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Best Practice Guide on Procedures for Management of Stockpiles of Conventional Ammunition

This revised Guide was drafted by the government of the United States of America with review and recommendations submitted from the United Kingdom, Russian Federation and OSCE Field Offices.

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I. Introduction

This guide provides recommended best practices that will facilitate and enhance proper management of national stockpiles of conventional ammunition, explosive material and detonating devices. It contains information useful for those individuals currently working in ammunition storage locations and those managers involved in the chain of command over these facilities that are working to establish national policy and procedures. These practices will help participating States (pS) both use their resources more efficiently and to diminish the risk of dangerous situations involving theft, loss, or accident.

Poor management can create situations in which unserviceable ammunition deteriorates and creates an unsafe environment for users or the local population. Conversely, the optimal management of national stockpiles of conventional ammunition and explosives will enhance military, paramilitary, internal security forces, and police force readiness and is essential to responsive and effective forces. Proper management also aids in securing a stockpile, providing a means to diminish and deter theft and to quickly identify loss. A clear understanding of what is contained in the stockpile is essential for its optimal management.

II. Scope and methodology

This guide provides the basic practices that Ammunition and explosives storage facilities can employ, while keeping in mind the cardinal principle of, “To protect the general public and environment, it will be the general principle to expose the minimum amount of ammunition and explosives for the minimum amount of time”.

Participating States recognize that the risks posed by surplus stockpiles of conventional ammunition, explosive material and detonating devices are often created by precarious and unsatisfactory conditions of storage. For this, stockpile security should be taken into account and proper national security and safety control over stockpiles become essential to prevent risks of explosion and pollution, as well as loss through theft, corruption and neglect.

Where these practices cannot all be implemented, participating States should implement those practices for which they have the capability, and work to implement further practices with the aim of creating a comprehensive stockpile management program.

Upon reference, this guide covers the same materials listed and addressed within the OSCE Document on Stockpiles of Conventional Ammunition (OSCE Stockpiles Document)¹.

While the principles identified within this guide apply to all national stockpiles of conventional ammunition, explosive material and detonating devices, they are relayed largely with military stockpiles in mind. The OSCE Stockpiles Document includes “conventional ammunition, explosive material and detonating devices of land-, air- and sea-based weapon

¹ FSC.DOC/1/03, 19 November 2003: <https://www.osce.org/fsc/15792>

III. General policies and procedures

A. Regulatory Guidance: Developing legislative and regulative framework⁴

Legislative development: Inventory management and accounting control procedures should be implemented at all levels of responsibility for stockpile facilities and there should be an organized system of reporting and communication between these levels. In order to complete regular reporting to higher levels of command, Facility Managers must have a firm grasp of their inventory and procedures and be able to provide higher levels of command with information necessary for auditing control and for projecting future usage and supply needs. Conducting periodic inspections of facilities not only encourages communication across various levels of an organization, but also holds Facility Managers accountable for their reporting.

Effective communication and reporting will ensure all facilities are adequately stocked and that required auditing, quality control and quality assurance are taking place.

Regulatory framework: It is important to implement a life-time approach to inventory management, i.e., positive control process and meticulous recordkeeping must be implemented and maintained from the moment a facility takes control of stock, through the various movements of the stock, and until the stock is expended or destroyed. It is particularly important to identify those munitions deemed as excess, obsolete and unserviceable / irreparable so that they can be demilitarized or destroyed as soon as possible, or set aside for training if the quality permits. Ensuring this level and type of inventory management will minimize safety and security risks.

² OSCE Stockpiles Document, Section II, paragraph 16.

³ OSCE Stockpiles Document, Section IV, paragraph 21

⁴ IATG 01.30 Policy Development and Advice; 2. Normative References [<https://www.UN.org/disarmament/un-safeguard/guide-lines/>]

B. Accountability: Receipt, storage, inventory, and materiel release procedures

Management Responsibilities: Inventory and accounting control procedures should take a life-cycle approach to management at all levels of responsibility for stockpile facilities and there should be an organized system of reporting and communication between these levels to ensure sustainability of practical assistance measures. In order to complete regular reporting to higher levels of command, Facility Managers must have a firm grasp of their inventory and procedures and be able to provide higher levels of command with information necessary for auditing control and for projecting future usage and supply needs. Conducting periodic inspections of facilities not only encourages communication across various levels of an organization, but also holds Facility Managers accountable for their reporting. Effective communication and reporting will ensure all facilities are adequately stocked and that required auditing, quality control and quality assurance are taking place.

Records and Reporting: It is important to implement a life-time approach to inventory management, i.e., positive control process and meticulous recordkeeping must be implemented and maintained from the moment a facility takes control of stock, through the various movements of the stock, and until the stock is expended or destroyed. It is particularly important to identify those munitions deemed as excess, obsolete and unserviceable / irreparable so that they can be demilitarized or destroyed as soon as possible, or set aside for training if the quality permits. Ensuring this level and type of inventory management will minimize safety and security risks.

On a monthly or quarterly basis, local distribution points should report to their regional or national distribution points (depending on the organization of the national system). Reports should contain information on current inventory and distributions made for the preceding time period, to include the destinations for these distributions.

This information will be utilized to identify inventory losses from accident or theft and to identify areas of insufficient inventory. This information should also be used to conduct periodic cost-benefit reviews to ensure that resources are being used in the most efficient manner.

Ideally, a computerized and networked inventory program would be developed to meet inventory needs of the national system. In this way, regional distribution facilities and / or the central distribution facility will have the ability to produce distribution activity reports of various programs as well as current inventory status of all active facilities.

In addition to enhanced reporting, a computerized system would greatly facilitate inventory management and auditing, as digital information is more readily accessible and recoverable. If it is not possible to develop and implement a digitalized inventory management system, then an organized, paper inventory system could be alternatively developed, although this type system can be more time-consuming and labor intensive.

