fire department about the changes and condition of the ammunition.

4.1.4 Fire Fighting

a. Fire-fighting principles and procedures for field operations are the same as those given for permanent depots in AASTP 1.

b. All fires in the vicinity of the ammunition should be fought until stacks of ammunition or explosives become involved in the fire or the fire is extinguished. If ammunition becomes involved in a fire, it is critical to remove personnel immediately from the site to safe locations/distances.

c. Ammunition fires involving other than Fire Division 4 must not be fought. When fighting fire involving ammunition in Fire Division 4, the minimum distance should be 25 m.

d. Personnel whose duties require them to fight secondary fires must not approach within 300 m of any fire involving explosives other than Fire Division 4.

e. All unprotected personnel not involved in the fire fighting activities should be ordered to withdraw to protected positions (inside protective shelters) and/or should be evacuated to at least 750 m, or to IBD, whichever is the greater.

f. After an ammunition fire has been extinguished, personnel must wait at least six hours before entering the area.

g. No one must touch ammunition involved in a fire or accidental explosion without being directed to do so by a qualified person.

h. The following additional provisions could be necessary:

(1) Fire Division 4 ammunition may be stored near the entrance to the Ammunition Area. (Note: If a fire does break out in this ammunition, it is possible to fight it and there is a realistic chance of saving ammunition in this Fire Division, while there is no chance of saving ammunition in the other Fire Divisions when fire breaks out.)

(2) The area in which ammunition from Fire Divisions 1, 2 and 3 is stored must be delineated very clearly.

(3) Empty packaging and combustible material are to be stored separately from the PES.

4.2 Electro-Magnetic (EM) Radiation Protection

a. Transmitting devices (cellular phones, pagers, vehicle transmitters, etc.) must not be used within 20 m from any PES, unless specifically authorized. Use of transmitters within the Ammunition Area must be reviewed on a case-by-case basis and a license to operate such equipment should be given by the ESO.
4.3 Weather Protection

4.3.1 Environmental Conditions

4.3.1.1 Temperature

a. High temperatures (>40°C), and large variations in temperatures can degrade the performance and safety of a variety of munitions (in particular those containing WP) and propellants. Every effort should be made to reduce this effect, through the use of covered storage, correct stacking procedures for provision of adequate ventilation and, if possible, the use of an air-conditioned environment. Proper surveillance of the ammunition and explosives (see Paragraph 3.6) is necessary to maintain the operational capability of the munitions.

b. Ammunition stored in the open should be shaded with light coloured tarpaulins and camouflage nets in order to reduce the effects of radiant heat. These coverings should not be in direct contact with the ammunition (or ammunition container) as this can lead to increased temperatures in the ammunition and containers. A minimum air gap of 30 cm should be maintained between the top of the explosives stack/container and any covering material to provide adequate ventilation.

c. Tarpaulins and camouflage nets should be erected so that ammunition can be removed rapidly at night without taking the covering down. This allows replacement ammunition to be inserted into the location with a minimum of work. However, the tarpaulins and camouflage nets must be capable of being lowered quickly or be made secure against the possibility of high winds or tropical storms, where these are a threat.

d. A light paint colour on a container may significantly reduce temperature inside the container.

4.3.1.2 Humidity

a. The effects of moisture at higher temperatures are worse than the effects of moisture at low temperatures. These increased effects resulting from high moisture and high temperature can lead to failure of initiation systems, reduction in propellant efficiency, and degradation of various munitions fills. Alternatively, low humidity environments can result in an increased risk from electrostatic discharge hazards and may also dry out critical seals and other components.
4.3.2 Environmental Controls

a. Every effort is to be made to reduce the effects of high temperatures and moisture on explosives held by units and in Ammunition Areas. All excess vegetation and combustible material shall be removed from open storage sites and within a radius of 20 m of such sites when ammunition and explosives are present. Ammunition shall not be located immediately adjacent to reservoirs or sewers.

4.3.2.1 Storage on the Ground

a. Ammunition should not to be stored directly on the ground in any situation but should be placed on pallets that provide a minimum of 75 mm clear distance from the ground to ensure ventilation. It is important that sand, earth and vegetation should not be allowed to build up around the base of pallets preventing the free passage of air.

4.3.2.2 Improvised Structures

a. Local improvised structures and shelters may prove useful for providing cover over ammunition. Alternatively, tents, galvanized iron shelters or ISO-containers can be used where available.

4.3.3 Lightning Protection

a. In order to mitigate the adverse effects of a lightning strike (accidental initiation, damage), all PES should be provided with lightning protection. In addition, PES should be located no less than 15 m from trees, telegraph poles, pylons in order to reduce side flash. The resistance to earth of any lightning protection system should be less than 10 Ohm or as low as possible given the existing soil conditions.

b. ISO containers used to store ammunition are to be considered a “Faraday cage” thereby not requiring additional lightning protection. However, they must be effectively grounded as described in AASTP-1.

4.4 Security

a. Since enhanced security is a prerequisite to improved explosives safety, sufficient coordination between security specialists and the ESO must be maintained.
5. **Field Distances and Risk Analysis**

5.1 **General**

a. FD are introduced to make a distinction between distances used in AASTP-1 and AASTP-5. A FD is a distance between two PES whereby prompt sympathetic detonations will be avoided or the distance between a PES and an ES where the FD are to maintain adequate protection levels.

