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Special safety precautions (storage and operations)

Warning

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Foreword

Ageing, unstable and excess conventional ammunition stockpiles pose the dual risks of **accidental explosions at munition sites** and **diversion to illicit markets**.

The humanitarian impact of ammunition-storage-area explosions, particularly in populated areas, has resulted in death, injury, environmental damage, displacement and disruption of livelihoods in over 100 countries. Accidental ammunition warehouse detonations count among the heaviest explosions ever recorded.

Diversion from ammunition stockpiles has fuelled armed conflict, terrorism, organized crime and violence, and contributes to the manufacture of improvised explosive devices. Much of the ammunition circulating among armed non-State actors has been illicitly diverted from government forces.¹ In recognition of these dual threats of explosion and diversion, the General Assembly requested the United Nations to develop **guidelines for adequate ammunition management**.² Finalized in 2011, the International Ammunition Technical Guidelines (IATG) provide voluntary, practical, modular guidance to support national authorities (and other stakeholders) in safely and securely managing conventional ammunition stockpiles. The UN SaferGuard Programme was simultaneously established as the corresponding knowledge-management platform to oversee and disseminate the IATG.

The IATG also ensure that the United Nations entities consistently deliver high-quality advice and support – from mine action to counter-terrorism, from child protection to disarmament, from crime reduction to development.

The IATG consist of 12 volumes that provide practical guidance for ‘through-life management’ approach to ammunition management. The IATG can be applied at the guidelines’ **basic, intermediate, or advanced levels**, making the IATG relevant for all situations by taking into account the diversity in capacities and resources available. Interested States and other stakeholders can **utilize the IATG for the development of national standards and standing operating procedures**.

The IATG are reviewed and updated at a minimum every five years, to reflect evolving ammunition stockpile-management norms and practices, and to incorporate changes due to changing international regulations and requirements. The review is undertaken by the UN SaferGuard Technical Review Board composed of national technical experts with the support of a corresponding Strategic Coordination Group comprised of expert organizations applying the IATG in practice.

The latest version of each IATG module can be found at www.un.org/disarmament/ammunition.

¹ S/2008/258.

² See also the urgent need to address poorly-maintained stockpiles as formulated by the United Nations Secretary-General in his Agenda for Disarmament, *Securing Our Common Future* (2018).

Introduction

The most obvious hazard from explosives during storage is an accidental explosion (detonation or deflagration). Explosives may function accidentally due to stimuli such as impact, friction, spark, heat, electrostatic discharge, radio frequencies (RF) induced current, reaction with another substance or inherent chemical instability. The inadvertent initiation of even small quantities of explosives can lead to death or serious injury and may lead to a major catastrophe. The aim of this particular IATG module is to reduce these risks by highlighting specific areas of special risk and describing the reduction and/or mitigation factors.

This IATG module falls within the group for Explosive Facilities (Storage) (Operations). Specific safety precautions during the processing of ammunition are contained under the group for *Ammunition processing operations - Safety and risk reduction (IATG 07.30)*, which should be consulted in parallel to this IATG module as there are some common safety precautions. Some of these risks described in this IATG module are also covered in other IATG modules but are repeated here for ease of reference.

Special safety precautions (storage and operations)

1 Scope

This IATG module introduces and explains special safety precautions that should be taken during ammunition processing operations in explosive facilities.

2 Normative references

A list of normative references is given in Annex A. These documents are referred to in the text in such a way that some, or all, of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

A further list of informative references is given in Annex B in the form of a bibliography, which lists documents that contain additional information related to the contents of this IATG module.

3 Terms and definitions

For the purposes of this module the following terms and definitions, as well as the more comprehensive list given in IATG 01.40 *Glossary of terms, definitions and abbreviations*, shall apply.

