# Module 2

# Module 2: Ammunition Management

## Module 2 at a Glance

### Aim

The aim of this module is to familiarise participants with the:

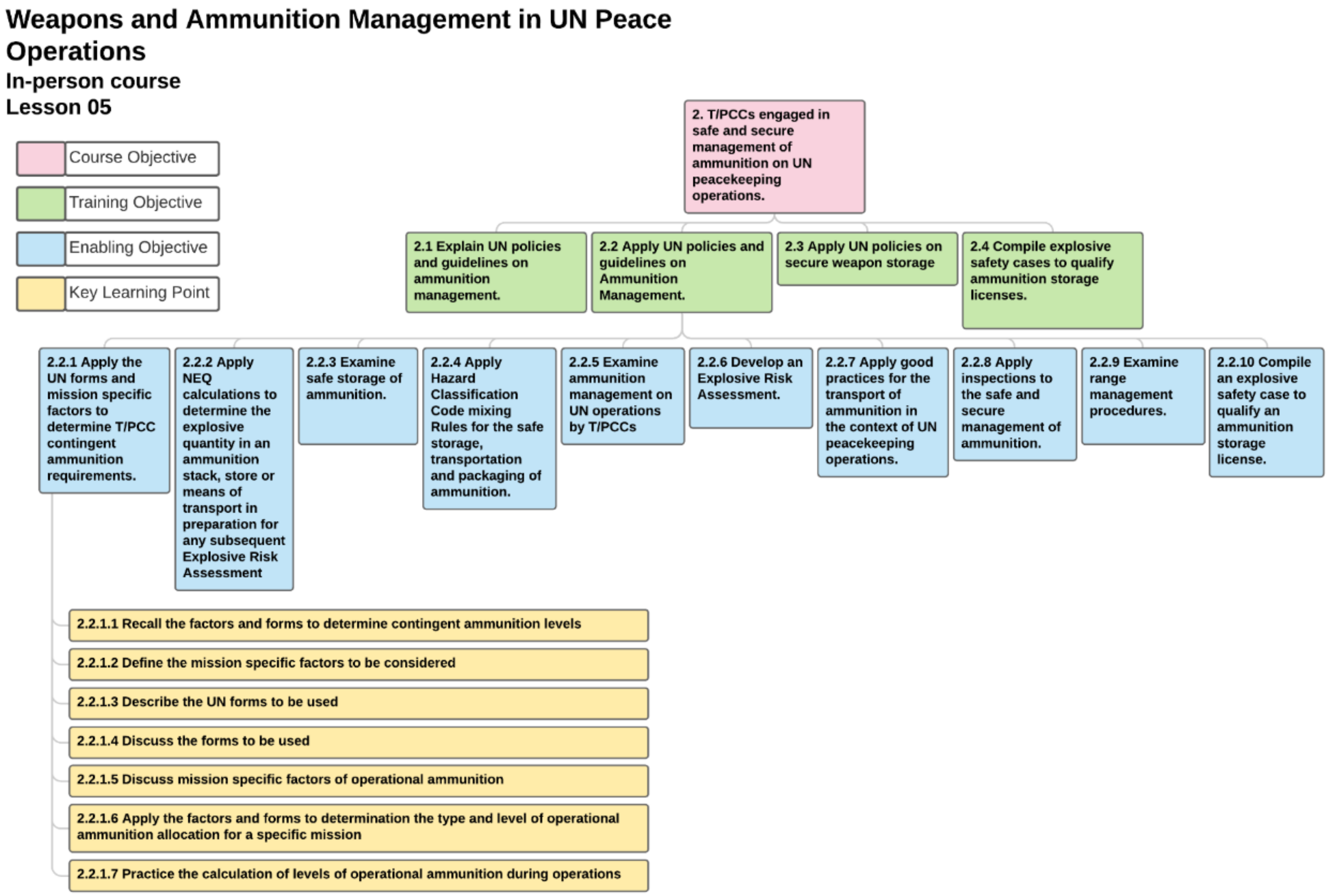
- Contingent Level of Operational Ammunition Conducting a baseline assessment
- Net Explosive Quantity Calculation
- Ammunition Safe Storage
- UN Hazard Classification Code
- Understanding Ammunition Management
- Explosive Risk Assessment
- Transporting ammunition on UN Operations
- Ammunition Inspection
- Range Management
- Safeguarding of ammunition storage area

### Overview

Module 2 provides in-depth lessons on the technical aspects of ammunition management, aiming at enhancing participants' knowledge and skills. Through a variety of exercises, participants gain a thorough understanding of key concepts and procedures. The module covers essential subjects such as storage, handling, transportation, and risk assessment. By engaging in practical activities and scenario-based learning, participants develop the necessary skills to navigate challenges in ammunition management confidently. Moreover, the module encourages collaboration and knowledge sharing among participants, fostering a dynamic learning environment. Overall, Module 2 plays a critical role in equipping participants with the expertise needed to contribute to the safety and success of peace operations through proficient ammunition management.

# Lesson 2.1

## Lesson 2.1: Contingent Levels of Operational Ammunition



### Weapons and Ammunition Management in UN Peace Operations

**In-person course**

**Lesson 05**

**2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.**

- **2.1 Explain UN policies and guidelines on ammunition management.**
- **2.2 Apply UN policies and guidelines on Ammunition Management.**
  - **2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.**
    - **2.2.1.1 Recall the factors and forms to determine contingent ammunition levels**
    - **2.2.1.2 Define the mission specific factors to be considered**
    - **2.2.1.3 Describe the UN forms to be used**
    - **2.2.1.4 Discuss the forms to be used**
    - **2.2.1.5 Discuss mission specific factors of operational ammunition**
    - **2.2.1.6 Apply the factors and forms to determination the type and level of operational ammunition allocation for a specific mission**
    - **2.2.1.7 Practice the calculation of levels of operational ammunition during operations**
  - **2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment**
  - **2.2.3 Examine safe storage of ammunition.**
  - **2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.**
  - **2.2.5 Examine ammunition management on UN operations by T/PCCs**
  - **2.2.6 Develop an Explosive Risk Assessment.**
  - **2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.**
  - **2.2.8 Apply inspections to the safe and secure management of ammunition.**
  - **2.2.9 Examine range management procedures.**
  - **2.2.10 Compile an explosive safety case to qualify an ammunition storage license.**
- **2.3 Apply UN policies on secure weapon storage**
- **2.4 Compile explosive safety cases to qualify ammunition storage licenses.**

# Section 1. Lesson Specification

## Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

## Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L05. Contingent Levels of Operational Ammunition |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 90 mins |

## Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements. | 2.2.1.1 Recall the factors and forms to determine contingent ammunition levels<br>2.2.1.2 Define the mission specific factors to be considered<br>2.2.1.3 Describe the UN forms to be used<br>2.2.1.4 Discuss the forms to be used<br>2.2.1.5 Discuss mission specific factors of operational ammunition<br>2.2.1.6 Apply the factors and forms to determination the type and level of operational ammunition allocation for a specific mission<br>2.2.1.7 Practice the calculation of levels of operational ammunition during operations |
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements. |
| **Assessment Criteria:** | N/A |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom |
| **Instructional tools & materials** | Calculators, projector and screen, flipchart, whiteboard |
| **Participant Resources:** | • Levels of Operational Ammunition Templates (Annex E-K, UN Manual of Ammunition Management)<br>• UN CARANA Scenario narrative.<br>• Full size printouts of some slides where required – see slide notes for details. Slides 29 – 37 needed for participant exercise. |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: http://www.hse.gov.uk/risk/classroom-checklist.pdf |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

# SECTION 2: LESSON PLAN

## Executive summary:

During this lesson participants will investigate the use of UN forms and mission specific factors to determine T/PCC contingent ammunition requirements. They will recall the factors and forms to determine contingent ammunition levels from the e-learning package. The class will then discuss the forms and mission specific factors and apply them to a set problem to determine the type and calculate the level of operational ammunition required for a specific mission.

## Setup:

Phase 1, 2 (Stage 1&2) and Phase 3 will be conducted with the class as a collective. Phase 2 (Stage 3) will be conducted in small groups (6-8 participants) with an allocated instructor per group.

## Conduct:

### Phase 1. Introduction (Time allocation - 20 min)

- Introduce the objectives of the lesson.
- Hand out copies of the UN Manual of Ammunition Managements Levels of Operational Ammunition templates (Annex E to K).
- Discuss the relevant key reference documents and how ammunition storage and management is a key component.

### Phase 2. Development

Stage 1 (Time allocation 20 mins) – Factors for consideration

- Use a flipchart and ask the participants what factors they think would affect the levels of ammunition that a unit may require on a UN mission. Place their factors on the flipchart and discuss relevance.
- Outline and discuss the various factors that should be considered when determining the levels of operational ammunition as outlined in the UN Manual.
- Generate a discussion on each factor to reinforce the participants' understanding and its role in the decision-making process.

Stage 2 (Time allocation 20 mins) – Calculation of Levels of Operational Ammunition

- Explain how the levels of operational ammunition are calculated.
- Introduce the participant to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).

- Using an example, calculate the levels of ammunition required for a defined mission and use the templates to demonstrate to the participants how to complete it correctly.
- Ask regular questions of the class to ensure uptake and engagement.

Stage 3 (Time allocation 20 mins) – Participant exercise

- Participant exercise to calculate levels of operational ammunition for the given scenario.
- Use the slides 30 – 37 as well as slides 22-24 to provide the participants with the data needed to carry out the calculations. e.g. Participants need to assess from slide 29 that there are 4 UNPOL armed as stated as well as 1 mechanised battalion.
- The maps are used for situational awareness of the scenario rather than for any calculations. It also helps to familiarise participants with the CARANA scenario as this will appear throughout the course.
- Instructors are to move around the class and help participants where required.
- Teamwork is permitted.
- Work through the answers with the class and field questions.
- Instructors can improvise additional calculations if participants require extra practice.

### Phase 3. Consolidation (Time allocation - 10 min)

- Review Enabling objective and Key Learning Points (see Section 1), drawing out any common themes in the participant
- Look ahead to the next lesson of the course:
    - Net Explosive Quantity Calculation

Slide 1

Weapons and Ammunition Management in UN Peace Operations

Contingent Levels of Operational Ammunition

**Key Reference Documents for lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2

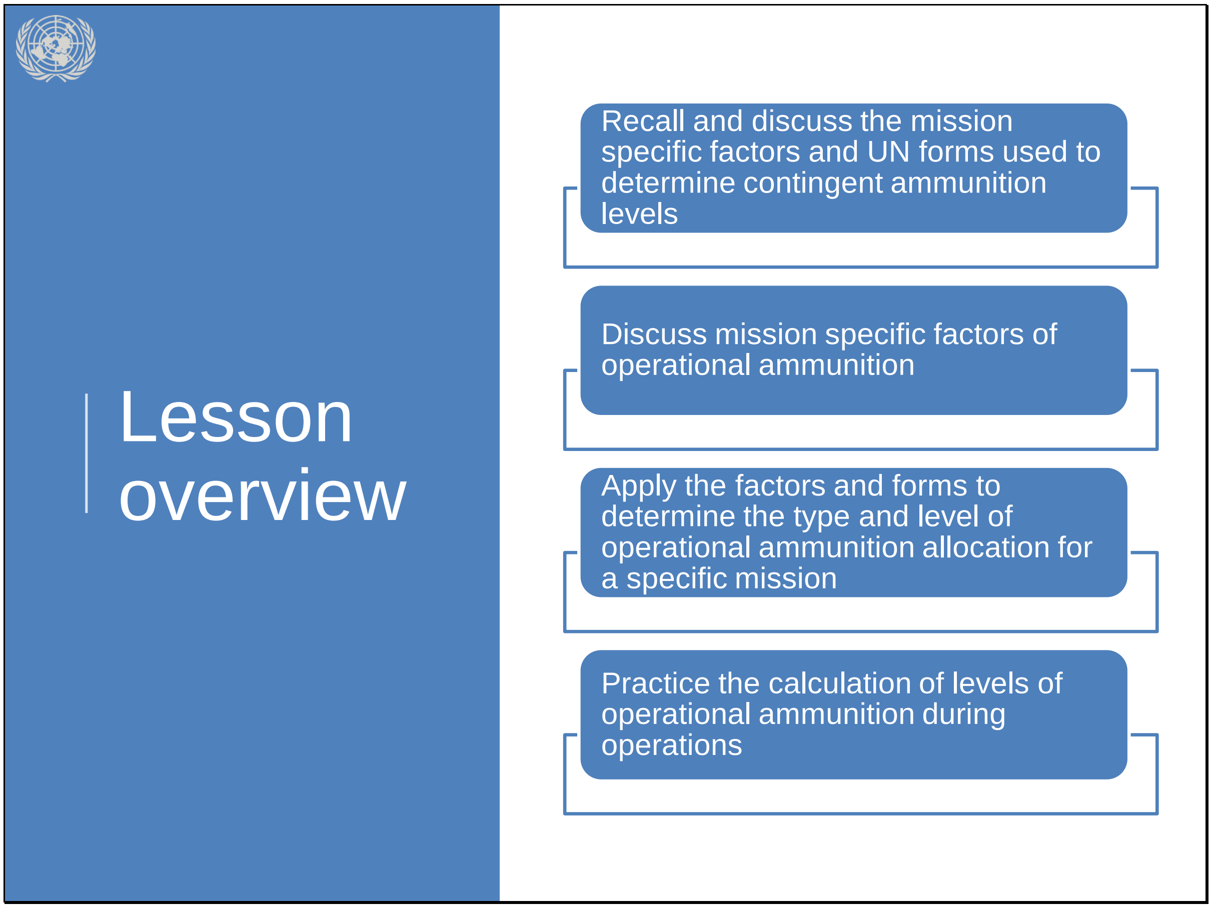
Objective

Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.

**<u>Main idea/objective for slide:</u>**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.)

<u>What the instructor should cover (in addition to slide content)</u>
By the end of this training session the participants will apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.

Slide 3



# Lesson overview

- Recall and discuss the mission specific factors and UN forms used to determine contingent ammunition levels
- Discuss mission specific factors of operational ammunition
- Apply the factors and forms to determine the type and level of operational ammunition allocation for a specific mission
- Practice the calculation of levels of operational ammunition during operations

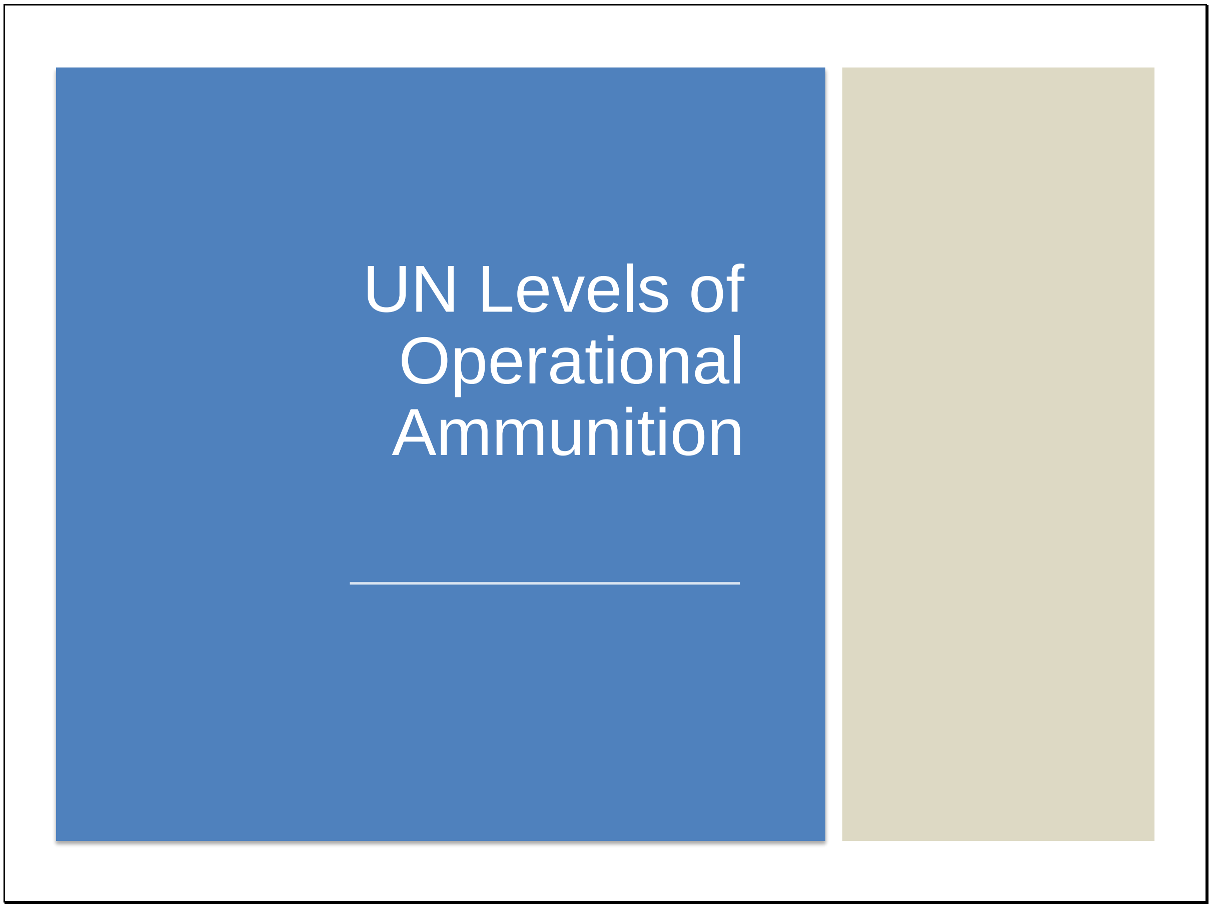
**<u>Main idea/objective for slide:</u>**
**Introduce the Key Learning Points**

<u>What the instructor should cover (in addition to slide content)</u>
Emphasise 'recall' – this is revisiting/revising content covered in the workbook

Key Learning Points
2.2.1.1 Recall the factors and forms to determine contingent ammunition levels
2.2.1.2 Define the mission specific factors to be considered
2.2.1.3 Describe the UN forms to be used
2.2.1.4 Discuss the forms to be used
2.2.1.5 Discuss mission specific factors of operational ammunition
2.2.1.6 Apply the factors and forms to determination the type and level of operational ammunition allocation for a specific mission

## 2.2.1.7 Practice the calculation of levels of operational ammunition during operations

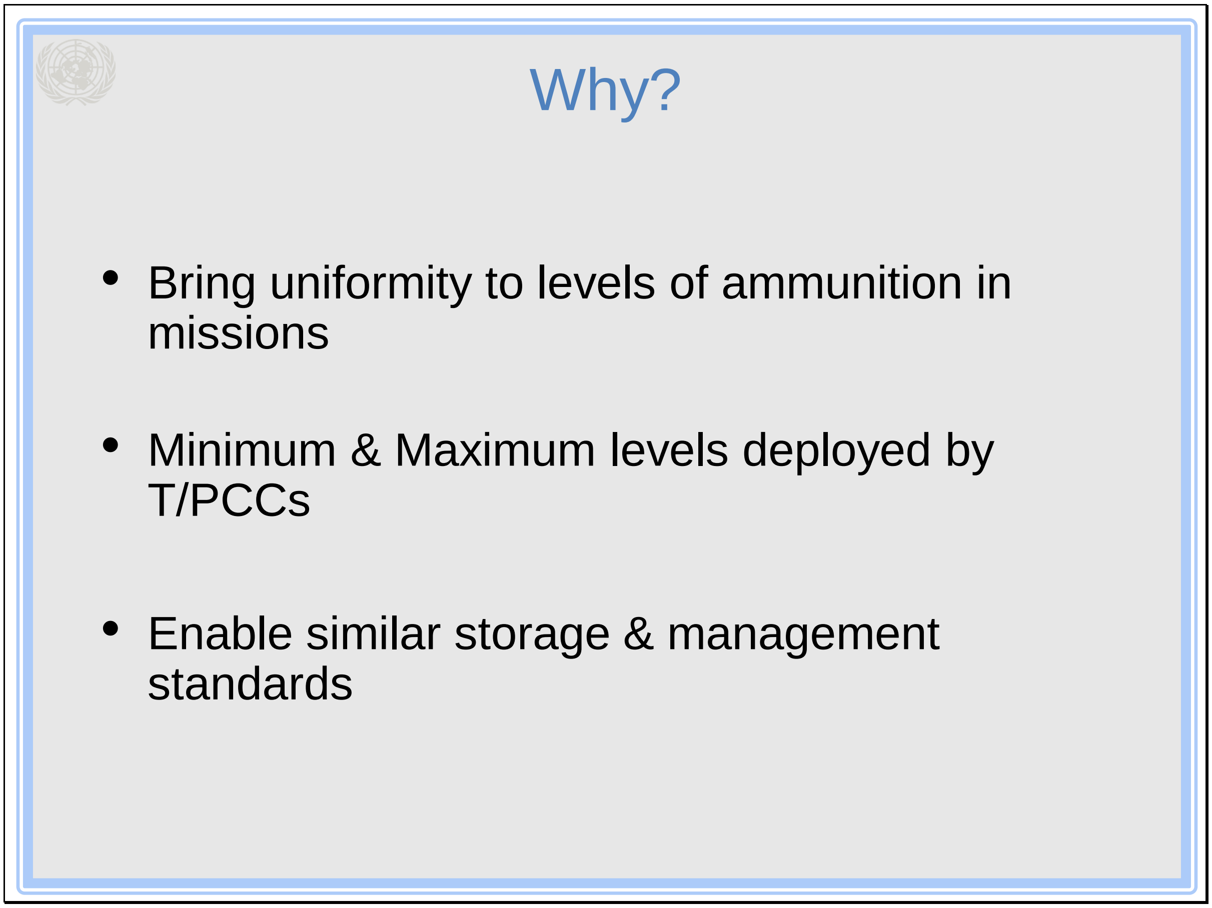
Slide 4



## UN Levels of Operational Ammunition

**Phase 1. Introduction (**Time allocation - 20 min**)**

Slide 5



## Why?

- Bring uniformity to levels of ammunition in missions
- Minimum & Maximum levels deployed by T/PCCs
- Enable similar storage & management standards

**<u>Main idea/objective for slide:</u>**
**Emphasise purpose and importance**

<u>What the instructor should cover (in addition to slide content)</u>

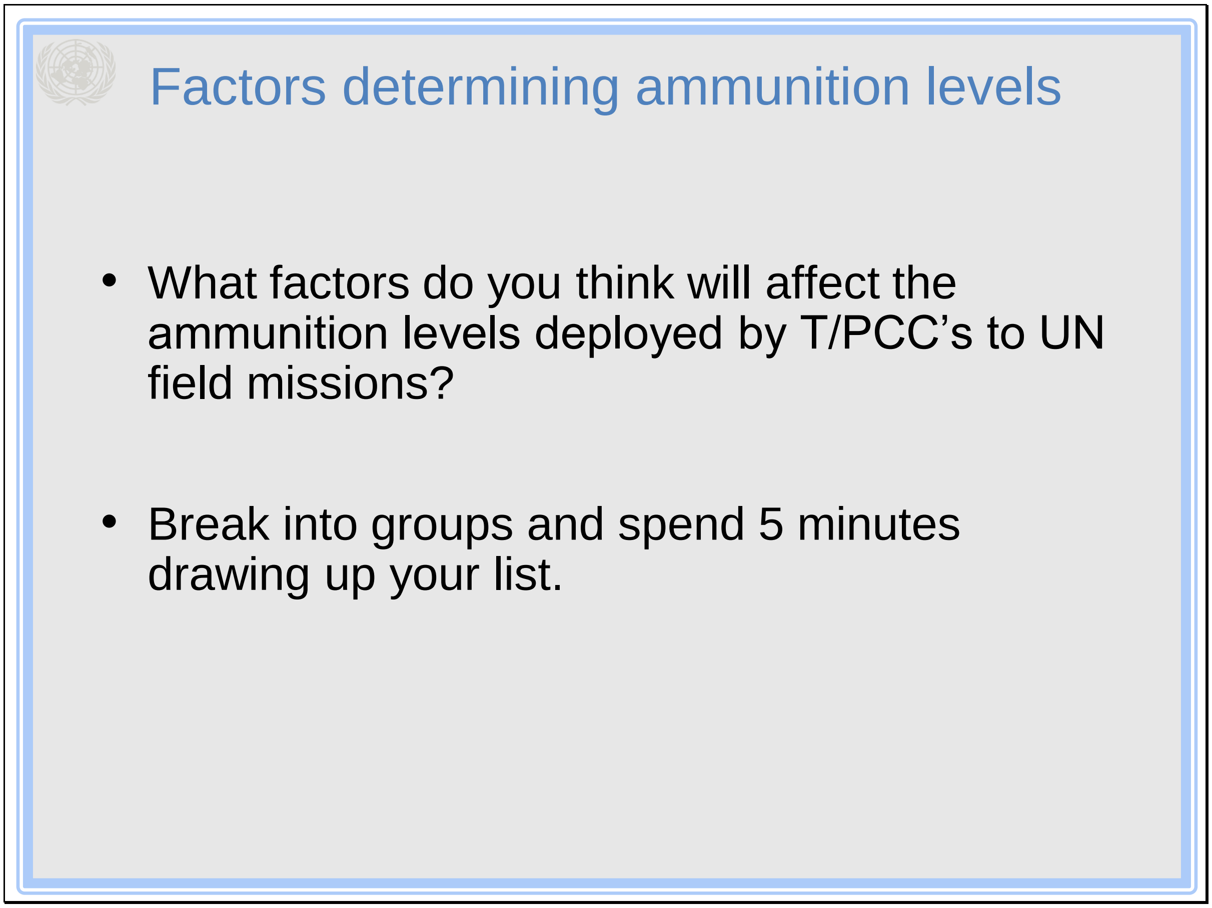
- Hand out copies of the UN Manual of Ammunition Managements Levels of Operational Ammunition templates **(Annex E to K).**
- Discuss the relevant key reference documents and how ammunition storage and management is a key component.

Slide 6

Factors for Consideration

**Phase 2. Development (**Time allocation - 60 min**)**

Stage 1 (Time allocation 20 mins) – Factors for Consideration



## Factors determining ammunition levels

- What factors do you think will affect the ammunition levels deployed by T/PCC's to UN field missions?
- Break into groups and spend 5 minutes drawing up your list.

**<u>Main idea/objective for slide:</u>**
**participants suggest factors determining ammunition levels and compare these to the manual**

<u>participants activity</u>
participants create lists in groups (5 mins)
Then participants compare their list to the list from the UN Manual on AM.

<u>What the instructor should cover (in addition to slide content)</u>
Capture the participants ideas on a flip chart or whiteboard. After slide 9 go back to the participants list and identify factors that the participants suggested which are not covered in the manual. Discuss the reasons for this. participants experience may add a different point of view or be more tactical rather than strategic.

Slide 8

## Factors determining the levels

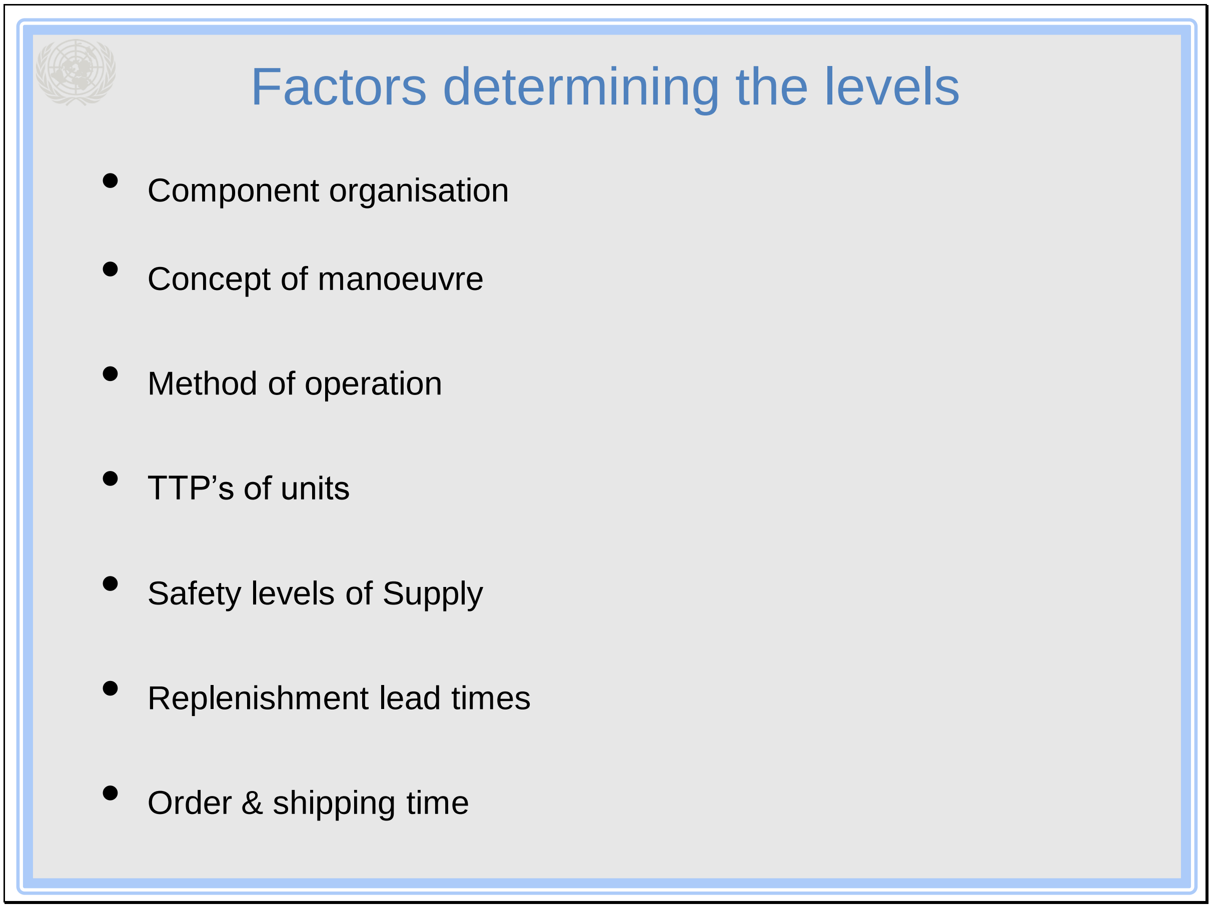
- Mandate
- Mission
- Threat
- Operational tempo
- Technical survey findings
- Mission strength

**Main idea/objective for slide:**
**Outline and discuss the various factors that should be considered when determining the levels of operational ammunition as outlined in the UN Manual.**

What the instructor should cover (in addition to slide content)

- Generate a discussion on each factor to reinforce the participants' understanding and its role in the decision-making process.