5.1.1 The use of FD

a. FD depend on the PES, NEQ, HD and the type of ammunition. The FD can be reduced by using appropriately designed barricades. When using FD all ammunition is calculated as HD 1.1, (HD 1.4 must not be included).

b. The FD also depends on the required protection level against prompt sympathetic propagation. By using the FD given below, a high level of protection against prompt sympathetic propagation is achieved. This implies that other types of reaction, such as mass-burning (HD 1.3), occasional explosions of single articles (HD 1.2) and delayed mass explosions, may occur. When a higher level of protection against prompt sympathetic propagation is needed, the appropriate QDs from AASTP-1, for storage of HD 1.1 should be used.

c. For practical purposes (loading and unloading, inspection, fire fighting), a minimum distance of 0.5 m is required between the outside of the ammunition container/stack and an adjacent barricade.

d. FD, as a function of NEQ, are given in Table 5.1. These FD assume that barricades in use are designed according to paragraph 2.4.1.
5.1.2 Field Distances

a. The FD are based on the following explosion effects on personnel in the open and on structures:

   (1) Blast.
   (2) Fragment impact.

The resulting FD are given below in Table 5.1a and Table 5.1b.

b. For PES and ES different structures can be used. Figure 5.1a shows examples of hardened structures, Figure 5.1b shows examples of semi-hardened structures and Figure 5.1c shows examples of light structure.

![Examples of hardened structures](image)

Figure 5.1a. Examples of hardened structures. Note that the structures are all based on surrounding some form of relatively thin-walled steel container with soil/sand-filled concertainers. The tank is included to represented hardened vehicles.
Figure 5.1b. Examples of semi-hardened structures. The light armoured vehicle is included to represent semi-hardened vehicles.

Figure 5.1c. Examples of light structures.
### Table 5.1a  Minimum Field Distances between PES for storage of ammunition on deployed missions or operations.

<table>
<thead>
<tr>
<th>Adjacent PES</th>
<th>PES →</th>
<th>FD from PES (m) Note 1 and 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NEQ (kg)</td>
<td>Barricaded Note 2</td>
</tr>
<tr>
<td><strong>Hardened</strong></td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>E.g. heavy armoured combat vehicles, 0.6 m thick sand/gravel overhead and 1.0 m thick container side protected ISO containers/ sites, see Fig 5.1a  Note 3 and 4</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td>Note 3 and 4</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>10</td>
</tr>
<tr>
<td><strong>Semi-hardened</strong></td>
<td></td>
<td>A2</td>
</tr>
<tr>
<td>E.g. light armoured combat vehicles, 0.6 m sand/gravel overhead and armour plated side protected ISO containers/ sites, see Fig 5.1b</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td>Note 4</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>10</td>
</tr>
<tr>
<td><strong>Light</strong></td>
<td></td>
<td>A3</td>
</tr>
<tr>
<td>E.g. containers, wooden, concrete and brick structures, non armoured vehicles, open stacks, see Fig 5.1c</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>10</td>
</tr>
</tbody>
</table>

**Note 1** Buildings that can generate debris like structures of concrete or bricks may not be used as PES.

**Note 2** Minimum barricade width is 2 m (bottom row). Minimum distance from barricade to PES is 0.5 m. The maximum distance from barricade to PES is 4 m.

**Note 3** For heavy armoured vehicles (with hatches closed) no minimum PES-PES distance is required.

**Note 4** Concrete structures designed for loads higher than 65 kPa and to resist high velocity fragments may be treated as a hardened structure. Concrete structures designed for loads higher than 21 kPa and to resist high velocity fragments may be treated as a semi-hardened structure.

**Note 5** For smaller charges, (i.e. NEQ<100 kg) in nationally approved structures reduced field distances and barrier thickness (minimum 1 m) may apply.

To further mitigate the damage to critical stocks in the event of an accident, planning should, where possible, avoid storing PES with HD1.1 munitions directly adjacent to other PES with HD1.1 munitions but have less hazardous materials in between these PES.