Physical Inventory: Each facility should conduct an annual physical inventory of stocks to ensure accountability. The term “physical inventory” means that operators will count the stock by hand or through automation (where applicable with an automated inventory system) to verify the current inventory. A physical inventory is a large resource commitment but it is the best way to truly verify the current inventory levels and ensure that present planning assumptions with regard to ammunition and explosives stockpiles are correct. This annual inventory would readily identify and discover inadvertent reporting errors, which may skew information and numbers in subsequent reports.

Self-contained weapons and items considered susceptible to theft (i.e. plastic explosives, detonators, High Explosive Hand Grenades, mines with fuses, shoulder-fired rockets) should be inventoried and accounted for on a quarterly basis (to include items not in their original packing/containers).

Maintaining these reports and any other necessary records will greatly facilitate the management of stockpiles while enabling periodic auditing as well. As record keeping is such an important component in managing stockpiles of ammunition and explosives, it will be further addressed in a best practice guide covering marking, registration and accounting of ammunition stockpiles.

C. Reporting: Procedures for immediate reporting and recovery of loss or incident

A key internal management control is accounting for events involving loss, accident, damage, or destruction of ammunition and / or explosives. Facilities must report any theft or other loss of ammunition or explosives immediately after the event or discovery of the loss, but no later than 72-hours after an event or discovery of loss, to appropriate levels of command. As soon as a loss is discovered, the supervisor of the facility must be notified and an independent, external investigation conducted. The sooner an external investigation can begin after a theft or loss, the greater the chance of recovering material or determining the individual or individuals responsible. The circumstances surrounding a loss will be examined, to include transportation of the stock if it is recently arrived. After a loss is discovered, the appropriate corrections to facility records must be made, with a notation to reference lost inventory.

To limit the variables that might influence or support a loss of inventory, ensure that any inventory being transferred and transported from one storage facility to another, travels in a sealed container, and the driver of the vehicle must not be allowed to leave until it is verified the seal is intact and inventory numbers match the shipping documents.

D. Training: Training of staff in effective stockpile management and security procedures

Facility Personnel Training: Individuals involved in day-to-day management and operations of various ammunition and

procedures and regulations governing the functioning of these facilities. Staff should receive standardized appropriate training in safe handling of these materials, and what should be done in an emergency situation when there are accidents or problems with explosive material. There should be internal training with national regulations and local requirements regarding stockpile management of ammunition and explosives, organization and operations of the facility, requisite record-keeping and reporting, and any computerized inventory programs if they are used. Facility Managers are responsible for ensuring their personnel are trained and for maintaining that level of training. A recommended approach would be to institute a periodic cycle of training, with appropriate certification and re-certification or testing integrated into the cycle.

Training Curriculum: A curriculum for training facility personnel should be established on the national level and it should be reviewed, evaluated and updated at least annually to ensure the adequacy of the training being conducted. Managers at all levels within the national system should ensure that training requirements are being met and that training is being properly documented. A “train-the-trainers” course, using curriculum established on the national level, would be useful as it would enable managers to be trained and then return to their facilities to train the rest of their staff on the facility procedures. Safety procedures could also be included in this training curriculum but it is recommended that a separate curriculum be established for training on safety issues. This would ensure that personnel at these facilities are adequately trained to handle the material. Train-the-trainer courses would also promote communication within the national system to ensure that practices are meeting the needs of the facilities and the end-users. This would also facilitate an exchange of ideas on training where participants could learn from other participants on practices and ideas which have worked well in other facilities.

E. Controls: Supervisory Considerations

Responsibilities through the Chain of Command:

“Responsibility” is the obligation of an individual to ensure that Government property and funds entrusted to his or her possession, command or supervision are properly utilized and cared for, and that proper custody and safekeeping are provided. Those individuals in supervisory roles in ammunition and explosives stockpile facilities have the responsibility to ensure that auditing takes place and that resources are being used in the best way possible. There should be a chain of command that should be followed and each level should have the responsibility for the facility and the property which they oversee. Final distribution points should be held accountable by regional distribution points or by the national distribution point (depending on the organization of the national system). If they exist, regional distribution points should be held accountable by the national distribution point. The national distribution point should be held accountable by a final committee or office at the national level which has been given oversight authority over the entire stockpile management process. “Being held accountable” means that each level of command audits the level beneath them to ensure that all of the property delivered to them is accounted for. Each storage organization performing the ammunition stock control function should implement and execute a quality control program.

This program will periodically sample receipts, ammunition transfer records, and materiel release orders, at a minimum to ensure that stored assets are being properly accounted for in terms of condition code, location, quantity, and ownership.

Inventory Accountability: Personal inspection of facilities and records are a vital part in holding Facility Managers accountable for their actions along with facility employees. As there are tremendously high quantities of ammunition, it may not be possible to ensure 100% accountability. Facilities should still be mandated to achieve as high a level of accountability as possible. Where any variation from 100% is identified, the discrepancy must be immediately reported and investigated, the reasons for any discrepancy must be ascertained, and any necessary remedial action taken to prevent a recurrence.

Continuity of Personnel: Ensuring the accountability of ammunition and explosives facilities is an essential responsibility of those supervisors involved in the ammunition stockpile management system. It is also essential for supervisors to focus on other areas affecting day-to-day functioning of a facility. One of the most critical elements in maintaining a well-organized, accountable system is the personnel whose job it is to support the facilities. Every effort should be made to ensure reliable personnel are hired and that they obtain further training and education to remain current in latest methodologies and practice used in the management of ammunition and explosives.

Personnel must be encouraged to continue professional development of knowledge and expertise in their occupational Specialty. This alone will encourage commitment and reduce the turn-over of personnel. The retention of knowledgeable personnel in key positions is essential to ensuring stockpiles are properly and safely managed.

Maintenance of personnel is a specific and ongoing responsibility of Facility Managers and higher levels of command within an ammunition management system.

Prioritization: Supervisors must pay particular attention to the availability of resources and prioritize their use in ways that will be of greatest use to individual facilities. Each participating State (pS) will have unique resource needs, and varying amounts of these resources may be available for individual facilities. Those in management positions must assess the needs of individual facilities and prioritize distribution of otherwise scarce resources. A necessary activity of this assessment process would be to establish and identify key requirements for each storage facility (e.g., which ammunition types, amounts or configurations are required and available for storage; what are the personnel training and development requirements; what are the wartime stockpile needs of a given storage facility; etc.).