Slide 9



## Factors determining the levels

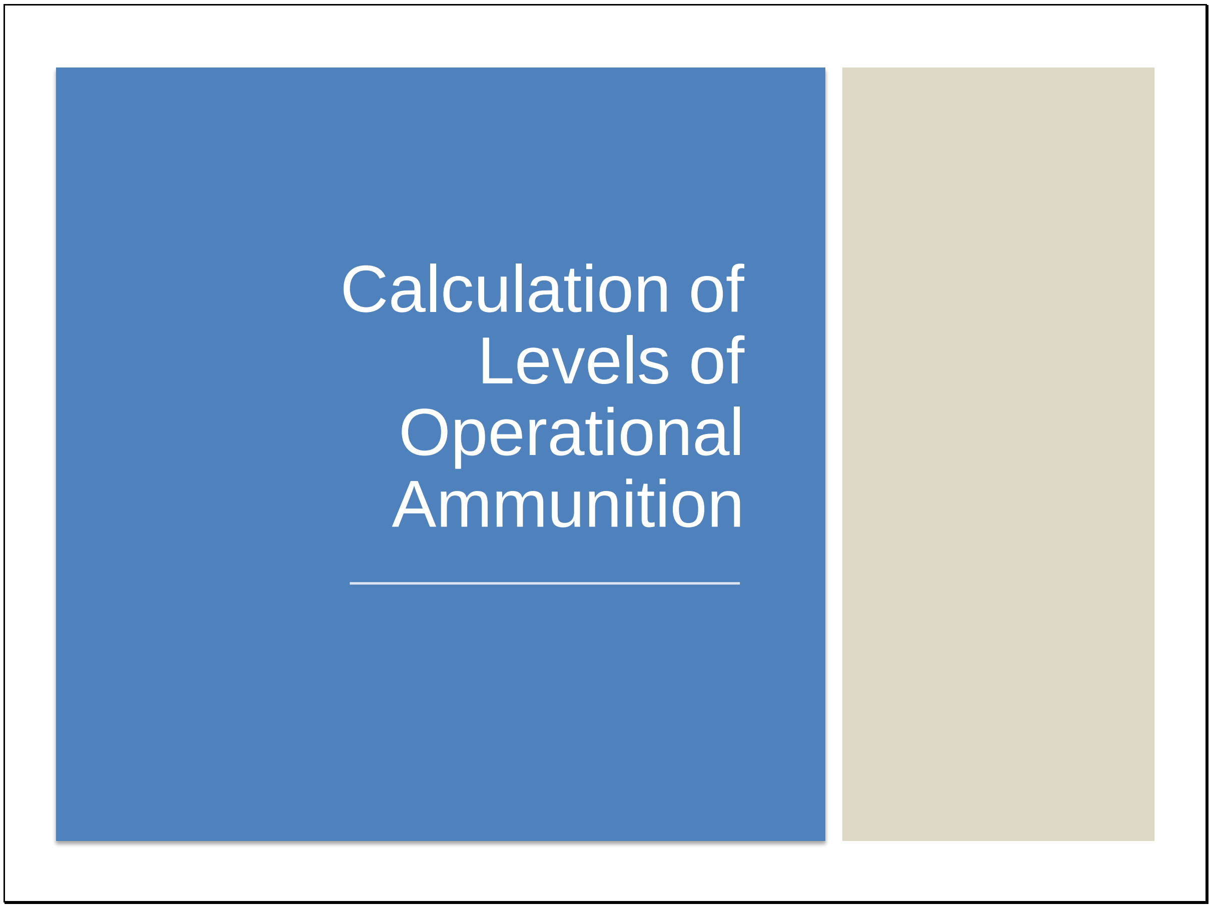
- Component organisation
- Concept of manoeuvre
- Method of operation
- TTP’s of units
- Safety levels of Supply
- Replenishment lead times
- Order & shipping time

**Main idea/objective for slide:**
**Outline and discuss the various factors that should be considered when determining the levels of operational ammunition as outlined in the UN Manual.**

What the instructor should cover (in addition to slide content)
- Generate a discussion on each factor to reinforce the participants' understanding and its role in the decision-making process.

**TTP’s –** Tactics techniques and procedures
**Order and shipping time**: (national supply, response time, distance, mode of transport, in-mission receipt, customs clearance and internal in mission movement).

Slide 10

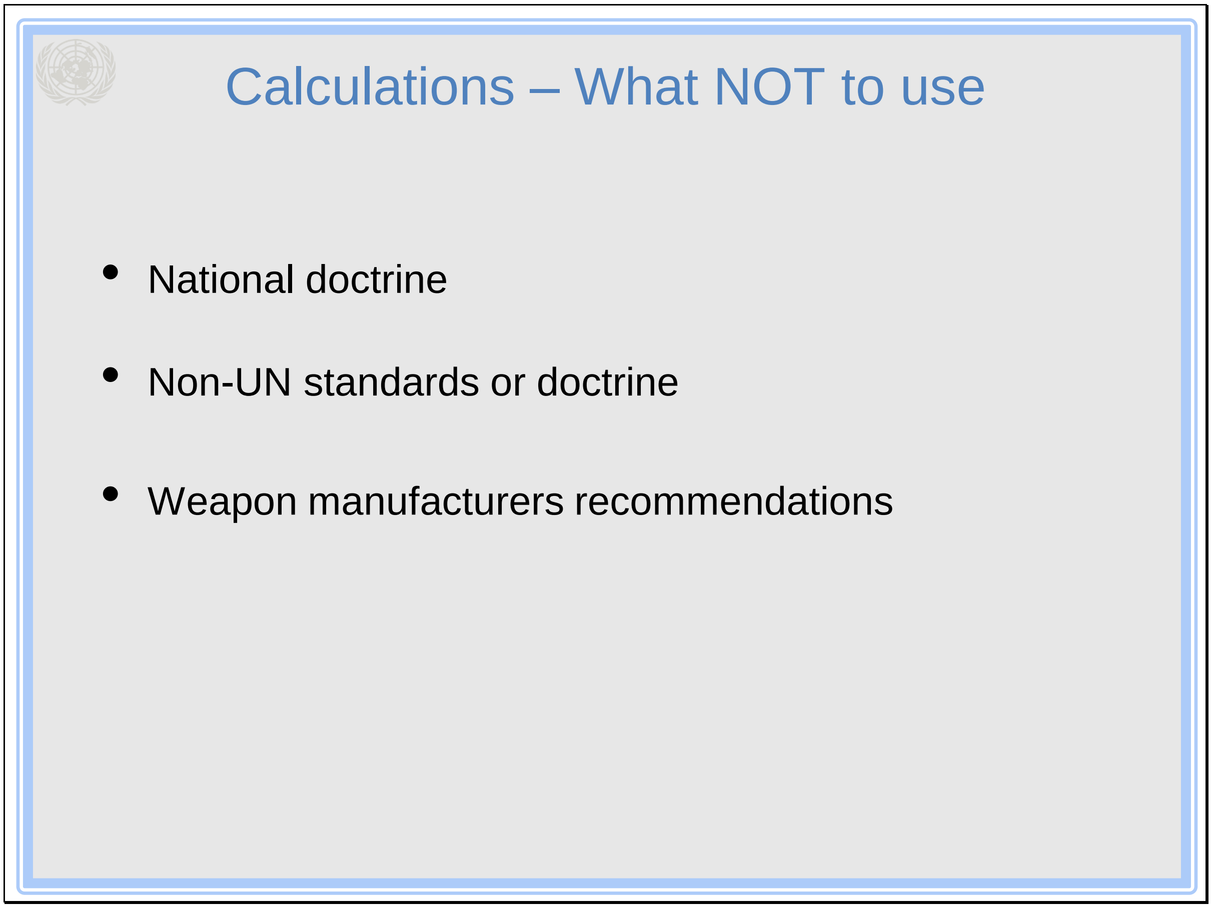


Calculation of Levels of Operational Ammunition

**Phase 2. Development (**Time allocation - 60 min**)**

Stage 2 (Time allocation 20 mins) – Calculation of Levels of Operational Ammunition

Slide 11



## Calculations – What NOT to use

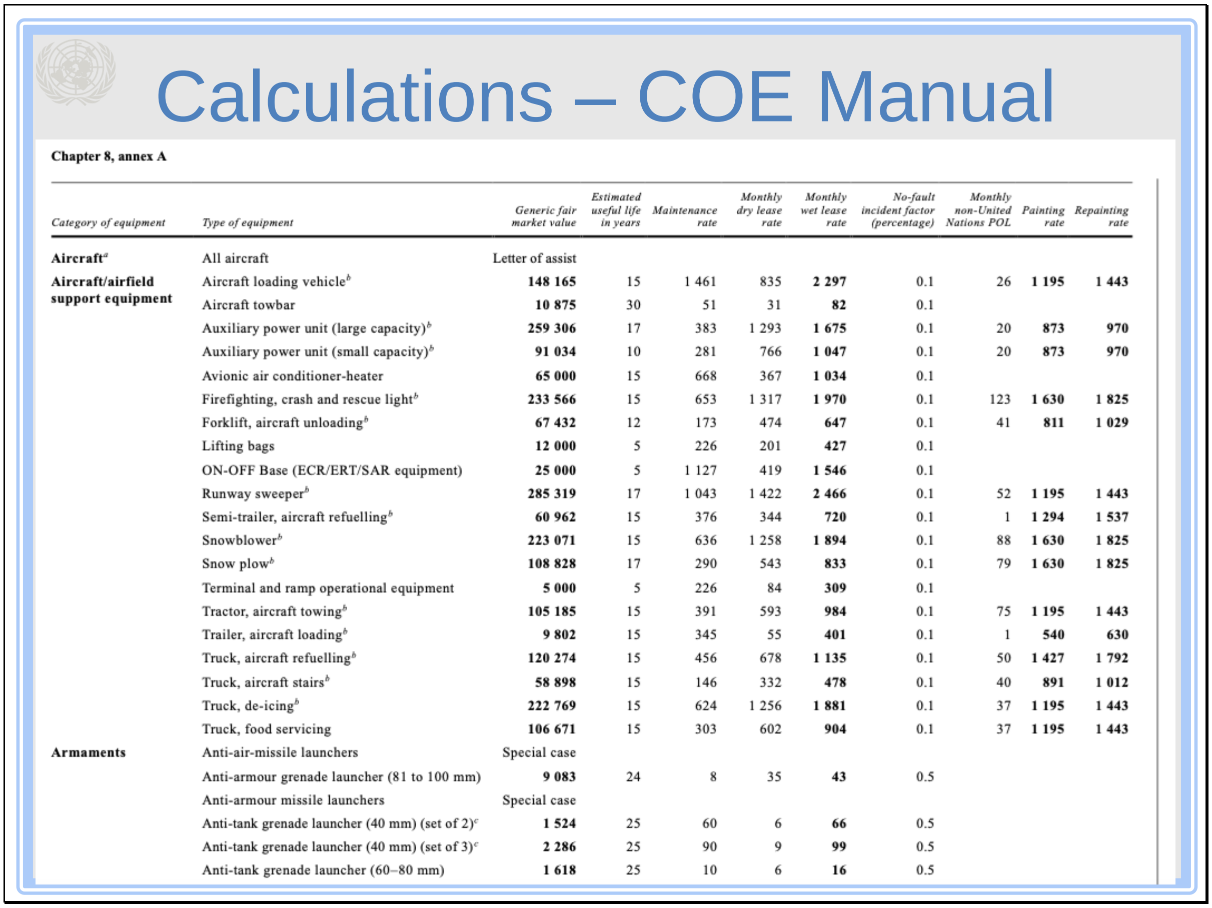
- National doctrine
- Non-UN standards or doctrine
- Weapon manufacturers recommendations

**<u>Main idea/objective for slide:</u>**
**Highlight what not to use in calculations**

<u>What the instructor should cover (in addition to slide content)</u>

Elaborate on this list. Consider asking the participants why these should not be used

Slide 12



# Calculations – COE Manual

**Chapter 8, annex A**

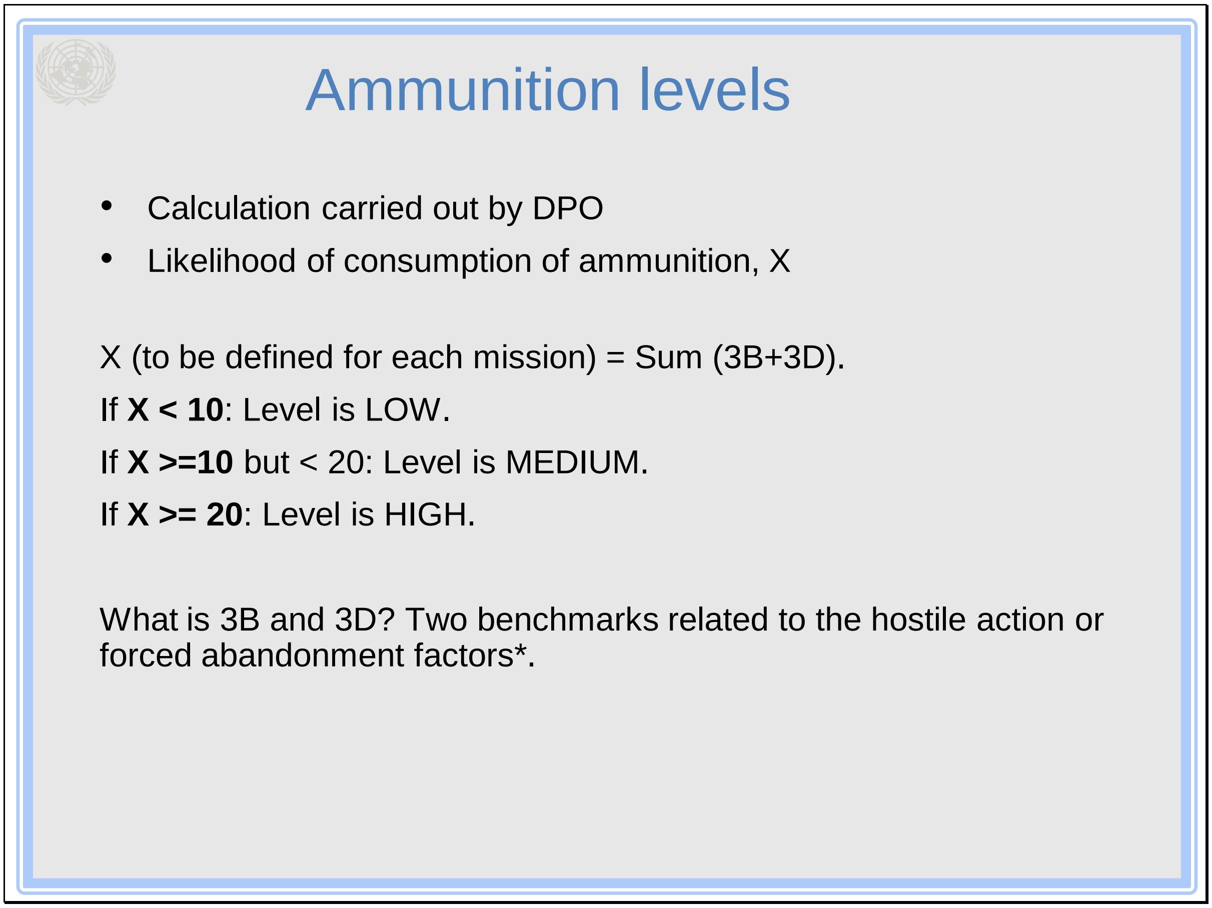
| *Category of equipment* | *Type of equipment* | *Generic fair market value* | *Estimated useful life in years* | *Maintenance rate* | *Monthly dry lease rate* | *Monthly wet lease rate* | *No-fault incident factor (percentage)* | *Monthly non-United Nations POL* | *Painting rate* | *Repainting rate* |
|---|---|---|---|---|---|---|---|---|---|---|
| **Aircraft**[a] | All aircraft | Letter of assist | | | | | | | | |
| **Aircraft/airfield support equipment** | Aircraft loading vehicle[b] | **148 165** | 15 | 1 461 | 835 | **2 297** | 0.1 | 26 | **1 195** | **1 443** |
| | Aircraft towbar | **10 875** | 30 | 51 | 31 | **82** | 0.1 | | | |
| | Auxiliary power unit (large capacity)[b] | **259 306** | 17 | 383 | 1 293 | **1 675** | 0.1 | 20 | **873** | **970** |
| | Auxiliary power unit (small capacity)[b] | **91 034** | 10 | 281 | 766 | **1 047** | 0.1 | 20 | **873** | **970** |
| | Avionic air conditioner-heater | **65 000** | 15 | 668 | 367 | **1 034** | 0.1 | | | |
| | Firefighting, crash and rescue light[b] | **233 566** | 15 | 653 | 1 317 | **1 970** | 0.1 | 123 | **1 630** | **1 825** |
| | Forklift, aircraft unloading[b] | **67 432** | 12 | 173 | 474 | **647** | 0.1 | 41 | **811** | **1 029** |
| | Lifting bags | **12 000** | 5 | 226 | 201 | **427** | 0.1 | | | |
| | ON-OFF Base (ECR/ERT/SAR equipment) | **25 000** | 5 | 1 127 | 419 | **1 546** | 0.1 | | | |
| | Runway sweeper[b] | **285 319** | 17 | 1 043 | 1 422 | **2 466** | 0.1 | 52 | **1 195** | **1 443** |
| | Semi-trailer, aircraft refuelling[b] | **60 962** | 15 | 376 | 344 | **720** | 0.1 | 1 | **1 294** | **1 537** |
| | Snowblower[b] | **223 071** | 15 | 636 | 1 258 | **1 894** | 0.1 | 88 | **1 630** | **1 825** |
| | Snow plow[b] | **108 828** | 17 | 290 | 543 | **833** | 0.1 | 79 | **1 630** | **1 825** |
| | Terminal and ramp operational equipment | **5 000** | 5 | 226 | 84 | **309** | 0.1 | | | |
| | Tractor, aircraft towing[b] | **105 185** | 15 | 391 | 593 | **984** | 0.1 | 75 | **1 195** | **1 443** |
| | Trailer, aircraft loading[b] | **9 802** | 15 | 345 | 55 | **401** | 0.1 | 1 | **540** | **630** |
| | Truck, aircraft refuelling[b] | **120 274** | 15 | 456 | 678 | **1 135** | 0.1 | 50 | **1 427** | **1 792** |
| | Truck, aircraft stairs[b] | **58 898** | 15 | 146 | 332 | **478** | 0.1 | 40 | **891** | **1 012** |
| | Truck, de-icing[b] | **222 769** | 15 | 624 | 1 256 | **1 881** | 0.1 | 37 | **1 195** | **1 443** |
| | Truck, food servicing | **106 671** | 15 | 303 | 602 | **904** | 0.1 | 37 | **1 195** | **1 443** |
| **Armaments** | Anti-air-missile launchers | Special case | | | | | | | | |
| | Anti-armour grenade launcher (81 to 100 mm) | **9 083** | 24 | 8 | 35 | **43** | 0.5 | | | |
| | Anti-armour missile launchers | Special case | | | | | | | | |
| | Anti-tank grenade launcher (40 mm) (set of 2)[c] | **1 524** | 25 | 60 | 6 | **66** | 0.5 | | | |
| | Anti-tank grenade launcher (40 mm) (set of 3)[c] | **2 286** | 25 | 90 | 9 | **99** | 0.5 | | | |
| | Anti-tank grenade launcher (60–80 mm) | **1 618** | 25 | 10 | 6 | **16** | 0.5 | | | |

**Main idea/objective for slide:**
**Introduce COE Manual**

participants activity
Identify the difference between wet and dry lease and discuss the pro's and con's of each for the UN, according to the participants knowledge and experience.

What the instructor should cover (in addition to slide content)
Handout the latest COE Manual (2020).
Bring the class through the contents. Focus on Chapter 8 and the annexes contained therein.

Slide 13



## Ammunition levels

- Calculation carried out by DPO
- Likelihood of consumption of ammunition, X

X (to be defined for each mission) = Sum (3B+3D).

If **X < 10**: Level is LOW.

If **X >=10** but < 20: Level is MEDIUM.

If **X >= 20**: Level is HIGH.

What is 3B and 3D? Two benchmarks related to the hostile action or forced abandonment factors*.

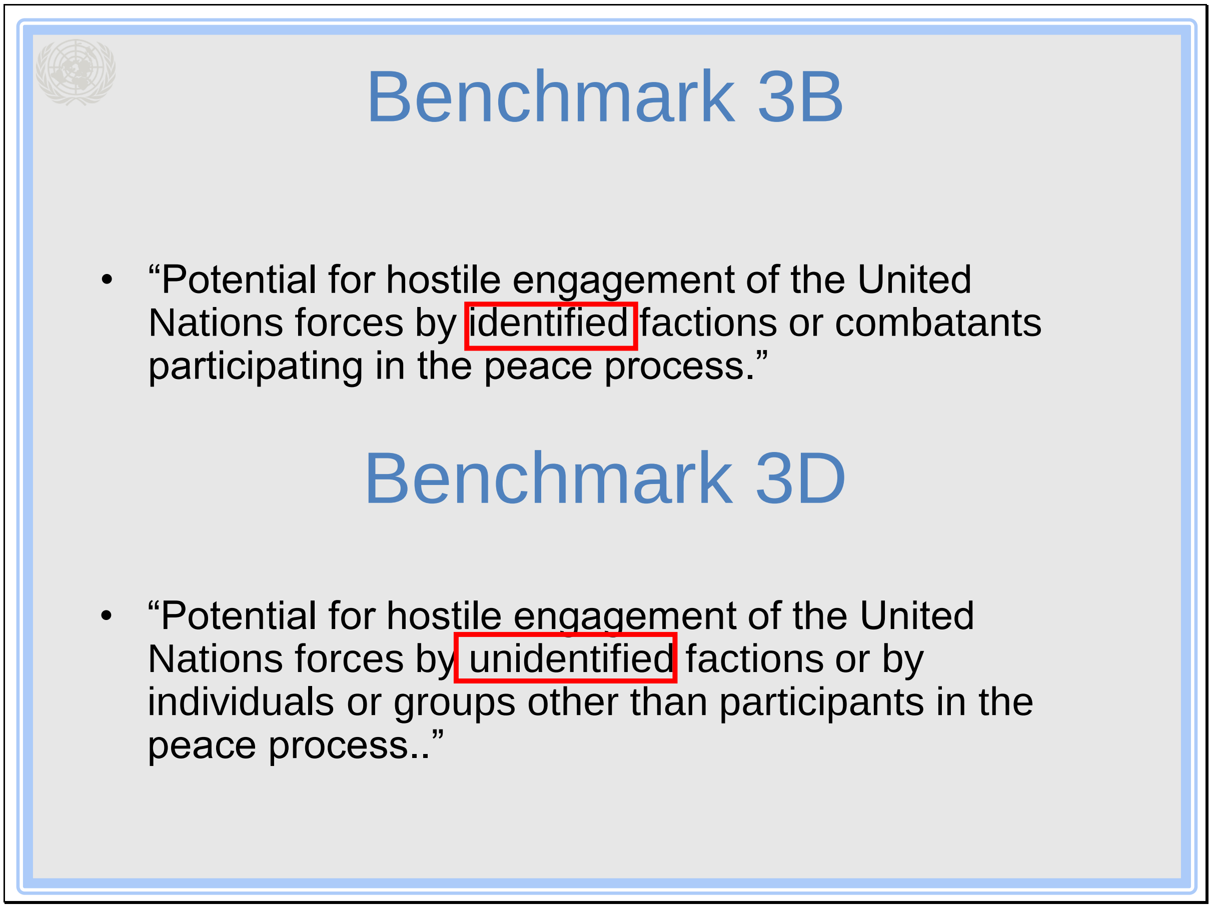
**Main idea/objective for slide:**

- **Explain how the levels of operational ammunition are calculated.**

What the instructor should cover (in addition to slide content)

*The hostile action or forced abandonment factor is part of the Mission Factors as defined in the Manual on Policies and Procedures concerning the Reimbursement and Control of Contingent-Owned Equipment of Troop/Police Contributors Participating in Peacekeeping Missions (2017).

Slide 14



## Benchmark 3B

- “Potential for hostile engagement of the United Nations forces by identified factions or combatants participating in the peace process.”

## Benchmark 3D

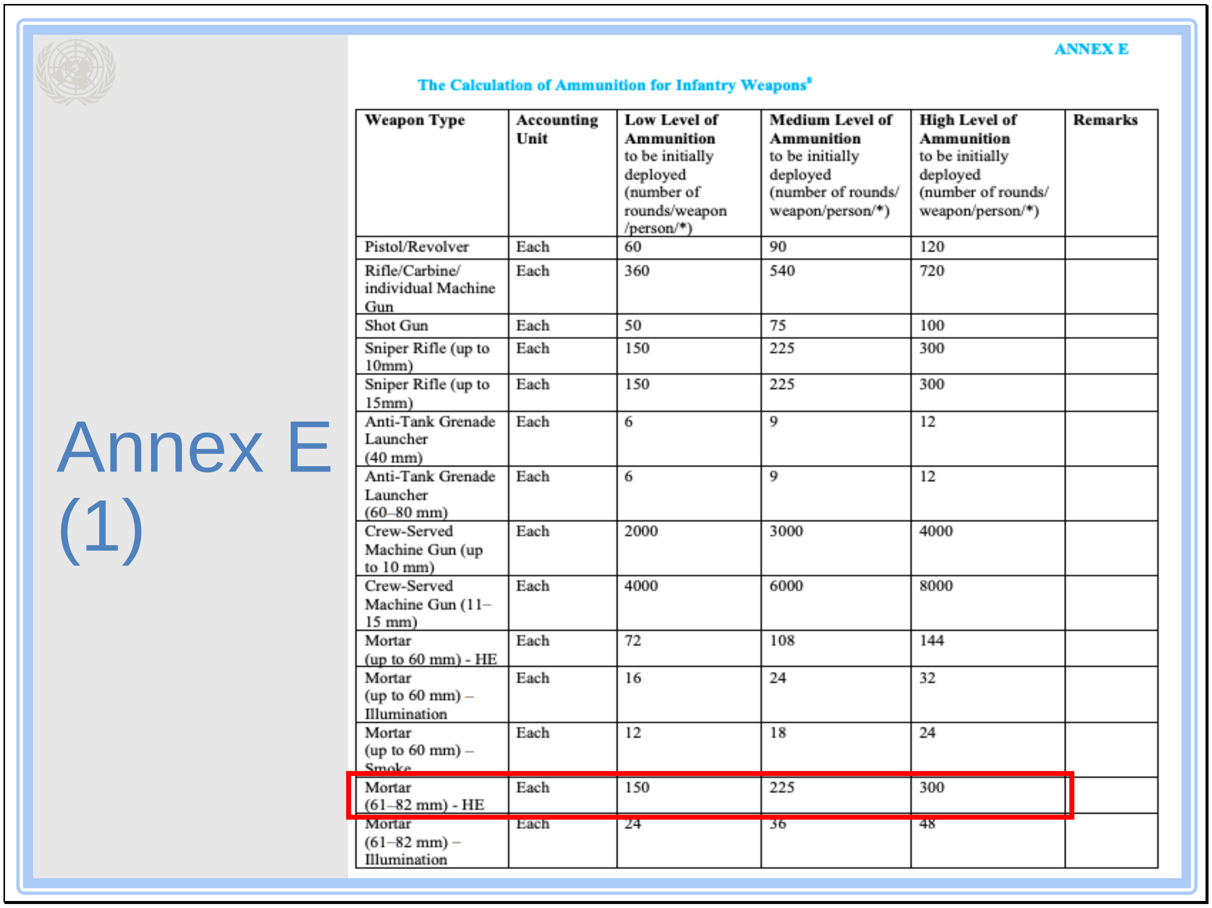
- “Potential for hostile engagement of the United Nations forces by unidentified factions or by individuals or groups other than participants in the peace process..”

**Main idea/objective for slide:**
To explain the concept of Benchmark 3B and 3D which are used in the calculation of ammunition levels.

participants activity
Suggest a mission and list the identified factions participating the peace process. Then using the same mission list the possible unidentified factions

What the instructor should cover (in addition to slide content)
For unidentified factions lead the participants to consider criminal gangs, traffickers, foreign terrorist groups, funding sources etc.

Slide 15



# Annex E (1)

ANNEX E

The Calculation of Ammunition for Infantry Weapons[8]

| Weapon Type | Accounting Unit | **Low Level of Ammunition** to be initially deployed (number of rounds/weapon /person/*) | **Medium Level of Ammunition** to be initially deployed (number of rounds/ weapon/person/*) | **High Level of Ammunition** to be initially deployed (number of rounds/ weapon/person/*) | Remarks |
|---|---|---|---|---|---|
| Pistol/Revolver | Each | 60 | 90 | 120 | |
| Rifle/Carbine/ individual Machine Gun | Each | 360 | 540 | 720 | |
| Shot Gun | Each | 50 | 75 | 100 | |
| Sniper Rifle (up to 10mm) | Each | 150 | 225 | 300 | |
| Sniper Rifle (up to 15mm) | Each | 150 | 225 | 300 | |
| Anti-Tank Grenade Launcher (40 mm) | Each | 6 | 9 | 12 | |
| Anti-Tank Grenade Launcher (60–80 mm) | Each | 6 | 9 | 12 | |
| Crew-Served Machine Gun (up to 10 mm) | Each | 2000 | 3000 | 4000 | |
| Crew-Served Machine Gun (11–15 mm) | Each | 4000 | 6000 | 8000 | |
| Mortar (up to 60 mm) - HE | Each | 72 | 108 | 144 | |
| Mortar (up to 60 mm) – Illumination | Each | 16 | 24 | 32 | |
| Mortar (up to 60 mm) – Smoke | Each | 12 | 18 | 24 | |
| Mortar (61–82 mm) - HE | Each | 150 | 225 | 300 | |
| Mortar (61–82 mm) – Illumination | Each | 24 | 36 | 48 | |

**<u>Main idea/objective for slide:</u>**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

<u>participants activity</u>

Choose one weapon system and discuss the difference between the Low, Medium and High levels of ammunition.

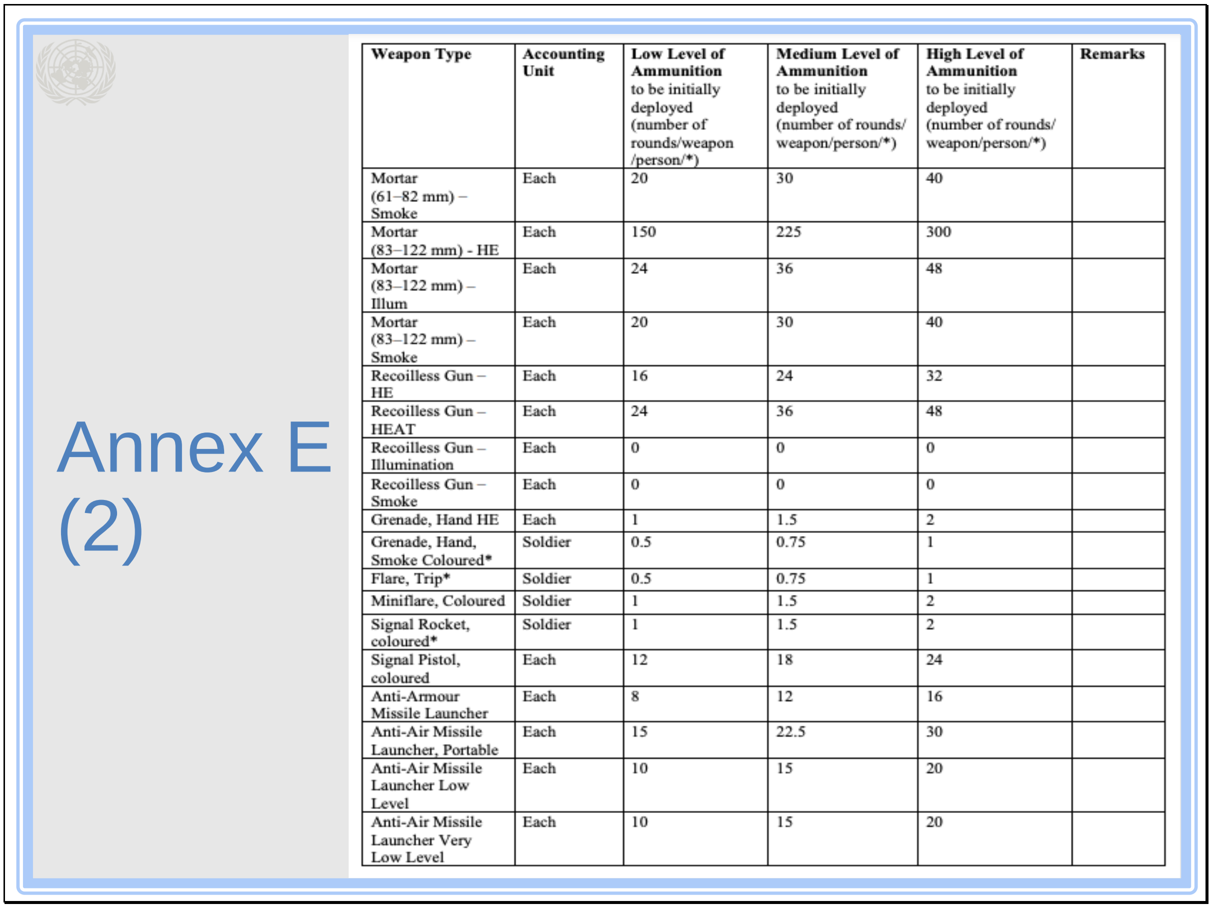
How would this affect ammunition storage, particularly temporary storage?