**Table 5.1a**  Minimum Field Distances between PES for storage of ammunition on deployed missions or operations. It should be emphasized that even with adherence to the Field Distances in the Table damages to structures and injuries (even lethality) to personnel may occur in case of an event in a storage facility. PES to PES distances are minimum intermodule distances for ammunition and explosives of HD1.1 necessary to prevent adjacent modules from prompt sympathetic detonation with a high degree of certainty. These distances do not cover assets preservation. Note: NEQ and Q are interchangeable.
<table>
<thead>
<tr>
<th>ES ↓</th>
<th>PES →</th>
<th>B1</th>
<th>D1</th>
<th>B2</th>
<th>D2</th>
<th>B3</th>
<th>D3</th>
<th>B4</th>
<th>D4</th>
<th>B5</th>
<th>D5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barricaded Note 2</td>
<td>Un-barricaded</td>
<td>Q-factor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEQ (kg)</td>
<td></td>
<td>50</td>
<td>15</td>
<td>15</td>
<td>50</td>
<td>22</td>
<td>29</td>
<td>50</td>
<td>33</td>
<td>212</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>19</td>
<td>19</td>
<td>100</td>
<td>28</td>
<td>57</td>
<td>100</td>
<td>46</td>
<td>294</td>
<td>100</td>
<td>100 (46) (Note 5)</td>
<td>294</td>
</tr>
<tr>
<td>500</td>
<td>32</td>
<td>32</td>
<td>500</td>
<td>103</td>
<td>400</td>
<td>500</td>
<td>130</td>
<td>400</td>
<td>500</td>
<td>155</td>
<td>400</td>
</tr>
<tr>
<td>1000</td>
<td>40</td>
<td>40</td>
<td>1000</td>
<td>235</td>
<td>400</td>
<td>1000</td>
<td>320</td>
<td>400</td>
<td>1000</td>
<td>320</td>
<td>400</td>
</tr>
<tr>
<td>2000</td>
<td>50</td>
<td>50</td>
<td>2000</td>
<td>400</td>
<td>400</td>
<td>2000</td>
<td>400</td>
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<td>2000</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>4000</td>
<td>64</td>
<td>64</td>
<td>4000</td>
<td>400</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1**: Buildings that can generate debris like structures of concrete or bricks may not be used as PES.

**Note 2**: Minimum barricade width is 2 m (bottom row). Minimum distance from barricade to PES is 0.5 m. The maximum distance from barricade to PES is 4 m.

**Note 3**: A concrete structure designed for loads higher than 65 kPa and to resist high velocity fragments may be treated as a hardened structure. A concrete structure designed for loads higher than 21 kPa and to resist high velocity fragments may be treated as a semi-hardened structure.

**Note 4**: ISO-containers and certain tent designs with overhead protection are considered to protect against terminal velocity fragments. For structures not giving protection from free falling fragments B4 distances should be used.

**Note 5**: For smaller charges, Q<100 kg, in nationally approved structures reduced field distances and barrier thickness (minimum 1 m) may apply.

**Note 6**: Distances for robust ammunition shells stored vertically. As most fragments initially move out perpendicular to the ammunition shells most fragments will be caught by the concertainers when the ammunition is stored vertically. When this is not the case many fragments may go above and far beyond the concertainers. For horizontally stored robust ammunition in combination with OHP the same distances apply. Without OHP and with robust ammunition stored horizontally D4 values should be used.

**Note 7**: AASTP-1 gives longer distances. B5 values are based upon new and validated test data.

**Table 5.1b**: Minimum Field Distances PES to ES for storage of ammunition on deployed missions or operations. It should be emphasized that even with adherence to the Field Distances in the Table damages to structures and injuries (even lethality) to personnel may occur in case of an event in a storage. PES to ES
distances are minimum distances to maintain adequate protection levels. These distances do not cover assets preservation.

5.2 The storage of readiness ammunition

a. The following guidelines apply to locations where combat units hold their readiness basic load ammunition in shipping containers, armoured vehicles, trucks, trailers, structures, or on combat aircraft or rearming pads. Provisions given can be used for the storage of ammunition in readiness in the theatre of operations or at home stations during training exercises.

b. Readiness ammunition explosives safety criteria do not apply to combat positions (such as artillery or mortar firing positions) or to ammunition needed at checkpoints.

c. Readiness ammunition storage criteria should not be used for the storage of training ammunition unless there is no other option available. When basic load ammunition and training ammunition are in the same storage, the training ammunition should be in a separate storage container if possible and where this is not possible the training ammunition must be clearly marked as such.

d. Readiness ammunition can be stored in a Basic Load Ammunition Holding Area (BLAHA) or in uploaded/combat vehicles, combat aircraft, etc. Any combination of BLAHA with combat loaded vehicle / combat aircraft or multiple BLAHA are called Basic Load Storage Areas (BLSA). An area with only multiple combat loaded aircraft is called a Combat Aircraft Loading / Parking Area (CALA /CAPA).

e. Bulk quantities of fuel should not be stored with ammunition. The only fuel allowed in or in the vicinity of the Ammunition Area is that contained in vehicle fuel tanks and/or necessary equipment (i.e. climate control unit).

f. Barracks, headquarters, maintenance facilities and other important facilities (i.e. water tower in a desert environment) within a military installation should be separated in all cases from the BLAHA.

g. Non-armoured vehicles, storage locations or administrative buildings can be protected by a combination of adequate barricades and OHP.

5.2.1 BLAHA Mixing Rules and NEQ Determination

a. The BLAHA is an area where readiness ammunition is stored. In a BLAHA, ammunition of all HD and all CG may be stored together without regard to the requirements of the mixing rules (HD and CG) when necessary. The maximum NEQ permitted at any single BLAHA must not exceed 4,000 kg. Each BLAHA must be separated from each other by the applicable FD reflected in Table 5.1. The total NEQ of ammunition in a BLAHA should be calculated according to paragraph 2.2e.

b. If total NEQ exceeds 4000 kg, AASTP-1 distances must be applied.
5.2.2 Loaded Vehicles

a. For the purposes of BLAHA criteria combat vehicles can be heavy armoured, light armoured or non-armoured.

b. FD can be computed from individual vehicles or groups of vehicles. If the distance between two or more vehicles does not meet the distances required in Table 5.1a and Table 5.1b then the explosive quantity of all vehicles must be summed and this total value used for FD computations.

