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**Ammunition processing operations -
Safety, risk reduction and mitigation**

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

Any task involving the repair, testing, modification, disassembly or breakdown of ammunition and explosives carries with it an increased risk of accidental initiation. It is therefore regarded as explosives processing and should be carried out in a facility suitable for the explosives process activity and normally in isolation from the storage of bulk stocks of explosives. This location is generally known as an ammunition process building (APB).

Explosives may function accidentally due to stimuli such as impact, friction, spark, heat, electrostatic discharge, radio frequency 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, through subsequent events, lead to a major catastrophe. Ammunition processing operations range from simple visual inspections, through component replacement to full breakdown.

It is much more hazardous to disassemble or breakdown explosives items than it is to fill them. During manufacture the components that contribute the greatest potential hazards are assembled to the main charge as late as possible, but in items for breakdown such components will be present when operations are begun. In many items where there is a requirement for breakdown, deterioration and corrosion will have occurred; this may have affected the explosives as well as the mechanical parts and will tend to make disassembly much more difficult and more hazardous than assembly.

This IATG module provides guidance on the general safety and management aspects of ammunition and explosive processing, whilst other IATG provide more specific safety advice for storage and processing operations³.

These processes entail more risk than storage and therefore:

- a) are conducted away from storage
- b) are carried out in buildings designed to minimum standards (in order to protect both the ammunition and the personnel),
- c) follow specific work plans (I&RIs/SOPs) identifying the process steps, safety hazards, equipment, and safety requirements,
- d) are planned to expose the minimum number of personnel and amount of ammunition to risk.

³ Specific safety precautions for the conduct of breakdown operations are contained in IATG 06.50 *Specific safety precautions*.

Ammunition processing operations - Safety and risk reduction and mitigation

1 Scope

This IATG module introduces and explains the specific requirements for safety and risk reduction and mitigation during the processing of ammunition and explosives within explosive facilities. It complements IATG 06.10:2015[E] *Control of explosive facilities*, IATG 06.30:2015[E] *Storage and handling* and IATG 06.50:2015[E] *Specific safety precautions* which all provide further safety advice for the storage of ammunition and explosives and the overall safety control of an explosives facility. The requirements of these IATG shall also be applied, where appropriate, to the processing of ammunition and explosives.

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 'ammunition process building' (APB) refers to *a building or area that contains or is intended to contain one or more of the following activities: maintenance, preparation, inspection, breakdown, renovation, test or repair of ammunition and explosives.*

The term 'processing' refers to *the activities undertaken in a process facility that involves building, repair, refurbishment, breakdown, test and inspection of explosives articles and their components.*

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 Risk assessment (LEVEL 2)

A risk assessment shall be carried out prior to starting any ammunition processing activity. This should be in accordance with the guidelines contained within IATG 02.10:2015[E] *Introduction to risk management principles and processes* and the specific requirements of this IATG.

The minimum information of the hazardous properties of the explosive article for processing should be available for the individual carrying out the risk assessment, which are:

- a) design drawings;
- b) previous processing technical instructions for the type of explosive article;
- c) sensitiveness data;⁴
- d) chemical stability information;⁵
- e) hazard classification codes;⁶ and
- f) health hazards.⁷

Any risk assessment should start from the perspective of remote processing or testing wherever possible, but if this is considered not to be necessary, or reasonably practicable, then established and tested processes should be used. The risk assessment should direct the selection of the most appropriate tools, equipment and processing to be used. Examples are shown in Table 1:

Findings	Details	Appropriate tools, equipment or process
Explosive vapour hazard	An explosive vapour hazard may be present during the process.	<ul style="list-style-type: none"> ▪ Category A APB (or rooms) required.
Explosive dust risk	Bare, exposed explosive may be present during the process; hence explosive dust may be present.	<ul style="list-style-type: none"> ▪ Category B APB (or rooms) required.⁸
Low sensitiveness ⁹	The hazard data sheet suggests that the explosive is very vulnerable to initiation by static electricity.	<ul style="list-style-type: none"> ▪ Anti static measures required. ▪ Non-sparking tools. ▪ Anti-static floor. ▪ Personal earthing equipment (Hazardous Area Personal Test Meter (HAPTM)).
Explosion risk	Disassembly requires high force to gain access to munition, hence there is a risk of explosion.	<ul style="list-style-type: none"> ▪ Remote process needed. ▪ Operator protected behind armoured screen. ▪ One person risk.
Irritant fumes	The re-painting process requires the use of paint that produces irritant fumes.	<ul style="list-style-type: none"> ▪ Protective face masks to be worn. ▪ Open windows, doors etc to provide air throughput or fit extractor fan.

Table 1: Example risk assessment findings

The findings of the risk assessment should be formally recorded and other documentation amended as necessary, for example:

- a) the explosive limits licence¹⁰ may require a temporary reduction in permitted net explosive quantity (NEQ) during the period of the processing task; or

⁴ This should be available from an Explosives Hazard Data Sheet, which is available from the manufacturer.

⁵ This should be available from the records maintained in accordance with IATG 07.10:2021[E] *Surveillance and in-service proof*.

⁶ This should be available from the records initiated under IATG 03.10:2015[E] *Inventory management*.

⁷ See Footnote 6.

⁸ See Clause 4 of IATG 05.40:2015[E] *Safety standards for electrical installations* for definition of building electrical categories.

⁹ This is not the same as sensitivity. See definitions in IATG 01.40:2015[E].

¹⁰ See IATG 02.30:2015[E] *Licensing of explosive facilities*.

- b) standard inspection and repair instructions (I&RI) may require amendment.

5 Safe systems of work (LEVEL 2)

The safe processing of ammunition and explosives shall be achieved through establishing and implementing safe systems of work (SSOW). These SSOW will be guided by the risk assessment and the guidance contained within this IATG. In summary they should cover:

- a) trained and competent staff (see Clause 6.6);
- b) appropriate levels of direct supervision and overall management (see Clause 6.6);
- c) suitable written work instructions (I&RIs) (see Clause 6.5);
- d) appropriate equipment; and
- e) adequate work facilities.

6 Controlling the risk (management)

There are a range of ammunition management systems and techniques available for controlling the risk during the processing of ammunition and explosives. These should all be implemented prior to the commencement of work.

6.1 Explosive limits (LEVEL 1)

A major element of risk reduction and mitigation shall be to limit the quantity of ammunition and explosives present in the APB (either being processed or in temporary storage). The guiding principle should be that if the task can be efficiently and effectively carried out by single explosive items it should be. Yet it is accepted that for minor tasks and lower calibre systems, operational efficiency will require the use of production line techniques. Technical judgement, combined with the results of the risk assessment, should be used to determine appropriate explosive limits for the APB during processing operations. These limits shall rarely be the maximum theoretical limit as determined in accordance with IATG 02.30:2015[E] *Licensing of explosive facilities*. The physical NEQ stored shall be the minimum necessary for the safe and efficient conduct of the processing task and shall never exceed the necessary quantity for one day's work.

The total licensed content of NEQ at or in an APB shall include ammunition in 'buffer stock' awaiting processing, the ammunition being processed and ammunition post processing. The level of post-processed, and pre-processed, ammunition should be kept as low as possible by regular collections and return to normal storage, and by good management principles by the I/C APB.

6.2 Personnel limits (LEVEL 1)

A limitation on the number of staff and visitors present within the APB shall be applied. This is known as the Personnel Limit. There should be two levels of personnel limits:

- a) normal. This is the personnel limit for those persons normally permanently located within the APB during the processing task; and
- b) maximum. This is the personnel limit that includes persons normally permanently present, transient staff involved in the delivery and collection of explosives, transitory supervisory staff and visitors.
- c) personnel limits shall be kept to the minimum necessary for the safe and efficient completion of the processing task.