The term 'explosive storehouse' (ESH) refers to *any building or structure approved for the storage of explosive materials. (c.f. magazine).*

The term 'national technical authority' refers to *the government department(s), organisation(s) or institution(s) charged with the regulation, management, co-ordination and operation of conventional ammunition storage and handling activities.*

In all modules of the International Ammunition Technical Guidelines, the words 'shall', 'should', 'may' and 'can' are used to express provisions in accordance with their usage in ISO standards.

- a) **'shall' indicates a requirement:** It is used to indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.
- b) **'should' indicates a recommendation:** It is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form, 'should not') a certain possibility or course of action is deprecated but not prohibited.
- c) **'may' indicates permission:** It is used to indicate a course of action permissible within the limits of the document.
- d) **'can' indicates possibility and capability:** It is used for statements of possibility and capability, whether material, physical or casual.

4 Dangerous chemicals

4.1 Ammunition containing white or red phosphorus or phosphides

4.1.1 Stacking and storage (LEVEL 1)

Ammunition containing white phosphorus (WP), red phosphorus (RP) or phosphide filled munitions should be stacked not more than 1.5m, or one pallet, high, with a passage between each two rows so that any item or box which develops defects can easily be seen and quickly removed. Internal temperatures should be below 40°C as temperatures above 40°C greatly increase the likelihood of leakage and hence of spontaneous ignition.

WP filled munitions shall be stored under the coolest conditions practicable and shall not be exposed to sunlight either directly or through windows. A regular inspection regime shall be instituted for the early detection of leaks in all storage buildings containing white phosphorus filled munitions. The frequency of the inspections will depend on the local conditions. In temperate climates, the inspections should take place at intervals not exceeding seven days. In the past the failure to detect a leaking item has led to catastrophic fires.

Munitions containing red phosphorus may generate phosphine gas during normal storage, which is toxic and flammable (see below). It is therefore necessary to ensure good ventilation.

4.1.2 WP and RP filled ammunition (LEVEL 1)

WP, unless wet, ignites spontaneously in air. It can be extinguished by immersion in water, but steps shall be taken to prevent re-ignition. A suitable container of clean water, large enough to immerse a complete package or item, shall be kept available at stacks, loading points, etc. for immersion of leaking stores if necessary, prior to their disposal. Leaking munitions should only be handled by trained personnel.

4.1.3 Leakage (LEVEL 1)

Leakage of WP filled munitions is indicated by the characteristic smell of phosphorus and the presence of white fumes. Leaking munitions shall be isolated and kept under water until they can be destroyed. The exposed phosphorus shall not be allowed to dry, or it will ignite spontaneously.

4.1.4 First aid instructions for WP (LEVEL 1)

First aid instructions and a contingency plan to deal with casualties from WP burns should be posted at buildings where WP munitions are stored (Annex C details such instructions). The contingency plan should, for instance, consider where water can be obtained to treat the casualty.

4.2 Phosphide-filled munitions (LEVEL 1)

Phosphide munitions are activated by water. They shall be stored under dry conditions and be protected from the ingress of moisture. Leakage of the filling, arising from fracture or slow corrosion of the case, may interact with water in any form and evolve toxic phosphine gas. If evolved in sufficient quantity, the phosphine will ignite and may cause a fire. Slower evolution of phosphine gas will be diluted by the air present such that the concentration in the atmosphere will not reach toxic proportions, unless it is in a confined space. A regular inspection regime shall be instituted to aid the prompt detection of leaking ammunition. Munitions believed to be leaking should only be handled by suitably trained personnel. When a leaking store is found, it shall be moved promptly to an isolated place in the open to await destruction. Suitable respirators should be made available on site for use in an emergency.

5 Metal powders and explosives containing metal powders (LEVEL 1)

Many explosives contain metal powders as they increase the power of the explosion. They are therefore present in explosives storage either as part of the completed ammunition item, as part of the raw explosive pre-fill or as neat powder. Finely divided metal powders may produce hydrogen on contact with water or high humidity. Hydrogen gas can form explosive mixtures with air. Therefore, where these materials are stored precautions should be taken to ensure they do not become wet. Steam or water space heating is therefore not advisable in buildings where they are stored. Explosives that contain metal powders, such as Torpex, shall be kept dry. Tools and containers used to process them should be kept at room temperature to avoid condensation.