5.2.2.1 Heavy Armoured Combat Vehicle

a. Heavy armoured combat vehicles are expected to contain most of the blast and fragments from an internal explosion and they are well protected against the effects of an external explosion.

b. The hatches of heavy armoured combat vehicles must be kept closed and locked; otherwise, the vehicles are considered as light armoured combat vehicles.

5.2.2.2 Light Armoured combat Vehicles

a. Light armoured combat vehicles are considered to be well protected from an external blast but will probably not contain the blast and fragments from an internal detonation of the stored ammunition.

b. Light armoured combat vehicles can be considered as being barricaded as an ES and un-barricaded as a PES.

5.2.2.3 Non-Armoured Vehicles and Stationary Storage Sites

a. Non-Armoured Vehicles and stationary storage sites provide minimal to no protection from an external explosion.

5.2.3 Field Distances

a. FD are given in Table 5.1a and Table 5.1b.

5.3 Airfields Used During Deployed Missions and Operations

5.3.1 General

a. Deployed missions and operations introduce unique safety issues as a result of the rapid movement of large amounts of munitions, generally a higher tempo of operations, and the necessary concentration of mission critical assets.

b. With regards to the storage of munitions, the assumption is made that ECM will not be available and munitions will be stored in the open under cover, in light-weight structures, or in barricaded above ground structures with or without OHP.
5.3.2 Combat and Cargo Aircraft Loading, Unloading, and Parking

a. Aircraft carrying explosives should be armed, loaded, unloaded and/or parked only in designated areas that meet required FD as indicated in Table 5.1a and Table 5.1b. This does not apply to aircraft containing only installed explosives and safety devices such as authorized signals in survival kits, egress systems components, engine starter cartridges, fire extinguisher cartridges and other such items necessary to flight operations.

b. FD can be computed from individual aircraft or groups of aircraft. If the distance between two or more aircraft does not meet the distances required in Table 5.1a and Table 5.1b then the explosive quantity of all aircraft must be summed and this total value used for FD computations. If an explosion should occur, aircraft within this group will be lost and aircraft in adjacent groups may be damaged by fragments; however, the explosion is unlikely to propagate simultaneously. Subsequent explosions may be caused by fragments, debris and/or secondary fires.

c. Combat-loaded aircraft should face the direction involving least exposure of personnel, equipment, facilities and civilian population to the line of fire of forward-firing armament.

d. Proper barricades placed between adjacent aircraft will prevent prompt sympathetic propagation due to high velocity, low angle fragments.

e. Lesser distances may be used for specific weapons where trials have shown that such distances are adequate to minimize the probability of propagation. For example, certain missile loads on fighter aircraft may have reduced FD based on testing performed (i.e. F16, F15, Tornado).

f. Freefall munitions may be armed/de-armed on the aircraft parking ramp. Forward firing munitions should be armed/de-armed in an area specifically designated as a forward-firing area with a safe aircraft heading established by airfield operations.

g. Ammunition should be positioned in designated storage areas near the flight line in order to be readily available in adequate time for safe aircraft loading. Such areas should be barricaded to further reduce separation distances.

h. In most cases an existing airfield will be used for operations. The FD used will depend on the availability of infrastructure, their construction and their function in relation to the mission. For example:
   - Central airport support facilities
   - Aircraft-maintenance
   - Crew support
   - Runways and taxiways

Special care must be taken when the airfield is also in use by civilians.
5.4 **Forward Ammunition and Refueling Point (FARP)**

5.4.1 **FD criteria for FARP**

a. The FARP criteria apply only to units conducting attack/rotary and/or fixed wing missions. A FARP is a temporary arming and refueling point organized, equipped and deployed by an aviation unit to support tactical operations. It is usually located closer to the Area of Operations than the combat service support area of an aviation unit. It provides fuel and ammunition for aviation units in combat situations. The situation on a modern battlefield demands that the FARP be flexible, transitory and able to support specific mission objectives. It should be flexible enough to self deploy or to be aerially inserted. It must meet the fuel and ammunition needs of mission aircrafts.

b. Aircraft parking should be in accordance with paragraph 5.3.2 c.

c. Due to the situation, special care must be taken with the grounding/earthing procedures.

d. FD from Table 5.1b will be used for separation of FARP PES and surrounding mission-related ES.

5.4.2 **Rearming / Refueling Pad (RP)**

a. The minimum distance for RP separation is based on rotor clearance or FD with a 40 m minimum separation required. The greater distance should be used.

b. The quantity of ammunition allowed at each RP should be limited to one aircraft load plus an aircraft re-supply. The minimum FD separation between pads should be based on 2 aircraft loads.

c. Aircraft maintenance and munitions loading should not be conducted concurrently.

d. Fueling of fixed wing aircraft should not be carried out at RP. Hot refueling with ammunition on board should be limited.