6.3 Lower risk operations (LEVEL 2)

Separate processing tasks on different types of ammunition and explosives in a single location should not normally be permitted. Separate tasks may be permitted to be carried out simultaneously if the

explosive risk is assessed as low (e.g. for Hazard Division 1.2 or 1.4 ammunition where there is no mass explosion hazard) and there is a low probability of initiation. Such tasks could include the visual inspection or marking of ammunition.

A processing task shall never be considered as a low risk operation where exposed explosives substances are present or could be exposed as a result of the process.

6.4 Restricted tasks (LEVEL 2)

Due to higher levels of inherent risk the following operations shall only ever be undertaken by named individuals who are specifically licensed for that particular processing task by the national technical authority. Assumption of an appointment previously occupied by a named individual shall not mean that authority is automatically transferred to the new incumbent. These operations are:

- a) experiments to alter the type or size of charges in propellant or bursting charges;
- b) breakdown operations on strange, unknown, unfamiliar or foreign ammunition and explosives;
- c) the manufacture of home made explosives (HME); and
- d) the manufacture of training or simulated improvised explosive devices.

6.5 Work instructions (LEVEL 2)

Formal, written work instructions shall be developed for each type of processing task. The level of detail in the work instruction should be determined by the risk involved, the complexity of the task and the competency levels of the staff. The work instructions shall be available in the APB for consultation during the processing task.

Work instructions should consist of:

- a) general work instructions on basic explosive safety that are applicable to all processing tasks; and
- b) specific work instructions applicable to a particular processing task.

An example general work instruction is at Annex C for information.

An example specific work instruction, in the form of an Inspection and Repair Instruction (I&RI), is at Annex D for information.

6.6 Supervision and competency (LEVEL 2)

Individuals shall be considered to be competent¹¹ to supervise or undertake ammunition processing operations when:

- a) they have been trained to an appropriate level on the specific task;
- b) they have been educated to an appropriate level as to the risks inherent in the handling and processing of ammunition and explosives; and
- c) they have gained sufficient experience of the task under direct supervision so as to be considered safe to work on the task.

¹¹ An individual's 'competence' to undertake any task is determined by a combination of his/her training, education and practical experience specific to that task. Just because someone has been doing the same ammunition related task for 20 years does not necessarily mean he/she is 'competent'; the person may just be extraordinarily lucky!

Records of training and qualifications shall be maintained throughout the career of the individual. These should be used as the basis for the written authorisation of individuals as to their competency to supervise or undertake specific ammunition processing tasks. No individual may process ammunition within an APB without written authorisation unless under the direct supervision of a qualified individual; this allows for 'on the job' training.

7 Controlling the risk (processes)

7.1 Processing facility (LEVEL 2)

Ammunition processing tasks should ideally take place in a building designed specifically for that purpose, although it may take place in a temporary location as long as all safety requirements can be met.

7.2 Exposed ammunition and explosives (LEVEL 1)

The quantity of exposed explosives (e.g. those unpacked) shall be kept to a minimum. Ideally only one container should ever be open at one time. All explosives that are not being worked on should be appropriately covered to minimise the risk of initiation by spark.

7.3 Remote operations (LEVEL 2)

Remote or semi-remote operations shall be the first choice wherever possible.

Remote operations shall always take place where:

- a) the explosive composition is sensitive; or
- b) the operation is considered more likely than normal to result in a fire or explosion.

The type of remote operation and the protection level required shall be determined by the type and quantity of explosive present. For example:

- c) for small quantities of sensitive explosives or small devices adequate explosives guards,¹² protective gloves and tweezers may be all that is necessary; or
- d) for larger quantities of explosives an armoured barrier with remotely operated tools may be required.

7.4 Personal protective equipment and clothing (LEVEL 1)

There may be a need for personal protective equipment or protective clothing (PPEC) during some ammunition processing tasks. The aim of PPEC should be to:

- a) provide a degree of protection against the effects of accidental fire or explosion;
- b) provide protection from health hazards; and
- c) reduce hazards such as static electricity.

The risk assessment should determine the need for PPEC and the type required should be stated in the work instruction for the task (Clause 6.5).

¹² Explosives guards or armoured barriers should be engineered to be resistant to 125% of the normal explosive load of the ammunition being processed.

A suitable material for PPEC during processing tasks is probanised cotton¹³ as this provides some protection from fire. Other types of PPEC may include face masks,¹⁴ disposable gloves, eye protection or personal static electricity dischargers. PPEC shall be provided in appropriate sizes and designs for the existing personnel, which may include men and women with different body shapes and sizes.

7.5 Authorised tools and equipment (LEVEL 2)

A formal system should be put in place to ensure that only tools and equipment that are intrinsically safe to use in process facilities are used; a list should be maintained. It should be the responsibility of the national technical authority to advise on appropriate tools and equipment for use during processing tasks. The use of iron or steel tools should be discouraged and non-sparking equivalent materials used instead. Further guidance is at Annex E.

The tools and equipment authorised for each process task should be stated in the work instruction (Clause 6.5 and Annex D).

7.6 General procedures (LEVEL 1)

General procedures should be implemented that are common to every processing task as shown in Table 2.

Activity	Rationale	Requirement
Pre and Post Work Inspection	This ensures that the APB, tools and equipment are clean and in good working order. It also ensures that tools etc are not left inside machinery or a munition.	<ul style="list-style-type: none"> ▪ This should be the responsibility of the task supervisor. ▪ 100% check of all tools. ▪ Cleanliness check. ▪ Unserviceable tools replaced.
Clear Exits	Unobstructed exits ensure that emergency evacuation and emergency service access is unimpeded.	<ul style="list-style-type: none"> ▪ All doors and windows unfastened and unlocked. ▪ Security bolts and bars removed.
Minimise Flammable Material	Reduces fire risk.	<ul style="list-style-type: none"> ▪ These include cotton rags, paints and solvents. ▪ Only the minimum required for each task should be in the APB. ▪ After use they should be stored in metal containers outside the APB and at least 1m from the wall. ▪ Rags with oil are susceptible to spontaneous combustion. These should be removed immediately from the APB.
Explosive Waste	Reduces fire and/or explosion hazard.	<ul style="list-style-type: none"> ▪ This should be segregated from all other waste. ▪ Explosively contaminated cleaning materials should be treated as explosive waste. ▪ Explosive waste should be disposed of in accordance with IATG 10.10:2015[E] <i>Demilitarization and destruction of conventional ammunition.</i>

¹³ Probanised cotton is cotton that is specially treated to improve fire resistance.

¹⁴ A requirement for face masks should not be used as a substitute for forced air extraction if fume levels are hazardous to health.

Activity	Rationale	Requirement
Temperature in APB	Reduces fire and/or explosion hazard.	<ul style="list-style-type: none"> ▪ The temperature within the APB should be maintained at a level consistent with the comfort of staff and the safety of the explosives. ▪ A temperature range of 13°C to 24°C should be optimum.
Humidity in APB	Reduces initiation risk due to static electricity.	<ul style="list-style-type: none"> ▪ The humidity within the APB should be damp enough to reduce the risk of initiation due to static electricity.
Clean Area	Reduces the risk of dirt and grit being introduced into ammunition and explosives. Reduces the risk of contaminated PPEC leaving the APB.	<ul style="list-style-type: none"> ▪ A separate room (normally a cloakroom) should be provided within the APB to allow staff to change into work clothes. ▪ This room should be accessible from the outside and offer appropriate privacy for male and female personnel. ▪ Within the room a 'clean line' should be established.
Electrostatic Discharge	Minimises the risk of ignition of primary explosives and electro-explosive devices (EED) from electrostatic discharge.	<ul style="list-style-type: none"> ▪ See IATG 06.50:2015[E] <i>Special safety precautions</i>.
Spark Prevention	Reduces initiation risk due to sparking.	<ul style="list-style-type: none"> ▪ Use soft soled footwear and clothing without metal fasteners. ▪ Use non-ferrous authorised tools and equipment. ▪ Floors, fittings and finishes susceptible to sparking should not be used (e.g. ceramic floor tiles).
Radio Frequency Hazards	Minimises the risk of ignition of electro-explosive devices (EED) from induced electrical current.	<ul style="list-style-type: none"> ▪ Prohibit mobile telephones within the APB.¹⁵ ▪ The location of radio transmitters should be controlled.