6 Health hazards associated with explosives (LEVEL 1)

In addition to the more obvious explosion hazard, many explosives present a health hazard. Absorption of toxic substances may occur by inhalation, ingestion or absorption through skin and eyes.

Organic nitro-compounds such as TNT and Tetryl (also known as Composition Exploding (CE)) are readily absorbed, either through the skin or by inhalation, into the bloodstream. They may cause severe toxic effects and dermatitis. When a person becomes sensitised to a particular substance, dermatitis may reoccur after only a minor re-exposure.

Some nitrate esters such as nitro-glycerine (NG) are also readily absorbed through the same entry routes. They can cause severe headaches and more severe toxic effects in the short term. Long term exposure can cause heart failure (see annex D).

Nitramines such as RDX and HMX are generally less readily absorbed through the skin but can enter the body through ingestion or inhalation of the dust. In severe cases this can prove fatal. Many pyrotechnic substances and associated chemicals present health hazards including both toxicity and dermatitis. A chemical tag is now often added to plastic explosives and this has an associated health hazard.

6.1 Information on the toxic effects of explosives (LEVEL 1)

The risk of harm with such substances varies with concentration, toxicity and duration of exposure. Suppliers of substances with associated health hazards shall be required to provide information regarding these hazards. For explosives this information is normally provided as a clause in the explosives hazard data sheet. Explosives hazard data sheets or nationally issued safety certificates are also available for many older explosives. The occupational exposure limits (OELs) for chemicals including explosives give guidance on permitted concentrations in air. These documents are either published by the national authority or are available from international organisations such as the EU. Although not explosives in themselves, WP, RP and phosphides are used in some munitions. In addition to fire hazards they have toxic properties.

6.2 Safety precautions when handling or storing explosives (LEVEL 2)

A safety assessment shall be carried out before any work is undertaken with explosives, particularly if those explosives have a known health hazard associated with them. The safety assessment shall identify the need for appropriate precautions. A qualified medical practitioner should be consulted regarding the need for pre-work screening and subsequent periodical checks before any work where exposure to toxic explosives and associated chemicals is undertaken. Natural air ventilation or forced local exhaust ventilation may need to be installed.

Personal protective equipment (PPE) in the form of respirators, gloves, barrier creams or special clothing may be required. Hand washbasins or showers may need to be installed. Food and drink shall not be taken into areas where such materials are handled but it may be allowed within the explosives area in specially designated places. It is important that personnel who handle explosives should wash their hands before touching food.

7 Explosives area management precautions (LEVEL 2)³

7.1 Certifying free from explosives (CFFE) packages, articles or equipment

The CFFE regime shall be applicable to all packages which have contained explosives, arisings from the firing of ammunition, munitions kept in museums or as souvenirs and displays etc, and for training aids and all arisings from breakdown and disposal of ammunition and explosives. It shall also be applicable to equipment used to process explosives and which subsequently require maintenance or repair. CFFE is required when such items are to be transported as non-explosives or sent to recipients who, because of a lack of knowledge of explosives, would be at risk if explosives were to be inadvertently left in a nominally empty article or package.

7.1.1 High risk categories of personnel

Those at particular risk are untrained personnel and those who receive items for scrap. The same regime should also be used to ensure the absence of other hazardous substances e.g. WP, RP and riot control agents. CFFE is a very important function and shall only be carried out by trained and competent staff who are authorised to do so. Where the initial CFFE has been carried out by field units or under adverse conditions, such as range activities, a second CFFE process or verification check may be required. This is especially important before such items are sent to recipients with a limited knowledge of explosives. The need for a second CFFE or check should be identified during the initial risk assessment.