5.5 **Consequence and Risk Analysis**

6. Transport

a. The purpose of this section is to provide expert advice to operational commanders assigned to out of area operations about the requirements for the transport of dangerous goods including ammunition and explosives. This chapter does not address the use of roads, road permission, etc., which are included in the Allied Movement Procedures (AMOVP).

b. International regulations such as IATA, IMDG, ADR, RID, AASTP-2 and local national regulations should be followed wherever possible. Deviations from these rules are possible, depending on the transport requirements and the operational situation. For example: see Table 6.1.

<table>
<thead>
<tr>
<th>Transport situation</th>
<th>Deviation from international rules</th>
<th>Deviation from national rules</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>From home country to POD and return (POE)</td>
<td>No deviations</td>
<td>Up to home country</td>
<td>Logistic transport</td>
</tr>
<tr>
<td>From POD to Compound1)</td>
<td>Deviations are possible (see note 2)</td>
<td>Up to home country</td>
<td>Tactical or logistic transport. Deviations depending of the security risk</td>
</tr>
<tr>
<td>From Compound to POE2)</td>
<td>Deviations are possible (see note)</td>
<td>Up to home country</td>
<td>Tactical or logistic transport. Deviations depending of the security risk</td>
</tr>
<tr>
<td>Inside the operational area1)</td>
<td>Deviations are possible (see note 2 and table 6.2)</td>
<td>Up to home country</td>
<td>Tactical transport. Deviations depending of the security risk</td>
</tr>
<tr>
<td>Captured/found ammunition inside the operational area3)</td>
<td>Not applicable (see notes)</td>
<td>Up to home country</td>
<td>Captured/found ammunition must be classified for transport or storage by EOD specialist</td>
</tr>
</tbody>
</table>

Notes:
1) For logistic transport, international regulations and local national regulations must be applied.
2) Special care is necessary when a tactical transport changes into a normal logistic transport. In this situation the international regulations and local national regulations have to be followed.
3) See paragraph 3.3. CEA is to be certified by an EOD expert as safe for transport to a demolition place or for temporary storage.

Table 6.1 Examples of Deviations from Transport Regulations.

c. The use of harbours, ports and airfields as a Point of Debarkation (POD) for loading and unloading dangerous goods and deviations from international rules should be, if possible, approved in agreement with the host nation.

d. This document provides guidance for those situations where deviations from the rules are required due to operational necessity. Every effort must be made to observe the minimum safety and risk requirements for the transport mode selected. For example:

- The use of CG.
- For air transport, the ammunition must be certified as air transportable and must meet criteria for (under)pressure, vibration, temperature, static electricity, and electro-magnetic radiation (type classification).
- Stuffing and stowing packaging and containers in accordance with IMDG Code for sea transportation.
- Securing of the load.
- Use of transmitters (radio, radar, mobile phone, etc.).
**Table 6.2 In the operational area**

<table>
<thead>
<tr>
<th>Item</th>
<th>Peace time (Inter)national rules</th>
<th>Deviation from (Inter)national rules</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document / Forms</td>
<td>(Inter)national rules apply</td>
<td>Possible</td>
<td>If not the driver has to be briefed how to act in case of an accident</td>
</tr>
<tr>
<td>AIS</td>
<td>Yes</td>
<td>Possible</td>
<td>Safety defects in equipments must be rectified at the earliest opportunity</td>
</tr>
<tr>
<td>Safety equipment</td>
<td>Yes</td>
<td>Possible</td>
<td>Consider removing or changing the colour of the plates, placards and</td>
</tr>
<tr>
<td>Remove or change the colour</td>
<td>No</td>
<td>Possible</td>
<td>Civilian contractor’s vehicles may be used if authorized by Force</td>
</tr>
<tr>
<td>of the plates / placards</td>
<td></td>
<td></td>
<td>Commander</td>
</tr>
<tr>
<td>Use of vehicles</td>
<td>Civilian contractor or military</td>
<td>Military</td>
<td></td>
</tr>
<tr>
<td>Type of vehicle Ex II / Ex III</td>
<td>Yes</td>
<td>Possible</td>
<td>It is recommended that EXII &amp; EX III vehicles are always used if</td>
</tr>
<tr>
<td>Escort</td>
<td>Yes (if required)</td>
<td>Ops concern</td>
<td></td>
</tr>
<tr>
<td>Route determination</td>
<td>Yes</td>
<td>Ops concern</td>
<td></td>
</tr>
<tr>
<td>Time in the area to be short</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>as possible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed loading</td>
<td>International rules (ADR, IMDG,</td>
<td>Ops concern</td>
<td>The decision must be based on the threat level and the necessity of the</td>
</tr>
<tr>
<td></td>
<td>IATA, RID) apply</td>
<td></td>
<td>transport i.a.w. the available capacity. Specialist advice must be</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sought.</td>
</tr>
<tr>
<td>Drivers education</td>
<td>ADR-certificate / suitable training</td>
<td>Advisory</td>
<td>Partner nation drivers may be used if suitably trained and qualified</td>
</tr>
<tr>
<td>Static electricity</td>
<td>No relaxation</td>
<td>No relaxation for helicopter transport</td>
<td></td>
</tr>
<tr>
<td>Upload vehicles</td>
<td>Possible?</td>
<td>Ops concern</td>
<td>Especially in the case of under slung loads</td>
</tr>
<tr>
<td>Load capacity</td>
<td>International rules (ADR, IMDG,</td>
<td>Ops concern</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IATA, RID) apply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaging</td>
<td>International rules (ADR, IMDG IATA, RID) apply</td>
<td>Ops concern</td>
<td></td>
</tr>
<tr>
<td>All up round</td>
<td>International rules (ADR, IMDG IATA, RID) apply</td>
<td>Ops concern</td>
<td></td>
</tr>
<tr>
<td>Transport of uploaded vehicle</td>
<td>International rules (ADR, IMDG IATA, RID) apply</td>
<td>Ops concern</td>
<td></td>
</tr>
<tr>
<td>Secure the load</td>
<td>International rules (ADR, IMDG IATA, RID) apply</td>
<td>Yes Possible (but creative)</td>
<td>Ensure no moving objects</td>
</tr>
</tbody>
</table>