Available resources must be prioritized to fulfill these requirements. Explosive safety and security should be the highest priority, be it securing the facility, ensuring that unstable ammunition and / or explosives are safely disposed of, or ensuring that a safe combination of ammunition and explosives (type, class and category) are being properly stored.

Surveillance: An important way to assess these facilities and ensure readily accessible information for prioritizing resources is for Facility Managers to ensure that there is continuous ammunition surveillance in the facility. This surveillance includes: 1) quality assurance and logistics functions related to the inspection, testing, and classification of ammunition and explosives; 2) functions that affect explosives safety during handling, storage, transportation, maintenance, use, and disposal of ammunition and explosives; 3) core functions of inspecting and determining the reliability of the stockpile, inspecting and monitoring ammunition / explosives operations for compliance with regulatory explosives safety requirements, and protecting the public and government assets from unnecessary exposures to explosive hazards.

Continuous ammunition surveillance managed and / or conducted by the facility manager is key to identifying safety risks and ensuring accountability of the facility while also facilitating resource prioritization.

Planning: The long-term planning at the facility level and at the national level will help in ensuring a productive use of resources and will facilitate resource prioritization. Being able to anticipate long-term needs will enable participating States and facilities to plan and allocate their resources in a way that will best benefit their facilities. Some long-term needs to anticipate could include updating technology such as computers used in inventory process; replacing degraded shelving; or performing a physical inventory. Anticipating these needs will allow resources to be allocated in such a way that they will not have to be re-allocated at the last minute at the expense of other essential components of a facility such as personnel or security measures.

Accountability of Managers and Personnel: Facility Managers have the responsibility for managing the resources at their disposal with the end-goal of effectively managing a stockpile of ammunition and explosives. These resources include both available finances and personnel. Facility Managers must hold their personnel accountable for their activities and use of resources in a facility. Furthermore, Facility Managers must also be held accountable for the Responsibility entrusted to them. Handling ammunition and Explosives is a serious responsibility and all levels of Management should emphasize the seriousness of this task by ensuring accountability at all levels. This is done by checking reports, periodic inspections, and ensuring punitive actions are taken if illegal actions are identified and taking place.

IV. Technical practices for stockpile facilities

A. Safety and Storage: Robustness and capacity of stockpile facilities

Facility Capacity: In order to organize and maintain an ammunition stockpile properly, the storage facility must be able to safely store, secure and physically contain the varying class' of ammunition and explosives with sufficient capacity to perform necessary activities of a stockpile storage facility. National facilities supplying smaller, local facilities must have the capacity to handle large amounts of ammunition and have ability to facilitate staging and shipping of that ammunition. Smaller, local stockpile facilities must have the capacity to receive shipments of ammunition and provide adequate storage and security.

Storage facilities should be constructed, designed and maintained to provide the greatest possible degree of protection to the public and the environment, as well as to prevent the spread of fire or explosion to other buildings in the facility. Regular trimming of vegetation will enhance security as well as safety.

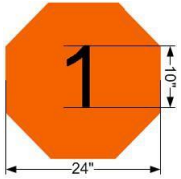
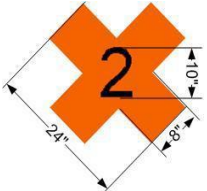
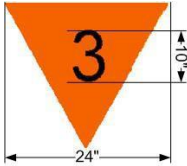
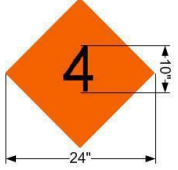
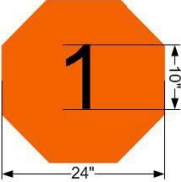
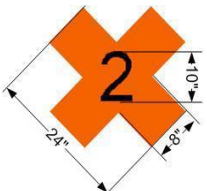
In addition, the buildings must have the capacity to organize its stockpiles. Facilities must be large enough to facilitate the organization of various types of ammunition so that they are kept separate and not mixed with other incompatible stock. Because of the chemical characteristics of different types of Ammunition and explosives, storing improper categories of these materials together can significantly increase an accident probability or, for a given quantity, the magnitude of an explosive incident's effect. Ammunition and explosives categories and compatibility will be further discussed in this section (see section IV.D. Supply Management: Organizational of Stockpiles)

Facility Markings: Stockpile facilities should be marked with the appropriate signs to indicate the appropriate fire hazard symbol for that facility. Facilities should use the United Nations Organization (UNO) Hazard Classification System, which designates nine (9) hazard classes.

Class 1 is applicable to ammunition and explosives and is divided into the following sub-categories to indicate the level of fire hazard within the facility.

The six (6) fire divisions are indicated by four (4) distinctive symbols in order to be recognized by the fire-fighting personnel approaching the fire scene. A fire division number is shown on each symbol.

Because of similar firefighting hazards, the **Fire Division 1** fire symbol and number are also used for **Fire Division 5** and the **Fire Division 2** fire symbol and number are also used for **Fire Division 6**:

Category and Description	Example of what would be in category	Symbol used for each category
1.1 – Mass Detonation (a mass explosion is one which affects almost the entire load instantaneously)	Artillery High Explosive Projectiles, e.g.: <ul style="list-style-type: none"> - Dynamite - Anti-tank Mines - 155mm Projectiles - Detonating Cord - Fragmentation Grenades - Most guided missiles and launchers 	
1.2 – Detonation with Fragments (have a projection hazard but not expected to mass detonate)	High Explosive Mortar Ammunition, e.g.: <ul style="list-style-type: none"> - 120mm, 60mm, 81mm cartridges - Some Guided Missiles and Launchers 	
1.3 – Mass Fire (have a fire hazard and either a minor blast hazard or minor projection hazard or both – no mass explosion hazard)	Propellants, e.g.: <ul style="list-style-type: none"> - 155mm Propellant Charge - Surface Trip Flares - Ground Illumination Signal 	
1.4 – Moderate Fire (presents a small hazard in event of ignition or initiation - no projection of appreciable fragments expected)	Small Arms Ammunition, e.g.: <ul style="list-style-type: none"> - 9mm, 5.56mm, .50cal, 7.62mm cartridges 	
1.5 – Mass Explosion Hazard (are so insensitive that there is very little probability of initiation or transition from burning to detonation under normal condition)	Commercial Blasting Agents, e.g.: <ul style="list-style-type: none"> - ammonium nitrate fuel oil (ANFO) and ammonium nitrate emulsions 	
1.6 – Explosion (articles that contain only extremely insensitive detonating substances and limited to the explosion of a single article)	Non-mass Explosion, e.g.: <ul style="list-style-type: none"> - extremely insensitive detonating substances (EIDS) 	