7.1.2 CFFE process

CFFE should be treated as an explosives process. In particular, the risks must be assessed, and work instructions prepared, before the commencement of work. It should be undertaken in a licensed site or building wherever possible. CFFE should be carried out in a site, building or designated quarantine area that is separate from the main explosives process area. Where the CFFE process involves more than one item, separate areas within the CFFE area are to be designated for:

- A) articles and packages awaiting CFFE;
- B) processing the articles and packages;
- C) the isolation of any live articles found during the process; and
- D) articles and packages that have been certified as free from explosives.

All articles and packages shall be inspected, and a thorough examination shall be carried out to ensure that they are free from explosives. For packages this shall include the removal and inspection of all internal packing fitments and furniture, although they can be subsequently replaced if required. If it can be stated with certainty that it is free from explosives a CFFE certificate shall be issued by a trained, competent individual. If it cannot be stated with absolute certainty that an item is completely free from explosives it shall be accompanied by a certificate indicating the level of potential explosives contamination remaining. Where such doubt regarding contamination still exists but there is a need for the item to be repaired or disposed of, it shall be subject to a proving procedure such as burning. Where CFFE is by a proving oven, the procedure shall ensure that the explosives reach a sufficiently high temperature for long enough to completely consume all the explosives present.

Detailed working instructions and procedures should be prepared for each separate task and the work is to be supervised to ensure that instructions are followed.

³ See IATG 06.10 *Control of explosives facilities*.

Hazard Classification Code markings shall be obliterated as part of the CFFE process and labels applied to clearly show the item to be CFFE.

7.1.3 CFFE certification

CFFE certificates shall be prepared for each item and are to be signed by the person carrying out the inspection. This person shall be present during the whole process. CFFE certificates shall be traceable documents. A copy shall be placed in the CFFE package or attached to the CFFE article. The certificate shall show:

- A) the name of the person certifying the item together with his or her appointment printed in capitals letters;
- B) the identity of the location where the CFFE process was carried out;
- C) a description of the contents, if any, of a package;
- D) the date of certification; and
- E) the signature of the person named.

A second copy of CFFE certificate should be retained by the organisation issuing the certificate for at least three years. Alternatively, the details from the CFFE certificates of a consignment of CFFE packages should be summarised on a document, such as the consignment note, such that the information in (a) to (e) above may be obtained. Similarly, the consignment note should be kept by the issuing organisation for three years.

7.1.4 Storage of CFFE articles

Once articles and packages have been CFFE they should be sealed and isolated in such a way that there is no possibility of any uncertified article or package finding its way into the CFFE area or storage area or of uncertified articles being placed in CFFE packages.

7.1.5 Explosive ordnance disposal (EOD), range clearance and demilitarisation arisings

Special consideration should be given to the certification of arisings from range clearance, EOD activities and from the demilitarisation of ammunition. Each separate process shall be subject to a risk assessment, which takes into consideration the residues likely to arise from the process method. The demilitarisation process should ensure that all explosives are removed or consumed, and that articles are sufficiently disfigured that they will not be mistaken for live ordnance or be useable for their intended purpose. The certification of such arisings is only to be undertaken by persons who are fully conversant with the demilitarisation process carried out and with the detailed makeup of the original article. It may be necessary to have a second CFFE process where complex articles are demilitarised and the need for this requirement should be identified during the initial risk assessment. Arisings from the disposal of explosives and ammunition by burning or incineration shall be subject to a CFFE procedure prior to final disposal of them as non-explosives.

7.1.6 Munitions in museums or as souvenirs, display items etc.

All munitions kept in museums, displays or as souvenirs should be examined by a competent person to ensure that all components of the munition are entirely free from explosives and other hazardous substances. Any item that may be confused with a live store, such as a training round, will be subject to this process. However, purpose manufactured training aids obtained from official sources are exempt this process.