Operational area: Deviations from (Inter)national rules do not affect the ammunition safety

Table 6.2 Deviations from (Inter)national rules for transport in Operational Area
### Explanations Table 6.2 Deviations and Definitions

<table>
<thead>
<tr>
<th>Item</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document / Forms</td>
<td>Transport documents other then AIS used i.a.w IMDG, IATA, ADR, RID</td>
</tr>
<tr>
<td>AIS</td>
<td>Accident Information Sheets</td>
</tr>
<tr>
<td>Safety equipment</td>
<td>Warning equipment (vests, sign, lamps, fire extinguisher, etc.)</td>
</tr>
<tr>
<td>Hazard warning placards / plates / labelling</td>
<td>Remove / or change the colour of the placards / plates</td>
</tr>
<tr>
<td>Use of vehicles</td>
<td>Use of military and / or contractor’s vehicles</td>
</tr>
<tr>
<td>Type of vehicle EX II / EX III</td>
<td>See ADR</td>
</tr>
<tr>
<td>Escort</td>
<td>Guard to secure the transport</td>
</tr>
<tr>
<td>Route determination</td>
<td>Time in the area to be as short as possible</td>
</tr>
<tr>
<td>Transport duration</td>
<td>Time in the area to be as short as possible</td>
</tr>
<tr>
<td>Mixed loading</td>
<td>Permission to mix CGs and hazard classes and non hazardous goods</td>
</tr>
<tr>
<td>Drivers education</td>
<td>Level of certification / training</td>
</tr>
<tr>
<td>Static electricity</td>
<td>Sensitivity for static electricity</td>
</tr>
<tr>
<td>Load capacity</td>
<td>ADR restrictions, (exceed NEQ weight limits), not vehicle capacity limits</td>
</tr>
<tr>
<td>Packaging</td>
<td>Articles in UN-approved packaging</td>
</tr>
<tr>
<td>All up round</td>
<td>Assembled ammunitions</td>
</tr>
<tr>
<td>Transport of uploaded vehicle</td>
<td>Transport of combat loaded vehicle on a trailer</td>
</tr>
<tr>
<td>Secure the load</td>
<td>Stowage requirements</td>
</tr>
<tr>
<td>Deviations from (Inter)national rules</td>
<td>Situations, when the use of (Inter)national regulations (ADR, IMDG, IATA, RID) and/or similar rules has an unacceptable effect on the mission or operation and can give rise to an additional threat for own military personnel and facilities.</td>
</tr>
</tbody>
</table>
Explosives Safety Officer; Ammunition Safety Inspections

Competencies of an Explosives Safety Officer

He/She should:

- Have knowledge and understanding of NATO Standards and Guidelines regarding Storage, Maintenance and Transport of Ammunition.
- Be able to identify FD applied from PES to PES and to ES.
- Be able to plan an Ammunition Area (e.g. number of PES required, barricade requirements, appropriate FD).
- Be able to organize an ammunition field depot based on economical storage principles and procedures.
- Have knowledge and understanding of lightning protection system and fire prevention requirements.
- Be able to visually identify explosive safety standard shortcomings during a survey of ammunition storage and maintenance operations.
- Be knowledgeable of accident reporting procedures.
- Be able to develop SOP.
- Be able to determine the risk and consequences of deviations from the regulations and communicate with the Operational Commander the mitigating efforts necessary to reduce or eliminate hazards.
- Be able to prepare draft explosives licences.
The purpose of scheduled explosives safety inspections is to detect hazards to life, materiel and facilities. Inspections will provide positive accident prevention measures by:

a. Detecting unsafe conditions and personnel operating errors.
b. Highlighting the need for specific safeguards for personnel, materiel and facilities.
c. Encouraging individuals to increase their overall explosives safety awareness within their own operating or training areas and to cultivate improvement.

**Quarterly**

HQ authorities should conduct explosives safety inspections of all areas and operations under their control.

**Commander:**

**Officer in charge:**

Explosives Safety Officer (ESO)

Fire Protection Officer (FPO)

**Verification**

- Are SOPs existent and current,
- Do SOPs contain required elements,
- Are magazine inspections current,
- Are deficiencies properly reported,
- Are correctives lay down in an acceptable time,
- Are corrective actions verified,
- When was last inspection by a responsible institution?