<u>What the instructor should cover (in addition to slide content)</u>

- Explain how the levels of operational ammunition are calculated.
- Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).

- Using an example, calculate the levels of ammunition required for a defined mission and use the templates to demonstrate to the participants how to complete it correctly.
- Ask regular questions of the class to ensure uptake and engagement e.g. If a mission is deemed to require a High Level of Ammunition after being equipped with a Low Level of Ammunition for a period of time (take Mortar 61-82mm) what is the knock on effect for temporary storage?

Slide 16



Annex E (2)

| **Weapon Type** | **Accounting Unit** | **Low Level of Ammunition** to be initially deployed (number of rounds/weapon /person/*) | **Medium Level of Ammunition** to be initially deployed (number of rounds/ weapon/person/*) | **High Level of Ammunition** to be initially deployed (number of rounds/ weapon/person/*) | **Remarks** |
|---|---|---|---|---|---|
| Mortar (61–82 mm) – Smoke | Each | 20 | 30 | 40 | |
| Mortar (83–122 mm) - HE | Each | 150 | 225 | 300 | |
| Mortar (83–122 mm) – Illum | Each | 24 | 36 | 48 | |
| Mortar (83–122 mm) – Smoke | Each | 20 | 30 | 40 | |
| Recoilless Gun – HE | Each | 16 | 24 | 32 | |
| Recoilless Gun – HEAT | Each | 24 | 36 | 48 | |
| Recoilless Gun – Illumination | Each | 0 | 0 | 0 | |
| Recoilless Gun – Smoke | Each | 0 | 0 | 0 | |
| Grenade, Hand HE | Each | 1 | 1.5 | 2 | |
| Grenade, Hand, Smoke Coloured* | Soldier | 0.5 | 0.75 | 1 | |
| Flare, Trip* | Soldier | 0.5 | 0.75 | 1 | |
| Miniflare, Coloured | Soldier | 1 | 1.5 | 2 | |
| Signal Rocket, coloured* | Soldier | 1 | 1.5 | 2 | |
| Signal Pistol, coloured | Each | 12 | 18 | 24 | |
| Anti-Armour Missile Launcher | Each | 8 | 12 | 16 | |
| Anti-Air Missile Launcher, Portable | Each | 15 | 22.5 | 30 | |
| Anti-Air Missile Launcher Low Level | Each | 10 | 15 | 20 | |
| Anti-Air Missile Launcher Very Low Level | Each | 10 | 15 | 20 | |

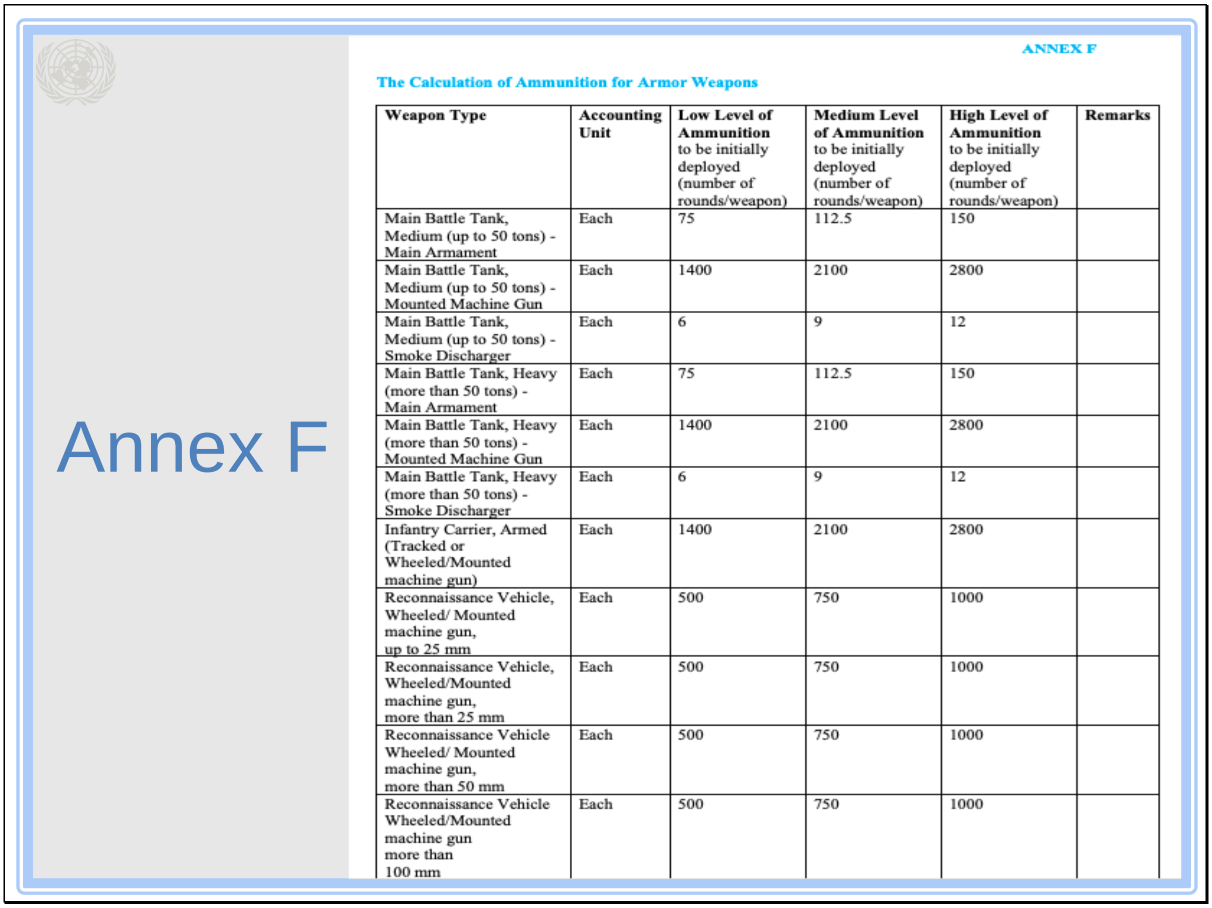
**<u>Main idea/objective for slide:</u>**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

<u>What the instructor should cover (in addition to slide content)</u>

Give the participants an idea of the variety of weapon systems that may be deployed in a UN mission and the associated complexity of ammunition management.

Slide 17



ANNEX F

# Annex F

**The Calculation of Ammunition for Armor Weapons**

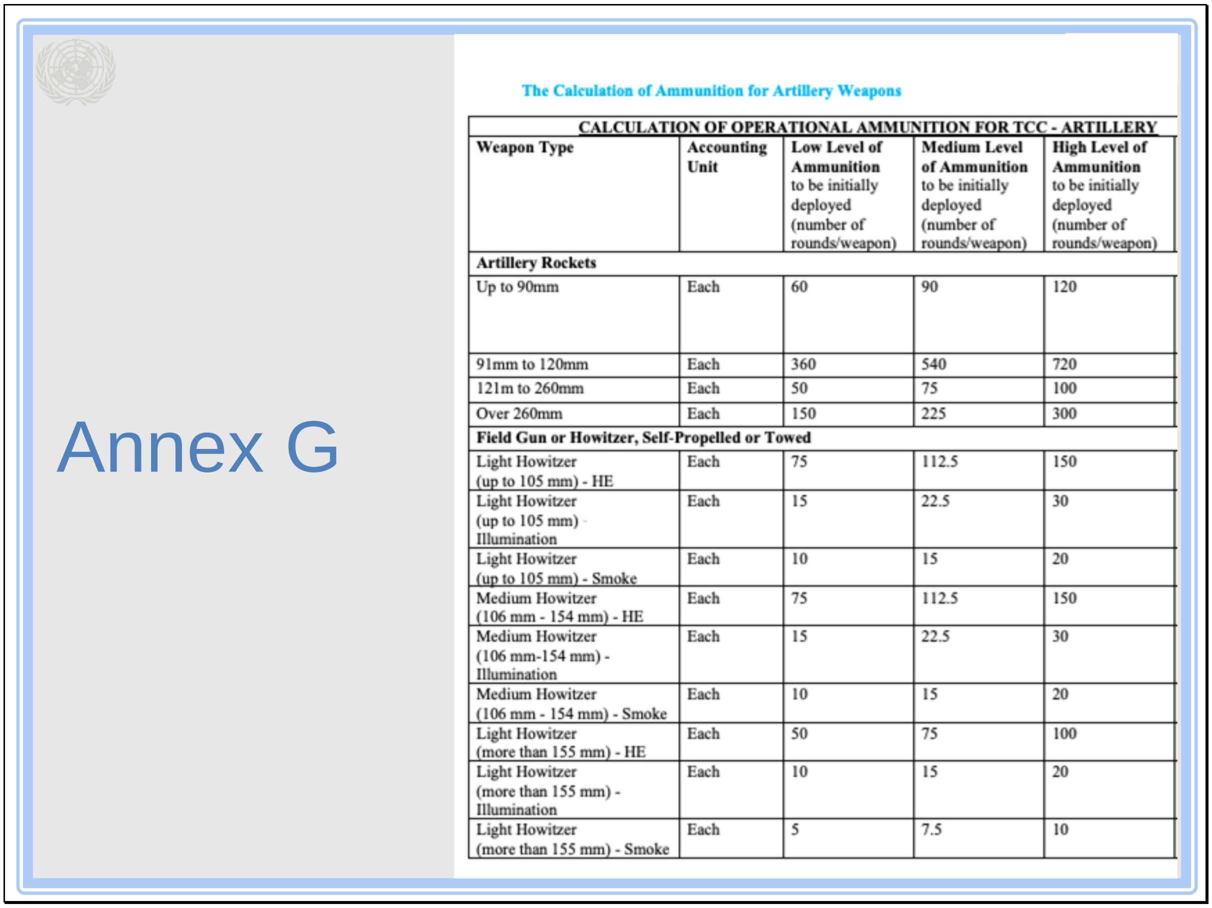
| **Weapon Type** | **Accounting Unit** | **Low Level of Ammunition** to be initially deployed (number of rounds/weapon) | **Medium Level of Ammunition** to be initially deployed (number of rounds/weapon) | **High Level of Ammunition** to be initially deployed (number of rounds/weapon) | **Remarks** |
|---|---|---|---|---|---|
| Main Battle Tank, Medium (up to 50 tons) - Main Armament | Each | 75 | 112.5 | 150 | |
| Main Battle Tank, Medium (up to 50 tons) - Mounted Machine Gun | Each | 1400 | 2100 | 2800 | |
| Main Battle Tank, Medium (up to 50 tons) - Smoke Discharger | Each | 6 | 9 | 12 | |
| Main Battle Tank, Heavy (more than 50 tons) - Main Armament | Each | 75 | 112.5 | 150 | |
| Main Battle Tank, Heavy (more than 50 tons) - Mounted Machine Gun | Each | 1400 | 2100 | 2800 | |
| Main Battle Tank, Heavy (more than 50 tons) - Smoke Discharger | Each | 6 | 9 | 12 | |
| Infantry Carrier, Armed (Tracked or Wheeled/Mounted machine gun) | Each | 1400 | 2100 | 2800 | |
| Reconnaissance Vehicle, Wheeled/ Mounted machine gun, up to 25 mm | Each | 500 | 750 | 1000 | |
| Reconnaissance Vehicle, Wheeled/Mounted machine gun, more than 25 mm | Each | 500 | 750 | 1000 | |
| Reconnaissance Vehicle Wheeled/ Mounted machine gun, more than 50 mm | Each | 500 | 750 | 1000 | |
| Reconnaissance Vehicle Wheeled/Mounted machine gun more than 100 mm | Each | 500 | 750 | 1000 | |

**<u>Main idea/objective for slide:</u>**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

<u>What the instructor should cover (in addition to slide content)</u>
Focus on the different weapon systems associated with armor. participants may not be familiar with the variety of weapon systems. If there is a doubt ask if other participants have experience of the ammunition or weapon system. Using the internet to find pictures of the system will be useful for visualisation.

Slide 18



Annex G

**The Calculation of Ammunition for Artillery Weapons**

**CALCULATION OF OPERATIONAL AMMUNITION FOR TCC - ARTILLERY**

| **Weapon Type** | **Accounting Unit** | **Low Level of Ammunition** to be initially deployed (number of rounds/weapon) | **Medium Level of Ammunition** to be initially deployed (number of rounds/weapon) | **High Level of Ammunition** to be initially deployed (number of rounds/weapon) |
|---|---|---|---|---|
| **Artillery Rockets** | | | | |
| Up to 90mm | Each | 60 | 90 | 120 |
| 91mm to 120mm | Each | 360 | 540 | 720 |
| 121m to 260mm | Each | 50 | 75 | 100 |
| Over 260mm | Each | 150 | 225 | 300 |
| **Field Gun or Howitzer, Self-Propelled or Towed** | | | | |
| Light Howitzer (up to 105 mm) - HE | Each | 75 | 112.5 | 150 |
| Light Howitzer (up to 105 mm) - Illumination | Each | 15 | 22.5 | 30 |
| Light Howitzer (up to 105 mm) - Smoke | Each | 10 | 15 | 20 |
| Medium Howitzer (106 mm - 154 mm) - HE | Each | 75 | 112.5 | 150 |
| Medium Howitzer (106 mm-154 mm) - Illumination | Each | 15 | 22.5 | 30 |
| Medium Howitzer (106 mm - 154 mm) - Smoke | Each | 10 | 15 | 20 |
| Light Howitzer (more than 155 mm) - HE | Each | 50 | 75 | 100 |
| Light Howitzer (more than 155 mm) - Illumination | Each | 10 | 15 | 20 |
| Light Howitzer (more than 155 mm) - Smoke | Each | 5 | 7.5 | 10 |

**Main idea/objective for slide:**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

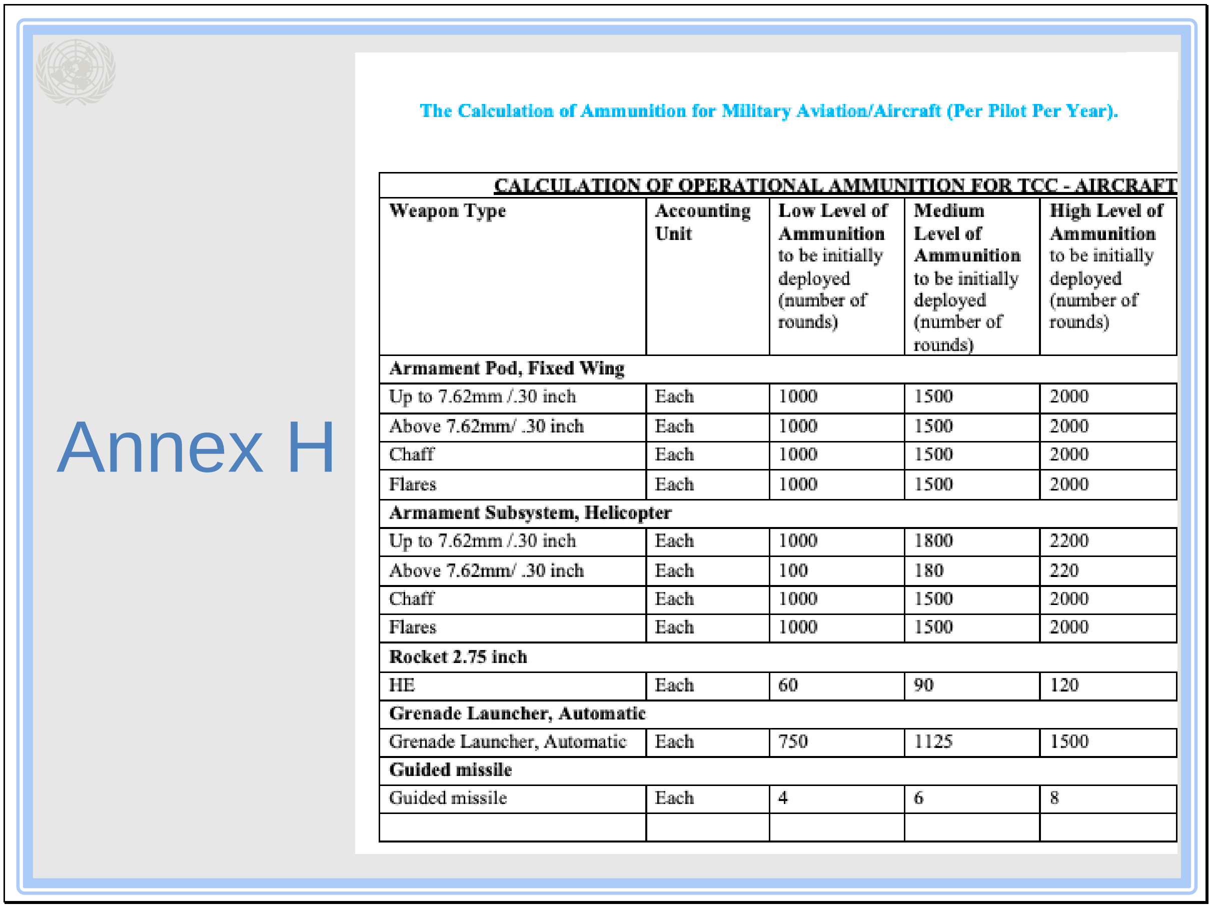
participants activity

Ask the participants the difference between artillery guns and rockets. What parts of the world use rockets over artillery (Palestine and Lebanon are examples of locations where the UN are based). In what situation might the UN deploy smoke rounds?

What the instructor should cover (in addition to slide content)

Focus on the different weapon systems associated with artillery. participants may not be familiar with the variety of ammunition. If there is a doubt ask if other participants have experience of the ammunition or weapon system. Using the internet to find pictures of the system will be useful for visualisation.

Slide 19



Annex H

The Calculation of Ammunition for Military Aviation/Aircraft (Per Pilot Per Year).

CALCULATION OF OPERATIONAL AMMUNITION FOR TCC - AIRCRAFT

| Weapon Type | Accounting Unit | **Low Level of Ammunition** to be initially deployed (number of rounds) | **Medium Level of Ammunition** to be initially deployed (number of rounds) | **High Level of Ammunition** to be initially deployed (number of rounds) |
|---|---|---|---|---|
| **Armament Pod, Fixed Wing** | | | | |
| Up to 7.62mm /.30 inch | Each | 1000 | 1500 | 2000 |
| Above 7.62mm/ .30 inch | Each | 1000 | 1500 | 2000 |
| Chaff | Each | 1000 | 1500 | 2000 |
| Flares | Each | 1000 | 1500 | 2000 |
| **Armament Subsystem, Helicopter** | | | | |
| Up to 7.62mm /.30 inch | Each | 1000 | 1800 | 2200 |
| Above 7.62mm/ .30 inch | Each | 100 | 180 | 220 |
| Chaff | Each | 1000 | 1500 | 2000 |
| Flares | Each | 1000 | 1500 | 2000 |
| **Rocket 2.75 inch** | | | | |
| HE | Each | 60 | 90 | 120 |
| **Grenade Launcher, Automatic** | | | | |
| Grenade Launcher, Automatic | Each | 750 | 1125 | 1500 |
| **Guided missile** | | | | |
| Guided missile | Each | 4 | 6 | 8 |
| | | | | |

**Main idea/objective for slide:**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

participants activity

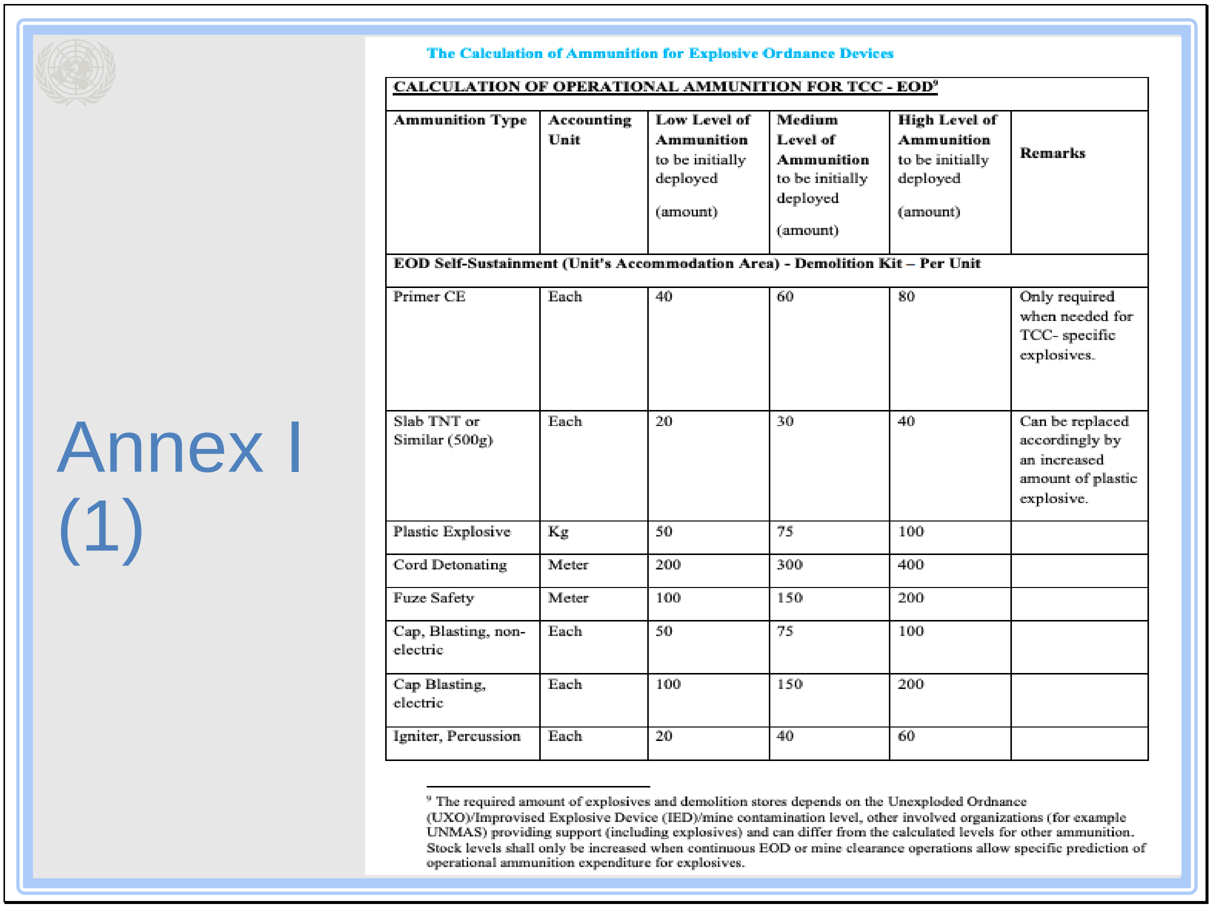
Why is the ammunition linked to the pilot and not the aircraft? It is because an aircraft will have a number of pilots assigned to it in order to maximise its availability.

What the instructor should cover (in addition to slide content)

Focus on the different weapon systems associated with aircraft. participants may not be familiar with the variety of weapon systems. If there is a doubt ask if other participants have experience of the ammunition or weapon system. Using the internet to find pictures of the system will be useful for visualisation.

What are the storage considerations with Chaff (strands of aluminum, fibreglass and plastic) and Flares? Chaff, while itself not hazardous, may contain a small pyrotechnic to discharge it from the aircraft and for dispersal.

Slide 20



Annex I (1)

The Calculation of Ammunition for Explosive Ordnance Devices

**CALCULATION OF OPERATIONAL AMMUNITION FOR TCC - EOD**[9]

| **Ammunition Type** | **Accounting Unit** | **Low Level of Ammunition** to be initially deployed (amount) | **Medium Level of Ammunition** to be initially deployed (amount) | **High Level of Ammunition** to be initially deployed (amount) | **Remarks** |
|---|---|---|---|---|---|
| **EOD Self-Sustainment (Unit's Accommodation Area) - Demolition Kit – Per Unit** | | | | | |
| Primer CE | Each | 40 | 60 | 80 | Only required when needed for TCC- specific explosives. |
| Slab TNT or Similar (500g) | Each | 20 | 30 | 40 | Can be replaced accordingly by an increased amount of plastic explosive. |
| Plastic Explosive | Kg | 50 | 75 | 100 | |
| Cord Detonating | Meter | 200 | 300 | 400 | |
| Fuze Safety | Meter | 100 | 150 | 200 | |
| Cap, Blasting, non-electric | Each | 50 | 75 | 100 | |
| Cap Blasting, electric | Each | 100 | 150 | 200 | |
| Igniter, Percussion | Each | 20 | 40 | 60 | |

---

[9] The required amount of explosives and demolition stores depends on the Unexploded Ordnance (UXO)/Improvised Explosive Device (IED)/mine contamination level, other involved organizations (for example UNMAS) providing support (including explosives) and can differ from the calculated levels for other ammunition. Stock levels shall only be increased when continuous EOD or mine clearance operations allow specific prediction of operational ammunition expenditure for explosives.

**<u>Main idea/objective for slide:</u>**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

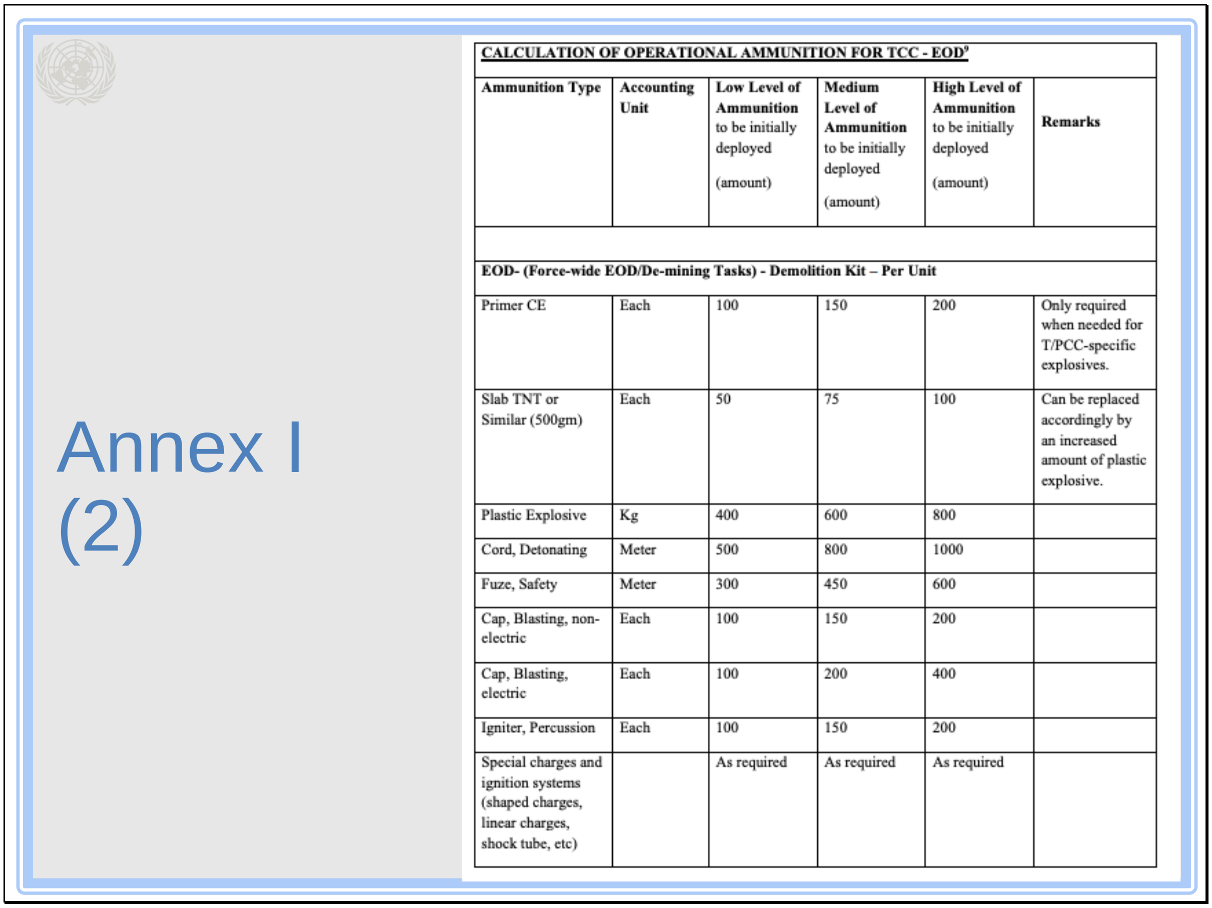
<u>participants activity</u>

Discuss why EOD equipment can require complex temporary storage conditions.

<u>What the instructor should cover (in addition to slide content)</u>

Focus on the different ammunition associated with EOD. If there is a doubt ask if other participants have experience of the ammunition.