Table 2: General procedures for processing tasks

8 Contingency planning

8.1 Accident procedures (LEVEL 1)

Procedures shall be established that state the action to be taken in the event of an accident. These should be in accordance with IATG 11.10:2015[E] *Ammunition accidents: reporting and investigation*. As a guide, the following actions should be considered:

- a) cease all processing tasks and make safe any ammunition or explosives that may present a further hazard;
- b) give immediate first aid to any injured personnel. In the case of fatal accidents, bodies should not be touched except to confirm death. Out of respect, bodies should be covered until they can be removed from the scene;
- c) summon medical assistance if required;

¹⁵ They should be prohibited from the entire explosives area anyway.

- d) immediately report the accident and await guidance from the nominated technical investigator (IATG 11.10:2015[E] *Ammunition accidents: reporting and investigation*);
- e) cordon off the area to preserve evidence for the investigating authority. Nothing should be moved and everything should remain as it is in situ;¹⁶ and
- f) record the names of potential witnesses.

8.2 Thunderstorms (LEVEL 1)

Thunderstorms potentially contain a massive build up of static electricity within the atmosphere and thus present a serious hazard to ammunition and explosive processing. Work on electro-explosive devices (EED) and primary explosives is to cease immediately when there is a thunderstorm in the vicinity.¹⁷ Where it is safe to do so, ammunition and explosives being worked on are to be made safe and all ammunition and explosives are to be repackaged and grounded.

The APB should then be evacuated and made secure until the thunderstorm has passed by.

8.3 Unsafe ammunition (LEVEL 1)

Procedures should be developed to deal with any spillage of explosives or any ammunition that is found to be in an unsafe condition (e.g. the exudation of explosives or if ammunition is inadvertently dropped).

Work should stop immediately until the situation has been resolved. If it is safe to do so all remaining ammunition and explosives should be repacked prior to evacuation of the APB.

These types of incidents may require the need for explosive ordnance disposal (EOD) support.

9 Heating explosives during processing (LEVEL 3)

Equipment for heating explosives will incorporate features designed to avoid overheating. There are special requirements for electrical appliances used for heating explosives during processing.¹⁸ Whatever medium is used for heating or cooling explosives in processing it is essential to consider at the design stage how to control the temperature within safe limits. The provision of an independent overriding protection feature to cover failure of primary controls is essential.

10 Breakdown of explosive items (LEVEL 2)

It is much more hazardous to break down explosive items than to fill them. During initial filling and assembly, components that contribute the greatest potential hazards are assembled to the main charge as late as possible. Items undergoing breakdown will have these components present when breakdown operations begin. In many items where there is a requirement for breakdown, deterioration and corrosion will have occurred and this may have affected the explosives as well as the mechanical parts and will thus make disassembly much more difficult and potentially more hazardous than assembly.

10.1 The requirement for breakdown (LEVEL 2)

Ammunition shall only be broken down if there is a definite advantage to be gained by so doing, for instance for safer disposal or for inspection. If a safe system of working cannot be determined the explosives should be destroyed by enclosed incineration or by detonation of the complete item.

¹⁶ Photographs should be taken prior to moving the casualty for medical treatment if at all possible.

¹⁷ It may be possible to get prior warning from the national meteorological office.

¹⁸ See IATG 05.40 *Safety standards for electrical installations*.

10.2 Inspection of stocks awaiting disposal (LEVEL 2)

Explosives awaiting breakdown should be regularly inspected. Such an inspection, with special reference to the onset and progress of corrosion, will assist in ensuring that explosives items are broken down before they become dangerous.¹⁹

10.3 Risk assessing and planning breakdown of ammunition (LEVEL 2)

Explosive items shall not be broken down until the risks have been assessed, the operation has been planned and a layout and system of work, with appropriate safety measures, has been approved.

10.3.1. Plan of operation (LEVEL 2)

Preparation and approval of working instructions for operatives shall be completed before the breakdown commences. The training of operatives in the operations they will carry out should include an explanation of the safety rules applicable to that work. It may be necessary to institute a system of accounting for the arisings from explosives breakdown so that the likelihood of explosives or their components being overlooked, stolen or mistakenly disposed of is minimised. The possibility of hazards arising from incompatibilities not present in the original item as manufactured should be provided for.

In preparing the plan of operation the following data should be obtained:

- a) drawings and specifications from the manufacturer;
- b) safety information from the manufacturer;
- c) explosives hazard data sheets; and
- d) history of the stores including such aspects as rough handling, temperature cycling, sea water contamination etc.

10.3.2. Breakdown under precautions (LEVEL 3)

Where the risk assessment determines the need, breakdown operations considered to have an unacceptable hazard shall be carried out by remote control. The supply of filled items to the breakdown process and the removal of the components after breakdown should be so arranged that there is no accumulation of exposed explosive compositions and filled components beyond the approved limits.

10.4 Machinery and tools for breakdown operations (LEVEL 2)

Consideration should be given to the design of machinery and tools so that they cannot be wrongly used. For example, the leverage which is possible with tools should be related to the amount of work, generation of heat by friction, etc that the item can safely tolerate. Any tool which is hollow and which could conceivably be used to fit over the handle of another tool and so increase the leverage obtainable should either be excluded from the breakdown area or be modified to prevent its misuse. Adjustable tools should not be prescribed for breakdown operations.

The number and type of tools permitted for the operation should be listed in sufficient detail to preclude any likelihood of doubt. The unauthorised entry into the breakdown area of any tool not on the permitted list or modification of any machine or tool to alter its mode of operation shall not take place. The marking, colour coding of tools or use of a tool board are examples of good practice and will facilitate checking.

¹⁹ See IATG 07.10 *Surveillance and proof*.

10.4.1. Use of water flushing equipment and autoclaves

Steaming out and water flushing shall only be carried out in a facility specially designed and provided for the purpose. Care shall be taken to avoid the mixing of incompatible explosives and also the contamination of explosives with any harmful materials. Therefore, the use of the same facility for steaming or flushing out explosives and items filled with inert ingredients should be avoided. Steaming out requires that special precautions be taken to prevent contamination of the surrounding area, and of aquifers in particular. Operatives are at particular risk from the toxic effects of TNT. Appropriate risk assessments shall be made and personal protective equipment and medical surveillance shall be provided.

10.5 Items not to be heated (LEVEL 1)

Items containing explosives shall not be heated to release the tightness of screw threads unless this operation has been authorised in the operating instructions. It is important to ascertain that such authorised heating will not cause migration of the filling into screw threads with subsequent increase in potential hazard during unscrewing operations. A trial designed to test this possibility should be carried out in advance and it should cover such ranges of temperature and time as may be used during normal working conditions. Unless a fail-safe system of automatic temperature control is used, there shall be a considerable margin of safety in the limits prescribed.

10.6 Sensitive components (LEVEL 2)

In breakdown operations, parts that are susceptible to initiation by light blows, friction etc, shall be protected during handling operations and this protection will only be removed at the latest practical stage. An example of this is the use of clips to cover primers in cartridge cases.