**Storage Situation**

- Are installation maps accurate,
- Is the Quantity limit to each PES verified and documented,
- Are IBD fixed and respected,
- Are calculated origin distances from PES to ES/accommodations/facilities in the field camp respected,
- Are there any waivers to the current storage regulations,
- Are barricades in good condition,
- Can it be verified at any time which people are in ammo area,
- Are the workers authorized within a proper described working area,
- Are they well instructed to handle the ammo,
- Are they firm to the ordered work,
- Is the equipment and the tools they use in good condition and permissible,
- Is electrical installation correct and permissible for use with explosives,
- Is non-standard ammunition separated from own ammo,
- Is the storage area restricted to regular traffic?
Ammunition Stacks
- Stacks in good condition,
- Stacks under weather protection,
- Allowed quantity in stack,
- Compatibility groups respected,
- Packaging correct,
- Clean area?

Lightning protection
- Containers earthed,
- Lightning Protection System (LPS) effective,
- Are checks of LPS documented?

Fire Protection
- Fire protection rules established,
- No open fire,
- Vegetation control practiced,
- Fire breaks adequate,
- Alarm system existent and signals known,
- Is an ESO to alarm in case of ammo fire,
- Is/are the assembly point/-s planned and known,
- Fire hazard symbols,
- Fire fighting equipment on place,
- Cooperation between ESO and Fire Protection Officer,
- Are fire fighting procedures clarified with FPO and rescue forces,
- Are all people in camp informed about reaction in case of an ammo fire?

Ammo loaded vehicles
- Safety distances to accommodation and buildings,
- Parking area min 25 m away from ammo stacks,
- Parking places barricaded?

Drivers
- Do drivers know the standard hazard distances of their load in case of a fire,
- Do they know basic emergency and alert behaviours?
## Site Survey Check List