Slide 21



Annex I (2)

**CALCULATION OF OPERATIONAL AMMUNITION FOR TCC - EOD[9]**

| **Ammunition Type** | **Accounting Unit** | **Low Level of Ammunition** to be initially deployed (amount) | **Medium Level of Ammunition** to be initially deployed (amount) | **High Level of Ammunition** to be initially deployed (amount) | **Remarks** |
|---|---|---|---|---|---|
| | | | | | |
| **EOD- (Force-wide EOD/De-mining Tasks) - Demolition Kit – Per Unit** | | | | | |
| Primer CE | Each | 100 | 150 | 200 | Only required when needed for T/PCC-specific explosives. |
| Slab TNT or Similar (500gm) | Each | 50 | 75 | 100 | Can be replaced accordingly by an increased amount of plastic explosive. |
| Plastic Explosive | Kg | 400 | 600 | 800 | |
| Cord, Detonating | Meter | 500 | 800 | 1000 | |
| Fuze, Safety | Meter | 300 | 450 | 600 | |
| Cap, Blasting, non-electric | Each | 100 | 150 | 200 | |
| Cap, Blasting, electric | Each | 100 | 200 | 400 | |
| Igniter, Percussion | Each | 100 | 150 | 200 | |
| Special charges and ignition systems (shaped charges, linear charges, shock tube, etc) | | As required | As required | As required | |

**<u>Main idea/objective for slide:</u>**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

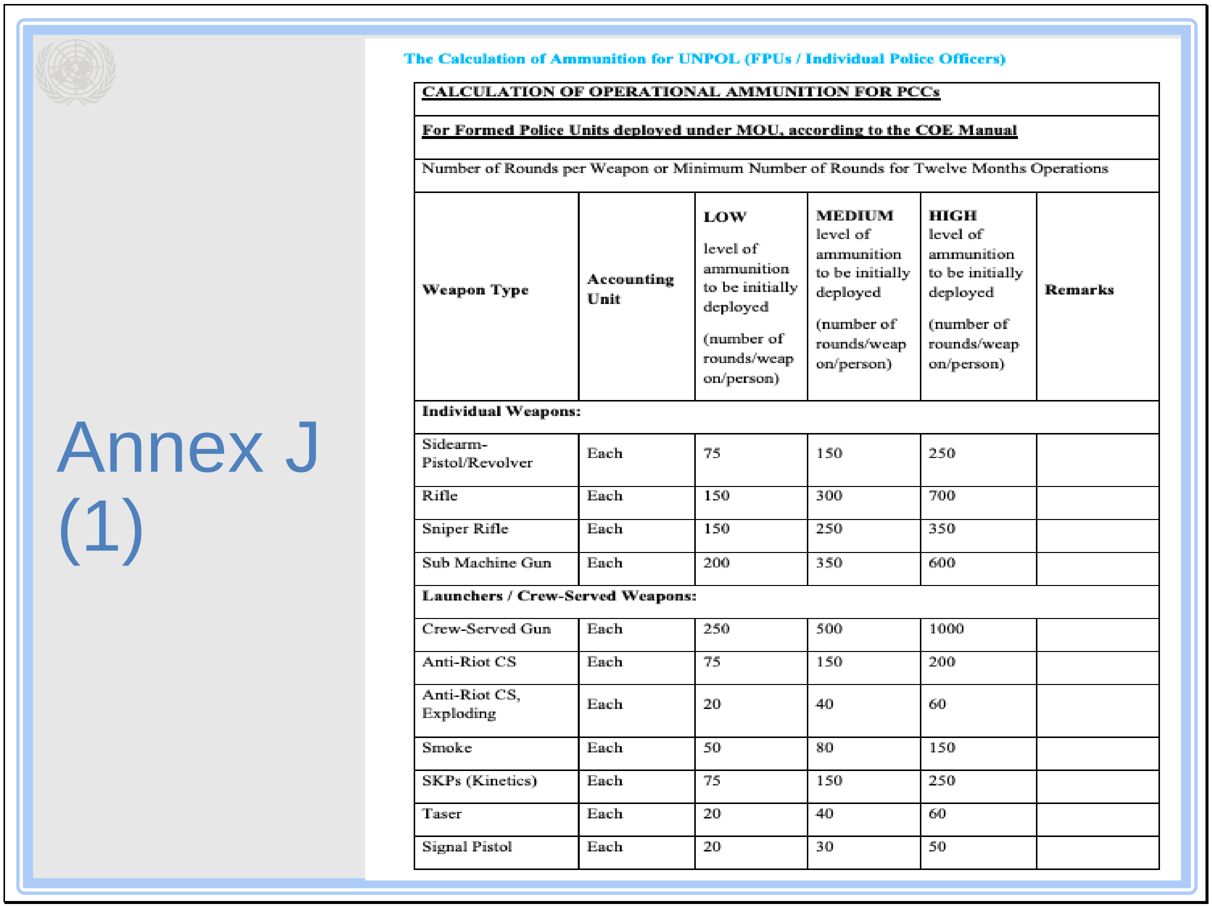
<u>participants activity</u>

Discuss why EOD equipment can require complex temporary storage conditions.

<u>What the instructor should cover (in addition to slide content)</u>

Focus on the different ammunition associated with EOD. If there is a doubt ask if other participants have experience of the ammunition.

Slide 22



# Annex J (1)

The Calculation of Ammunition for UNPOL (FPUs / Individual Police Officers)

**CALCULATION OF OPERATIONAL AMMUNITION FOR PCCs**

**For Formed Police Units deployed under MOU, according to the COE Manual**

Number of Rounds per Weapon or Minimum Number of Rounds for Twelve Months Operations

| **Weapon Type** | **Accounting Unit** | **LOW** level of ammunition to be initially deployed (number of rounds/weapon/person) | **MEDIUM** level of ammunition to be initially deployed (number of rounds/weapon/person) | **HIGH** level of ammunition to be initially deployed (number of rounds/weapon/person) | **Remarks** |
|---|---|---|---|---|---|
| **Individual Weapons:** | | | | | |
| Sidearm-Pistol/Revolver | Each | 75 | 150 | 250 | |
| Rifle | Each | 150 | 300 | 700 | |
| Sniper Rifle | Each | 150 | 250 | 350 | |
| Sub Machine Gun | Each | 200 | 350 | 600 | |
| **Launchers / Crew-Served Weapons:** | | | | | |
| Crew-Served Gun | Each | 250 | 500 | 1000 | |
| Anti-Riot CS | Each | 75 | 150 | 200 | |
| Anti-Riot CS, Exploding | Each | 20 | 40 | 60 | |
| Smoke | Each | 50 | 80 | 150 | |
| SKPs (Kinetics) | Each | 75 | 150 | 250 | |
| Taser | Each | 20 | 40 | 60 | |
| Signal Pistol | Each | 20 | 30 | 50 | |

**Main idea/objective for slide:**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

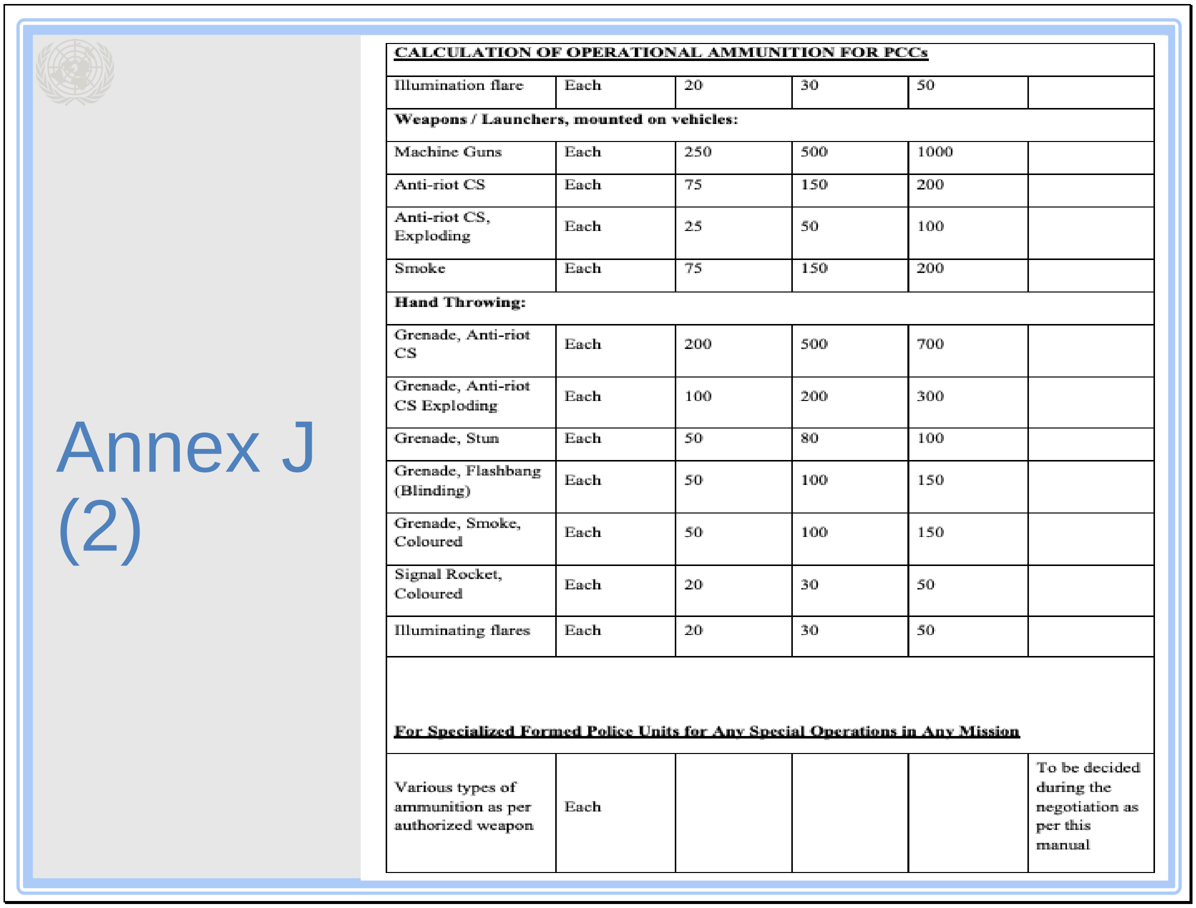
participants activity

Where Formed Police Units (FPU's) are based separate to the military, are there any special temporary storage considerations?

What the instructor should cover (in addition to slide content)

FPU ammunition is to be treated the same as any military unit.

Slide 23



Annex J (2)

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| **CALCULATION OF OPERATIONAL AMMUNITION FOR PCCs** |  |  |  |  |  |
| Illumination flare | Each | 20 | 30 | 50 |  |
| **Weapons / Launchers, mounted on vehicles:** |  |  |  |  |  |
| Machine Guns | Each | 250 | 500 | 1000 |  |
| Anti-riot CS | Each | 75 | 150 | 200 |  |
| Anti-riot CS, Exploding | Each | 25 | 50 | 100 |  |
| Smoke | Each | 75 | 150 | 200 |  |
| **Hand Throwing:** |  |  |  |  |  |
| Grenade, Anti-riot CS | Each | 200 | 500 | 700 |  |
| Grenade, Anti-riot CS Exploding | Each | 100 | 200 | 300 |  |
| Grenade, Stun | Each | 50 | 80 | 100 |  |
| Grenade, Flashbang (Blinding) | Each | 50 | 100 | 150 |  |
| Grenade, Smoke, Coloured | Each | 50 | 100 | 150 |  |
| Signal Rocket, Coloured | Each | 20 | 30 | 50 |  |
| Illuminating flares | Each | 20 | 30 | 50 |  |
| **For Specialized Formed Police Units for Any Special Operations in Any Mission** |  |  |  |  |  |
| Various types of ammunition as per authorized weapon | Each |  |  |  | To be decided during the negotiation as per this manual |

**Main idea/objective for slide:**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

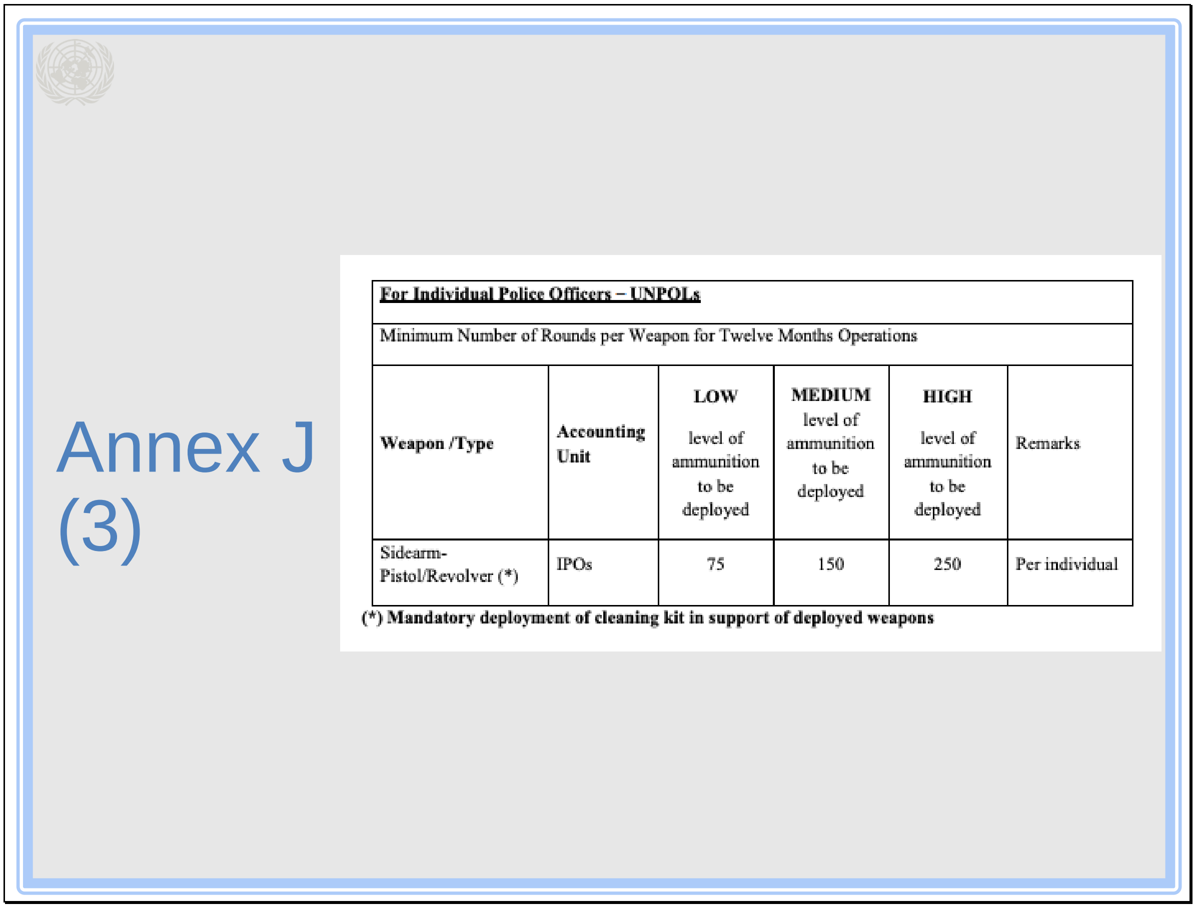
participants activity

Where Formed Police Units (FPU's) are based separate to the military, are there any special temporary storage considerations?

What the instructor should cover (in addition to slide content)

FPU ammunition is to be treated the same as any military unit.

Slide 24



## Annex J (3)

**For Individual Police Officers – UNPOLs**

Minimum Number of Rounds per Weapon for Twelve Months Operations

| **Weapon /Type** | **Accounting Unit** | **LOW** level of ammunition to be deployed | **MEDIUM** level of ammunition to be deployed | **HIGH** level of ammunition to be deployed | Remarks |
|---|---|---|---|---|---|
| Sidearm-Pistol/Revolver (*) | IPOs | 75 | 150 | 250 | Per individual |

**(*) Mandatory deployment of cleaning kit in support of deployed weapons**

**Main idea/objective for slide:**

- **Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

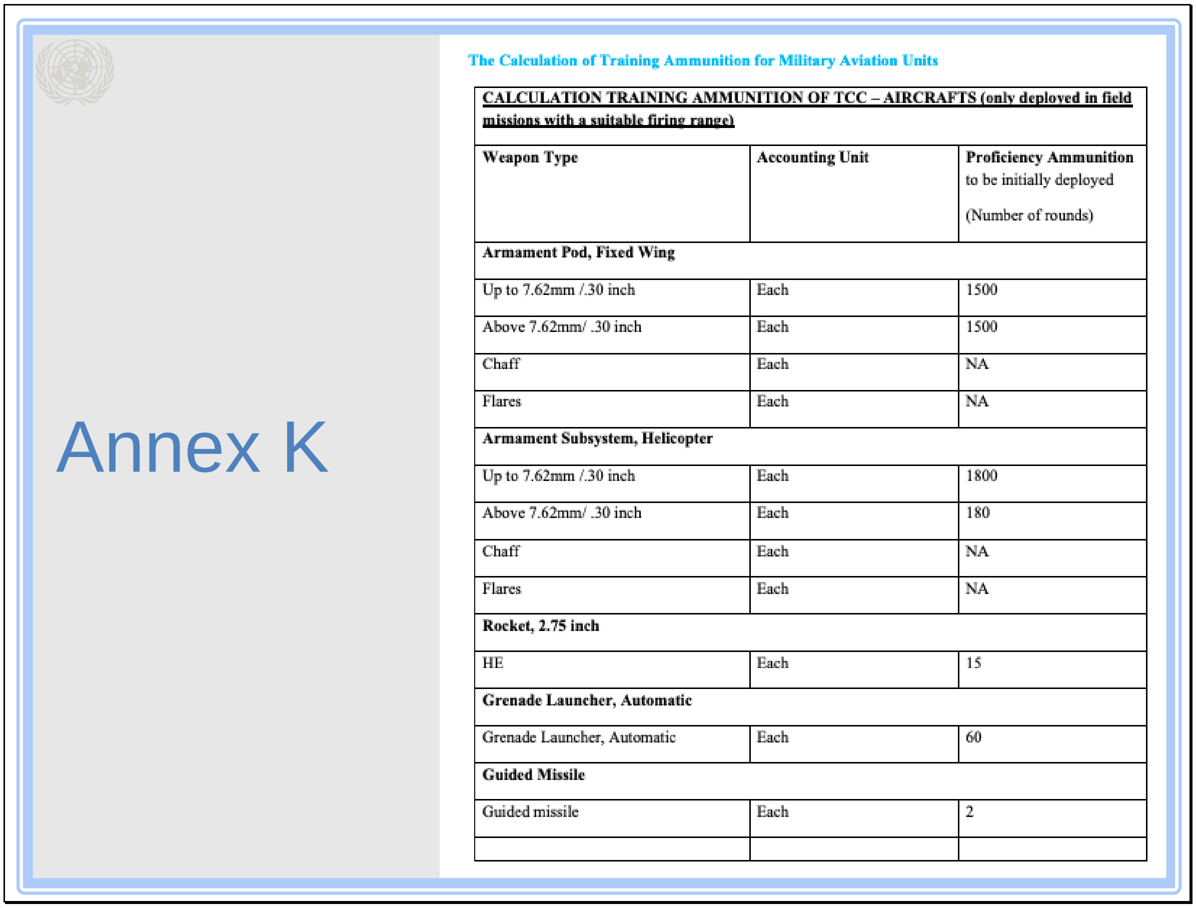
participants activity

Where UNPOLs are based separate to the military or FPUs, are there any special temporary storage considerations?

What the instructor should cover (in addition to slide content)

UNPOL ammunition is to be treated the same as any military or FPU.

Slide 25



Annex K

The Calculation of Training Ammunition for Military Aviation Units

**CALCULATION TRAINING AMMUNITION OF TCC – AIRCRAFTS (only deployed in field missions with a suitable firing range)**

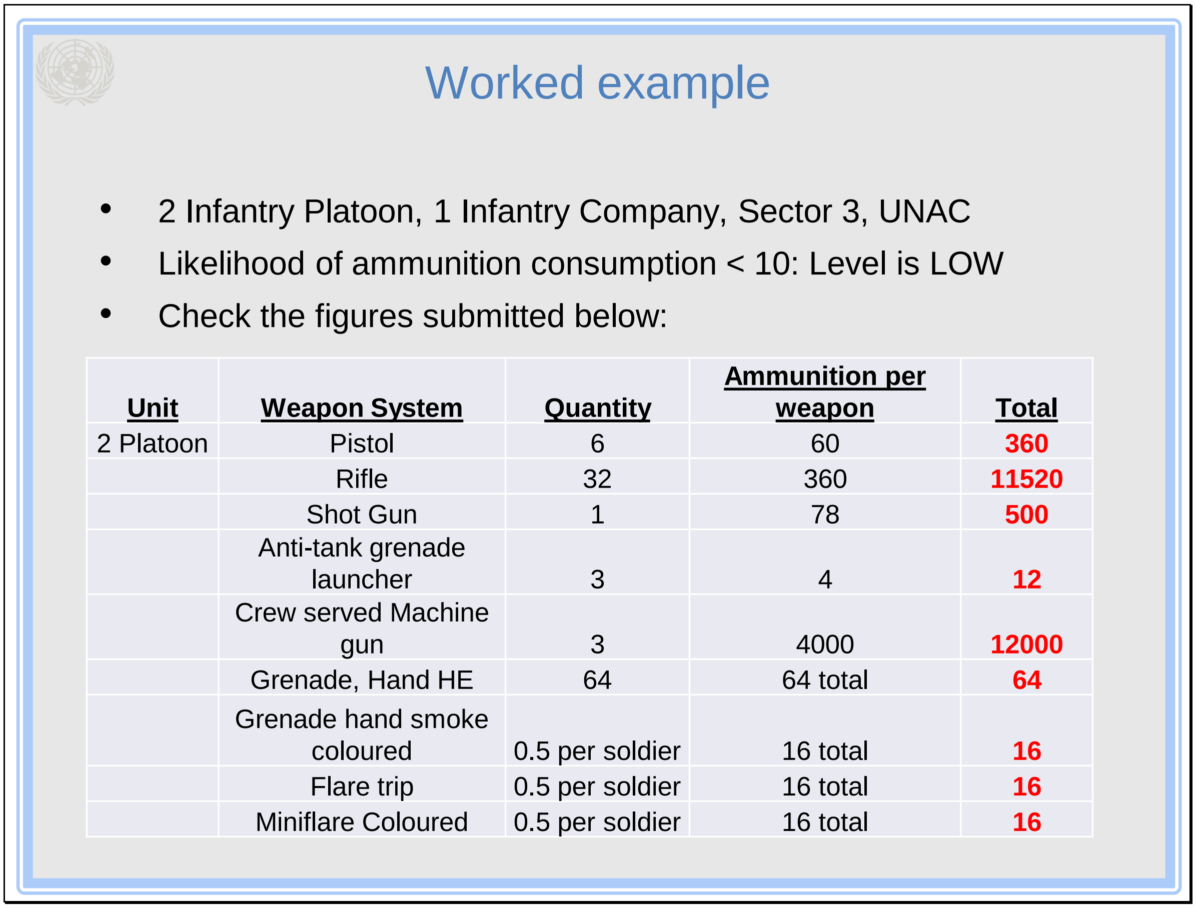
| **Weapon Type** | **Accounting Unit** | **Proficiency Ammunition** to be initially deployed<br>(Number of rounds) |
|---|---|---|
| **Armament Pod, Fixed Wing** | | |
| Up to 7.62mm /.30 inch | Each | 1500 |
| Above 7.62mm/ .30 inch | Each | 1500 |
| Chaff | Each | NA |
| Flares | Each | NA |
| **Armament Subsystem, Helicopter** | | |
| Up to 7.62mm /.30 inch | Each | 1800 |
| Above 7.62mm/ .30 inch | Each | 180 |
| Chaff | Each | NA |
| Flares | Each | NA |
| **Rocket, 2.75 inch** | | |
| HE | Each | 15 |
| **Grenade Launcher, Automatic** | | |
| Grenade Launcher, Automatic | Each | 60 |
| **Guided Missile** | | |
| Guided missile | Each | 2 |
| | | |

**Main idea/objective for slide:**
**Introduce the participants to the relevant Templates (Annex E-K, UN Manual of Ammunition Management).**

participants activity
Why is the ammunition linked to training only?

What the instructor should cover (in addition to slide content)
Focus on the fact that this ammunition is only deployed where the mission has access to a suitable military aviation firing range.

Slide 26



## Worked example

- 2 Infantry Platoon, 1 Infantry Company, Sector 3, UNAC
- Likelihood of ammunition consumption < 10: Level is LOW
- Check the figures submitted below:

| **Unit** | **Weapon System** | **Quantity** | **Ammunition per weapon** | **Total** |
|---|---|---|---|---|
| 2 Platoon | Pistol | 6 | 60 | **360** |
| | Rifle | 32 | 360 | **11520** |
| | Shot Gun | 1 | 78 | **500** |
| | Anti-tank grenade launcher | 3 | 4 | **12** |
| | Crew served Machine gun | 3 | 4000 | **12000** |
| | Grenade, Hand HE | 64 | 64 total | **64** |
| | Grenade hand smoke coloured | 0.5 per soldier | 16 total | **16** |
| | Flare trip | 0.5 per soldier | 16 total | **16** |
| | Miniflare Coloured | 0.5 per soldier | 16 total | **16** |

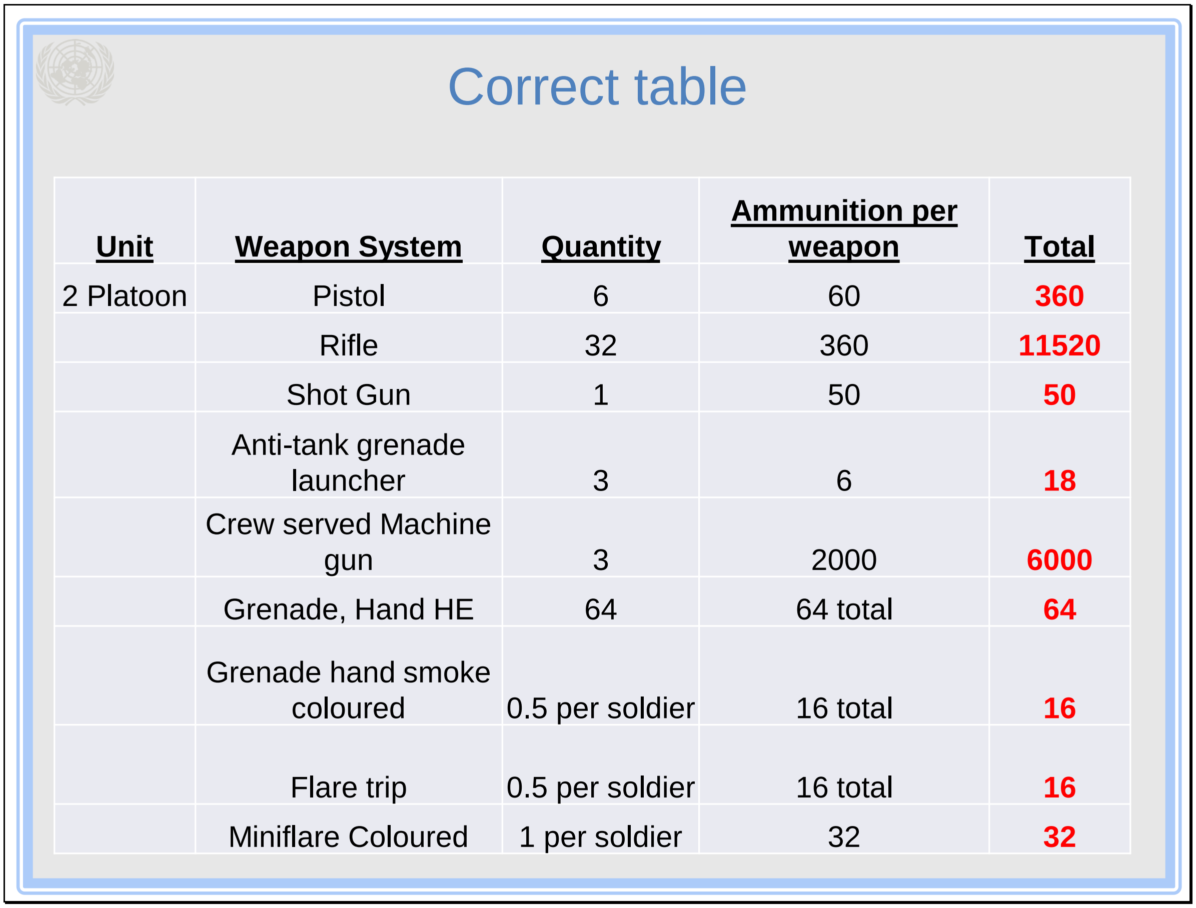
**Main idea/objective for slide:**
**Using an example, calculate the levels of ammunition required for a defined mission and use the templates to demonstrate to the participants how to complete it correctly.**

participants activity
Ask regular questions of the class to ensure uptake and engagement. Ask the participants to check these figures against the annexes just discussed. Tip: There are mistakes in the table.