The CFFE procedures outlined above may need to be used. A formal CFFE certificate should be issued by the person carrying out this examination to the keeper of the munitions. All organisations holding such munitions should keep a register with details of this freedom from explosives certification. These requirements may be waived where it is completely obvious that the item is free from explosives. An example is an empty brass cartridge case without a projectile fitted and with the primer and cap assembly removed so that a clear hole is visible.

The details held in the register should include information enabling each item to be uniquely identified. It is suggested that this requirement is best met by allocating each item a brief description and a unique number. The name of the person who carried out the CFFE certification and the date on which it was carried out should also be included. The item itself should be marked or tagged with the unique number from the register and also be labelled as 'INERT' or 'FREE FROM EXPLOSIVES'.

7.2 CFFE of buildings and land no longer required used for the storage, handling or processing of explosives

Buildings or land that may at any time have been used for the storage, handling and processing of explosives should be made free of all explosive contamination and formally certified as such before being used for other purposes. These buildings and areas of land should be treated as contaminated until proven otherwise. When buildings, or land, previously used for explosives are to be sold or pass out of the immediate custody of the head of the establishment the following procedure shall be implemented.

A thorough visual search of the buildings or areas involved shall be organised to ensure that no explosive items have been overlooked. Additional instrumental searches should be undertaken when considered necessary. Technical staff capable of identifying and disposing of any items discovered shall form part of the search party.

Any places where exposed explosives could have been handled shall be decontaminated and specialist ammunition technical advice should be sought as necessary. A joint inspection by establishment staff and appropriate technical professional shall be arranged as a final check. For Category C buildings⁴ an inspection by establishment staff shall be sufficient. CFFE certificates are to be prepared and copies held by the establishment and the appropriate national authority organisations.

When buildings or land previously used for explosives are re-allocated to other functions and remain under the direct control of the head of establishment they should be formally certified in accordance with these procedures. Records of these procedures and other relevant paperwork shall be retained so that only the minimum amount of work is required should the building or land subsequently pass out of the control of the head of establishment.

8 Emergency arrangements (LEVEL 2)⁵

Accidents or incidents involving conventional ammunition are a regular occurrence, even in the best-trained military and security forces, even though most of them are preventable.

The head of the establishment at any facility or location where explosives are processed, handled or stored, shall ensure that adequate emergency arrangements are in place. Such contingencies include incidents and those accidents resulting in property damage, fire, explosion, injury and fatality. Identification of contingencies will be aided by a comprehensive site wide risk assessment.

⁴ See Clause 4 IATG 05.40 *Safety standards for electrical installations* for definitions of electrical categories for buildings.

⁵ See IATG 02.50 *Fire safety*.

8.1 Incidents

Incidents, for which emergency plans shall be required, can be classed as major, which affect the whole site as well as areas external to the site, or minor, which are local in their effects.

In addition to specifying emergency actions for the building where the primary incident occurs, emergency plans should specify actions for personnel in adjacent buildings. For example, it may be safer for personnel to remain where they are. Personnel shall be made familiar with the actions to be taken in emergency. Notices giving information regarding emergency action in the event of fire, evacuation and first aid shall be displayed at suitable locations throughout the site and these are to include all ammunition process buildings. Emergency instructions shall include details on how to shut processes down safely, how to move to a safe place, and the arrangements for re-entering the explosives area after an emergency incident.

Arrangements shall be made to ensure that any particularly vulnerable persons, such as visitors or any disabled people, are conducted to safety in an emergency. Fire and evacuation drills shall be carried out for ammunition process buildings at least every six months. All available exits shall be used during the evacuation drill. Records of the exercises shall be maintained and where appropriate post exercise reports prepared.

8.2 Accidents

An ammunition accident, irrespective of cause or however minor, is any incident involving ammunition and explosives that results in death or injury to a person(s) and/or damage to equipment and/or property, military or civilian.