<table>
<thead>
<tr>
<th>Subject</th>
<th>Topic</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General</td>
<td>Type of Mission</td>
<td>Humanitarian Mission, Peace keeping, Peace enforcement, Other:</td>
</tr>
<tr>
<td></td>
<td>Host Nation Rules with demands of Ammo Safety</td>
<td></td>
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<tr>
<td></td>
<td>MOU with demands of Ammo Safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Population</td>
<td>Density: Low, medium, high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attitude: Friendly, Hostile</td>
</tr>
<tr>
<td>2. Climate</td>
<td>Temperature</td>
<td>High, Average:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low (&lt; 0°C):</td>
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<tr>
<td></td>
<td>Weather</td>
<td>Dry, Average humidity</td>
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<tr>
<td></td>
<td></td>
<td>Rainy seasons:</td>
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<tr>
<td>3. Infrastructure</td>
<td>Airports</td>
<td>Traffic density:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distance to tower</td>
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<td></td>
<td></td>
<td>to dispatch building</td>
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<td></td>
<td></td>
<td>to runway</td>
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<tr>
<td></td>
<td>Harbours</td>
<td>Availability of:</td>
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<tr>
<td></td>
<td></td>
<td>Temporary storage / parking</td>
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<tr>
<td></td>
<td></td>
<td>Access roads</td>
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<td></td>
<td>Waterways</td>
<td>Rail</td>
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<td></td>
<td></td>
<td>Depth</td>
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<tr>
<td></td>
<td>Railways</td>
<td>Width</td>
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<td></td>
<td>Bridges</td>
<td>Tunnels</td>
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<tr>
<td></td>
<td>Highways / Mainstreets</td>
<td>Traffic density:</td>
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<tr>
<td></td>
<td></td>
<td>Bridges</td>
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<td></td>
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<td>Tunnels</td>
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<tr>
<td></td>
<td>Sensitive structures</td>
<td>Hospitals</td>
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<tr>
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<td>Chem. Industry</td>
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<tr>
<td></td>
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<td>Nuclear Power Station</td>
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<tr>
<td></td>
<td>Agriculture and stockbreeding</td>
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<tr>
<td></td>
<td>Cultural Facilities</td>
<td></td>
</tr>
<tr>
<td>4. Forces</td>
<td>Type of unit:</td>
<td>Combat Force, Combat Support Force</td>
</tr>
<tr>
<td></td>
<td>Combat loaded platforms</td>
<td>(Airplanes, vehicles, vessels)</td>
</tr>
<tr>
<td></td>
<td>Number:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of military personnel</td>
<td>Own Troops:</td>
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<tr>
<td></td>
<td></td>
<td>Other Troops:</td>
</tr>
<tr>
<td>Subject</td>
<td>Topic</td>
<td>Points</td>
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<tr>
<td>---------</td>
<td>-------</td>
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<tr>
<td>5. Ammunition</td>
<td>Total number (approx.)</td>
<td>NEQ 1.1 – 1.3 □</td>
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<tr>
<td></td>
<td>Number of Ammunition Container</td>
<td>NEQ 1.4 □</td>
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<tr>
<td></td>
<td>Quantity Distance for Ammo stacks as one PES (un-barricaded)</td>
<td>NEQ (kg)</td>
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<tr>
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<td></td>
<td>AASTP-1 QD (m)</td>
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<td></td>
<td>AASTP-5 FD (m)</td>
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<td>D5 table 5.1 b</td>
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<td>Special Protection</td>
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<td>100000</td>
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<td>6. Additional Risks</td>
<td>Defence against terrorism</td>
<td>Threat</td>
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<tr>
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<td>Civil Organisation</td>
<td>NGO</td>
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<td>Natural disaster</td>
<td>Earthquake Zones</td>
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<tr>
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<td>Risk zones</td>
<td>Flood Zones</td>
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<td>Avalanche Zones</td>
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<td>Hurricane</td>
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<tr>
<td></td>
<td></td>
<td>“Don’t use dry riverbeds!”</td>
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<tr>
<td></td>
<td>Contamination of dangerous goods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UXO / Mines</td>
<td></td>
</tr>
<tr>
<td>7. Ammo Storage Sites</td>
<td>Distances to infrastructure and type of buildings</td>
<td>Field camp structures incl. ammo storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other military infrastructure</td>
</tr>
<tr>
<td></td>
<td>Area incl. Protection zone</td>
<td>Usable storage area in general:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total area including hazard zones:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum Storage Quantity in NEQ (kg)</td>
</tr>
<tr>
<td></td>
<td>Internal roads</td>
<td>Pass ability (two way roads)</td>
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<tr>
<td></td>
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<td>Turning possibility for trucks with lorries</td>
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<tr>
<td></td>
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<td>Loading and unloading</td>
</tr>
<tr>
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<td>Environment</td>
<td>Hilly/Flat</td>
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<td>Vegetation</td>
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<td>Usable Barricades?</td>
<td>Natural Barricades</td>
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<td>Ground strength:</td>
<td>Concertainers</td>
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<td>Height:</td>
<td>Sand sack</td>
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<td>Other □</td>
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<tr>
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<td>Soil</td>
<td>Usable for Barricades</td>
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<tr>
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<td>Existing storage areas: number, capacity, quality</td>
<td>Shelter:</td>
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<td>Open stacks:</td>
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<td>Container:</td>
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<tr>
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<td>Other:</td>
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<tr>
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<td>Free storage areas</td>
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<td>Storage areas in use</td>
<td>for Ammo,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for other hazard goods</td>
</tr>
<tr>
<td></td>
<td>Drainage systems</td>
<td></td>
</tr>
<tr>
<td>Subject</td>
<td>Topic</td>
<td>Points</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7. Ammo Storage Sites</td>
<td>Electric Support</td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>Illumination</td>
<td>Availability, Inside magazines, Outside, Level of protection</td>
</tr>
<tr>
<td></td>
<td>Lightning protection</td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>Grounding</td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>Climate systems</td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>Fire protection</td>
<td>Availability of water</td>
</tr>
<tr>
<td></td>
<td>Explosive working facility</td>
<td>Necessity  and availability</td>
</tr>
<tr>
<td></td>
<td>Parking space for</td>
<td>Cars, Trucks, Hazard good vehicles, Combat loaded vehicles</td>
</tr>
<tr>
<td></td>
<td>Distance to gas station</td>
<td>Internal (military or civil), External (civil)</td>
</tr>
<tr>
<td></td>
<td>Radar/Radio station, antennas</td>
<td>Power: Frequency: Antenna sector:</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td>Availability of Telephone, Radio</td>
</tr>
<tr>
<td>8. Guarding of the storage site</td>
<td>Guarded by:</td>
<td>Own troops, Allied troops, Local troops</td>
</tr>
<tr>
<td></td>
<td>Existing fence</td>
<td>Distance</td>
</tr>
<tr>
<td>9. Field camp</td>
<td>Ammunition in the compound total number</td>
<td>NEQ 1.1 – 1.3, NEQ 1.4</td>
</tr>
<tr>
<td></td>
<td>Location of ammo storage</td>
<td>Necessity and availability Distance to and structure of camp accommodation</td>
</tr>
<tr>
<td></td>
<td>Parking of combat loaded vehicles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fire Protection</td>
<td></td>
</tr>
</tbody>
</table>
Templates for Consequence Analysis

## Explosives Storage License

### Structure:

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
</table>

### Mixed Total

<table>
<thead>
<tr>
<th>Amount of Permitted Explosives</th>
<th>Limiting Target Information</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC/D</td>
<td>Target ID</td>
<td>Name</td>
</tr>
<tr>
<td>1.1</td>
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<tr>
<td>1.2.1</td>
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<tr>
<td>1.2.2</td>
<td></td>
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<tr>
<td>1.2.3</td>
<td></td>
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<tr>
<td>1.3</td>
<td></td>
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</tr>
<tr>
<td>1.4</td>
<td>Mission</td>
<td>Necessity</td>
</tr>
<tr>
<td>1.6</td>
<td></td>
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</tr>
</tbody>
</table>

### Notes:
1. This license was prepared/issued.
2. Any mistake or violation of this license will be reported immediately to the undersigned.
3. Should the site limits exceed the license limits, notify the Safety Office immediately.

### Issuing Official:

- **Title:** Safety Manager
- **Date:**

### Revised for adequacy and compliance by:

1. **Date:**
2. **Date:**
3. **Date:**