What the instructor should cover (in addition to slide content)

Correct table is on next page

Slide 27



## Correct table

| **Unit** | **Weapon System** | **Quantity** | **Ammunition per weapon** | **Total** |
|---|---|---|---|---|
| 2 Platoon | Pistol | 6 | 60 | **360** |
| | Rifle | 32 | 360 | **11520** |
| | Shot Gun | 1 | 50 | **50** |
| | Anti-tank grenade launcher | 3 | 6 | **18** |
| | Crew served Machine gun | 3 | 2000 | **6000** |
| | Grenade, Hand HE | 64 | 64 total | **64** |
| | Grenade hand smoke coloured | 0.5 per soldier | 16 total | **16** |
| | Flare trip | 0.5 per soldier | 16 total | **16** |
| | Miniflare Coloured | 1 per soldier | 32 | **32** |

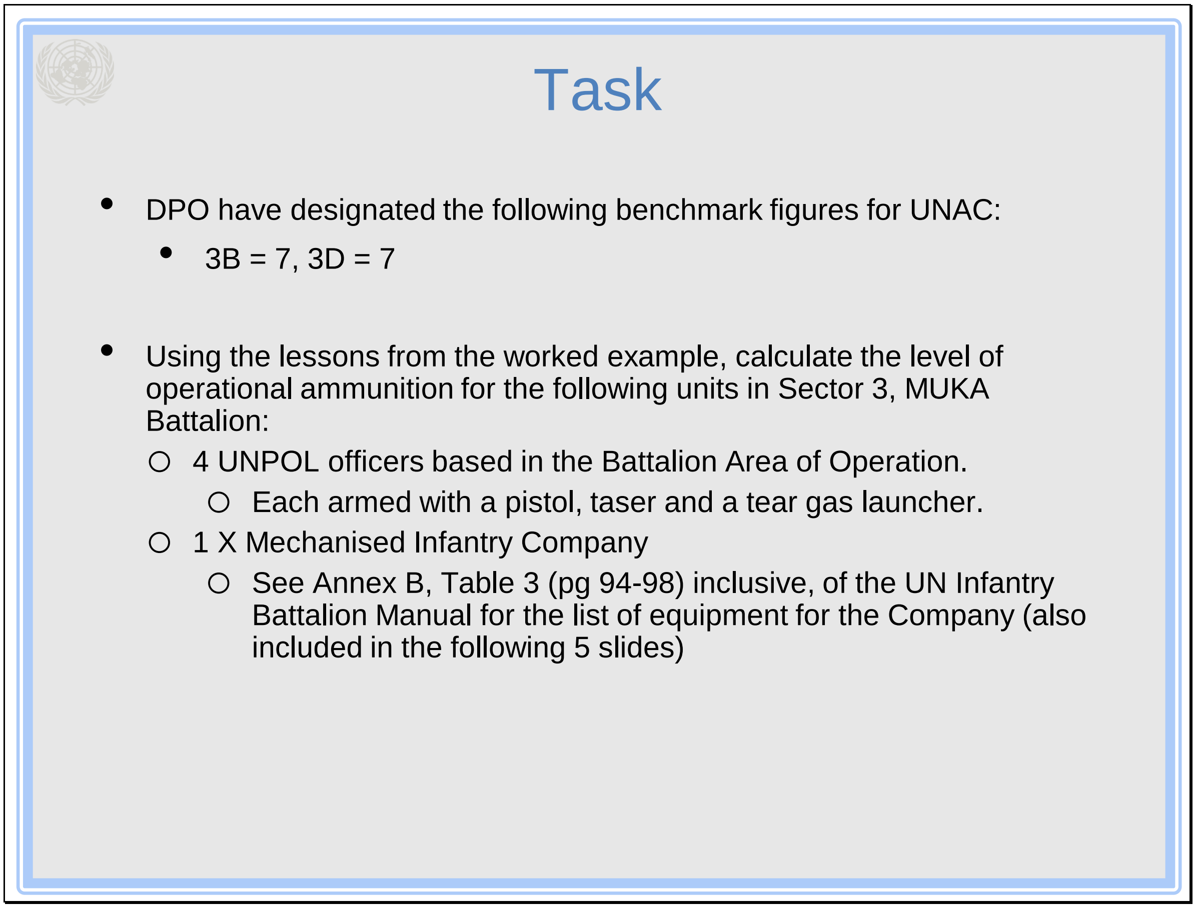
Slide 28

Participants
Exercise

**Phase 2. Development (**Time allocation - 60 min**)**

Stage 3 (Time allocation 20 mins) – participants Exercise

Slide 29



## Task

- DPO have designated the following benchmark figures for UNAC:
    - 3B = 7, 3D = 7
- Using the lessons from the worked example, calculate the level of operational ammunition for the following units in Sector 3, MUKA Battalion:
    - ○ 4 UNPOL officers based in the Battalion Area of Operation.
        - ○ Each armed with a pistol, taser and a tear gas launcher.
    - ○ 1 X Mechanised Infantry Company
        - ○ See Annex B, Table 3 (pg 94-98) inclusive, of the UN Infantry Battalion Manual for the list of equipment for the Company (also included in the following 5 slides)

**<u>Main idea/objective for slide:</u>**
**participants use templates to perform calculation**

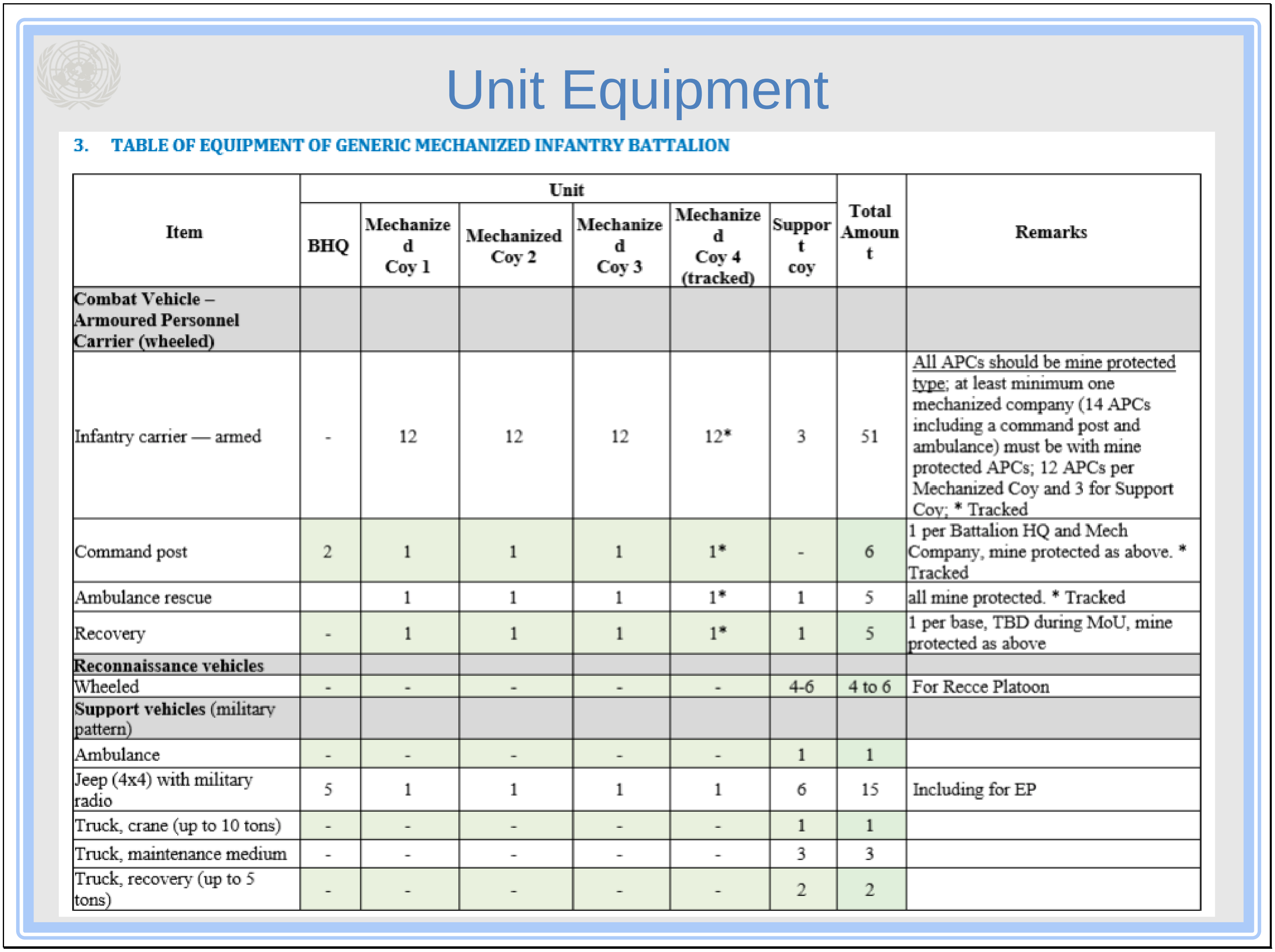
<u>participants activity</u>

- Using the calculation formula, and completing the relevant templates, have the participants determine the levels of operational ammunition required.
- Instructors are to move around the class and help participants where required.
- Teamwork is permitted.
- Use the following slides 30 – 37 as well as slides 22-24 to provide the participants with the data needed to carry out the calculations. E.g. participants need to assess from slide 29 that there are 4 UNPOL armed as stated as well as 1 mechanised battalion.

- The maps are used for situational awareness of the scenario rather than for any calculations. It also helps to familiarise participants with the CARANA scenario as this will appear throughout the course.

What the instructor should cover (in addition to slide content)

- When complete, work through the answers with the class and field questions.



# Unit Equipment

**3. TABLE OF EQUIPMENT OF GENERIC MECHANIZED INFANTRY BATTALION**

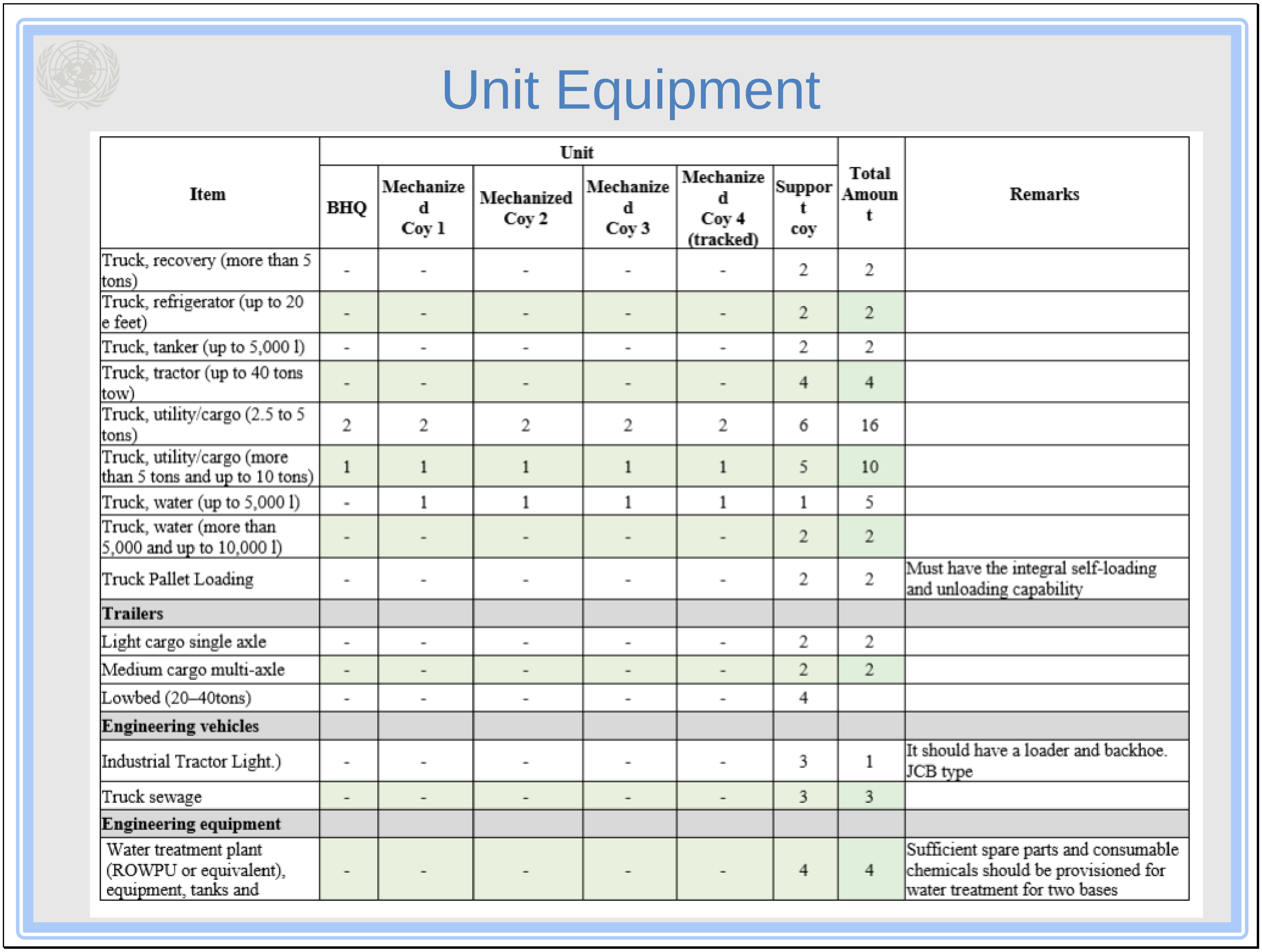
| Item | Unit | | | | | | Total Amount | Remarks |
|---|---|---|---|---|---|---|---|---|
| | BHQ | Mechanized Coy 1 | Mechanized Coy 2 | Mechanized Coy 3 | Mechanized Coy 4 (tracked) | Support coy | | |
| **Combat Vehicle – Armoured Personnel Carrier (wheeled)** | | | | | | | | |
| Infantry carrier — armed | - | 12 | 12 | 12 | 12* | 3 | 51 | All APCs should be mine protected type; at least minimum one mechanized company (14 APCs including a command post and ambulance) must be with mine protected APCs; 12 APCs per Mechanized Coy and 3 for Support Coy; * Tracked |
| Command post | 2 | 1 | 1 | 1 | 1* | - | 6 | 1 per Battalion HQ and Mech Company, mine protected as above. * Tracked |
| Ambulance rescue | | 1 | 1 | 1 | 1* | 1 | 5 | all mine protected. * Tracked |
| Recovery | - | 1 | 1 | 1 | 1* | 1 | 5 | 1 per base, TBD during MoU, mine protected as above |
| **Reconnaissance vehicles** | | | | | | | | |
| Wheeled | - | - | - | - | - | 4-6 | 4 to 6 | For Recce Platoon |
| **Support vehicles** (military pattern) | | | | | | | | |
| Ambulance | - | - | - | - | - | 1 | 1 | |
| Jeep (4x4) with military radio | 5 | 1 | 1 | 1 | 1 | 6 | 15 | Including for EP |
| Truck, crane (up to 10 tons) | - | - | - | - | - | 1 | 1 | |
| Truck, maintenance medium | - | - | - | - | - | 3 | 3 | |
| Truck, recovery (up to 5 tons) | - | - | - | - | - | 2 | 2 | |

**Main idea/objective for slide:**

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

What the instructor should cover (in addition to slide content)

The disposition of friendly forces across the mission.



# Unit Equipment

| Item | Unit | | | | | | Total Amount | Remarks |
|---|---|---|---|---|---|---|---|---|
| | BHQ | Mechanized Coy 1 | Mechanized Coy 2 | Mechanized Coy 3 | Mechanized Coy 4 (tracked) | Support coy | | |
| Truck, recovery (more than 5 tons) | - | - | - | - | - | 2 | 2 | |
| Truck, refrigerator (up to 20 e feet) | - | - | - | - | - | 2 | 2 | |
| Truck, tanker (up to 5,000 l) | - | - | - | - | - | 2 | 2 | |
| Truck, tractor (up to 40 tons tow) | - | - | - | - | - | 4 | 4 | |
| Truck, utility/cargo (2.5 to 5 tons) | 2 | 2 | 2 | 2 | 2 | 6 | 16 | |
| Truck, utility/cargo (more than 5 tons and up to 10 tons) | 1 | 1 | 1 | 1 | 1 | 5 | 10 | |
| Truck, water (up to 5,000 l) | - | 1 | 1 | 1 | 1 | 1 | 5 | |
| Truck, water (more than 5,000 and up to 10,000 l) | - | - | - | - | - | 2 | 2 | |
| Truck Pallet Loading | - | - | - | - | - | 2 | 2 | Must have the integral self-loading and unloading capability |
| **Trailers** | | | | | | | | |
| Light cargo single axle | - | - | - | - | - | 2 | 2 | |
| Medium cargo multi-axle | - | - | - | - | - | 2 | 2 | |
| Lowbed (20–40tons) | - | - | - | - | - | 4 | | |
| **Engineering vehicles** | | | | | | | | |
| Industrial Tractor Light.) | - | - | - | - | - | 3 | 1 | It should have a loader and backhoe. JCB type |
| Truck sewage | - | - | - | - | - | 3 | 3 | |
| **Engineering equipment** | | | | | | | | |
| Water treatment plant (ROWPU or equivalent), equipment, tanks and | - | - | - | - | - | 4 | 4 | Sufficient spare parts and consumable chemicals should be provisioned for water treatment for two bases |

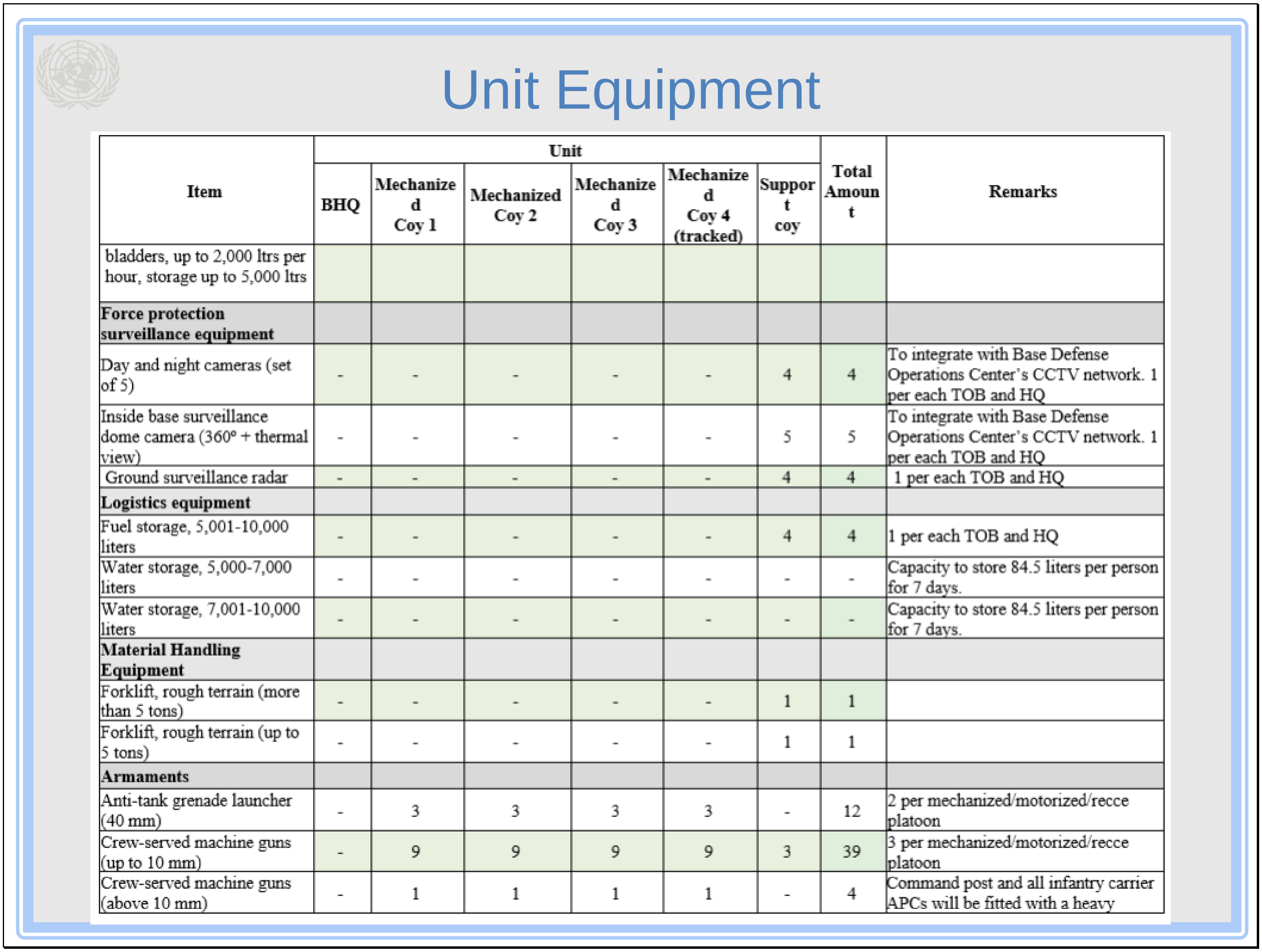
<u>**Main idea/objective for slide:**</u>

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

What the instructor should cover (in addition to slide content)

The disposition of friendly forces across the mission.

Slide 32



# Unit Equipment

| Item | Unit | | | | | | Total Amount | Remarks |
|---|---|---|---|---|---|---|---|---|
| | BHQ | Mechanized Coy 1 | Mechanized Coy 2 | Mechanized Coy 3 | Mechanized Coy 4 (tracked) | Support coy | | |
| bladders, up to 2,000 ltrs per hour, storage up to 5,000 ltrs | | | | | | | | |
| **Force protection surveillance equipment** | | | | | | | | |
| Day and night cameras (set of 5) | - | - | - | - | - | 4 | 4 | To integrate with Base Defense Operations Center's CCTV network. 1 per each TOB and HQ |
| Inside base surveillance dome camera (360° + thermal view) | - | - | - | - | - | 5 | 5 | To integrate with Base Defense Operations Center's CCTV network. 1 per each TOB and HQ |
| Ground surveillance radar | - | - | - | - | - | 4 | 4 | 1 per each TOB and HQ |
| **Logistics equipment** | | | | | | | | |
| Fuel storage, 5,001-10,000 liters | - | - | - | - | - | 4 | 4 | 1 per each TOB and HQ |
| Water storage, 5,000-7,000 liters | - | - | - | - | - | - | - | Capacity to store 84.5 liters per person for 7 days. |
| Water storage, 7,001-10,000 liters | - | - | - | - | - | - | - | Capacity to store 84.5 liters per person for 7 days. |
| **Material Handling Equipment** | | | | | | | | |
| Forklift, rough terrain (more than 5 tons) | - | - | - | - | - | 1 | 1 | |
| Forklift, rough terrain (up to 5 tons) | - | - | - | - | - | 1 | 1 | |
| **Armaments** | | | | | | | | |
| Anti-tank grenade launcher (40 mm) | - | 3 | 3 | 3 | 3 | - | 12 | 2 per mechanized/motorized/recce platoon |
| Crew-served machine guns (up to 10 mm) | - | 9 | 9 | 9 | 9 | 3 | 39 | 3 per mechanized/motorized/recce platoon |
| Crew-served machine guns (above 10 mm) | - | 1 | 1 | 1 | 1 | - | 4 | Command post and all infantry carrier APCs will be fitted with a heavy |

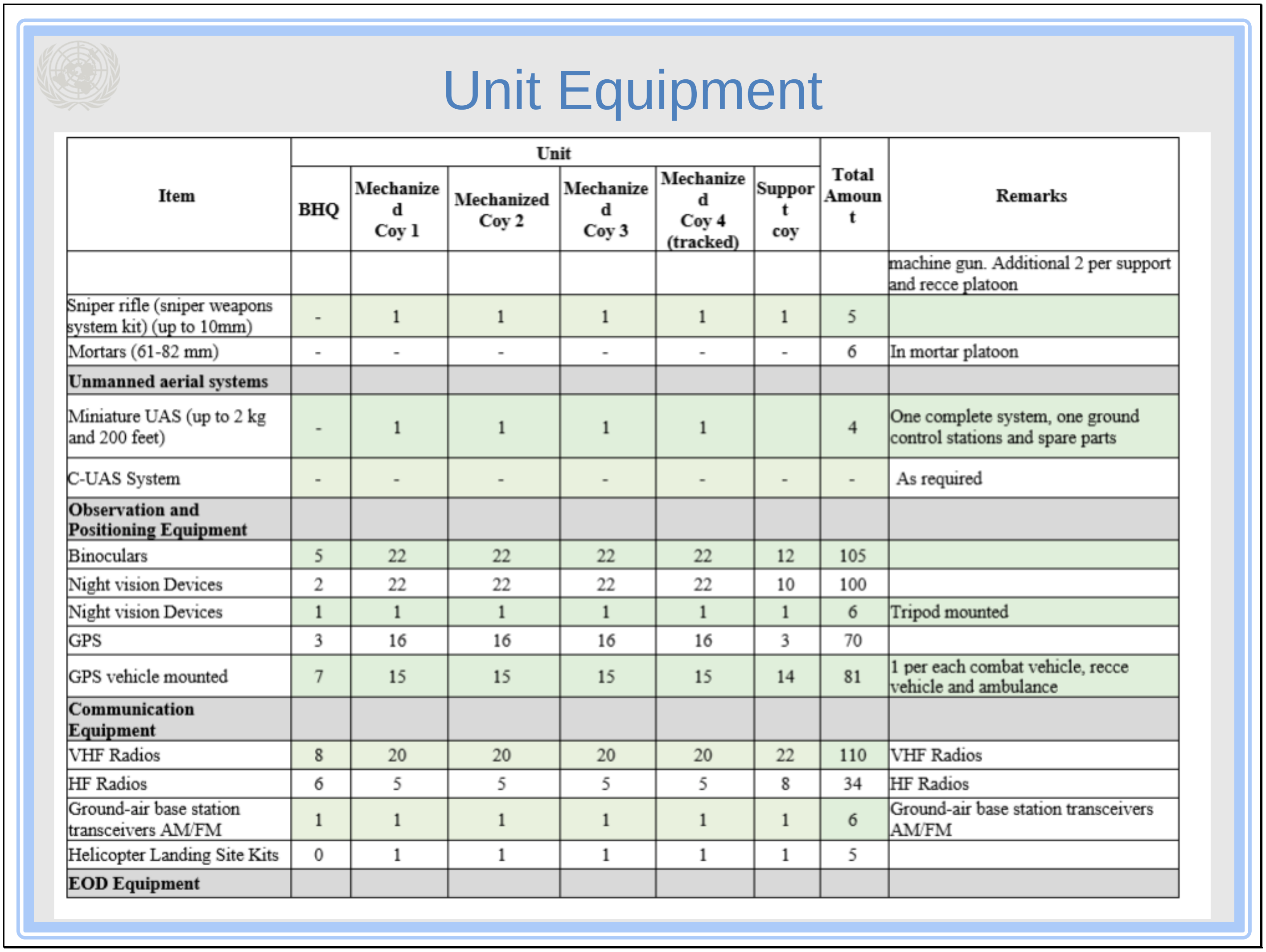
**Main idea/objective for slide:**

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

What the instructor should cover (in addition to slide content)

The disposition of friendly forces across the mission.

Slide 33



# Unit Equipment

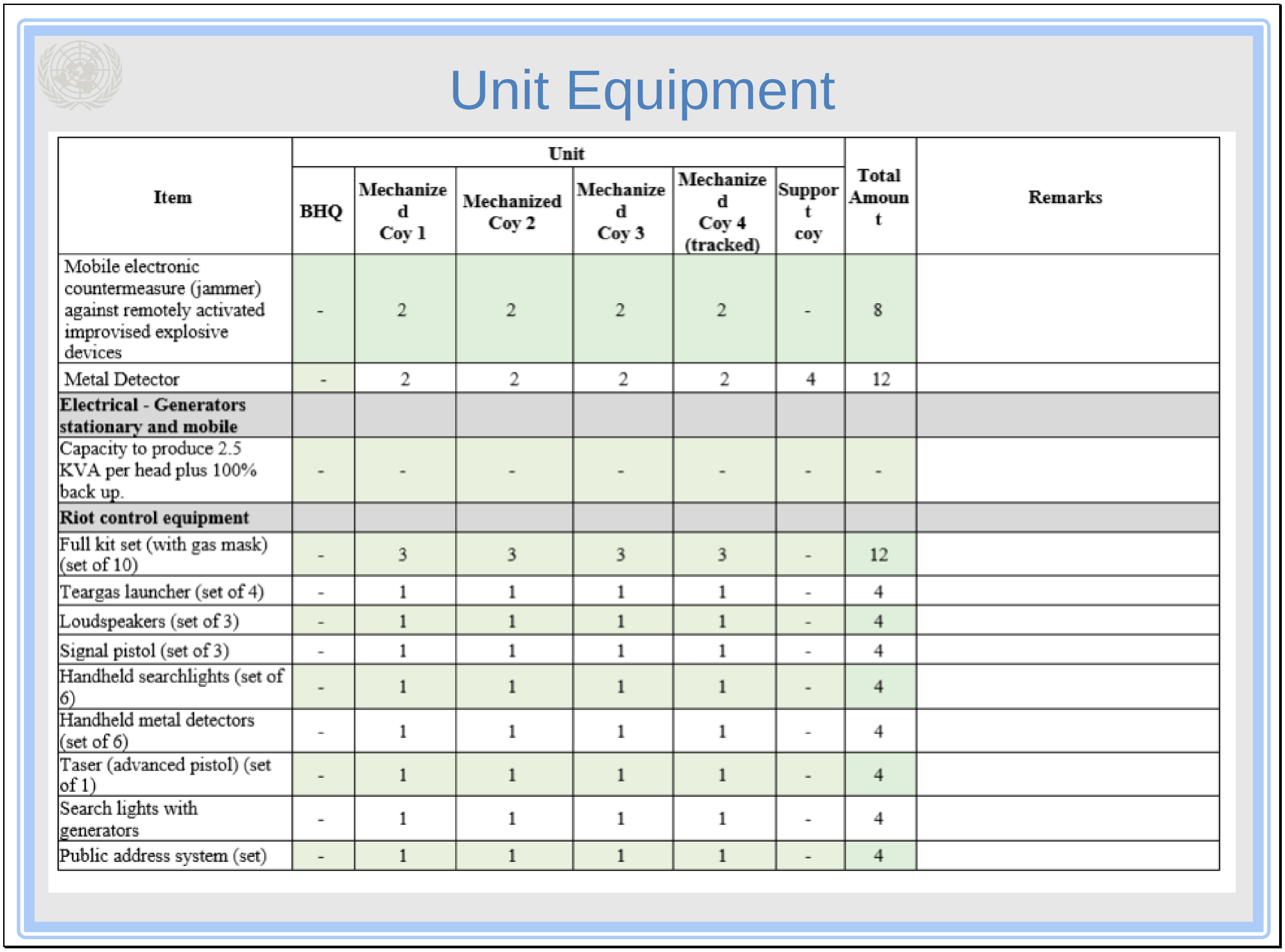
| Item | Unit | | | | | | Total Amount | Remarks |
|---|---|---|---|---|---|---|---|---|
| | BHQ | Mechanized Coy 1 | Mechanized Coy 2 | Mechanized Coy 3 | Mechanized Coy 4 (tracked) | Support coy | | |
| | | | | | | | | machine gun. Additional 2 per support and recce platoon |
| Sniper rifle (sniper weapons system kit) (up to 10mm) | - | 1 | 1 | 1 | 1 | 1 | 5 | |
| Mortars (61-82 mm) | - | - | - | - | - | - | 6 | In mortar platoon |
| **Unmanned aerial systems** | | | | | | | | |
| Miniature UAS (up to 2 kg and 200 feet) | - | 1 | 1 | 1 | 1 | | 4 | One complete system, one ground control stations and spare parts |
| C-UAS System | - | - | - | - | - | - | - | As required |
| **Observation and Positioning Equipment** | | | | | | | | |
| Binoculars | 5 | 22 | 22 | 22 | 22 | 12 | 105 | |
| Night vision Devices | 2 | 22 | 22 | 22 | 22 | 10 | 100 | |
| Night vision Devices | 1 | 1 | 1 | 1 | 1 | 1 | 6 | Tripod mounted |
| GPS | 3 | 16 | 16 | 16 | 16 | 3 | 70 | |
| GPS vehicle mounted | 7 | 15 | 15 | 15 | 15 | 14 | 81 | 1 per each combat vehicle, recce vehicle and ambulance |
| **Communication Equipment** | | | | | | | | |
| VHF Radios | 8 | 20 | 20 | 20 | 20 | 22 | 110 | VHF Radios |
| HF Radios | 6 | 5 | 5 | 5 | 5 | 8 | 34 | HF Radios |
| Ground-air base station transceivers AM/FM | 1 | 1 | 1 | 1 | 1 | 1 | 6 | Ground-air base station transceivers AM/FM |
| Helicopter Landing Site Kits | 0 | 1 | 1 | 1 | 1 | 1 | 5 | |
| **EOD Equipment** | | | | | | | | |

**<u>Main idea/objective for slide:</u>**

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

<u>What the instructor should cover (in addition to slide content)</u>

The disposition of friendly forces across the mission.



## Unit Equipment

| Item | Unit | | | | | | Total Amount | Remarks |
|---|---|---|---|---|---|---|---|---|
| | BHQ | Mechanized Coy 1 | Mechanized Coy 2 | Mechanized Coy 3 | Mechanized Coy 4 (tracked) | Support coy | | |
| Mobile electronic countermeasure (jammer) against remotely activated improvised explosive devices | - | 2 | 2 | 2 | 2 | - | 8 | |
| Metal Detector | - | 2 | 2 | 2 | 2 | 4 | 12 | |
| **Electrical - Generators stationary and mobile** | | | | | | | | |
| Capacity to produce 2.5 KVA per head plus 100% back up. | - | - | - | - | - | - | - | |
| **Riot control equipment** | | | | | | | | |
| Full kit set (with gas mask) (set of 10) | - | 3 | 3 | 3 | 3 | - | 12 | |
| Teargas launcher (set of 4) | - | 1 | 1 | 1 | 1 | - | 4 | |
| Loudspeakers (set of 3) | - | 1 | 1 | 1 | 1 | - | 4 | |
| Signal pistol (set of 3) | - | 1 | 1 | 1 | 1 | - | 4 | |
| Handheld searchlights (set of 6) | - | 1 | 1 | 1 | 1 | - | 4 | |
| Handheld metal detectors (set of 6) | - | 1 | 1 | 1 | 1 | - | 4 | |
| Taser (advanced pistol) (set of 1) | - | 1 | 1 | 1 | 1 | - | 4 | |
| Search lights with generators | - | 1 | 1 | 1 | 1 | - | 4 | |
| Public address system (set) | - | 1 | 1 | 1 | 1 | - | 4 | |

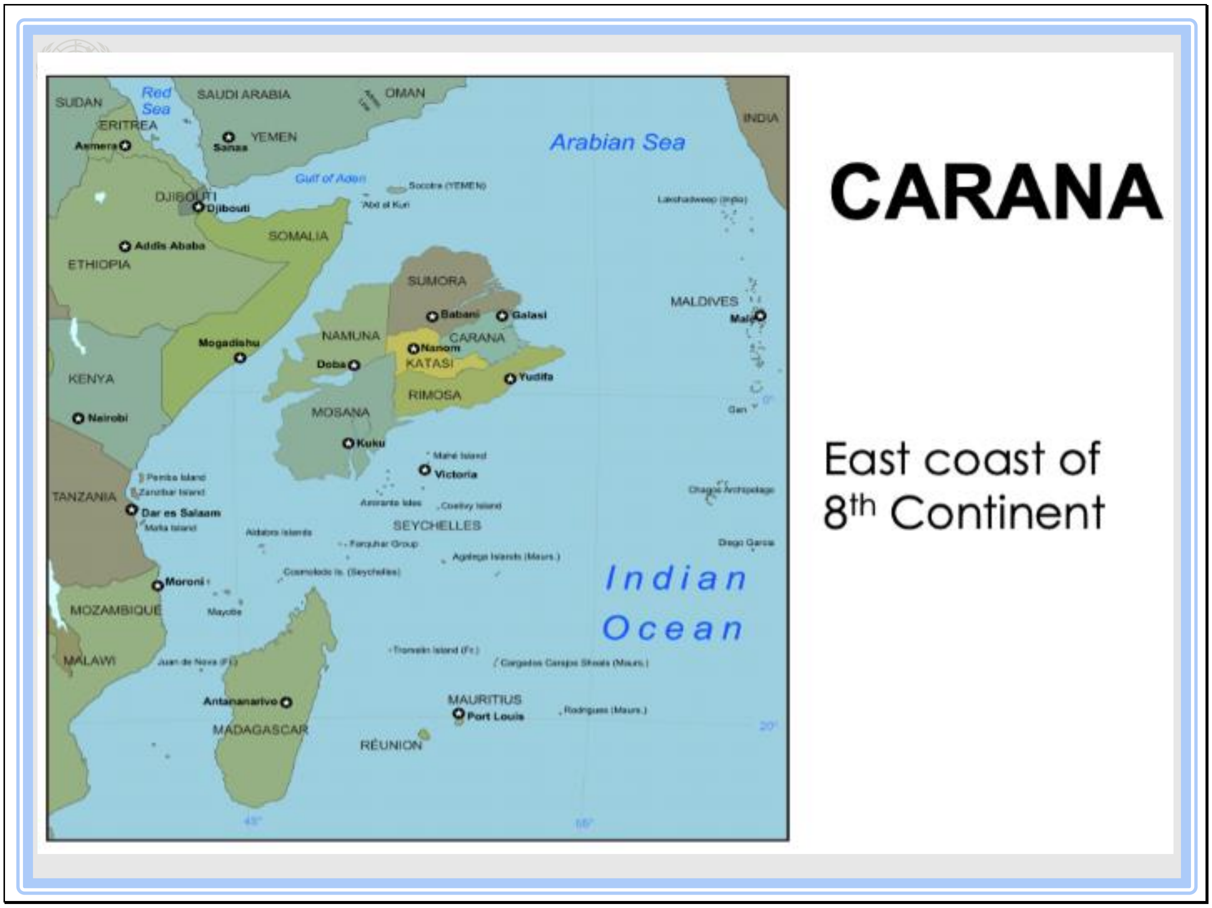
**Main idea/objective for slide:**

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

What the instructor should cover (in addition to slide content)

The disposition of friendly forces across the mission.