10.7 Difficult items (LEVEL 1)

Operatives engaged in the breakdown of explosive items shall be given precise and detailed instructions on the action to take if a situation arises which is not covered by the procedure laid down. Provision shall be made for the identification, collection and removal of all explosive items that cannot be broken down by the accepted procedure. Special consideration should be given to their storage and subsequent disposal.

10.8 Breakdown procedures (LEVEL 2)

The following examples of breakdown are not detailed procedures but should be used as an indicator of what should be included in working instructions.

10.8.1. Fixed ammunition

The order in which component parts of a complete round of gun ammunition undergoing breakdown should be removed will be decided after consideration of the nature and condition of the filling and, in particular, of the propellant in the cartridge. It is sound practice to sub-divide the quantity of explosives at risk as soon as practicable. Separation of the projectile from the cartridge case is an example. Components should usually be disassembled in order of decreasing sensitivity and for the projectile this will normally be as follows:

- a) initiating devices such as fuzes;
- b) gaines or exploders; and
- c) the main filling.

Having segregated the projectile for later disassembly, the propellant charge should be removed and placed in a suitable receptacle. If the propellant is single base, provision shall be made to guard against the generation of static and its potential discharge by earthing and the use of anti-static or full conducting conditions as necessary. The cartridge primer should be removed using the appropriate tool and placed in a suitable container.

Fuzes removed should be suitably packed and segregated for later breakdown and disposal. Where there is any doubt as to the safety of manual removal of fuzes they should be removed by remote operation. If possible fuze magazines should be removed and packaged for later disposal. Further breakdown of fuzes should only be undertaken if essential for trials or test purposes and shall be carried out under strict control using approved tools and procedures. Exploders and any other internal components should be removed and separately packaged for later disposal.

Projectiles shall have the fuze well plugged with suitable paper and be taped closed, then suitably packaged for later disposal.

10.8.2. Aircraft bombs

Aircraft bombs shall not be broken down until it has been confirmed that they do not contain detonators or fuzes. Aircraft bombs should be broken down singly in isolation. The degree of isolation should be no more than is necessary to prevent the propagation of explosion to other explosives stores and to arrest fragments. The following technique described applies to all bombs completed to specifications that call for liners to the exploder cavity and sealing compositions to the filling. If the bombs being processed are not to this specification great care should be taken as exposed explosive will be present and may have migrated into screw threads etc.:

- a) the plug representing pistol or fuze should be unscrewed and the exploder cavity examined to ensure that there is no detonator present;
- b) exploders should be removed by means of lifting hooks or failing this by using kit sticks (a dowel rod with a rubber suction cap fitted to one end). Any exploders not removable by these methods shall be left and the bombs plugged for disposal; and
- c) the exploder container and base plate should be removed by unscrewing the base plate. The component parts shall be separated at a later process.

10.8.3. Rocket tails and motors

The work instruction for the breakdown of rocket tails and motors shall be designed to prevent damage to the igniter and to ensure the protection of operatives against fire. It is particularly important to keep the igniters that have been removed from items away from the recovered propellant. This shall be achieved by a good working place layout and constant supervision.

10.8.4. White phosphorus (WP) and red phosphorus (RP) ammunition

WP or RP ammunition shall be broken down in two locations that are well separated from one another. The explosive components present shall be removed in the explosives area and the phosphorus on an area of the site reserved for work of this nature. If ammunition containing explosives does find its way to the WP or RP section of the breakdown operation it shall be removed immediately. All explosives are strong oxidants and violent reactions can occur if they come into physical contact with phosphorus. It is only by 100 per cent examination for the absence of explosive before the removal of white or red phosphorus is begun that freedom from accidents due to the presence of explosive can be ensured. During the removal of white or red phosphorus from ammunition special precautions shall be taken against fire hazards.

Annex A **(normative)** **References**

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the guide. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the guide 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 *Terms, glossary and definitions*. UNODA. 2015;
- b) IATG 02.10 *Introduction to risk management principles and processes*. UNODA. 2015;
- c) IATG 05.40 *Safety standards for electrical installations*. UNODA. 2015;
- d) IATG 06.10 *Control of explosive facilities*. UNODA. 2015;
- e) IATG 06.30 *Storage and handling*. UNODA. 2015;
- f) IATG 06.50 *Specific safety precautions*. UNODA. 2015;
- g) IATG 06.80 *Inspection of ammunition*. UNODA. 2015;
- h) IATG 07.10 *Surveillance and proof*. UNODA. 2015; and
- i) IATG 10.10 *Demilitarization and destruction of conventional ammunition*. UNODA. 2015.

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UN ODA) holds copies of all references²⁰ used in this guide. A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UN ODA, 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.

²⁰ 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 guide:²¹

- a) AASTP-1, Edition 1 (Change 3). *Manual of NATO Safety Principles for the Storage of Military Ammunition and Explosives*. NATO. 04 May 2010; 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 (UN ODA) holds copies of all references²² used in this guide. A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UN ODA, 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.

²¹ Data from many of these publications has been used to develop this IATG.

²² Where copyright permits.

Annex C (informative) **Example General Work Instruction**

GENERAL WORK PROCEDURES FOR AMMUNITION PROCESS BUILDINGS

C.1 General. This procedure is designed to provide general information on the daily operating of Ammunition Process Buildings (APBs). Specific information on technical functions may be found in the relevant Inspection and Repair Instruction (I&RI) appropriate to the task in hand. For the purpose of this procedure the term APB is to be taken to mean any location where an ammunition process, with the exception of disposals, is carried out.

C.2 APB Supervisor. The APB Supervisor is responsible to the Technical Officer in Charge (TOIC)²³ for the technical efficiency and supervision of all personnel in the APB.

C.3 Commencement of Work. Prior to commencement of work each day, or on taking over an APB, the APB Supervisor is to ensure that:

- a) the APB is searched for any suspicious objects;
- b) that all tools, equipment and expendable stores are inspected for serviceability;
- c) the required number and grade of staff are present and that all members of the staff are conversant with the duties detailed in the relevant I&RI;
- d) the staff are fully briefed as to the task in hand with particular emphasis on fire and accident procedures, and any special safety precautions to be implemented;
- e) the staff are correctly dressed in the approved protective clothing and footwear;
- f) the correct Fire Division Symbols are displayed with any Supplementary Symbols where necessary;
- g) all doors are unlocked or unbolted and panic bolts fitted to exits are functioning correctly; and
- h) the task board within the APB is completed to show:
 - TOIC;
 - APB Supervisor;
 - Nature and type of ammunition being processed;
 - Details of task;
 - Hazard Division, Compatibility Group and Fire Division Symbol of the ammunition;
 - Persons nominated for the fire party;
 - Personnel- and Explosive-Limits (shown as total rounds in APB and rounds exposed);
 - Location of First Aid Post;
 - Overall explosive limits of the APB;
 - Emergency telephone numbers for TOIC, Senior Fire Officer (SFO), Fire and Medical services; and
 - Copy of the relevant I&RI, Fire Orders, Explosive Limit Licence for the APB and national health regulations for any substances used .

²³ The TOIC should normally be the senior ammunition qualified officer responsible for overall explosive safety at the facility.

C.4 Supervision. The APB Supervisor is to maintain constant supervision of the following points:

- a) discipline, control and guidance of all APB staff;
- b) Explosive and Personnel Limits within the APB and correct segregation of Compatibility Groups;
- c) adherence to the instructions for the task detailed in the relevant I&RI; and
- d) observance of working hours as detailed by the TOIC.

The APB Supervisor is not to leave the APB whilst work is in progress.

C.5 Cessation of Work.