A part of the emergency planning process is the consideration of the provision of an external fire fighting force and medical assistance. The latter may encompass first aid parties, nursing staff, qualified medical practitioners, ambulances, medical supplies and facilities. Because of the particular nature of injuries that result from accidents involving explosives these arrangements should normally include the provision of medical personnel who are adequately trained to deal with such injuries. Exceptionally at small sites, where less hazardous classes or small quantities of explosives are involved, specially trained first aiders may suffice. Special consideration shall be given to those working with explosives in remote locations and plans shall be made to provide medical assistance and evacuation to a hospital as quickly as possible. A part of the emergency planning process for sites with the potential for major explosives accidents will include the designation of buildings for use as temporary casualty clearing stations.

9 Safe to move and handle (LEVEL 2)

The requirements for the transportation of dangerous goods by road, rail and sea includes the basic principle that explosives and packaging when consigned for transportation will withstand the stresses encountered during transport and the condition will not prejudice safety. Consignors of explosives for transport are required to assure that the consignment meets the appropriate hazardous movement regulations. In meeting this requirement, the consignor shall require evidence that the explosives are safe to transport. In situations where the condition of the explosives is unknown or the condition of the explosives may have deteriorated, then an assessment of the stores and their condition shall be made. This assessment is to take consideration of both the 'safe to store' and 'safe to transport' life of the item and the physical condition of both the explosive items and the packaging.

9.1 Certificate of safety

A locally produced certificate of safety shall accompany each consignment of explosives sent for disposal to any place or establishment, including other storage locations. This certificate shall state that all explosives items, as packed, are safe for transport and handling. For serviceable items in their correct packaging this can be given without the need for an examination. Items that are unserviceable, shelf-life expired etc. and which have not been examined within the previous 12 months, should be examined by technical staff before the certificate is given to confirm that they are in fact safe for handling and transportation. Ammunition in this category requires a sample inspection in accordance with guidance provided by ammunition technical staff.

10 Storage temperatures (LEVEL 2)

10.1 Introduction

In an ideal situation explosives storage should be designed and equipped so that the inside temperature rarely falls below 5°C and rarely rises above 25°C. Additionally, daily temperature variations should not differ by more than 5°C and the relative humidity (RH) should be no greater than 75%. It is appreciated that this situation may only be achieved by the installation of heating and/or cooling systems. In practice there are many explosives that can be kept safely in buildings that are not equipped with space heating and/or cooling systems; however, some explosives should not be allowed to get too cold and some should not get too hot. Some types of explosives need to be protected from moisture.

10.1.1 High temperature limit

Deterioration of explosives in terms of physical attributes and performance, and a reduction of the shelf life of propellants and other explosives containing nitrate esters, will occur more rapidly with increasing temperature. Wherever possible the temperature in a storage building should not exceed 30°C. The chemical stability of explosives in storage should be kept under surveillance in order to avoid problems associated with auto-ignition.

10.1.2 Low temperature limit

To reduce the possibility of nitroglycerine exudation, and to avoid problems arising out of changes in physical properties, gun and rocket propellants containing nitroglycerine or other nitrate esters should not be stored in a building any part of which could remain below 5°C for a continuous period exceeding one month.

Similarly, water wet explosives should not be stored in any place where the temperature may fall below 0°C.

The temperature in buildings containing cordite pastes, dynamite or blasting gelatine, unless of the low freezing variety, should be kept from falling below 15°C. Under no circumstances should the temperature be allowed to fall below 13°C as below this temperature nitroglycerine freezes.

If freezing does occur then these materials should be allowed to thaw at a natural rate and shall not be moved or handled until they have thawed completely. Once they are thawed, a suitably qualified and experienced person shall make a visual inspection of the munition and its packaging to ensure that no exuded nitroglycerine is present either as liquid or permeated into the packaging. The Technical Authority should consider whether to undertake chemical test on the affected explosive to confirm that it remains safe to store and move.