Slide 35



CARANA

East coast of 8th Continent

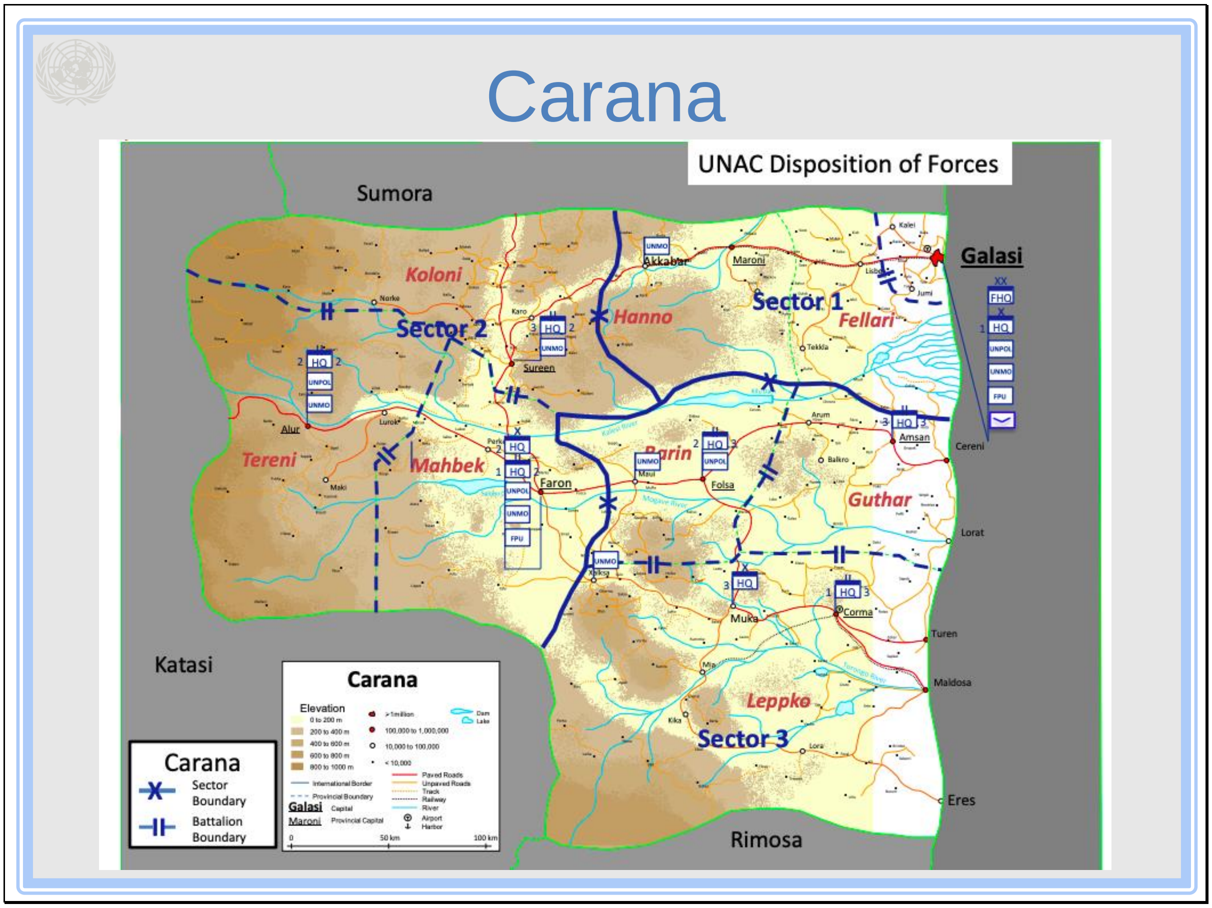
**<u>Main idea/objective for slide:</u>**

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

<u>What the instructor should cover (in addition to slide content)</u>

The location of CARANA and the fact that the mission is called UNAC. The instructor can hand out CARANA scenario documents detailing the mandate and mission structure. One booklet per group will suffice.

Slide 36



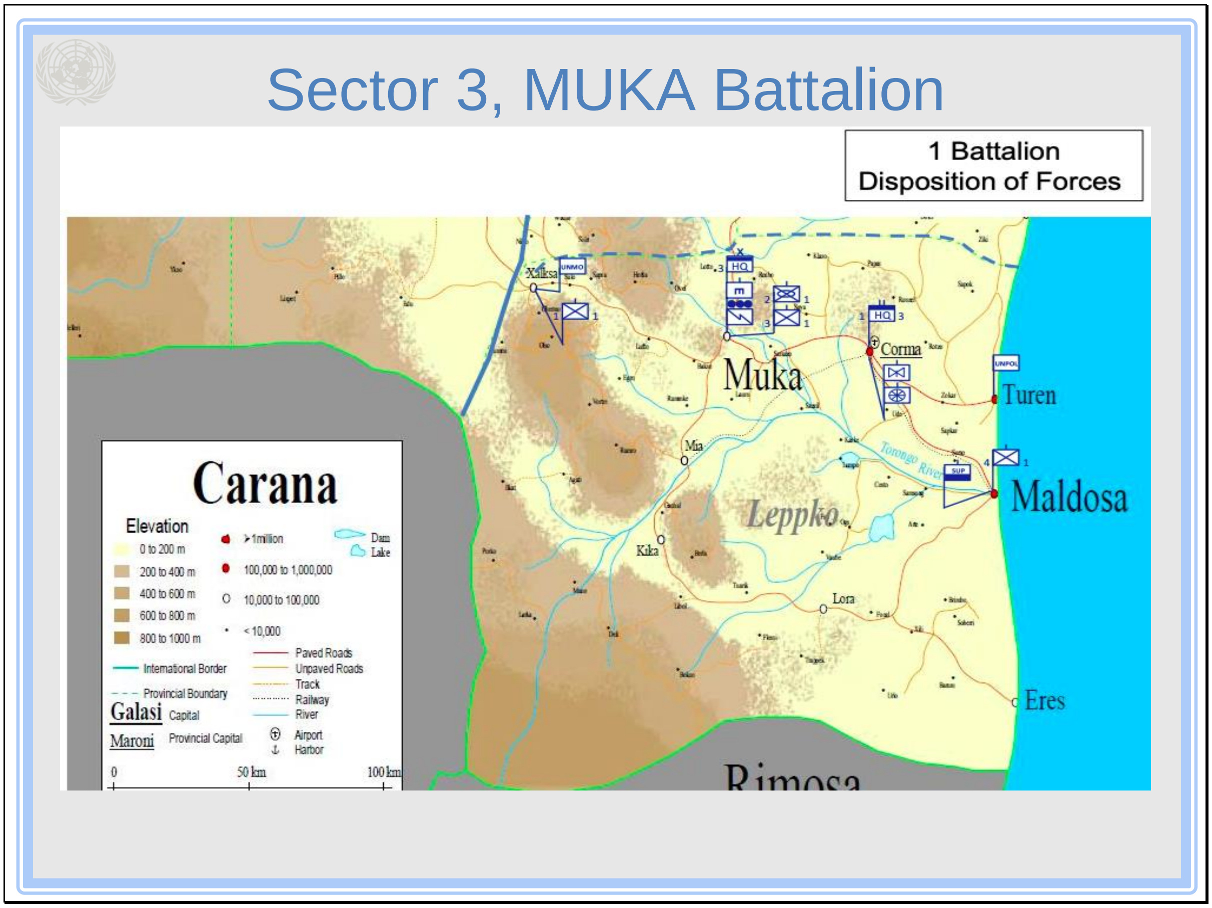
## Carana

**Main idea/objective for slide:**

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

What the instructor should cover (in addition to slide content)

The disposition of friendly forces across the mission.



Sector 3, MUKA Battalion

1 Battalion Disposition of Forces

**<u>Main idea/objective for slide:</u>**

**Using the CARANA scenario, provide the participants with a basic situation with a range of relevant factors pertaining to the calculation of the levels of operational ammunition for this mission.**

<u>What the instructor should cover (in addition to slide content)</u>

The instructor should highlight the disposition of the units in Sector 3.

Ask the participants about ammunition siting concerns.

The purpose of this is to raise the participants interest in this topic which will be discussed in subsequent lessons. participants will have an opportunity to develop a siting plan during the STX and CPX.

Slide 38

# Lesson overview

- Recall and discuss the mission specific factors and UN forms used to determine contingent ammunition levels
- Discuss mission specific factors of operational ammunition
- Apply the factors and forms to determine the type and level of operational ammunition allocation for a specific mission
- Practice the calculation of levels of operational ammunition during operations

## Summary

This lesson focused on equipping participants with the knowledge and skills to accurately determine contingent ammunition levels for specific missions by recalling, defining, describing, discussing, and applying key factors and UN forms. The key learning points included:

- Review and remember the critical factors and forms necessary for assessing contingent ammunition levels.
- Identify and define the unique factors specific to each mission that influence ammunition requirements.
- Provide a detailed description of the UN forms that are essential for calculating ammunition needs.
- Engage in discussions about the various forms, their purposes, and how they should be used in different contexts.
- Explore the specific factors related to operational ammunition that are unique to each mission and their implications.
- Use the identified factors and forms to assess and allocate the appropriate type and level of operational ammunition for a given mission.
- Engage in practical exercises to calculate the required levels of operational ammunition during various operational scenarios.

Slide 39

Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Net Explosive Quantity Calculation

**Main idea/objective for slide:**

Look ahead to the next lesson of the course:

Net Explosive Quantity Calculation

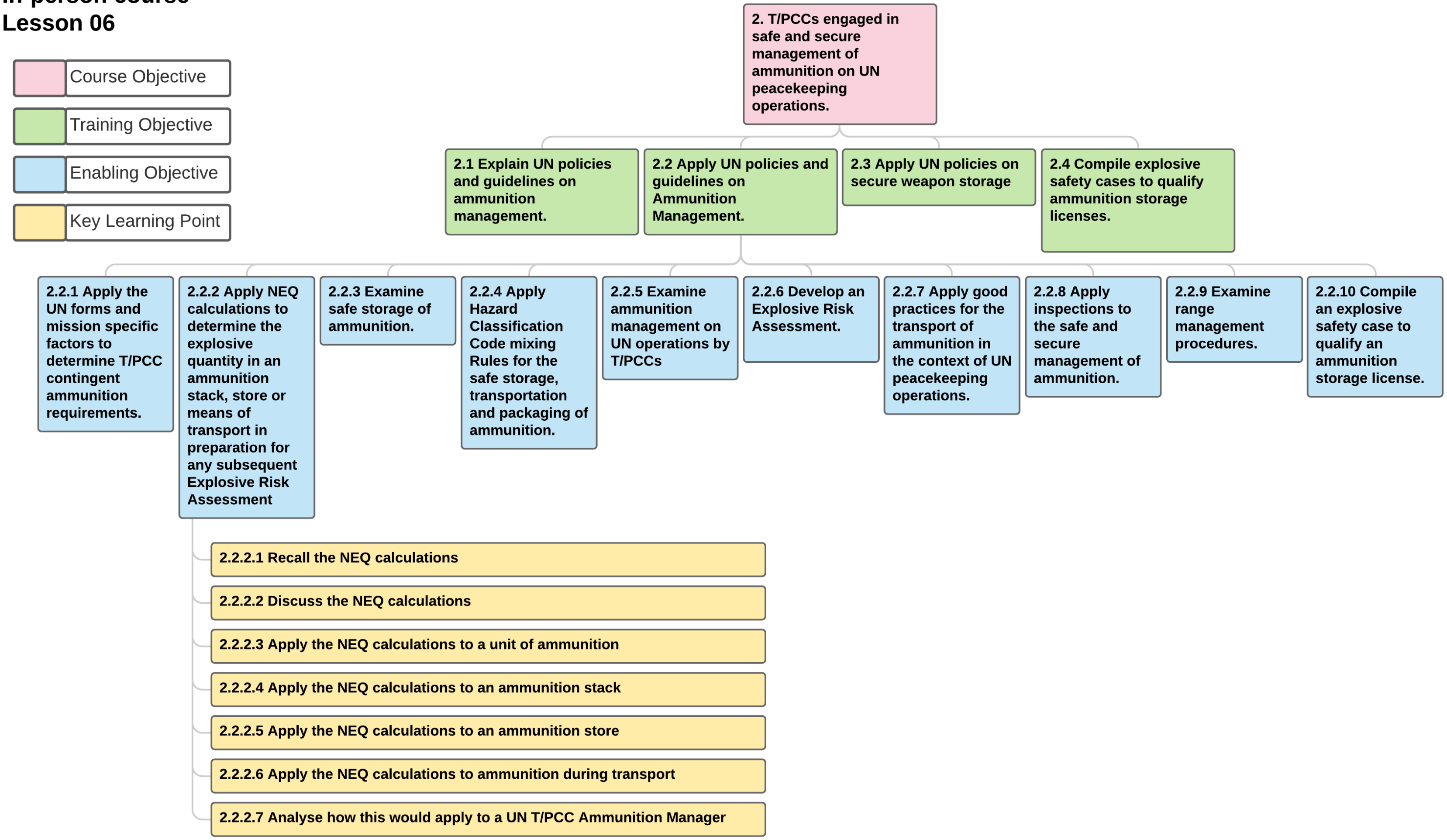
# Lesson 2.2

## Lesson 2.2: NEQ Calculation

### Weapons and Ammunition Management in UN Peace Operations

**In-person course**
**Lesson 06**

- 🟥 Course Objective
- 🟩 Training Objective
- 🟦 Enabling Objective
- 🟨 Key Learning Point



- **2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.**
  - **2.1 Explain UN policies and guidelines on ammunition management.**
  - **2.2 Apply UN policies and guidelines on Ammunition Management.**
    - **2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.**
    - **2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment**
      - **2.2.2.1 Recall the NEQ calculations**
      - **2.2.2.2 Discuss the NEQ calculations**
      - **2.2.2.3 Apply the NEQ calculations to a unit of ammunition**
      - **2.2.2.4 Apply the NEQ calculations to an ammunition stack**
      - **2.2.2.5 Apply the NEQ calculations to an ammunition store**
      - **2.2.2.6 Apply the NEQ calculations to ammunition during transport**
      - **2.2.2.7 Analyse how this would apply to a UN T/PCC Ammunition Manager**
    - **2.2.3 Examine safe storage of ammunition.**
    - **2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.**
    - **2.2.5 Examine ammunition management on UN operations by T/PCCs**
    - **2.2.6 Develop an Explosive Risk Assessment.**
    - **2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.**
    - **2.2.8 Apply inspections to the safe and secure management of ammunition.**
    - **2.2.9 Examine range management procedures.**
    - **2.2.10 Compile an explosive safety case to qualify an ammunition storage license.**
  - **2.3 Apply UN policies on secure weapon storage**
  - **2.4 Compile explosive safety cases to qualify ammunition storage licenses.**

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L06. NEQ Calculation |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 90 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment | 2.2.2.1 Recall the NEQ calculations<br>2.2.2.2 Discuss the NEQ calculations<br>2.2.2.3 Apply the NEQ calculations to a unit of ammunition<br>2.2.2.4 Apply the NEQ calculations to an ammunition stack<br>2.2.2.5 Apply the NEQ calculations to an ammunition store<br>2.2.2.6 Apply the NEQ calculations to ammunition during transport<br>2.2.2.7 Analyse how this would apply to a UN T/PCC Ammunition Manager |
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment |
| **Assessment Criteria:** | N/A |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom |
| **Instructional tools & materials** | Calculators, projector and screen, flipchart, whiteboard<br>Examples or photos of markings that indicate weight on ammunition packaging |
| **Participant Resources:** | • Participant handout (word doc 'Lesson 06a - NEQ Calculation practical exercise')<br>• UN CARANA Scenario narrative<br>• Full size printouts of some slides where required – see slide notes for details. |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: http://www.hse.gov.uk/risk/classroom-checklist.pdf |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

# SECTION 2: LESSON PLAN

## Executive summary:

During this lesson participants will investigate the calculation of the Net Explosive Quantity (NEQ) of any particular item of ammunition or explosive item. This will allow the participant to calculate the complete explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment.

## Setup:

Stages 1 & 2 will be completed with the participants as a single collective. Stage 3 will be conducted in small groups (6-8 participants), each working to a specific instructor.

## Conduct:

### Phase 1. Introduction (Time allocation - 15 min)

- Introduce the objectives of the lesson.
- Briefly revise the Theory of Explosives covering the differences in primary and secondary explosives as well as propellants and pyrotechnics.
- Discuss the impact of explosive material inadvertently igniting or detonating. Write the expected outcomes on a flipchart.

### Phase 2. Development

Stage 1 (Time allocation 25 mins) – Understanding Net Explosive Quantity (NEQ)

- Use a flipchart and ask the participant if they understand what NEQ means and how it applies to ammunition and explosives storage.
- Define All Up Weight (AUW) and outline the other markings that indicate weight on ammunition packaging (ideally use examples or photos of packaging for this). Distinguish between these markings for the participants.
- Explain TNT equivalence and its relevance to calculating the NEQ of ammunition.
- Question the class on how they would determine the NEQ of a single ammunition stack and also a mixed ammunition container.

Stage 2 (Time allocation 20 mins) – Calculation of NEQ

- Provide an example of how to calculate the NEQ of single unit of ammunition, including the use of TNT equivalence.

- Complete an example NEQ calculation for an ammunition stack with a defined level of ammunition stock.
- Discuss how to apply NEQ calculations to ammunition during transport
- Ask questions to the class at each stage to check understanding.

Stage 3 (Time allocation 25 mins) – Participant exercise

- Participant exercise to calculate the required NEQ for a convoy of vehicles moving by road while deployed on a UN mission.
- Participants to calculate the NEQs using the information provided in the Lesson Handout (Word doc 'UN MAM Lesson 6 exercise handout FINAL 2022). Participants need to:
    - Identify the NEQ for each nature of ammunition in the convoy
    - Determine the NEQ for each vehicle load
    - Provide the total NEQ for the Convoy
    - Make a list of safety considerations for the transport of this quantity of ammunition to FOLSA
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions.

**Phase 3. Consolidation (Time allocation - 5 min)**

- Review Enabling Objective and Key Learning Points (see Section 1), drawing out any common themes.
- Look ahead to the next lesson of the course:
    - Ammunition Safe Storage

Slide 1

Weapons and Ammunition Management in UN Peace Operations

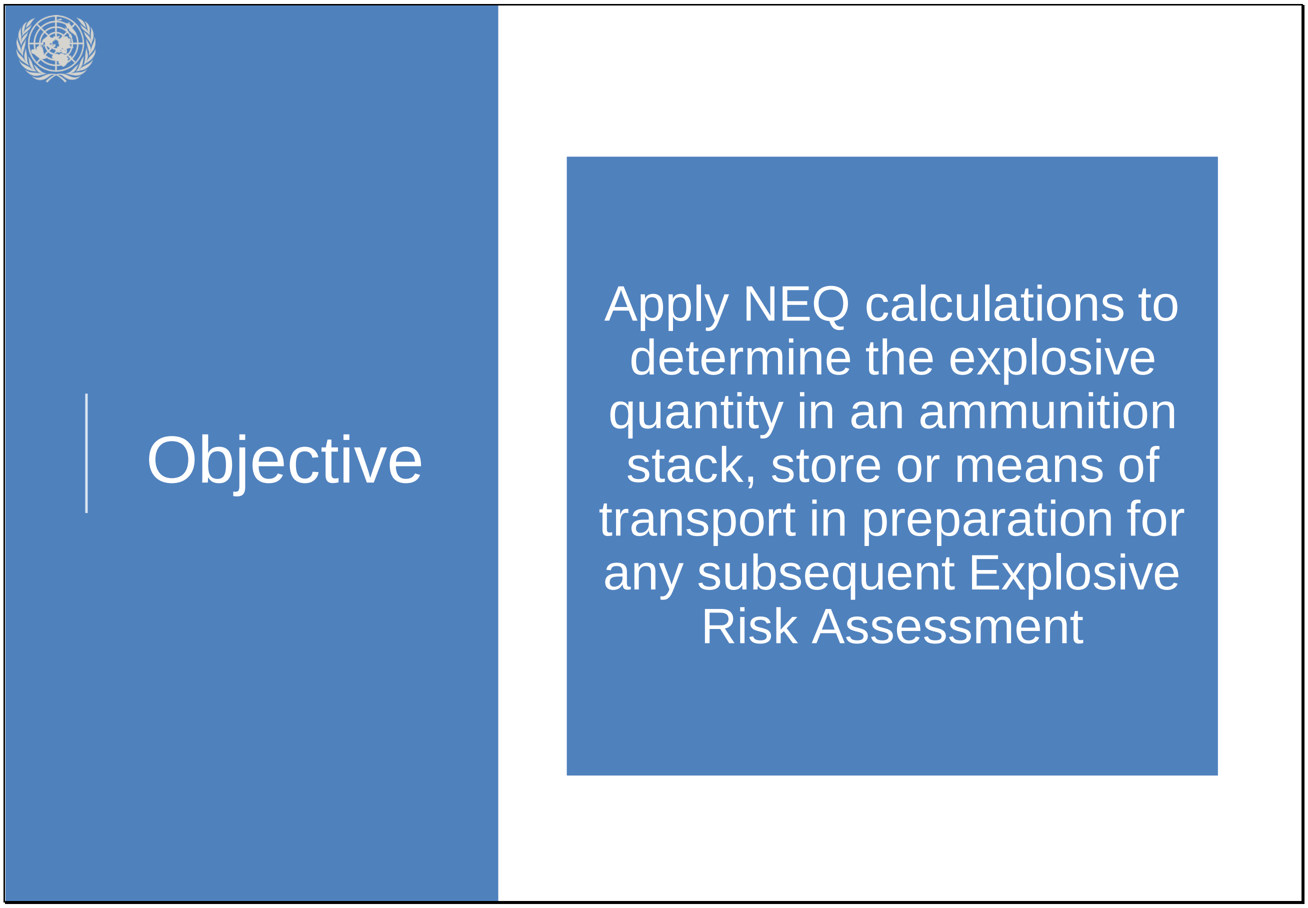
Lesson 6
Net Explosive Quantity Calculation

**Key Reference Documents for lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2



Objective

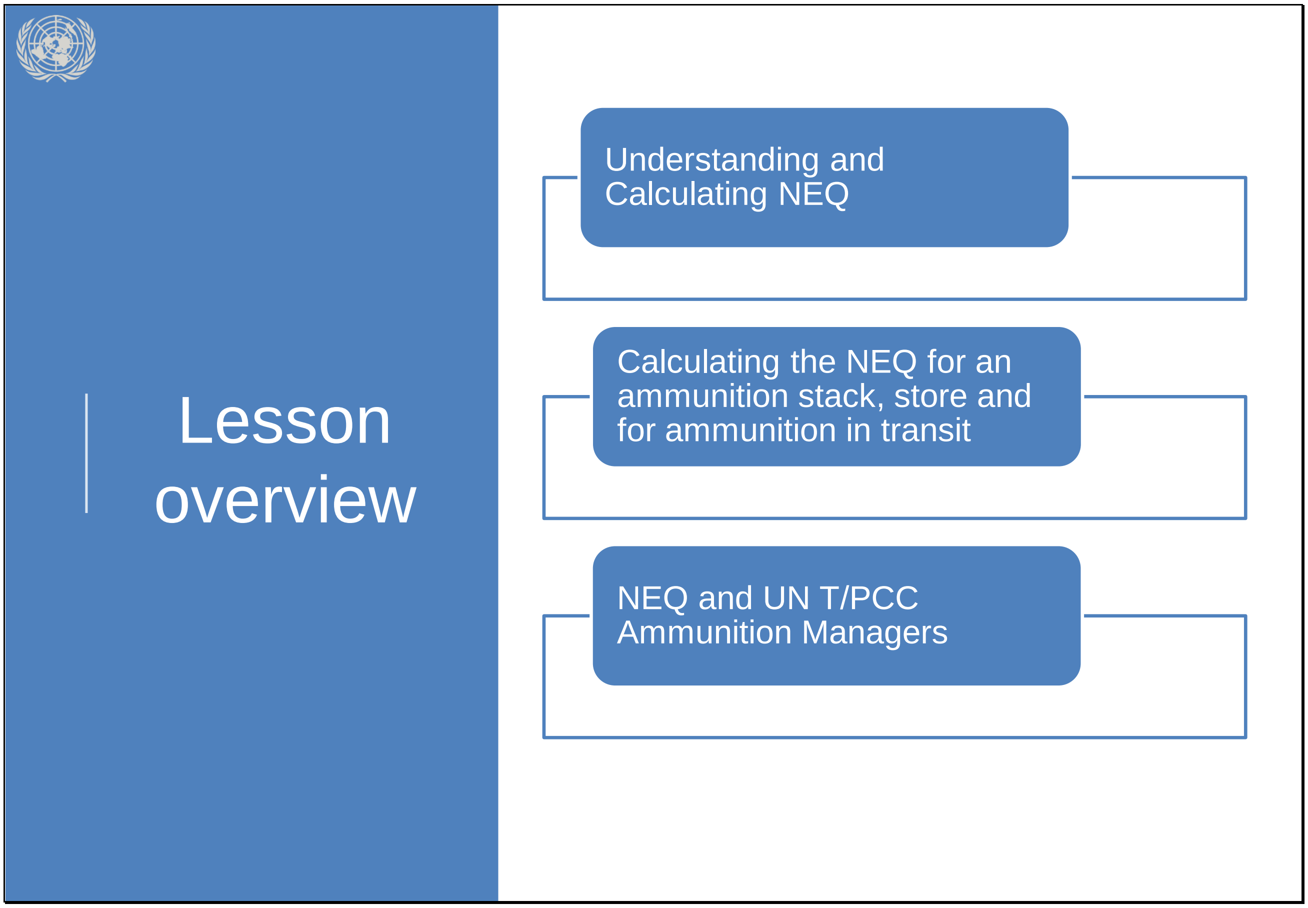
Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment

**Main idea/objective for slide:**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.2

What the instructor should cover (in addition to slide content)
By the end of this training session the participant will understand and be able to

app

Slide 3



Lesson overview

Understanding and Calculating NEQ

Calculating the NEQ for an ammunition stack, store and for ammunition in transit

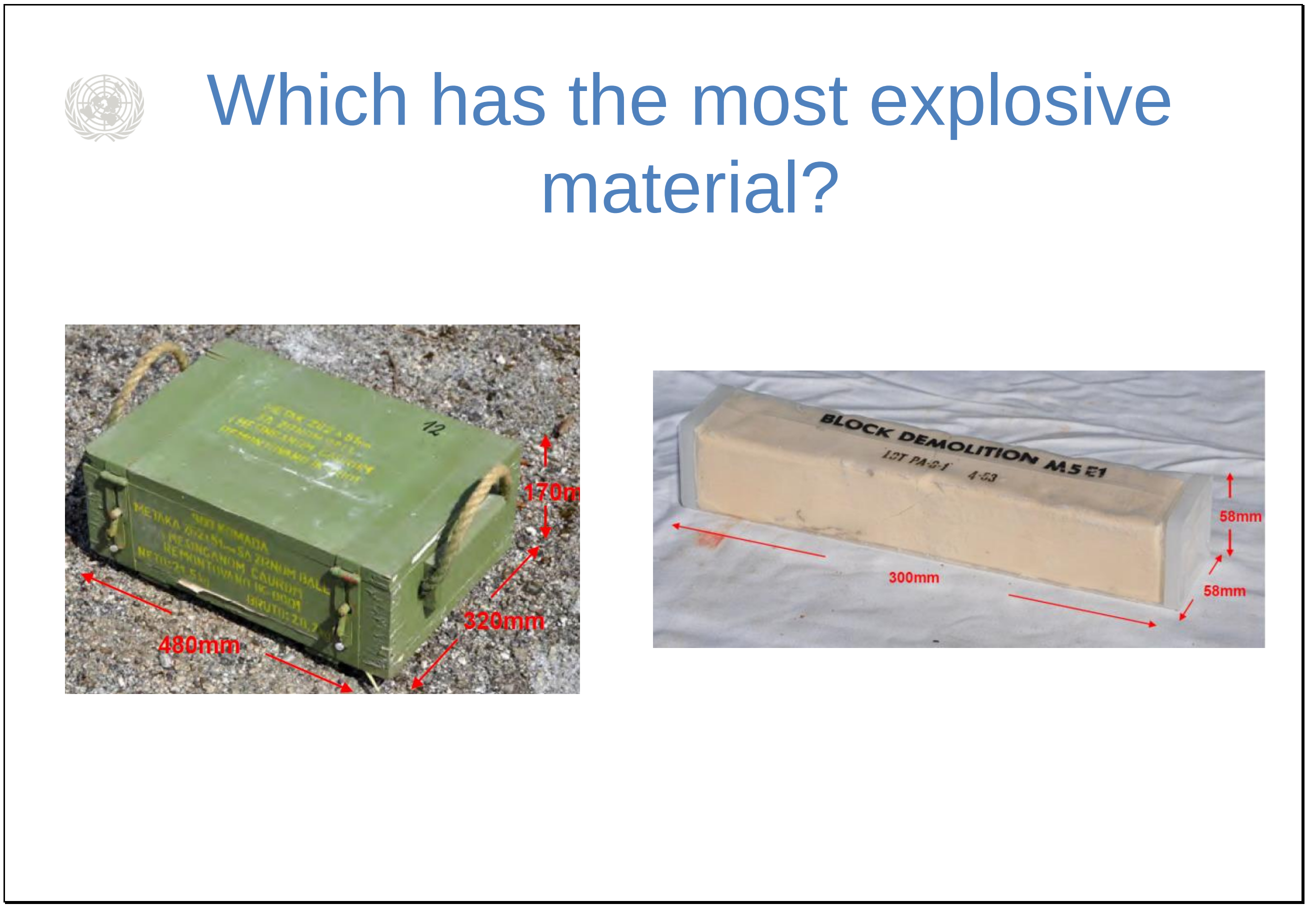
NEQ and UN T/PCC Ammunition Managers

**Main idea/objective for slide:**
**Introduce the Key Learning Points**

What the instructor should cover (in addition to slide content)
Emphasise 'recall' – this is revisiting/revising content covered in the workbook