- a) the APB Supervisor is directly responsible for the security and safety of the APB;
- b) the APB Supervisor is to ensure that on the cessation of work at break periods:
 - all personnel are checked out of the APB;
 - that no ammunition filling is left exposed. For example, all shells are to be plugged or fuzed;
 - that electricity and machinery, with the exception of alarm circuits, is turned off; and
 - all external doors and windows are secured.
- c) Additionally, on cessation of daily work he/she is to ensure that:
 - all paints, solvents, cleaning cloths and other inflammable materials are removed from the APB and returned to the Paint Store;
 - that ammunition is repacked and grounded; and
 - the security guards are to be informed if ammunition is to be left in an APB overnight. TOIC approval must be sought to leave ammunition in an APB overnight.

C.6 APB Maintenance.

- a) a high standard of cleanliness is to be maintained at all times. Floors are to be kept clean by washing with water and soap or detergent. The use of floor polish on conducting floors is prohibited;
- b) tools and equipment are only to be retained for the task in hand and for imminent tasks. All other tools and equipment are to be returned to storage;
- c) rubbish and waste materials are to be kept to a minimum and placed in the receptacles provided. Appropriate Free From Explosive (FFE) Procedures are to be followed as laid down in *insert unit document reference*.²⁴
- d) outside areas and roadways are to be kept free of all nails, tape banding etc which could cause damage to vehicle tyres; and
- e) the APB Supervisor is to ensure that a weekly check is carried out on the interior and exterior fabric of the APB. Particular attention is to be paid to front doors, transit doors, windows, pneumatic and electrical installations including security lights, lightning conductors, drains and concrete traverse supports. Any defects are to be reported to the Ammunition Storage Officer (ASO) for inclusion in the APB defects diary. Defects involving safety or operation of the APB are to be reported immediately.

²⁴ The relevant document reference should be inserted here by anyone choosing to use these general work instructions.

C.7 Fire Precautions.

- a) smoking is strictly prohibited within the APB and NO SMOKING signs shall be displayed at all important places in the APB. Individuals shall be prohibited from possessing or carrying smoking materials;
- b) the APB Supervisor is to acquaint him/herself and his/her staff with the regulations governing fire precautions and action to be taken in event of a fire;
- c) fire orders, including the location of the APB Assembly Point, are to be prominently displayed. Personnel are to be instructed as to their specific duties in event of fire, and the fire party listed on the APB process board;
- d) fire doors and escape routes are to be clearly marked, and kept clear of obstructions at all times. All personnel are to be provided with an unimpeded escape route at least 1m wide, and are not to be enclosed by Conveyor Gravity Rollers (CGR), benches or other equipment. Lift up sections of CGR do not constitute an escape route. All doors (including transit doors) are to be kept unbolted or unlocked whilst the APB is occupied;
- e) approach roads are to be kept clear at all times to permit access to emergency services; and
- f) fire practices are to be held monthly.

C.8 Accidents. The APB Supervisor is to ensure that all personnel are conversant with the action to be taken in the event of an accident involving ammunition. When in the opinion of the APB Supervisor there is any possibility of an explosion occurring as a result of an accident involving ammunition, the APB is to be immediately evacuated to the nearest Assembly Point. TOIC and the ASO are to be informed by the fastest possible means. No person is to re-enter the APB until authorised to do so by TOIC.

C.9 First Aid.

- a) First Aid boxes are to be held in each APB and Transit Area. The location of the nearest first aid trained persons is to be displayed on the APB task board, these persons being responsible for the administration of first aid to the 'walking injured'. Serious cases are to be reported immediately to the TOIC and Medical Centre;
- b) injuries are to be recorded in the APB Accident Register. In the event of serious injuries, written statements regarding the circumstances of the accident should be obtained from any witnesses as soon as practicable by the senior present person;
- c) the APB accident register is an accountable document; and
- d) when ammunition containing white phosphorus (WP) is held in an APB, a supply of clean water or copper sulphate solution (CuSO_4) and gauze is to be readily available. All personnel are to be aware of the immediate action to be taken for the treatment of phosphorus burns and a copy of the procedure to be followed is to be displayed in the APB. A large container of water capable of holding a full container of WP ammunition shall also be available.

C.10 Health and Safety.

- a) The APB Supervisor is directly responsible for the health and safety of all staff whilst employed in the APB. The health regulations contained in *insert unit document reference* are to be followed at all times. Particular attention is to be paid to the correct use of protective clothing and gloves, respirators and barrier cream whenever these are required. Compressed air equipment is to be operated in accordance with *insert unit document reference*;

- b) general safety precautions to be observed during movement and handling of ammunition and safety precautions specific to the nature involved are contained in *insert unit document reference* and the I&RI appropriate to the task in hand respectively. The APB Supervisor is to ensure that these precautions are rigorously observed by all APB staff;
- c) the APB Supervisor is to take immediate action to halt any dangerous practice within the APB, whether or not it involves ammunition;
- d) the APB Supervisor is to ensure that the relevant Safety Data Sheets for hazardous materials in use are displayed within the APB; and
- e) the correct safety shoes are to be worn by all personnel employed within an APB.

C.11 Free From Explosive (FFE) Procedure.

- a) the FFE procedures are contained in *insert unit document reference*;
- b) all waste material and rubbish is to be bagged and have a FFE Certificate completed and taped to the outside of the bag. The APB Supervisor is to ensure that no bagged waste or rubbish is permitted to leave the APB without this certificate; and
- c) staples and other sharps are not to be bagged. They are to be kept in a rigid container, marked and disposed of as at Sub Paragraph 11b.

C.12 Thunderstorms.

- a) during thunderstorms all personnel are to be evacuated from buildings containing ammunition. When conditions indicate that thunderstorms are approaching the APB all work on ammunition requiring anti-static precautions is to cease and the ammunition is to be re-packed and grounded. The APB is to be evacuated until the threat has passed; and
- b) when thunderstorms are sudden or imminent, the repacking and grounding of ammunition is to be carried out at the discretion of the APB Supervisor, subject to the evacuation of personnel being of prime importance. Ammunition not requiring anti-static precautions need not be re-packed.

C.13 Visitors.

- a) any visitor entering the APB is to report immediately to the APB Supervisor. Work may proceed in the presence of authorised visitors provided that such visits are transitory and do not impede any person in the performance of his or her duties;
- b) the personnel limit for the APB may exclude such visitors; and
- c) the limit may also exclude not more than two supervisory personnel for periods of not more than 30 minutes at a time.

C.14 Anti-Static Precautions. The procedure to be followed when anti-static precautions are required is detailed in *insert unit document reference*.

C.15 Working Categories. The APB Supervisor is to ensure that the correct category is to be applied to the process in hand. The procedures specified in *insert unit document reference* are to be strictly adhered to. Particular attention is to be paid to APB cleanliness when special working categories are in force.

C.16 Prohibited Articles. The APB Supervisor is to ensure that all APB staff are aware of the regulations concerning prohibited articles. A list of these articles should be displayed at the entrance to each Explosives Area.

C.17 Accounting. The APB Supervisor is to ensure that all ammunition and components entering or leaving the APB are strictly controlled and accounted for. Checks are to be carried out frequently to ensure that ammunition cannot leave the APB incorrectly assembled. These checks should be

carried out at least four times daily. On discovery of an apparent discrepancy all work is to cease until the matter is resolved and the appropriate TOIC is to be informed immediately.

C.18 APB Transit Areas.

- a) whenever ammunition is being loaded or unloaded in an APB Transit Area the engines of all non-Cat C protected vehicles²⁵ are to be switched off; and
- b) the maximum safe stacking heights for ammunition are not to be exceeded.