B. Facility Standard Operating Procedures⁵

The Standard Operating Procedure (SOP) is a written directive that provides detailed procedures prescribing all safety requirements for the facility. This document should be based on national regulations if they exist. Otherwise, SOPs are based on the circumstances, needs and responsibilities of the facility. An SOP should be developed prior to starting any operation involving ammunition or explosives. Inside the facility, the SOP for the facility should be posted in conspicuous locations. The Document should include:

- (i) Minimum training requirements for explosives operators or munition handlers;
- (ii) Emergency notification procedures for accidents or incidents resulting in personnel injury or damage to ammunition stock;
- (iii) Responsibilities and duties of personnel authorized entry into the facility;
- (iv) Non-emergency explosive ordnance disposal;
- (v) Fire safety, including lightning protection;
- (vi) Drawings, specifications, gauge schedules, tools, apparatus, and restriction lists;
- (vii) Static electricity grounding (earthing) requirements;
- (viii) Maximum and/or minimum humidity;
- (ix) Clothing and foot-wear requirements;
- (x) The maximum number of personnel to be in the workshop or laboratory at any one time;
- (xi) The maximum quantity of explosive items permitted in the building and / or to be worked on at any one time;
- (xii) Any additional safety precautions necessary for the ammunition being worked on, such as the provision of evacuation routes and assembly points.

The Facility Manager has approval authority for all SOPs and any future changes to the document. All personnel working in the facility must read the SOP and document their understanding of content as well as individual responsibilities. Any questions pertaining to the SOP should be clarified prior to the employee signing that they understand. In addition to an SOP being posted, signs should be posted inside the facility indicating the safety precautions and regulations applicable to specific material stored within the facility. Emergency evacuation plans should be practiced periodically. The SOP should clearly describe each aspect of the operation, so there is no doubt or flexibility in the manner which a specific operation is to be conducted. The SOP should include a complete listing of the tools and equipment approved for the completion of specific tasks.

National regulations will determine the maximum number of personnel permitted in the facility at any given time. Prior to national regulations being established, it is the Facility Manager that will determine the appropriate number of personnel for the facility. This number will be kept to the minimum required to properly perform the work safely and efficiently. A sign stating the maximum / minimum number of personnel allowed in a facility containing ammunition and explosives should be posted in a conspicuous location. This number will include supervisors as well as the number of visitors permitted.

⁵ Standard Operating Procedures that have been expanded to address local facility operations and conditions are often referred to as 'Standing Orders.' For purposes of this handbook, no distinction is made between the two types of documents.

C. Quality: Conditions of conventional ammunition, explosive material and detonating devices

Observation: A process for quality management of ammunition and explosives must be established within the national system. Quality assurance must be monitored and implemented upon initial receipt, while in storage and transport, during interim storage in other locations, during use by national authorities, during maintenance and finally during demilitarization.

Continual observation and maintenance of records on the condition of ammunition, explosive material, and detonating devices will ensure the safety of both the facility and surrounding areas and increase cost-effectiveness of the stockpile facility. Through continuous monitoring of ammunition, participating States can identify and remove deteriorating or unsafe ammunition from the stockpile. If ammunition stockpiles are managed properly, older ammunition can be used prior to newer stocks (first in – first out), ensuring that older ammunition does not deteriorate and require emergency disposal. Degraded ammunition should not be used and must be destroyed as quickly and efficiently as possible. Ammunition that is considered unsafe for storage should be moved to an Isolated Storage Area while awaiting disposal actions.

Actions to improve the condition of stockpiled ammunition: Facilities can work on de-rusting, cleaning, painting, and repackaging of material to upgrade stocks and correct nonfunctional defects of the ammunition and explosives. These activities could come as a result of regular surveillance inspections by facility personnel or from management decisions. These duties should be performed multiple times a year to keep stockpiled material in an optimal state.

Applying good supply techniques such as “first in-first out” will reduce the need for maintenance and rework caused by deterioration. Improving the condition of these stocks will also improve security of the entire stockpile by ensuring that stock is not degraded to a point that it becomes unstable and poses a threat to the facility and surrounding areas. The ammunition required for immediate peacetime needs or for primary war reserve⁵ requirements should receive the priority attention for cleaning, painting, repackaging, etc. Ammunition required for peacetime needs during the first year or for the second level of war reserve requirements should receive the next level of priority.

Storage Techniques: Proper storage techniques can help maintain or improve the condition of ammunition and explosives within a facility. Ammunition and explosives should be separated in stacks by class, type, and lot number and they should always be stored inside their original shipping containers. These containers should be stacked to maintain an orderly arrangement that will facilitate the safe and effective inventory and handling of ammunition. The bottom-layer of a stack of ammunition and / or explosives should be raised off the floor by suitable means, preferably metal or wood, to allow ventilation and to protect the material from water and dampness. Wooden pallets are suitable means to raise the stacks when they are received as part of the packaged unit. Unobstructed aisles should be maintained between stacks to ensure that the ammunition and explosives can be inspected, inventoried, and removed or rotated as necessary. These aisles should be at least eighteen inches (46 cm) wide so that individual containers or stacks are accessible for inspection. It is recommended that a clearance of at least two feet (61 cm) be maintained from the front wall of the facility along with a space of at least six inches (15 cm) from stacks to the sides, rear, and ceiling of the facility.