Key Learning Points
2.2.2.1 Recall the NEQ calculations
2.2.2.2 Discuss the NEQ calculations
2.2.2.3 Apply the NEQ calculations to a unit of ammunition
2.2.2.4 Apply the NEQ calculations to an ammunition stack
2.2.2.5 Apply the NEQ calculations to an ammunition store
2.2.2.6 Apply the NEQ calculations to ammunition during transport

## 2.2.2.7 Analyse how this would apply to a UN T/PCC Ammunition Manager



## Which has the most explosive material?

**Phase 1. Introduction (**Time allocation - 15 min**)**

**<u>Main idea/objective for slide:</u>**

**Discuss using images, which of these two items holds the most explosive material (in Kg's) and which is more powerful/destructive.**

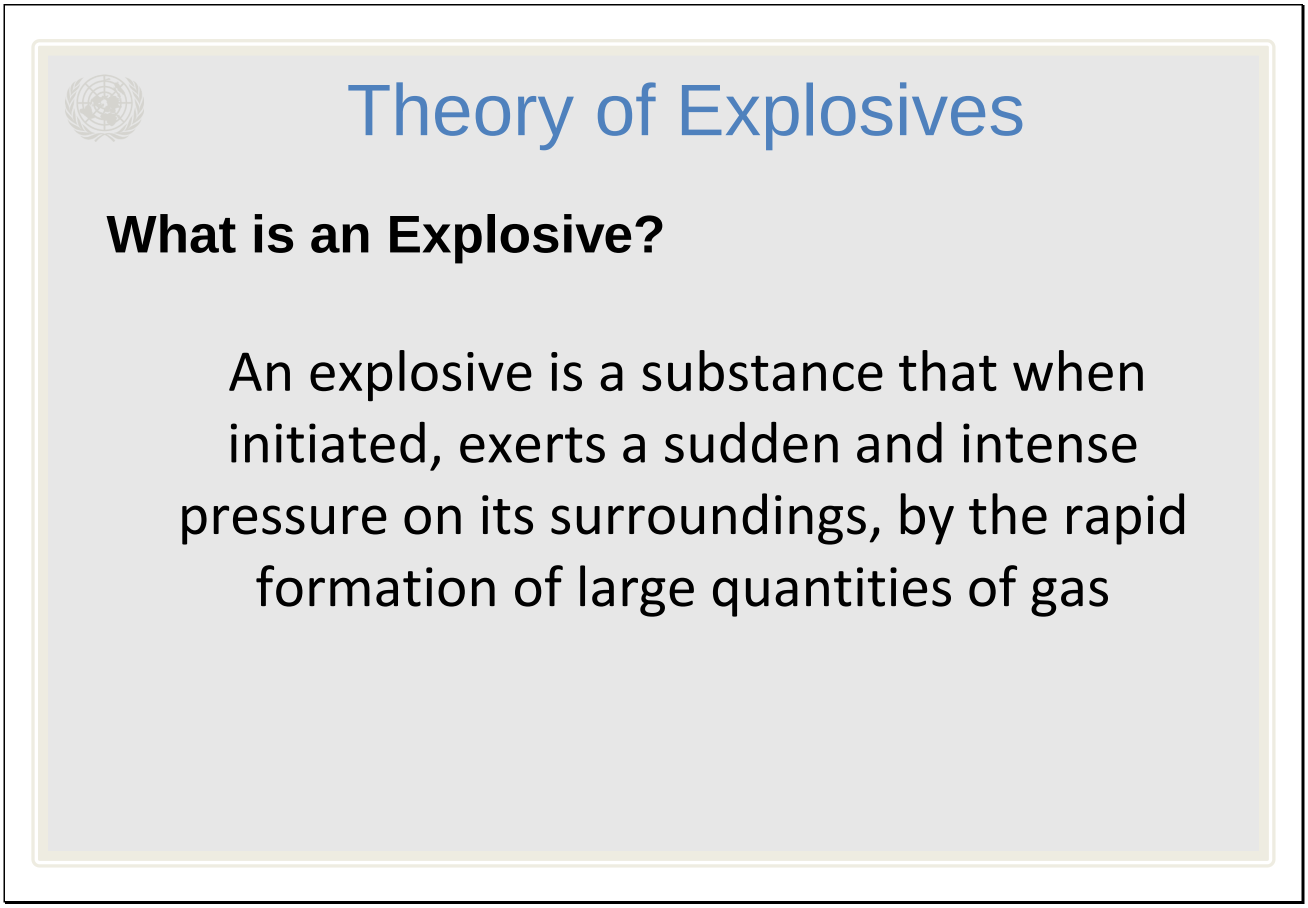
<u>What the instructor should cover (in addition to slide content)</u>

Explore with the participants, how you find out the amount of explosive material in ammunition.

Block Demolition M5 = 1.1Kg NEQ 1.1D
Round 7.62mm x 51 = 900 x 2.85 grams = 2.565Kg NEQ 1.4S

**<u>Photographs in this slide are © Swedish EOD Centre</u>**

Slide 5



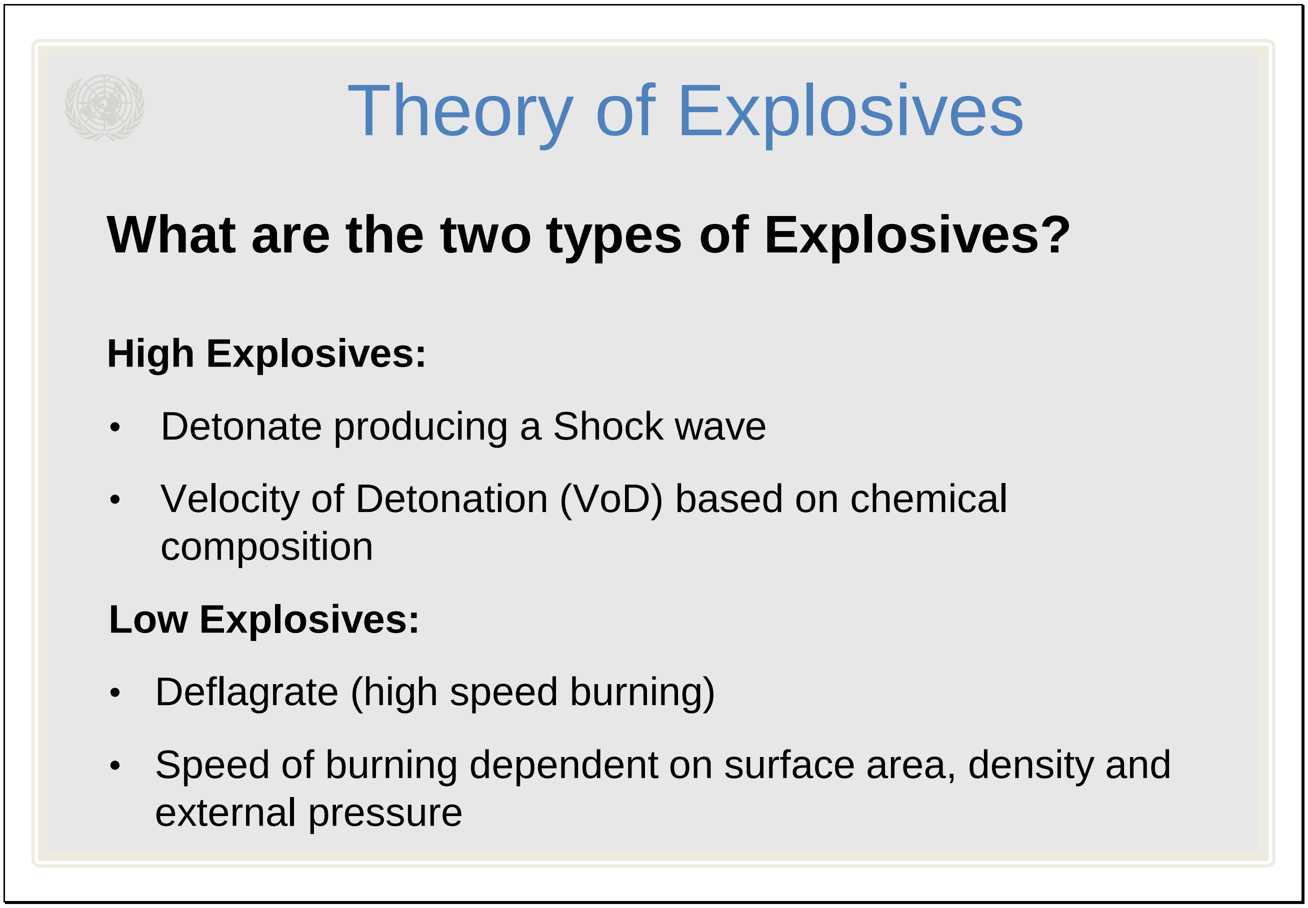
## Theory of Explosives

**What is an Explosive?**

An explosive is a substance that when initiated, exerts a sudden and intense pressure on its surroundings, by the rapid formation of large quantities of gas

**Main idea/objective for slide:**
**Briefly revise the Theory of Explosives based on the pre-course work book.**

participant activity
Before revealing the text on the slide, ask participants
- What is an Explosive?
- Write the participants comments on a whiteboard



## Theory of Explosives

**What are the two types of Explosives?**

**High Explosives:**

- Detonate producing a Shock wave
- Velocity of Detonation (VoD) based on chemical composition

**Low Explosives:**

- Deflagrate (high speed burning)
- Speed of burning dependent on surface area, density and external pressure

**Main idea/objective for slide:**
**Briefly revise the Theory of Explosives based on the pre-course work book.**

participant activity
Before revealing the text on the slide, ask participants

- What are the two types of Explosives?
- What are the differences between these?

## Classify these as High or Low Explosives

**Main idea/objective for slide:**
**Practice classifying high vs low explosives**

What the instructor should cover (in addition to slide content)
Ask the participants to write down whether they classifiy each of these items as a 'high' or 'Low' explosive
Check their understanding by going through each image one at a time.

1: Green Signal Cartridge : Low Explosive (Pyrotechnics)
2. 122mm Projectile : High Explosive (TNT )
3. 200gr. Explosive block : High Explosive
4. Electric detonator/blasting cap: High Explosive
5. 60mm Illuminating Mortar round: Low explosive (Pyrotechnics)

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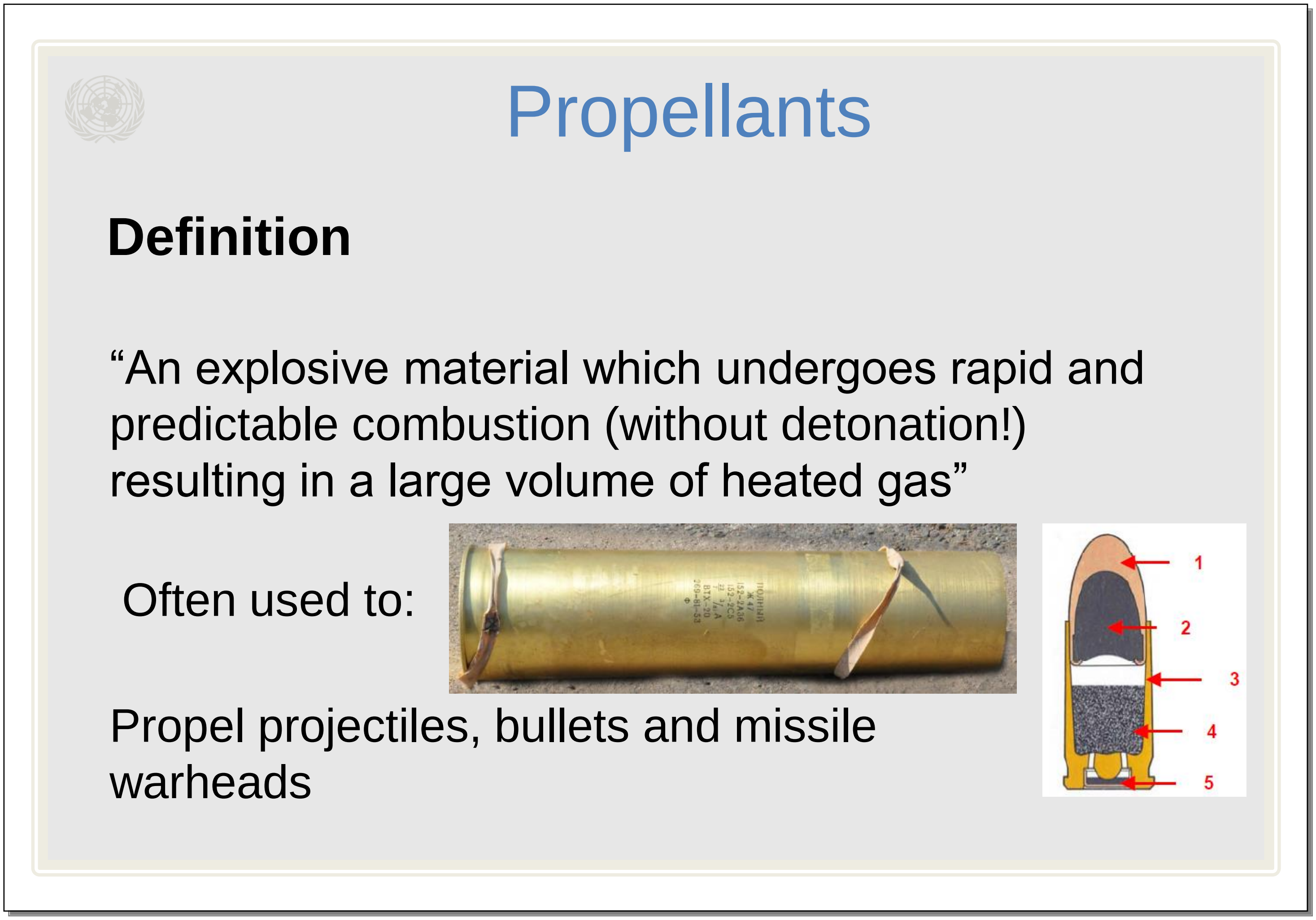

# Propellants

**Definition**

"An explosive material which undergoes rapid and predictable combustion (without detonation!) resulting in a large volume of heated gas"

Often used to:

Propel projectiles, bullets and missile warheads

**Main idea/objective for slide:**
**Briefly revise the Theory of Explosives based on the pre-course workbook.**

participant activity
Before revealing the text on the slide, ask participants for definition

What the instructor should cover (in addition to slide content)

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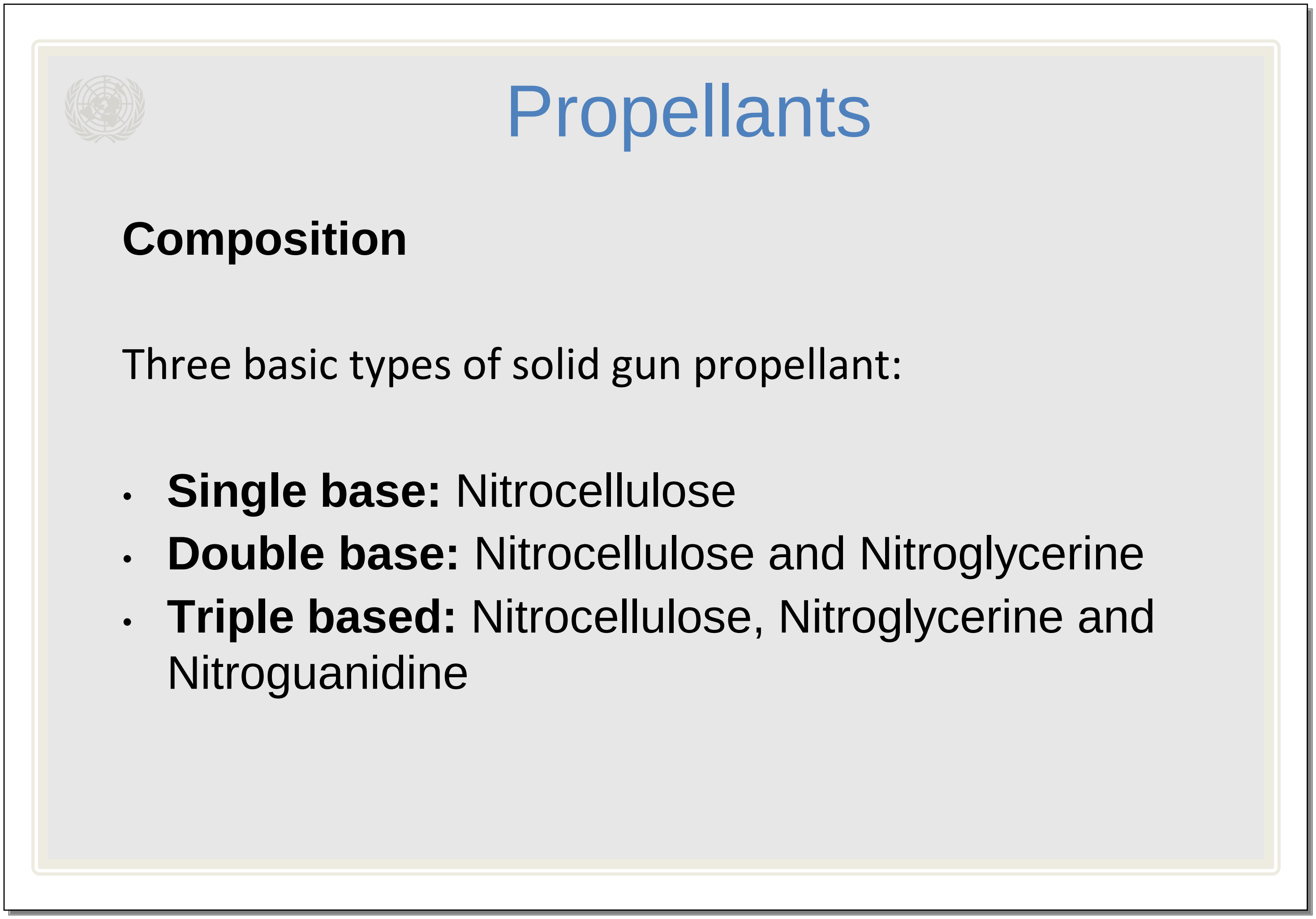
Slide 9



# Propellants

**Composition**

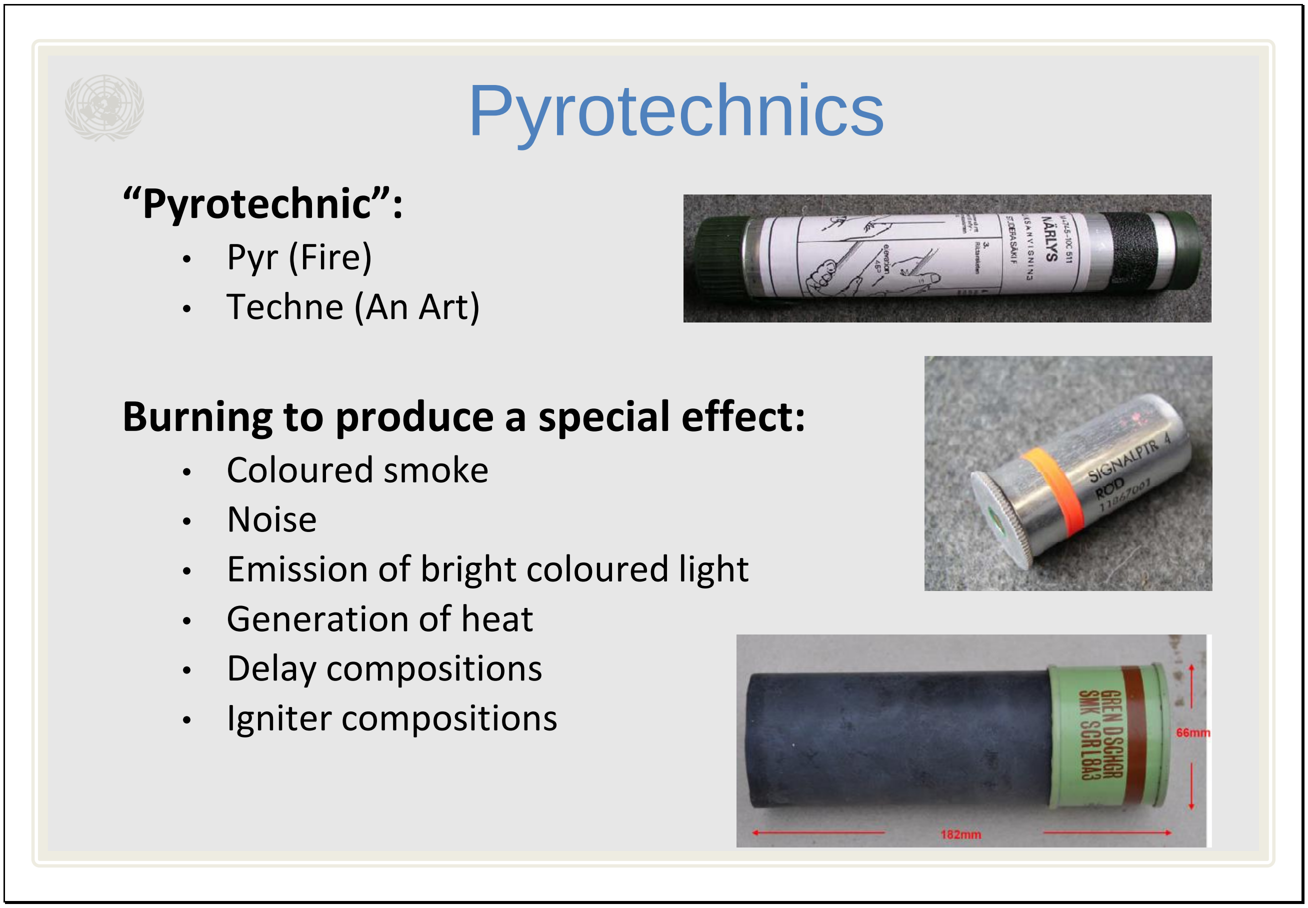
Three basic types of solid gun propellant:

- **Single base:** Nitrocellulose
- **Double base:** Nitrocellulose and Nitroglycerine
- **Triple based:** Nitrocellulose, Nitroglycerine and Nitroguanidine

**Main idea/objective for slide:**
**Briefly revise the Theory of Explosives based on the pre-course work book.**

participant activity
Ask the participants to comment on the differences between the three types of propellants and in what ways are they used

What the instructor should cover (in addition to slide content)



# Pyrotechnics

**"Pyrotechnic":**

- Pyr (Fire)
- Techne (An Art)

**Burning to produce a special effect:**

- Coloured smoke
- Noise
- Emission of bright coloured light
- Generation of heat
- Delay compositions
- Igniter compositions

**Main idea/objective for slide:**
**Briefly revise the Theory of Explosives based on the pre-course work book.**

participant activity
Ask the participants to comment on the various ways that pyrotechnics are used on deployed missions

What the instructor should cover (in addition to slide content)

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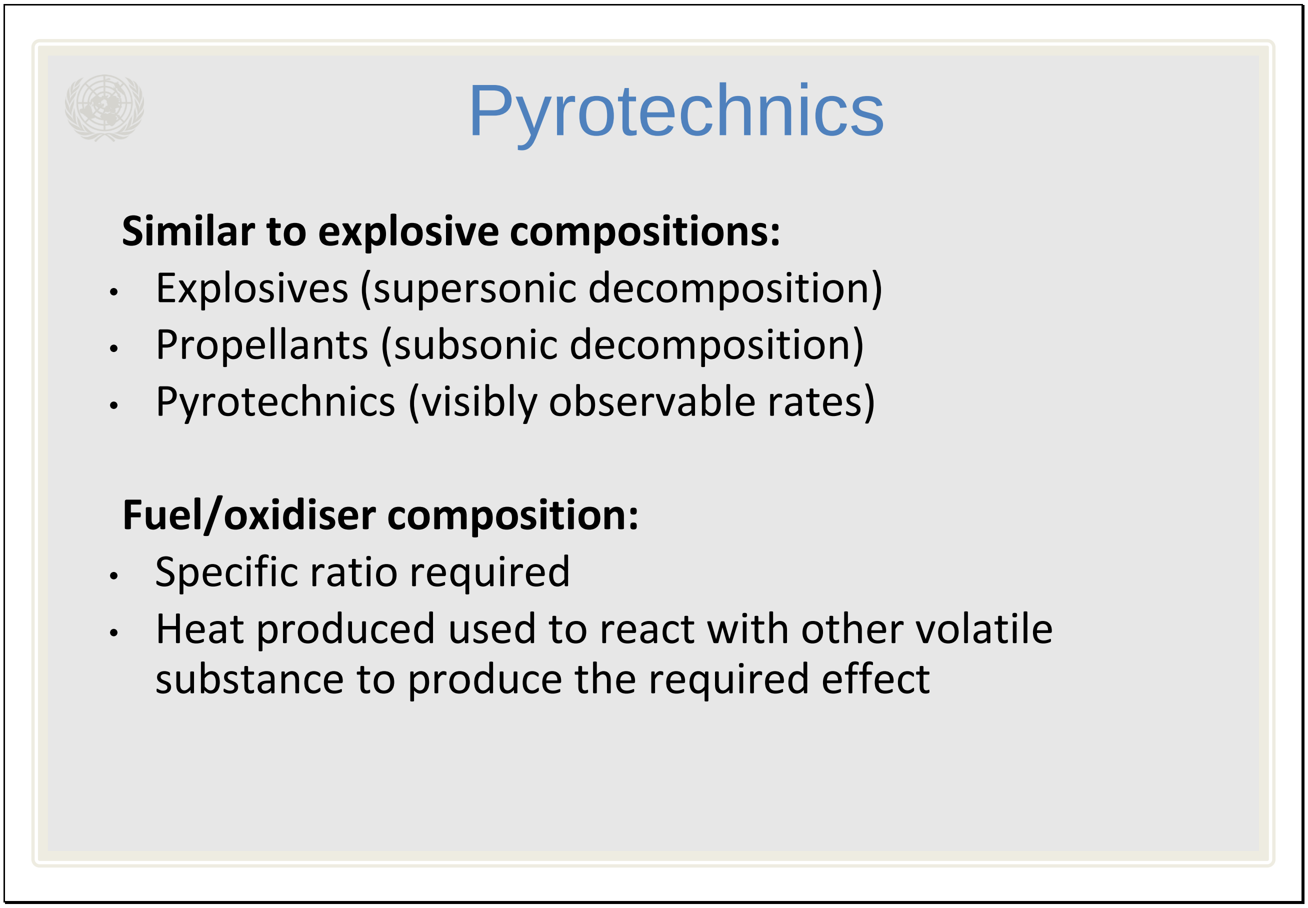
Slide 11



# Pyrotechnics

**Similar to explosive compositions:**

- Explosives (supersonic decomposition)
- Propellants (subsonic decomposition)
- Pyrotechnics (visibly observable rates)

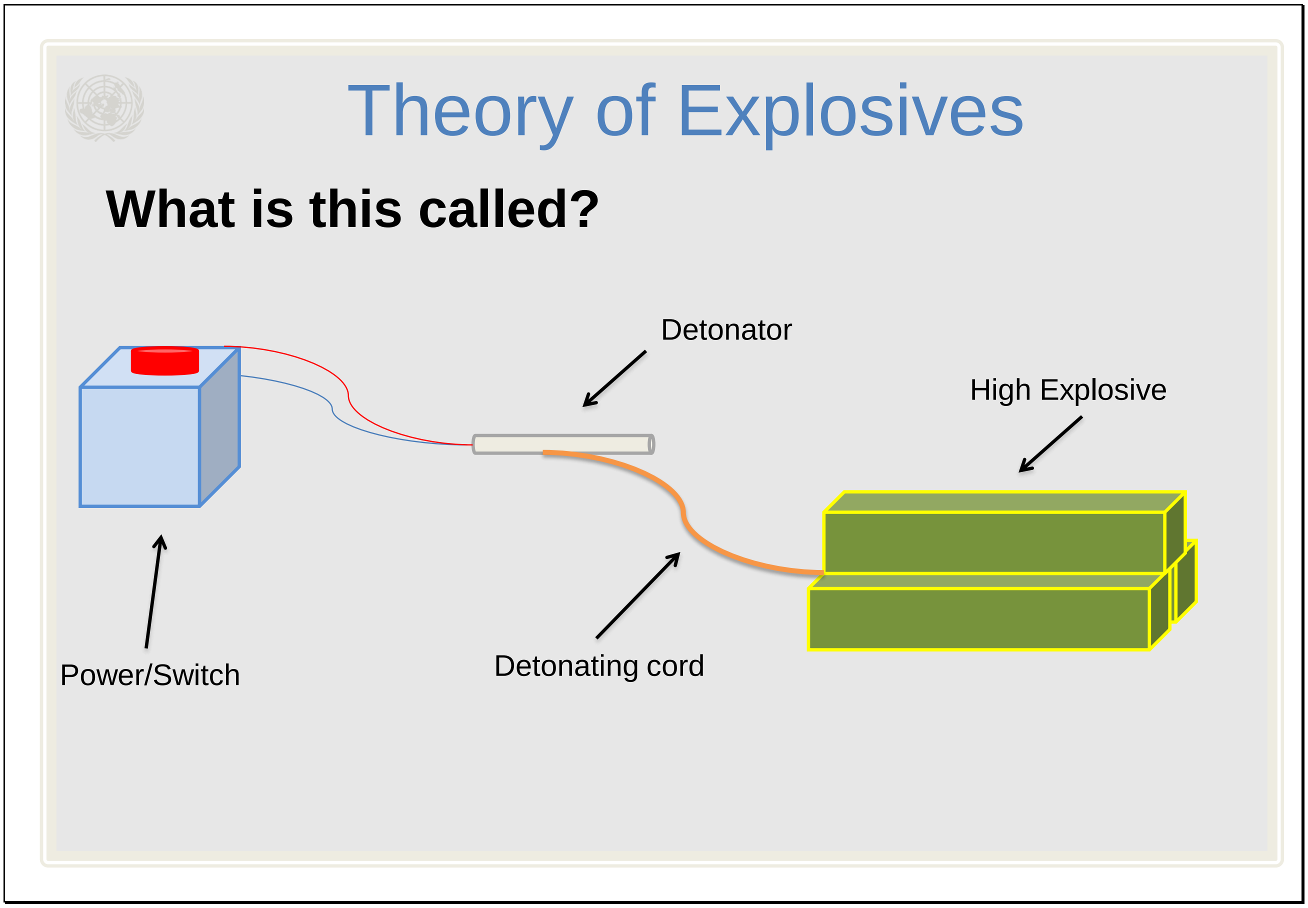
**Fuel/oxidiser composition:**

- Specific ratio required
- Heat produced used to react with other volatile substance to produce the required effect

**Main idea/objective for slide:**
**Briefly revise the Theory of Explosives based on the pre-course work book.**

participant activity
Explore the participants understanding of supersonic and subsonic decomposition

What the instructor should cover (in addition to slide content)



# Theory of Explosives

**What is this called?**

Detonator

High Explosive

Power/Switch

Detonating cord

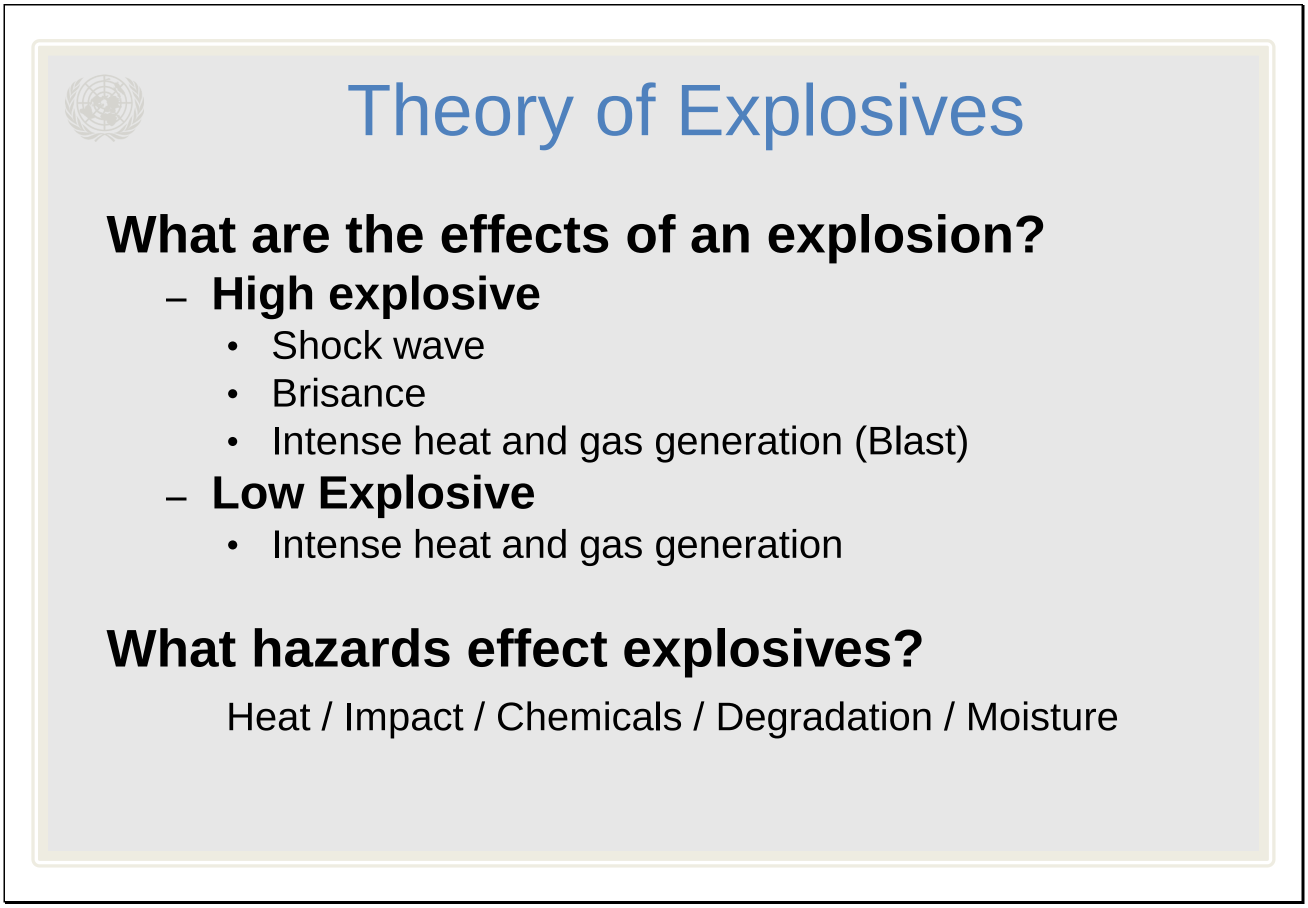
**<u>Main idea/objective for slide:</u>**
**Explore with participants their understanding of Explosive Trains.**

<u>participant activity</u>
Before revealing this graphic:

- Ask a participant to draw an explosive train on a white board

<u>What the instructor should cover (in addition to slide content)</u>
Highlight the Primary, and secondary explosive materials in this diagram.