C.19 Foreman. The Foreman of the team employed within the APB may carry out the duties of the APB Supervisor if appropriately qualified. He/she is responsible to the APB Supervisor for the following, and must carry them out him/herself if acting as APB Supervisor:

- a) control of all ammunition and components passing through the APB;
- b) calling forward of ammunition to ensure a regular flow of work and collection of processed ammunition;
- c) maintenance of all tools and equipment within the APB to ensure availability and serviceability;
- d) maintenance of an adequate supply of expendable stores;
- e) general cleanliness of the APB and surrounding areas and roadways;
- f) adherence to all regulations;
- g) checking of the interior and exterior fabric of the APB and surrounding area and reporting of all defects;
- h) direct supervision of staff employed on non-technical tasks within the APB;
- i) ensuring that all rubbish and waste materials have been inspected to ensure they are FFE before removal from the APB, and that a completed FFE Certificate is attached; and
- j) instruction of all workers employed in the APB in the performance of their duties.

C.20 Documentation. The procedures contained within *insert unit document reference* are to be adhered to.

C.21 Ammunition Locations ex-APB. Ammunition leaving an APB after processing, that is, ammunition which has been subject to a change in Configuration, Condition or Hazard Division, may require a new storage location to be allocated. The ammunition accountant is to be contacted prior to the ammunition leaving the APB to obtain a receipt location for the adjusted ammunition.

²⁵ See IATG 05.50 *Vehicles and mechanical handling equipment (MHE) in explosives facilities*.

Annex D (informative) Example Specific Inspection and Repair Instruction (I&RI)

Technical Officer in Charge (TOIC) Inspection & Repair Instruction

Part 1 – General

Designation of Ammunition:	<p>Correct Technical Name ADAC / NSN / Other specific identifier Lot # / BKI</p> <p><i>Provide sufficient information to identify the ammunition type that is the subject of the I&RI. If the inspection is relevant to a specific lot or batch, this should also be included.</i></p>
Process/Task:	<p>INSPECTION & REPAIR</p> <p><i>Specify the operation that is to take place, e.g. PERIODIC ROUTINE EXAMINATION or IN-SERVICE SURVEILLANCE or BREAKDOWN FOR DISPOSAL or REPLACEMENT OF FUZES etc.</i></p>

1.1 TOIC Authorisation

I&RI Serial No:	<i>Insert serial number identifying processing unit</i>
Copy No:	<i>x of total copies</i>
Signature:	
Name and Appointment	M Y SIGNATURE TOIC
Date:	29 February 2020

1.2 Contents

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1.3 Warnings & Cautions

WARNINGS:	WARNING In this section tabulate all warnings that are identified in the process Operative Instructions at Part 8. Warnings provide critical safety information and should be highlighted in RED BOLD block capitals.
Cautions:	Caution In this section tabulate all Cautions that are identified in the process Operative Instructions at Part 8. Cautions provide important safety information and should be highlighted in Red Bold using sentence case, to differentiate from the warnings.

1.4 Preliminaries

Location:	e.g. Ammunition Process Building A3, Western Processing Area Provide the specific location at which the task is to be undertaken. If required this section should include any specific safety requirements for the location, such as: <ul style="list-style-type: none"> • Process Building to be traversed on all sides • Electrical Category B • Conducting or Anti-Static regime required in the Process Building • etc.
Personnel:	a. Supervisor: Ammunition Supervisor (IATG L3) [AS] b. Operators: (1) 3 x Ammunition Processor (IATG L2A) [AP1, AP2, AP3] (2) 1 x Ammunition Handler (IATG L1) [AH1] (3) 1 x Ammunition Handler (IATG L1) & MHE Operator [AH2] <i>NB – references shown in square brackets are to identify individual operatives in order to allocate specific tasks in the Sequence of Operations (Part 5) and develop individual Operative Instructions (Part 8).</i> The composition of the team and the qualification levels will vary depending on the task. The team shall be large enough to complete the task safely and efficiently. Additional supervisors and/or operators under training may be authorised, but the total number of personnel present shall remain ALARP.
Personnel Limits:	Normal: This is the personnel limit for workers normally permanently located in the APB during the processing task. (e.g. 6 using the above example for personnel) Maximum: This is the personnel limit that includes all workers normally permanently present, transient staff involved in the delivery and collection of explosives, transitory supervisory staff and visitors. (e.g. 8 based on the above example for personnel) Definitions from IATG 07.10 s6.2. NB – The Normal and Maximum personnel limits must be in compliance with the ELL for the Process Building.
Explosive Limits:	Maximum: In accordance with ELL (specified by HD) Task: Specify in kg the maximum NEQ that shall be present in the APB at any given time to enable safe and efficient operations. The Task NEQ should take account of how much ammunition is expected to be processed in a normal day (or session) of work. The Task Explosive limit shall be the lower of the NEQ authorised on the ELL and the NEQ of the amount of ammunition expected to be processed in a day (or session).

HCC	List the HCC of: <ul style="list-style-type: none">• Ammunition and components at start of task• Ammunition and components at end of task Some tasks may entail break down of ammunition and replacement of components, e.g. fuzes. The HCC of the ammunition may change as a result of the changed component and/or the removed component may have a different HCC to the new component.
Publications and Documentation:	List all relevant publications and documents that are to be readily available during the processing task, e.g. APB General Work Instruction; Ammunition specific Technical Documentation; etc.

Part 2 – Munitions, Components & Packaging

2.1 Munitions (Complete Rounds)

Quantity	Designation	Description	Remarks
Total number of rounds to be processed	ADAC / NSN / Other specific identifier (as per “Designation of Ammunition” box in Part 1)	Correct Technical Name (as per “Designation of Ammunition” box in Part 1)	Provide sufficient information to identify the ammunition type that is the subject of the I&RI. If the inspection is relevant to a specific lot or batch, this should also be included.

2.2 Energetic Components

In this table list all energetic components that will be required to complete the processing task and any energetic components that may be generated as part of the breakdown of the ammunition undergoing processing. E.g. Fuzed artillery ammunition that is having the fuzes removed to be replaced with lifting eyes will generate Fuzes as energetic components at the end of the task.

Serial	Quantity	Designation	Description	Remarks
1.		ADAC / NSN / Other specific identifier	Correct Technical Name (of component)	Specify if the component is consumed or generated during the processing task.
2.				
3.				
4.				
5.				

2.3 Non-Energetic Components

In this table list all non-energetic components that will be required to complete the processing task and any energetic components that may be generated as part of the breakdown of the ammunition undergoing processing. E.g. It may be necessary to change rubber “O-ring” seals due to deterioration. The table should identify the new “O-ring” seal to be inserted in the ammunition. The removed components should also be listed and the remarks column specify their disposal, e.g. “Waste – for contaminated disposal” or “For inspection, refurbishment and return to store” etc.

Serial	Quantity	Designation	Description	Remarks
1.		ADAC / NSN / Other specific identifier	Correct Technical Name (of component)	Specify if the component is consumed or

				generated during the processing task.
2.				Suggested “disposal” of components removed from ammunition.
3.				
4.				
5.				

2.4 Packaging

In this table list all packaging that is required for the complete munition or any components. This should include both external (e.g. ammunition boxes) and internal (e.g. spacers) packaging. Packaging that is to be re-used need not be specified, unless it requires re-marking as part of the process.

Serial	Quantity	Designation	Description	Remarks
1.		UN Packaging Code or other specific identifier	Packaging description	e.g. Describe metal or wooden box; quantity of rounds/components per item of packaging
2.				
3.				
4.				
5.				

Part 3 – Tools & Equipment

3.1 Specialist Tools

List any tools that are provided by, or on behalf of, the ammunition manufacturer that are developed especially for operations on this particular ammunition type. This will often be the case for guided weapons, but may also include, for example, function safety testers for electronic artillery fuzes.