⁵ The term “war reserve” is defined: “Stocks of materiel amassed in peacetime to meet increased military requirements consequent to an outbreak of war. War reserves provide the interim support necessary to sustain operations until re-supply can be effected.”

Ammunition stacks should be placed at least one meter from doorways to provide protection from direct sunlight, rain, etc. when doors are open. If pallets are un-banded, stack height should not exceed two meters (or one pallet).

D. Supply Management: Organization of Stockpiles

Ammunition and Explosive Compatibility: Quantities of conventional ammunition can be in the hundreds of thousands in a single stockpile. Furthermore, there are different types of ammunition, different calibers, different manufacturers and different ages, all with varying degrees of volatility. The combination of these factors makes the strict organization of a stockpile essential in ensuring safety and the effective use of materials. In order to facilitate the organization of ammunition and explosives and to ensure that they are safely housed in a facility, they are assigned to specific groupings. These “ammunition compatibility groups” are assigned to ammunition in order to reduce the probability of an accident or, for a given quantity, the magnitude of the effects of such an accident. Refer to Annex A for the Compatibility Group Assignments and Storage Facilities Compatibility Chart that details which groups can be safely stored together.

Net Explosive Quantity (NEQ): A factor that is affected by the organization of stockpiles is the NEQ⁶. The NEQ is the weight in kilograms (pounds) of the explosive content of an individual round of ammunition. The NEQ must be calculated to determine the safe distance ammunition may be stored from inhabited buildings, public traffic routes, ammunition operating buildings, and other storage sites. The NEQ for each item of ammunition in the stockpile must be identified and published by the appropriate authority.

When ammunition and explosives of more than one Hazard Division are stored in a single site, the required Quantity - Distances or permissible NEQ should be calculated using the following rules:

- a) When Hazard Divisions 1.1 and 1.2 are co-located in the same site, determine the distances for the total quantity considered first as 1.1 and then as 1.2. The required distance is the greater of the two. When the 1.1 requirements are controlling and the HE equivalences of the 1.2 is known, the HE equivalent weight of the 1.2 items may be added to the total explosive weight of 1.1 items to determine the NEQ for 1.1 distance determination; otherwise, the total explosive weight of the 1.2 items (including net propellant weight) is to be added to the total explosive weight of the 1.1 items to determine the NEQ for 1.1 distance determination.
- b) When Hazard Divisions 1.1 and 1.3 are co-located in the same site, determine the distances for the total quantity as 1.1. However, when HE equivalents of the 1.3 is known, the HE equivalent weight of the 1.3 items may be added to the total explosive weight of 1.1 items to determine the NEQ for 1.1 distance determination; otherwise the total net propellant weight of the 1.3 items is to be added to the total explosive weight of the 1.1 items to determine the NEQ for 1.1 distance determinations.
- c) When Hazard Divisions 1.2 and 1.3 are co-located in the same site, determine the required distance for each separately. The two quantities do not need to be added together for Q – D purposes. The required distance is the greater of the two.

⁶ “Net Explosive Quantity” (NEQ) is a term used by many States, where the quantity of explosives is identified in kilograms (kg). Other States may use “Net Explosive Weight” (NEW), where the quantity of explosives is identified in pounds (lbs).

- d) When Hazard Divisions 1.1, 1.2, and 1.3 are co-located in the same site, determine the distances for the total quantity considered first as 1.1, next as 1.2, and finally, as 1.3. The required distance is the greatest of the three. As permitted by paragraphs C9.2.1.3. and C9.2.1.4. above, HE equivalences weight for 1.2 and 1.3 items may be used in NEQ determinations for Q – D purposes; otherwise the rules for adding total explosive (and / or propellant) weight of 1.2 and 1.3 items is to be added to the explosive weight of the 1.1 items (when controlling) to determine the NEQ for 1.1 distance requirements.
- e) Explosives designated as Hazard Division 1.5 for transportation, are considered Hazard Division 1.1 for Q - D purposes (storage).
- f) When Hazard Division 1.6 is co-located with Hazard Division 1.1 or 1.5, Hazard Division 1.6 is considered Hazard Division 1.1 for Q – D purposes. When Hazard Division 1.6 is co-located with Hazard Division 1.2, Hazard Division 1.6 is considered Hazard Division 1.2 for Q – D purposes.
- g) When Hazard Division 1.6 is co-located with Hazard Division 1.3, then add the explosive weight of the Hazard Division 1.6 to the weight of Hazard Division 1.3 and determine the distances for the total quantity considered first as Hazard Division 1.3 (if demonstrated by testing or analogy; otherwise, treat as Hazard Division 1.1) and second as Hazard Division 1.6. The required distance is the greater distance of the two.
- h) The Q – D's for Hazard Division 1.1, 1.2, 1.3, 1.5 or 1.6 individually or in combination are not affected by the presence of Hazard Division 1.4.i). If approved buffer configurations are provided, the NEQ for

Q – D purpose is the explosive weight of the largest stack plus the explosives weight of buffer material.

The NEQ is also involved in another equation, the Explosive Safety Quantity Distance (ESQD). This equation provides the acceptable levels of protection (distance) based on the type and quantity of explosives, the type of structure they are stored in, and the relationship to the exposed sites, (e.g., inhabited buildings, public transportation routes, and different ammunition storage facilities). The equation used to determine the ESQD is: $D = XQ^{1/3}$, where D = Distance (m), X = Safety factor (the X variable⁷ is a constant and represents the degree of damage that is acceptable).

Typical constants range from 1.25 to 50; the lower the factor, the greater the damage that is accepted), Q = NEQ (kilograms). A full and complete explanation of ESQD calculations is beyond the scope of this document. However, there are several national and other documents, which can further explain the ESQD implementation. Annex D contains contact information for regional organizations and other OSCE participating States' practices in this area.

Maintaining Organization in a Facility: Ammunition should be organized in such a way that promotes the timely receipt, storage, and issue of stock and also promotes the accuracy within ammunition location records. A way of promoting this organization is by utilizing an “ammunition locator record” which provides a record of each lot of ammunition and identifies the site location in which it is stored. Included in the locator record could be a “planograph”⁸ which is a diagram reflecting all of the items stored in the facility, grid locations of the items, and occupied and vacant storage space within an ammunition storage structure or site.