10.1.3 Humidity conditions and air flow

Conditions of high humidity will produce deterioration in physical and ballistic properties of composite propellants. Certain double-based compositions are adversely affected by high humidity and care should be taken to provide adequate protection against high humidity. Almost all pyrotechnics deteriorate in conditions of high humidity. Phosphide ammunition shall be kept dry as possible because it can generate phosphine gas, which is explosive and toxic. A free passage of air around the ammunition stack is vital and the stack should be raised off the floor by the use of battens. The clearance between the stack and the wall is normally to be at least 0.5m.

Annex A

(normative)

References

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this module. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this module are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO maintain registers of currently valid ISO or EN:

- a) IATG 01.40 *Glossary of terms, definitions and abbreviations*. UNODA;
- b) IATG 01.50 *UN Explosive hazard classification system and codes*. UNODA;
- c) IATG 02.50 *Fire safety*. UNODA;
- d) IATG 05.40 *Safety standards for electrical installations*. UNODA.;
- e) IATG 06.10 *Control of explosives facilities*. UNODA.;
- f) IATG 07.10 *Surveillance and proof*. UNODA; and
- g) IATG 10.10 *Demilitarization, destruction and logistic disposal of conventional ammunition*. UNODA.

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references⁶ used in this guideline and these can be found at: www.un.org/disarmament/un-safeguard/references. A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UNODA, and can be read on the IATG website: www.un.org/disarmament/ammunition. National authorities, employers and other interested bodies and organisations should obtain copies before commencing conventional ammunition stockpile management programmes.

⁶ Where copyright permits.

Annex B

(informative)

References

The following informative documents contain provisions, which should also be consulted to provide further background information to the contents of this guideline:⁷

- a) AASTP-1, Edition B, Version 1. *NATO Guidelines for the Storage of Military Ammunition and Explosives*. NATO Standardization Organization (NSO). December 2015.
<http://nso.nato.int/nso/nsdd/listpromulg.html>; and
- b) DSA03.OME part 2 provides for the safe storage and processing of Ordnance, Munitions and Explosives (OME). UK MOD. November 2020.

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references⁸ used in this guideline and these can be found at: www.un.org/disarmament/un-safeguard/references. A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UNODA, and can be read on the IATG website: www.un.org/disarmament/ammunition. National authorities, employers and other interested bodies and organisations should obtain copies before commencing conventional ammunition stockpile management programmes.

⁷ Data from many of these publications has been used to develop this IATG.

⁸ Where copyright permits.

Annex C
(informative)
Treatment of White Phosphorus and Red Phosphorus burns
(LEVEL 1)

WARNING - SYSTEMIC POISONING. PREPARATIONS OTHER THAN WATER ARE NOT TO BE USED AS WP IS SOLUBLE IN OIL OR GREASE AND MAY BE ABSORBED INTO THE SYSTEM RESULTING IN SYSTEMIC POISONING.

C.1 The following items are to be provided in, or at, the building or compartment in which explosives belonging to CG H are stored:

- a) A container filled with water large enough to completely immerse the largest ammunition container holding explosives of CG H.
- b) A container of clean water or bottles of sterile water together with gauze and a selection of large dressings for First Aid use. Containers of water are to be cleaned and refilled weekly.
- c) A suitable tool to cut Tensile Steel Strapping (TSS) in the case of palletised explosives.
- d) Goggles or eye shields.
- e) Protective apron.
- f) Elbow length fire retardant gauntlets.
- g) Suitable lifting tool or apparatus.
- h) Fire retardant head protective wear.
- i) Eyewash equipment.

C.2 It is the responsibility of the head of the establishment to ensure that all persons connected with the handling or storage of WP and RP ammunition are conversant with the method of rendering first aid to any person burnt or contaminated by WP and RP.