Any tools that have to be specially manufactured for the processing task should also be listed.

Serial	Catalogue No	Description	Quantity	Remarks
1.	If the tool has been catalogued, its reference should be included. This may be NSN or other catalogue system.	Provide as specific a description as possible, e.g. "Function Safety Tester, Fuze Electronic [specific designation]"		Include any comments, such as if a tool has to be locally manufactured.
2.				
3.				
4.				
5.				

3.2 General Equipment & Tools

List any common tools that may be used for multiple processing tasks on different ammunition natures.

Serial	Catalogue No	Description	Quantity	Remarks
1.	If the tool has been catalogued, its reference should be included. This may be NSN or other catalogue system.	Provide as specific a description as possible, e.g. "Mobile Dispenser for Oscillation Mill Wound Steel Strapping 19mm"		Include any additional information, e.g. "Non-Ferrous tool."
2.				
3.				
4.				
5.				

3.3 Expendable Items

List any expendable items and consumables. This includes items used as part of the task and any consumable items of Personal Protective Equipment, e.g. nitrile gloves.

Serial	Catalogue No	Description	Quantity	Remarks
1.	If available	Provide as specific a description as is necessary, e.g. "Protective Coveralls, without metallic fastenings."		Where appropriate, an explanation of what the item(s) will be used for may be included.
2.				
3.				
4.				
5.				

Part 4 – Sequence of Operations

Designation of Ammunition:	<p>Correct Technical Name ADAC / NSN / Other specific identifier Lot # / BKI</p> <p>Provide sufficient information to identify the ammunition type that is the subject of the I&RI. If the inspection is relevant to a specific lot or batch, this should also be included.</p>
Process/Task:	<p>INSPECTION & REPAIR</p> <p>Specify the operation that is to take place, e.g. PERIODIC ROUTINE EXAMINATION or IN-SERVICE SURVEILLANCE or BREAKDOWN FOR DISPOSAL or REPLACEMENT OF FUZES etc.</p>

The Sequence of Operations is a step by step description of the processing task. The Sequence may be divided into individual or team-sized stages to aid understanding.

- Specific operations may be repeated at different points of the process, e.g. “visual inspection of propellant augmenting cartridges” may occur after removal of a mortar round from its packaging and again before it is returned to its packaging. These operations would have the same Operation Number.
- Tasks must be allocated to an operative by grade and, where necessary, by individual operative number.
- The task statement shall be succinct. Complex tasks should be broken down into simple sub-steps. The task statement says only what is to be done, not how it is done.
- Any tools & equipment required for the task shall be listed and cross-referenced with the tools & equipment lists at Part 4.

Serial	Operation	Operative	Task	Tools & Equipment Required
1.		Identified in Personnel box in section 1.4 above, e.g. AS, AP2, AH2 etc.	e.g. “Remove mortar bomb from packaging and place on processing bench.”	
2.				
3.				
4.				
5.				

Part 5 – Outline Process Chart

Designation of Ammunition:	Correct Technical Name ADAC / NSN / Other specific identifier Lot # / BKI Provide sufficient information to identify the ammunition type that is the subject of the I&RI. If the inspection is relevant to a specific lot or batch, this should also be included.
Process/Task:	INSPECTION & REPAIR Specify the operation that is to take place, e.g. PERIODIC ROUTINE EXAMINATION or IN-SERVICE SURVEILLANCE or BREAKDOWN FOR DISPOSAL or REPLACEMENT OF FUZES etc.

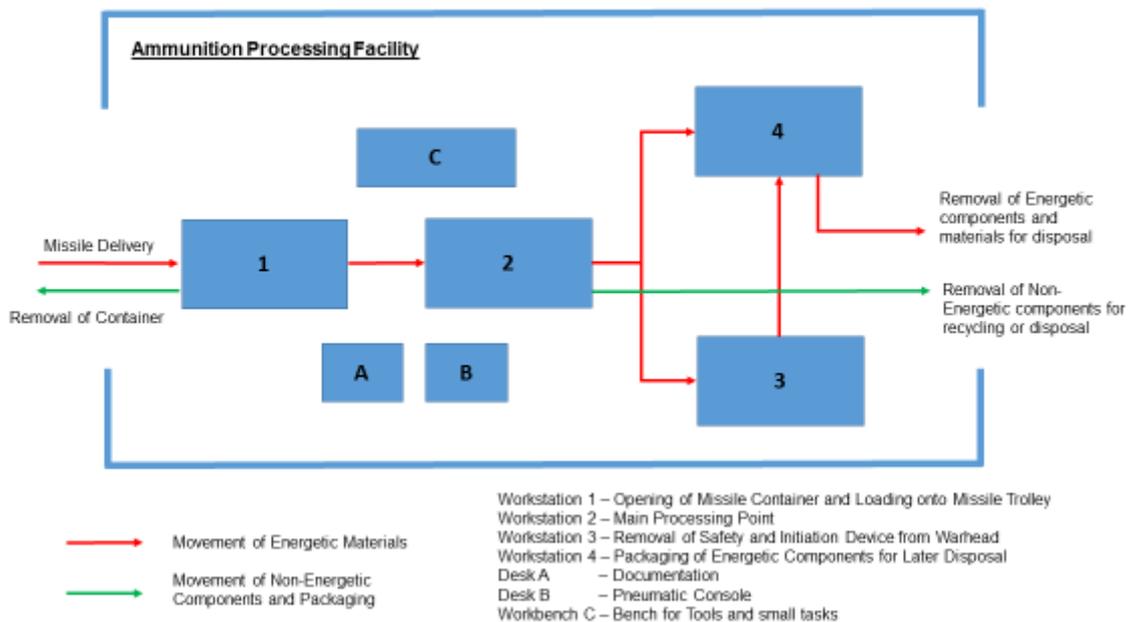
The format for the Outline Process Chart may be a simple list or a flow diagram. The important aspects are that:

- Operations and Inspections shall be listed in a logical order.
- The Chart shall show changes of state, e.g. from fuzed round to plugged etc.
- All materials and components being introduced to the main process line shall be shown.
- All materials and components being removed from the main process line shall be shown.

Part 6 – Process Area Flow Diagram

Designation of Ammunition:	<p>Correct Technical Name ADAC / NSN / Other specific identifier Lot # / BKI</p> <p>Provide sufficient information to identify the ammunition type that is the subject of the I&RI. If the inspection is relevant to a specific lot or batch, this should also be included.</p>
Process/Task:	<p>INSPECTION & REPAIR</p> <p>Specify the operation that is to take place, e.g. PERIODIC ROUTINE EXAMINATION or IN-SERVICE SURVEILLANCE or BREAKDOWN FOR DISPOSAL or REPLACEMENT OF FUZES etc.</p>

This may be in one of two formats, or a combination. One format is to show a diagrammatic layout of the processing area with the flow of the munition through the various workstations. The example shown here was used for a processing instruction for the breakdown of 9M33M OSA Surface-to-Air missile (SA-8 “Gecko”):



If more detail of exactly what task is carried out at each workstation, this can be shown in a flow process chart, as per the attached example. This could either be as a table, or as a conventional flow chart with the operation numbers (as shown in the example) shown at each stage of the flow.

Part 7 – Operative Instructions

Designation of Ammunition:	Correct Technical Name ADAC / NSN / Other specific identifier Lot # / BKI Provide sufficient information to identify the ammunition type that is the subject of the I&RI. If the inspection is relevant to a specific lot or batch, this should also be included.
Process/Task:	INSPECTION & REPAIR Specify the operation that is to take place, e.g. PERIODIC ROUTINE EXAMINATION or IN-SERVICE SURVEILLANCE or BREAKDOWN FOR DISPOSAL or REPLACEMENT OF FUZES etc.