⁷ Some countries denote this factor with a 'K'

⁸ Refer to Annex B for a sample 'planograph'

A “grid location” is a specific area within the confines or boundaries of an ammunition storage structure or site, which relates the location of the stocks in the facility to the floor plan / layout / or planograph of the location. The organization of a stockpile should facilitate the objectives of seeking to 1) accelerate the selection of stock for issue or shipment to facilities; 2) expedite the movement of received stock to its proper location in the facility; 3) achieve maximum use of storage space; 4) provide rapid response to inquiries for location information; and 5) maintain high accuracy standards for ammunition locator records.

Once a diagram of the facility has been completed which facilitates the objectives of an organized stockpile, any changes to the diagram should be highly regulated and documented if location changes are necessary.

Stocks within the individual grid locations should also be highly organized and separated according to lot number and condition. It is important to separate stocks by lot number and condition largely for quality control reasons. Often ammunition or explosives from a certain lot are sent to multiple regional distribution facilities. If a particular lot of ammunition is found to be unstable or dangerous, then the inventory from this lot would be recalled (i.e. it would be returned to proper authorities for safe disposal). It is essential that facilities be able to immediately identify lots in question so that the risk to those in the facility or surrounding areas is minimized.

Higher cost ammunition such as rockets and guided missiles may be assigned individual serial numbers. The serial numbers should also be carefully kept and the location of these items should also be designated on the planograph.

To keep stocks organized within grid locations, forms⁹ can be attached to each lot in a grid location which would be used to track additions or removals from that lot. If multiple lots are stored in one grid location, then there should be a separate form for each lot. If storage locations cause the deterioration of these forms (due to climactic conditions or the presence of rodents or insects, etc.), they should be placed in plastic envelopes or suitable substitutes to prevent deterioration of the forms. When the last of the lot of ammunition is removed from the facility, the form should be maintained for at least two years in case there are any questions or issues with that stock.

Clearly identified physical security procedures are also a valuable way to maintain the organization of a stockpile. Less complex measures, such as controlling who has keys to the facility and sign-in / check-out lists are cost effective measures to enhance loss-prevention efforts in a facility. Other measures such as increased lighting and fencing around the facility, increased security staff, and an intrusion detection system can provide invaluable protection for an ammunition stockpile facility.

⁹ Refer to Annex C for a sample form

V. Additional information

Participating States looking for more specific information on stockpile management can refer to the regulations in place of other OSCE participating States. Regional organizations such as NATO have also produced regulations on ammunition and explosives topics which have been agreed to by all NATO members, with many Partnership for Peace and Mediterranean Dialogue countries participating in their development. Annex D contains contact information for regional organizations and other OSCE members' practices in this area.

In support of implementation of this BPG, consider the UN International Ammunition Technical Guidelines (IATG)¹⁰, among others, the following volumes:

- 01 – Introduction and Principles of Ammunition Management
- 02 – Risk Management
- 03 – Ammunition Accounting
- 05 – Explosives Facilities (Storage) (Infrastructure and Equipment)
- 06 – Explosive Facilities (Storage) (Operations)
- 07 – Ammunition Processing
- 09 – Security of Ammunition
- 11 – Ammunition Accidents, Reporting and Investigation

¹⁰ UN IATG: <https://www.un.org/disarmament/un-safeguard/guide-lines/>

Annex A

Ammunition and Explosives Compatibility Groups and Compatibility Chart

Above ground Storage of Explosive Substances – Rules for Mixing of Compatibility Groups

Compatibility Group	A	C	D	G	L	S
A	X					
C		X ⁽¹⁾	X ⁽¹⁾	⁽³⁾		X
D		X ⁽¹⁾	X ⁽¹⁾			X
G		⁽³⁾	⁽³⁾	X		X
L					⁽²⁾	
S						X

Legend: X = Mixing permitted

Notes:

- (1) Mixing permitted provided substances have all passed UN Test series 3. Storage substances of any Compatibility Groups C, D or G which have failed UN test 3 will require special consideration by the National Competent Authority
- (2) Compatibility Group L substances must always be stored separately from all substances of other compatibility groups as well from all other substances of Compatibility Group L.
- (3) The mixing of Compatibility Group G substances with other compatibility groups is at the discretion of the National Competent Authority.

Above ground Storage of Explosive Substances – Rules for Mixing of Compatibility Groups

Compatibility Group	B	C	D	E	F	G	H	J	K	L	N	S
B	X		X ⁽¹⁾	X ⁽¹⁾	X ⁽¹⁾							X
C		X	X	X	(2)	(4)					X ⁽⁵⁾	X
D	X ⁽¹⁾	X	X	X	(2)	(4)					X ⁽⁵⁾	X
E	X ⁽¹⁾	X	X	X	(2)	(4)					X ⁽⁵⁾	X
F	X ⁽¹⁾	(2)	(2)	(2)	X							X
G		(4)	(4)	(4)	(4)	X						X
H							X					X
J								X				X
K									X			
L										(3)		
N		X ⁽⁵⁾	X ⁽⁵⁾	X ⁽⁵⁾							X ⁽⁶⁾	X ⁽⁷⁾
S	X	X	X	X	X	X	X	X			X ⁽⁷⁾	X ⁽⁷⁾

LEGEND: X = Mixing permitted

NOTES:

- (1) Compatibility Group B fuses 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) Mixing of articles of Compatibility Group G with articles of other compatibility groups is at the discretion of the National Competent Authority.
- (5) Articles of Compatibility Group N should not in general be stored with articles in other compatibility groups except S. However, if such articles are stored with articles of Compatibility Group 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.

- (6) It is allowable to mix 1.6N munitions. The Compatibility Group of the mixed set remains N if the munitions belong 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 considered “compatible”). If this is not the case, the whole set of munitions should be considered as having the characteristics of Compatibility Group D.
- (7) A mixed set of munitions 1.6N and 1.4S may be considered as having characteristics of Compatibility Group N.