C.3 The following first aid treatment shall be given in the event of any person being burnt or contaminated by WP:

- j) where practicable, immediately immerse the burn area in water, or alternatively, pour liberal quantities of water over the area. An attempt may be made to remove loose WP particles with forceps while under water. No attempt is to be made to dig out imbedded particles. Do not use the fingers to avoid burning them;
- k) apply a large wet dressing and ensure that it is kept wet or burning will recommence;
- l) in the event of WP being splashed into the eye of a person, copious quantities of water are to be used to wash the eye and a wet dressing, in the form of a pad, applied. This dressing is to be kept wet by pouring water on to it; it is not to be removed or allowed to dry, as in either instance, burning will recommence; and

- m) the contaminated person is to be taken to the nearest medical establishment for treatment as quickly as possible.

C.4 Medical authorities recommend only the above initial treatment. More qualified individuals may consider the use of copper sulphate and hydrogen peroxide as part of first aid treatment for WP burns.

C.5 RP unlike WP is not liable to spontaneous ignition. However, it is friction sensitive and can reignite. RP burns should be treated in the same way as WP burns. RP hazards are most likely to be from the smoke produced by activated ammunition, but some hazard is posed by the substance itself.

C.6 Although RP is not liable to spontaneous ignition there is a possibility of RP reverting to WP on combustion in an oxygen deprived environment. All personnel shall be briefed on the hazards of both solid phosphorus and the smoke produced. Personnel should not enter the smoke cloud at training and should avoid contact with any unburnt solid particles.

C.7 Extinguished RP particles may re-ignite if, during the burning process, WP has been produced. Care should be taken to avoid friction when removing quenched RP particles as this may cause re-ignition.

Annex D

(informative)

Treatment on hazards of Nitroglycerine poisoning

(LEVEL 1)

Nitroglycerine may be absorbed into the body by ingestion through the mouth, inhalation through the nose, or absorption through the skin. Improper handling of explosives containing nitroglycerine may result in personnel suffering adverse reactions, the most common of which are severe headache, nausea, rapid heart rate and shortness of breath. In extreme cases, nitroglycerine poisoning can lead to coma and death.

Undue emphasis should not be made of the harmful effects of nitroglycerine. Rather, personnel should be made aware of the presence of explosives containing nitroglycerine and trained in the following basic handling precautions:

- a) Ensure area is well-ventilated before opening sealed packages.
- b) Wear appropriate PPE to prevent absorption of nitroglycerine through the skin when directly handling articles.
- c) Do not touch eyes, nose or mouth while hands are potentially contaminated.
- d) Thoroughly wash hands and exposed skin as soon as possible after exposure.
- e) Persons suspected of mild, short-term exposure to nitroglycerine should avoid exertion and be permitted to lie down for one to two hours. A mild stimulant such as coffee or tea may provide some symptomatic relief. Alcohol and aspirin should be avoided as they tend to hasten the onset of headache and increase its severity.
- f) Anyone suspected of a severe exposure to nitroglycerine or complaining of respiratory or cardiac problems will be taken immediately to the nearest medical facility for evaluation.

Amendment record

Management of IATG amendments

The IATG are subject to formal review on a five-yearly basis. This does not preclude amendments being made within these five-year periods for reasons of operational safety, efficacy and efficiency or for editorial purposes.

As amendments are made to this IATG module they will be given a number, and the date and general details of the amendment will be shown in the table below. The amendment will also be shown on the cover page of the IATG by the inclusion of the amendment number and date.

As the formal reviews of each the IATG module is completed, new editions will be issued. Amendments will be incorporated into the new edition and the amendment record table cleared. Recording of amendments will then start again until a further review is carried out.

The most recently amended, and thus extant, IATG module is posted on www.un.org/disarmament/ammunition

Number	Date	Amendment Details
0	01 Feb 15	Release of Edition 2 of IATG.
1	31 March 21	Release of Edition 3 of IATG.