Each operative involved in the processing task, as identified in the Personnel Box at Part 1, section 1.4 shall be provided with a personalized Operative Instruction Sheet. For each individual the task instructions shall:

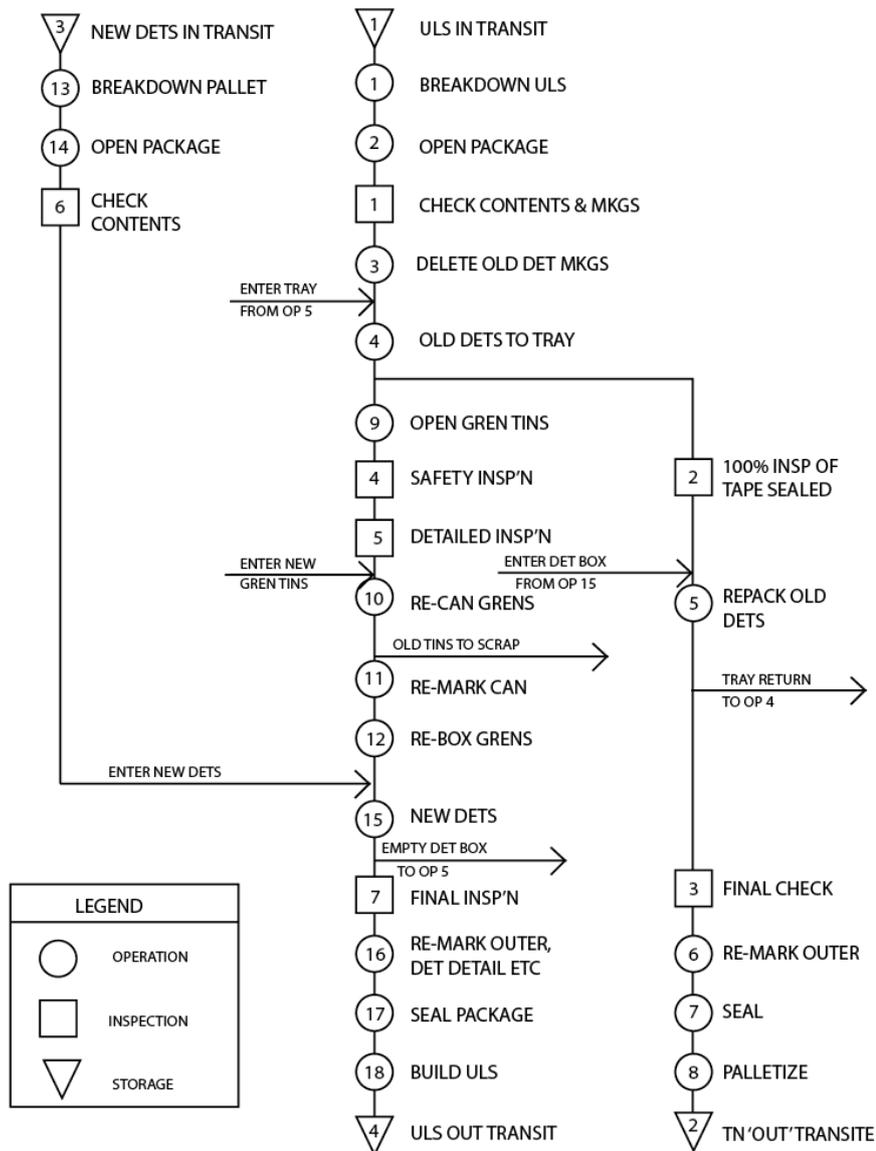
- State exactly what is to be done.
 - All inspection points shall be listed in a logical order.
- State how it is to be done.
 - The TOIC must satisfy himself/herself that the method stated is the safest effective way for the task to be completed.
 - Diagrams, drawings and photographs should be used where possible to illustrate how the task step is to be completed.
- State the order in which it is to be done.
- State all tools & equipment required for the task.
- All Safety points and information shall be **HIGHLIGHTED**.

Operative Name:	A MOWTECK
Operative Grade:	Ammunition Processor [AP2]
Task:	e.g. Receive, Unpack and Visually Inspect the Ammunition

Serial	Operation	Task Instructions	Tools & Equipment Required
1.	Cross-refer to Sequence of Operations at Part 5	Detailed, step-by-step instructions.	
2.		Include Safety information: WARNING: ALL WARNINGS ARE TO BE INCLUDED IN RED BOLD BLOCK CAPITALS AND LISTED IN THE TABLE AT PART 1, SECTION 1.3. Caution: All Cautions are to be included in Red Bold (Sentence Case) and listed in the table at Part 1, Section 1.3.	
3.			

4.			
5.			

TASK: 100% INSP'N & REPLACE DETS, GRENS, NO BO WP



Annex E (informative) **Guidance on processing tools and equipment (LEVEL 3)**

E.1 All tools and equipment used for processing explosives and munitions should comply with the requirements of the relevant national technical authority. A formal system of approval should be operated which confirms that the tools and equipment are suitable for use in the relevant processing environment, comply with national legislation and, where appropriate, are acceptable to the national technical authority for the munition concerned.

E.2 All materials used in the construction of a machine, its tools and associated equipment that are likely to come into contact with explosives, should be approved as compatible with the explosives concerned. Compatibility in this context means that the material shall not produce any chemical or physical interaction to cause the explosives to deteriorate and cause fire, explosion or render them unserviceable. Due regard must be given to the requirement that the material chosen must not be liable to produce sparks.

E.3 All equipment and machinery and their related components will be bonded together and earthed to prevent electrical discharges. See IATG 05.40:2015[E] *Safety standards for electrical installations* and IATG 05.50:2015[E] *Vehicles and mechanical handling equipment in explosives facilities*.

E.4 Hoppers etc. feeding explosives to machines should be sited and protected to minimise the transmission of fire and explosion and their effects on the operatives. The quantity of explosives shall be kept as low as possible bearing in mind the need for efficient operation. Particular care is required with small arms propellants as these may burn to detonation if the depth of bed is sufficient (see the Explosives Hazard Data Sheet for the particular propellant).

E.5 Machinery for use with explosives shall be designed to keep frictional effects of moving parts to a minimum. Consideration shall be given to the robustness of the machines and any possibility of distortion under load that could compromise the clearances between moving parts during operation.

E.6 Where there is a possibility that they could work loose and fall into mixing machinery, nuts should be secured in position by drilling through them and their bolts and securing them with twisted wire. Blind holes in a machine where explosives can accumulate, especially if threaded, should to be avoided. Where such cavities are unavoidable they shall be closed off or filled.

E.7 When machines are designed or selected, due regard should be paid to their suitability for inspection, dismantling and cleaning. A suitable receptacle shall be provided where leakage or spillage of explosives or oil from a machine occurs. Receptacles should be readily removable so that they may be emptied frequently.

E.8 Electrical circuits should be designed to the requirements of IATG 05.40:2015[E] *Safety standards for electrical installations*.

E.9 All control gear should be designed to 'fail' to a known safe condition, (using 'fail to safe' principle).

E.10 A maintenance regime should be devised, in conjunction with the manufacturer of the equipment, for all machinery used for processing of explosives. This shall be recorded and held by the user of the machine. It should include the measurement of any critical clearances and the location of all lubrication points on a machine. Only lubricants compatible with the materials being processed should be used. Machinery should be designed to prevent the lubricant and explosives from contaminating each other. The maintenance regime should include a visual examination to ensure that explosives dust does not accumulate. Details of the routine maintenance carried out, including lubrication, should be recorded in the maintenance logbook for each machine.