1.2.3.3. *Mixed Storage - Special Circumstances:*

- a) There may be special circumstances where the above mixing rules may be modified by the National Competent Authority subject to adequate technical justification based on tests where these are considered appropriate.
- b) Very small quantity Hazard Division 1.1 and large quantity Hazard Division 1.2.1 / 1.2.2. It should be possible to arrange storage in such a manner that the mixture will behave as 1.2.1 / 1.2.2.
- c) Mixing of Hazard Division 1.1, Hazard Division 1.2.1 / 1.2.2 and Hazard Division 1.3. The quantity distance to be applied in these unusual circumstances is that which is the greatest when considering the aggregate NEQ as Hazard Division 1.1, Hazard Division 1.2.1, Hazard Division 1.2.2 or Hazard Division 1.3.
- d) With the exception of substances in Compatibility Group A, which should not be mixed with other compatibility groups, the mixing of substances and articles is permitted as shown in Tables 5 and 6.

Compatibility Group Assignments

Group A: Primary explosive substance. Examples are lead azide, lead styphnate, mercury fulminate, tetracene, dry RDX, and dry PETN. Group A materials are prohibited aboard combatant ships.

Group B: Articles containing a primary explosive substance and not containing two or more effective protective features. Some articles, such as detonators for blasting, detonator assemblies for blasting and primers, cap-type, are included, even though they do not

contain primary explosives. Examples are detonators, blasting caps, small arms primers, and fuses without two or more safety features.

Group C: Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance. Examples are single-, double-, triple-based, and composite propellants, rocket motors (solid propellant), and ammunition with inert projectile.

Group D: Secondary detonating explosive substance or black powder or articles containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features. Examples are bulk TNT, Composition B, wet RDX, bombs, projectiles, warheads, or fuses with two or more safety features.

Group E: Article containing a secondary detonating explosive substance, without means of initiation, with a propelling charge (other than one containing flammable liquid or gel or hypergolic liquid). Examples are artillery ammunition, rockets, or guided missiles.

Group F: Articles containing a secondary detonating explosive substance with its own means of initiation, with a propelling charge (other than one containing flammable liquid or gel or hypergolic liquid) or without a propelling charge. An example is a grenade.

Group G: Pyrotechnic substance or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating, incendiary, tear-producing or smoke-producing substance (other than a water-activated article or one containing white phosphorous (WP), phosphide or flammable liquid or gel or hypergolic liquid). Examples are flares, signals, incendiary or illuminating ammunition, and other smoke and tear producing devices.

Group H: Ammunition containing both explosives and WP or other pyrophoric material. Ammunition in this group contains fillers which are spontaneously

flammable when exposed to the atmosphere. Examples are WP, plasticized white phosphorus (PWP), or other ammunition containing pyrophoric material.

Group J: Ammunition containing both explosives and flammable liquids or gels. Ammunition in this group contains flammable liquids or gels other than those which are spontaneously flammable when exposed to water or the atmosphere. Examples include liquid- or gel-filled incendiary ammunition.

Group K: Articles containing both an explosive substance and a toxic chemical agent. Articles in this group contain chemicals specifically designated for incapacitating effects more severe than lachrymation. Examples are artillery or mortar ammunition, fused or unfused, grenades, and rockets or bombs filled with a lethal or incapacitating chemical agent.¹¹

Group L: Explosive substance or article containing an explosive substance and presenting a special risk needing isolation of each type. Examples are prepackaged hypergolic liquid-fueled rocket engines, TPA (thickened TEA), and damaged or suspect ammunition of any group.

Group N: Hazard Division 1.6 ammunition containing only extremely insensitive detonating substance (EIDS). Examples are bombs and warheads. If dissimilar Group N munitions, such as Mk 82 and Mk 84 Bombs, are mixed together and have not been tested to assure non-propagation; the mixed munitions are considered to be Hazard Division 1.2, Compatibility Group D for purposes of transportation and storage.

¹¹ All OSCE participating States have ratified the Chemical Weapons Convention.

Group S: Substance or article so packed or designed that any hazardous effects arising from accidental functioning are confined within the package. That is unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder or prohibit firefighting or other emergency response efforts in the immediate vicinity of the package. Examples are explosive switches or valves.

Items that should be stored separately from other items of ammunition:

- Detonators and blasting caps (separated from Compatibility Groups C, D, E, and F by a dividing wall capable of preventing sympathetic detonation of other items,
- White Phosphorous (storage site equipped with appropriate equipment required to take Immediate Actions in case of leakage)

- Damaged ammunition (if considered unsafe for storage, damaged munitions should be destroyed at the earliest convenience),
- Ammunition in an unknown condition (should be stored at such distance that detonation of this ammunition will not jeopardize national stocks),
- Ammunition which has deteriorated and become hazardous (should be stored in Isolation and destroyed at the earliest convenience),
- Pyrotechnics and propellants.

Annex B

Sample 'planograph' (inventory location in ammunition and explosives storage facility)

Title: Strathmore Facility **Planograph - Site Number:** 107010

Latitude Grid = 02 Feet **Longitude Grid =** 05 Feet

Date: 12/04/05

	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	
A A	[ [												] ]	A A
B B	[ [	(BCAB)]		(BCCD) ]									] ]	B B
C C	[ [	] ]		] ]									] ]	C C
D D	[ [							(DEAH) ]					] ]	D D
E E	[ [							] ]					] ]	E E
F F	[ [													F F
G G	[ [													G G
H H	[ [			(HJAD)]								(HJJM)]		H H
J J	[ [			] ]								] ]	] ]	J J
K K	[ [												] ]	K K
L L	[ [												] ]	L L
M M	[ [							(MNAH) ]					] ]	MM
N N	[ [							] ]					] ]	N N
	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	

Grid	Serial/Lot Number	Quantity	Stock Number__
BCAB	HAQ-3162-7BY	89	15406544050PD62
BCCD	HAQ-3148-2AY	48	15406544089PD62
DEAH	VRD-9873-4AH	45	15402246597AH74
HJAD	RTS-542-3GV	67	15405265014HY54
HJJM	RSV-432-4RD	59	15402546540HP74
MNAH	HYO-740-6ST	121	15409701657YO12

Explanation - Sample Planograph:

This is a sample planograph for an imaginary facility. Participating States and / or facilities can adjust the planograph and the included information to best fit their needs.

The goal is to provide a map of the facility and ensure that, 1) there is an awareness of all stock within the facility, and 2) that there is control over that stock and its movements.

Title: Strathmore Facility	Name of the facility
Planograph - Site Number: 107010	Facility identification number (sometimes facilities are assigned identification numbers along with names)
Latitude Grid = 02 Feet	Length of the grid containing the ammunition / Explosives
Longitude Grid = 05 Feet	Width of the grid containing the ammunition / Explosives
Date: 12/04/2005	Date the planograph was printed from the system or date created
BCAB, BCCD, DEAH, etc.	Names for grid locations. First two letters indicate the vertical length of the grid. Last two letters indicate the horizontal width of the grid. These grid locations indicate that a specific type and lot of ammunition are stored in these locations.

[-]

These markings indicate the front and back of the building. The lack of these markings through grids FF, GG, and HH on the right-hand side indicate the entrance to the facility.

- These markings also indicate the end of a specific location of ammunition, e.g. for grid location name DEAH, the “]” indicates that this certain type of ammunition ends at grid HH.

Grid location names can then be matched up with specific type of ammunition stored in that location, as is done at the bottom of the planograph. Participating States should include whatever information necessary for the identification of the ammunition.

Annex C

Sample Form for Tracking Additions or Removals from a Lot within a Grid Location

Lot Data Card						
Internal Control No.: (if applicable):		Description of Lot:				
Lot Number:		Site Location:			Grid Location:	
Date	Document Number (paperwork used to track internal supply movements)	Received From or Issued To	(+) or (-)	Quantity Received (+) or Issued (-)	Balance	Signature

Annex D

Contact Information for Additional Background

Regional Organizations

North Atlantic Treaty Organization (NATO)

Military Agency for Standardization (MAS)

B – 1110 Brussels

Tel: 707.55.76

Fax: 707.57.18

Email: mas@hq.nato.int

NATO AC/326 Ammunition Safety Group

Mrs. Marie Claire Mortier, Secretary

Armaments Directorate

Defense Investment Division

Room J 344

NATO Headquarters

B - 1110 Brussels

Tel: +32-2-707.3942

Fax: +32-2-707.4103

Email: mc.mortier@hq.nato.int

South Eastern European Clearinghouse for the Control of Small Arms and Light Weapons (SEESAC)

Team Leader,

SEESAC,

UNDP Belgrade,

Ms. Janka Veselinovica,

11000 Belgrade,

Serbia

Tel: (+381)(11)244.29.02

Fax: (+381)(11)245.43.51

Email: rmds@undp.org.yu

Participating States

Belgium

a. Military ammunition and explosives:

Logistiek Steuncomplex

NOORD-SIPEG

Fort Colonel IMF Brosius

B - 2070 Zwijndrecht

Tel: 03/253 7248

Fax: 03/253 7269

b. Civil ammunition and explosives

MINISERE DES AFFAIRS

ECONOMIQUES

Administration des Mines

Service des Explosifs

Rue J.H. De Mot 28-30

B - 1040 Bruxelles 4

Denmark

a. Military ammunition and explosives

ARMY

Haerens Materielkommando
Arsenalvej 55
DK - 9800 Hjørring
Tel : ++45 98901322
Fax : ++45 98900623

NAVY Sovaernets Materielkommando
Holmen
DK - 1433 København K
Tel : ++45 31541313
Fax : ++45 32968055

AIR FORCE

Flyvematerielkommandoen
Postboks 130
DK - 3500 Vaerlose
Tel : ++45 44682255
Fax : ++45 44662533

b. Civil ammunition and explosives

Justitsministeriet
Civilkontoret
Slotholmsgade 10
DK - 1216 København K
Tel : ++45 33923340
Fax : ++45 33933510

Netherlands

Military Committee on Dangerous Goods

DMKL/Bevod/Milan

PO Box 90822

2509 LV The Hague

Netherlands

Tel: --31 70 316 5090

Fax: --31 70 316 5091

Norway

a. For military ammunition and explosives

1) Haerens forsyningskommandos ammunisjonskontroll

Postboks 24,

N-2831 RAUFOSS

Norway

Tel: ++47 61 19 1230

2) Sjøforsvarets forsyningskommando

Postboks 3,

N-5078 HAAKONSVERN

Norway

Tel: ++47 55 50 2000

3) Luftforsvarets forsyningskommando

Postboks 10,
N-2007 KJELLER
Norway
Tel: ++47 63 80 8000

- b. For civilian explosives and articles containing explosive substances:
DIREKTORATET FOR BRANN OG
EXPLOSIONSVÉR
Postboks 355, Sentrum
N-3101 TONSBERG
Norway
Tel: ++47 33 39 880

Turkey

- a. For military ammunition and explosives:
Ministry of Defense
ANKARA
- b. For non-military explosives:
Ministry of Internal Affairs
ANKARA

United Kingdom

Explosives Storage and Transport
Committee (ESTC)
Room 755, St Giles Court
1-13 St Giles High Street
London WC2H 8LD

(civil net) Tel: ++44 171 305 7109/7006

Fax: ++44 171 305 6022

(mil net) Tel: LHQ 57109/57006

Fax: LHQ 56022

United States

- a. Military ammunition and explosives
Chairman DoD Explosives Safety
Board, Room 856C, Hoffman
Building I, 2461 Eisenhower Avenue
Alexandria, VA 22331-0600 USA
Tel: ++1-703-325-8624
Fax: ++1-703-325-6227
- b. Non-military explosives
Associate Administrator for
Hazardous Materials Safety Material
Transportation Bureau (RSPA/DOT)
1200 New Jersey Ave., SE
Washington, D.C. 20590 USA
Tel: ++1-202-366-4535
Fax: ++1-202-366-3755