Slide 13



## Theory of Explosives

**What are the effects of an explosion?**

- **High explosive**
  - Shock wave
  - Brisance
  - Intense heat and gas generation (Blast)
- **Low Explosive**
  - Intense heat and gas generation

**What hazards effect explosives?**

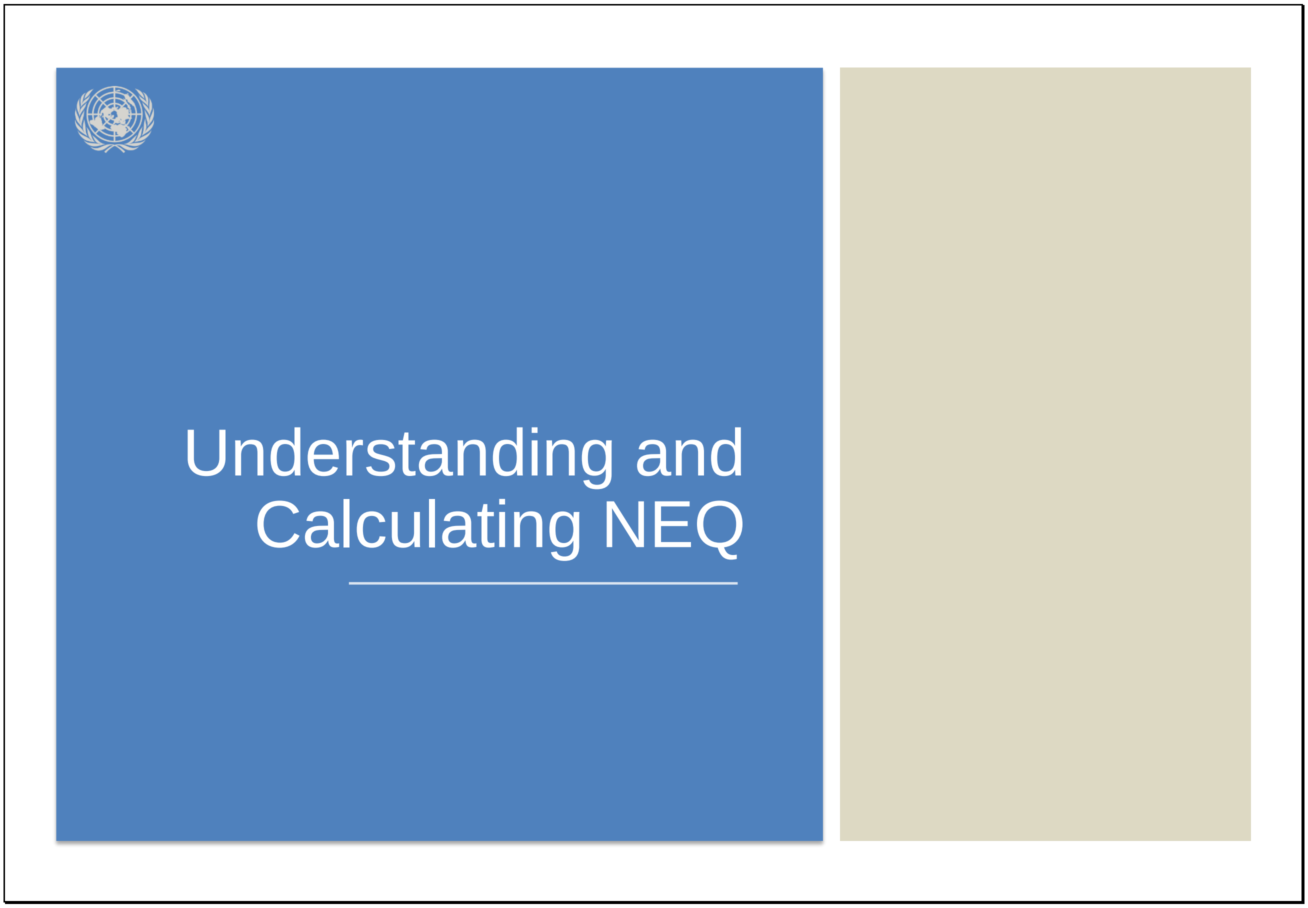
Heat / Impact / Chemicals / Degradation / Moisture

**Main idea/objective for slide:**
**Briefly revise the Theory of Explosives based on the pre course work book**

participant activity
Before revealing the text on the slide, ask participants for suggestions

What the instructor should cover (in addition to slide content)

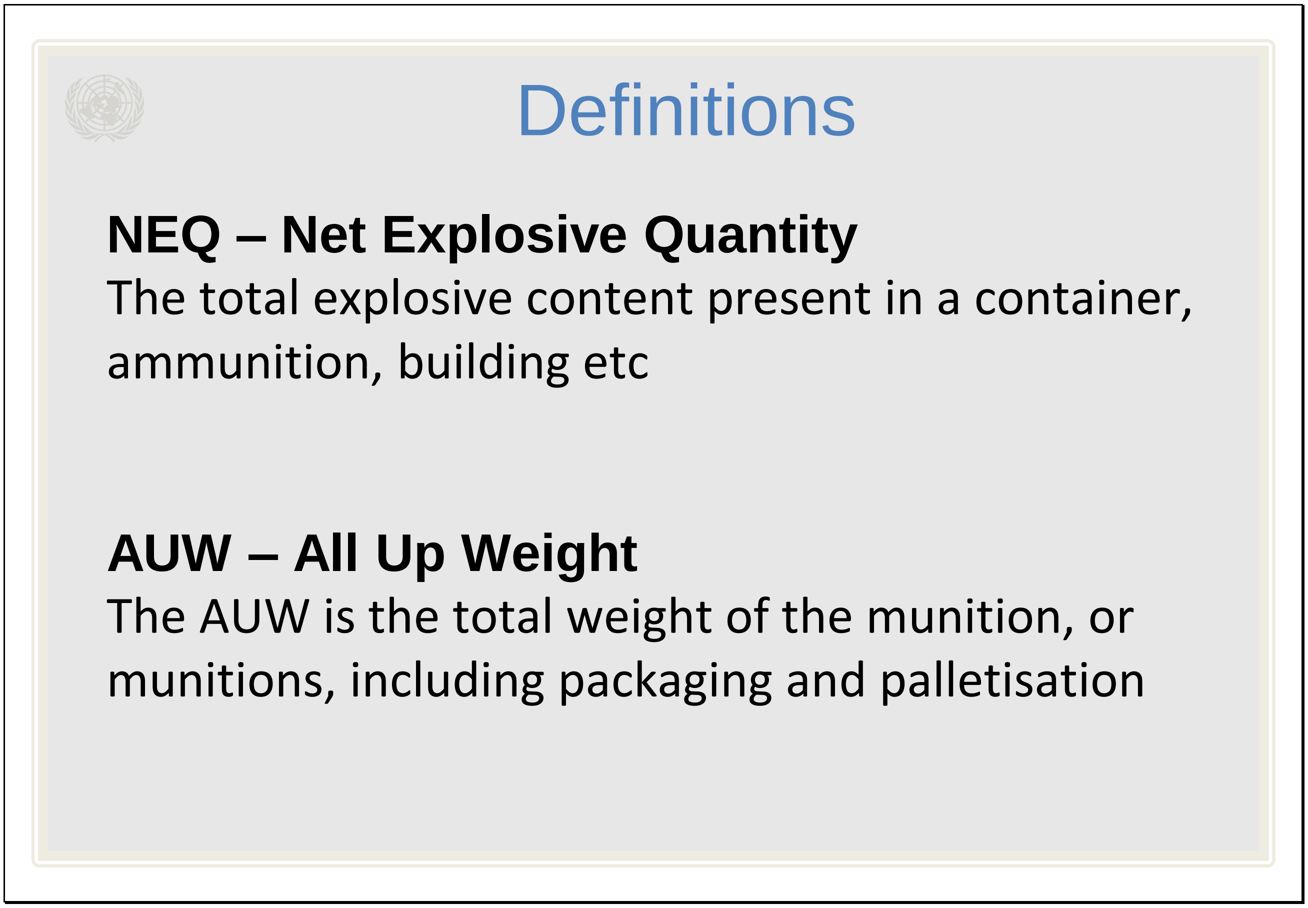
Slide 14



Understanding and Calculating NEQ

**Phase 2. Development**
Stage 1 – Understanding and Calculating NEQ

Slide 15



## Definitions

**NEQ – Net Explosive Quantity**
The total explosive content present in a container, ammunition, building etc

**AUW – All Up Weight**
The AUW is the total weight of the munition, or munitions, including packaging and palletisation

**Main idea/objective for slide:**
**Introduce the participants to the concept of NEQ and AUW**

participant activity
Before revealing the text on the slide, ask participants for definitions

What the instructor should cover (in addition to slide content)
Highlight the differences.
Use a flipchart to draw images to explain the difference.

Slide 16

## Markings on Containers

**<u>Main idea/objective for slide:</u>**
**outline the other markings that indicate weight on ammunition packaging**

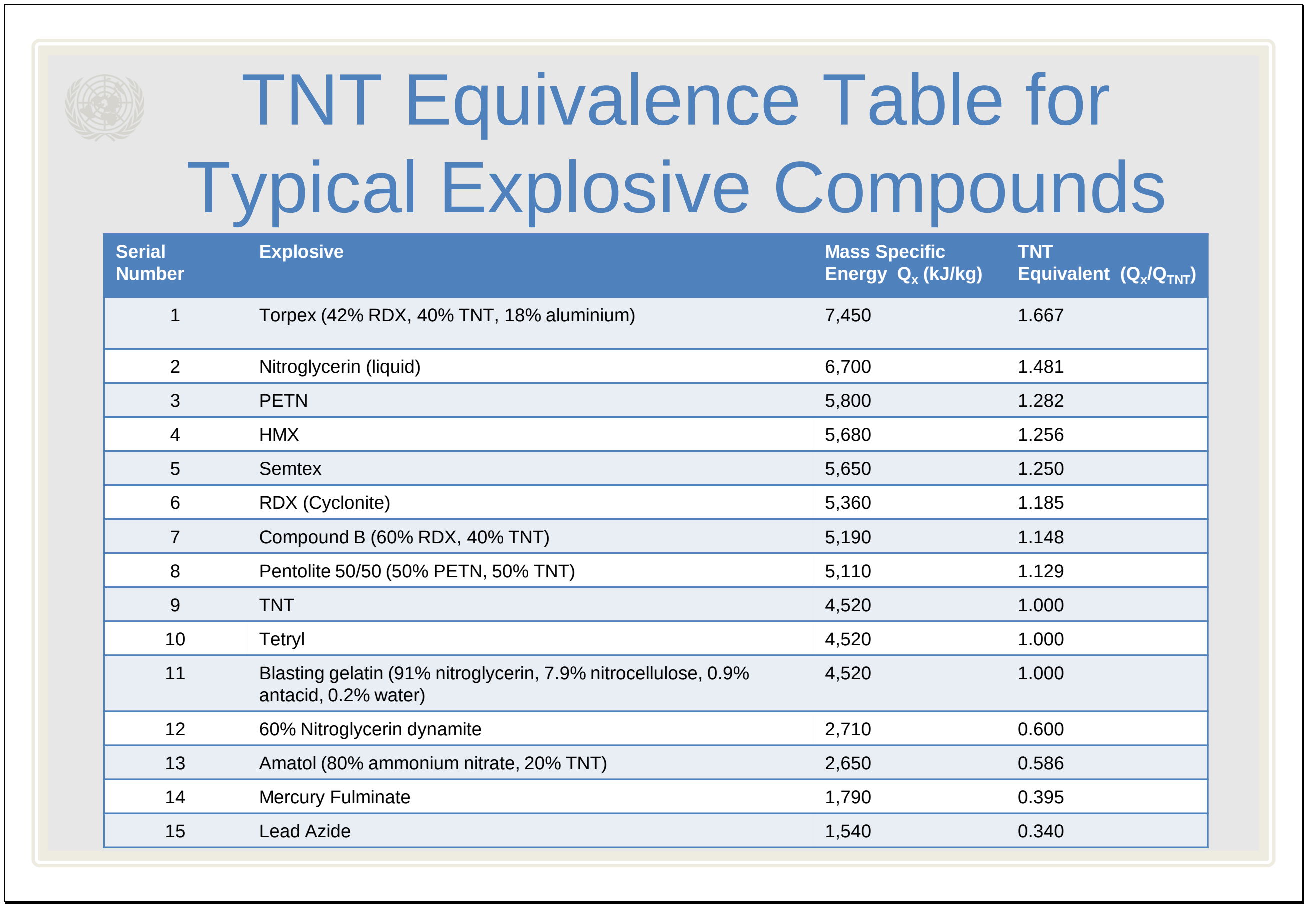
<u>participant activity</u>
Ask the participants to name and explain the markings on the above image

1 - Net Explosive Quantity
2 - Net Weight of Box
3 - Gross Weight of Box
4 - Volume of Box

<u>Some boxes do not have all the markings</u>

<u>What the instructor should cover (in addition to slide content)</u>
Distinguish between these markings for the participants.

Slide 17



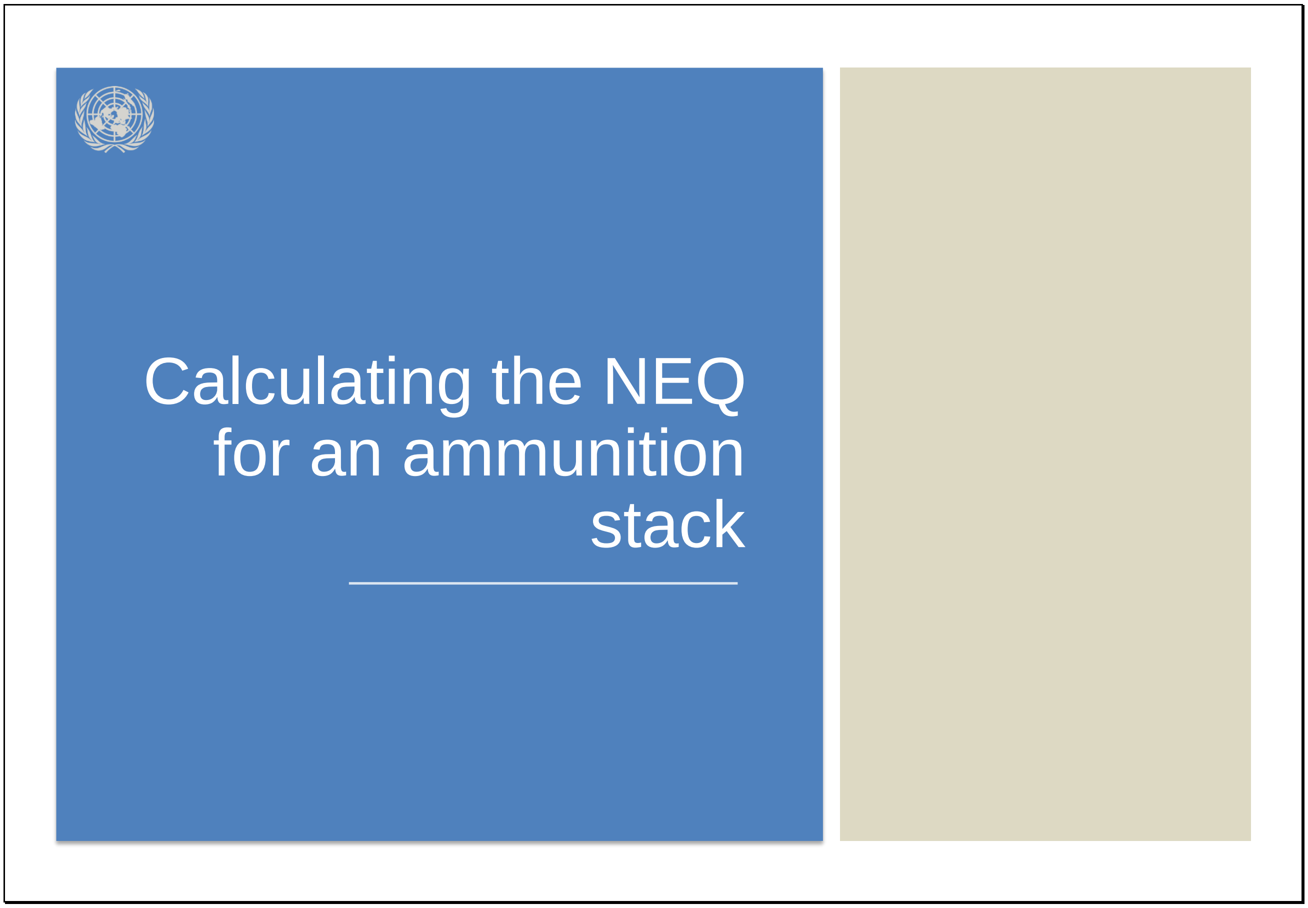
# TNT Equivalence Table for Typical Explosive Compounds

| Serial Number | Explosive | Mass Specific Energy $Q_x$ (kJ/kg) | TNT Equivalent ($Q_x/Q_{TNT}$) |
|---|---|---|---|
| 1 | Torpex (42% RDX, 40% TNT, 18% aluminium) | 7,450 | 1.667 |
| 2 | Nitroglycerin (liquid) | 6,700 | 1.481 |
| 3 | PETN | 5,800 | 1.282 |
| 4 | HMX | 5,680 | 1.256 |
| 5 | Semtex | 5,650 | 1.250 |
| 6 | RDX (Cyclonite) | 5,360 | 1.185 |
| 7 | Compound B (60% RDX, 40% TNT) | 5,190 | 1.148 |
| 8 | Pentolite 50/50 (50% PETN, 50% TNT) | 5,110 | 1.129 |
| 9 | TNT | 4,520 | 1.000 |
| 10 | Tetryl | 4,520 | 1.000 |
| 11 | Blasting gelatin (91% nitroglycerin, 7.9% nitrocellulose, 0.9% antacid, 0.2% water) | 4,520 | 1.000 |
| 12 | 60% Nitroglycerin dynamite | 2,710 | 0.600 |
| 13 | Amatol (80% ammonium nitrate, 20% TNT) | 2,650 | 0.586 |
| 14 | Mercury Fulminate | 1,790 | 0.395 |
| 15 | Lead Azide | 1,540 | 0.340 |

**Main idea/objective for slide:**
**Discuss the importance of TNT Equivalence and highlight the range of TNT Equivalence factors for common explosives as per the table.**

participant activity

What the instructor should cover (in addition to slide content)
Use the whiteboard and give example calculations for a range of primary and secondary explosives.



## Calculating the NEQ for an ammunition stack

**Phase 2. Development**
Stage 2 – Calculating the NEQ for an ammunition stack

## Calculate NEQ for an Ammunition Stack

Stack of 100 Rds 105mm HE (TNT)

Each Round has 2.35kg HE

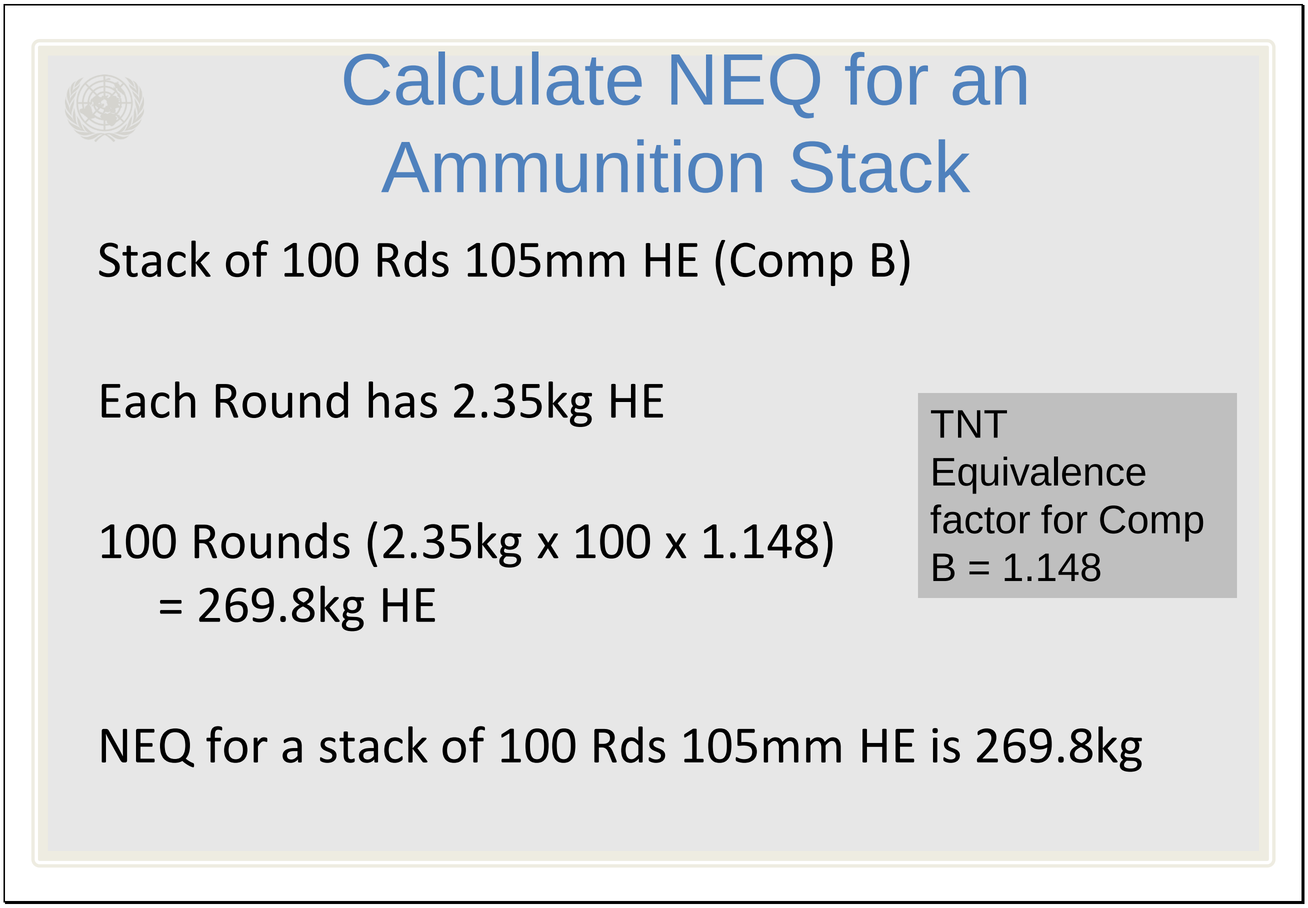
100 Rounds (2.35kg x 100)
= 235kg HE

NEQ for a stack of 100 Rds 105mm HE is 235kg

**Main idea/objective for slide:**
**Introduce the participants to calculating the NEQ for an ammunition Stack.**

participant activity
Ask participants questions as this example is being prepared on the board, such as 'What next..?'

What the instructor should cover (in addition to slide content)
Work out this example on a white board to ensure participants understanding.



## Calculate NEQ for an Ammunition Stack

Stack of 100 Rds 105mm HE (Comp B)

Each Round has 2.35kg HE

100 Rounds (2.35kg x 100 x 1.148)
= 269.8kg HE

TNT Equivalence factor for Comp B = 1.148

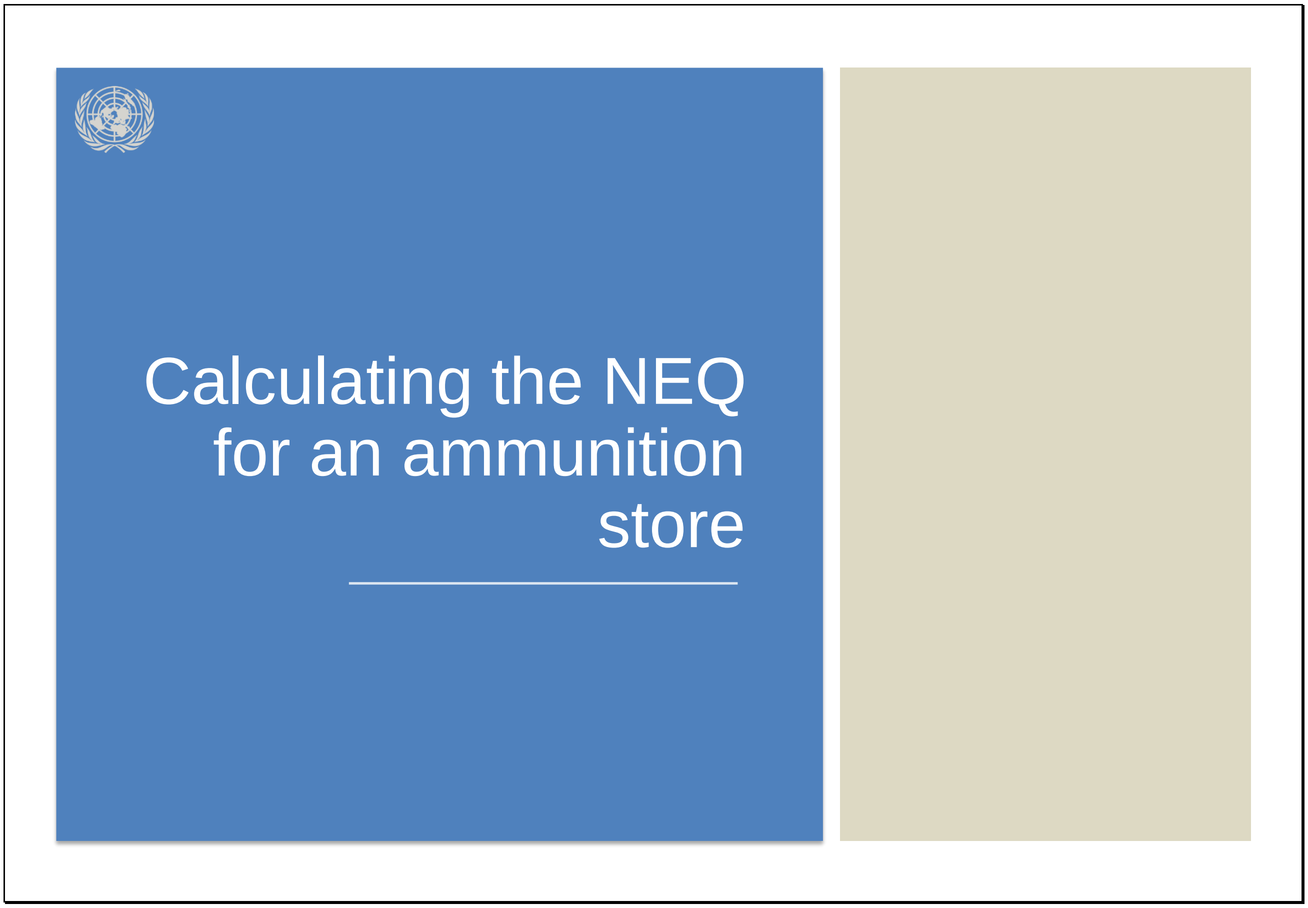
NEQ for a stack of 100 Rds 105mm HE is 269.8kg

**<u>Main idea/objective for slide:</u>**
**Introduce the participants to calculating the NEQ for an ammunition Stack.**

<u>participant activity</u>
Ask participants questions as this example is being prepared on the board, such as 'What next..?'

<u>What the instructor should cover (in addition to slide content)</u>
Work out this example on a white board to ensure participants understanding.

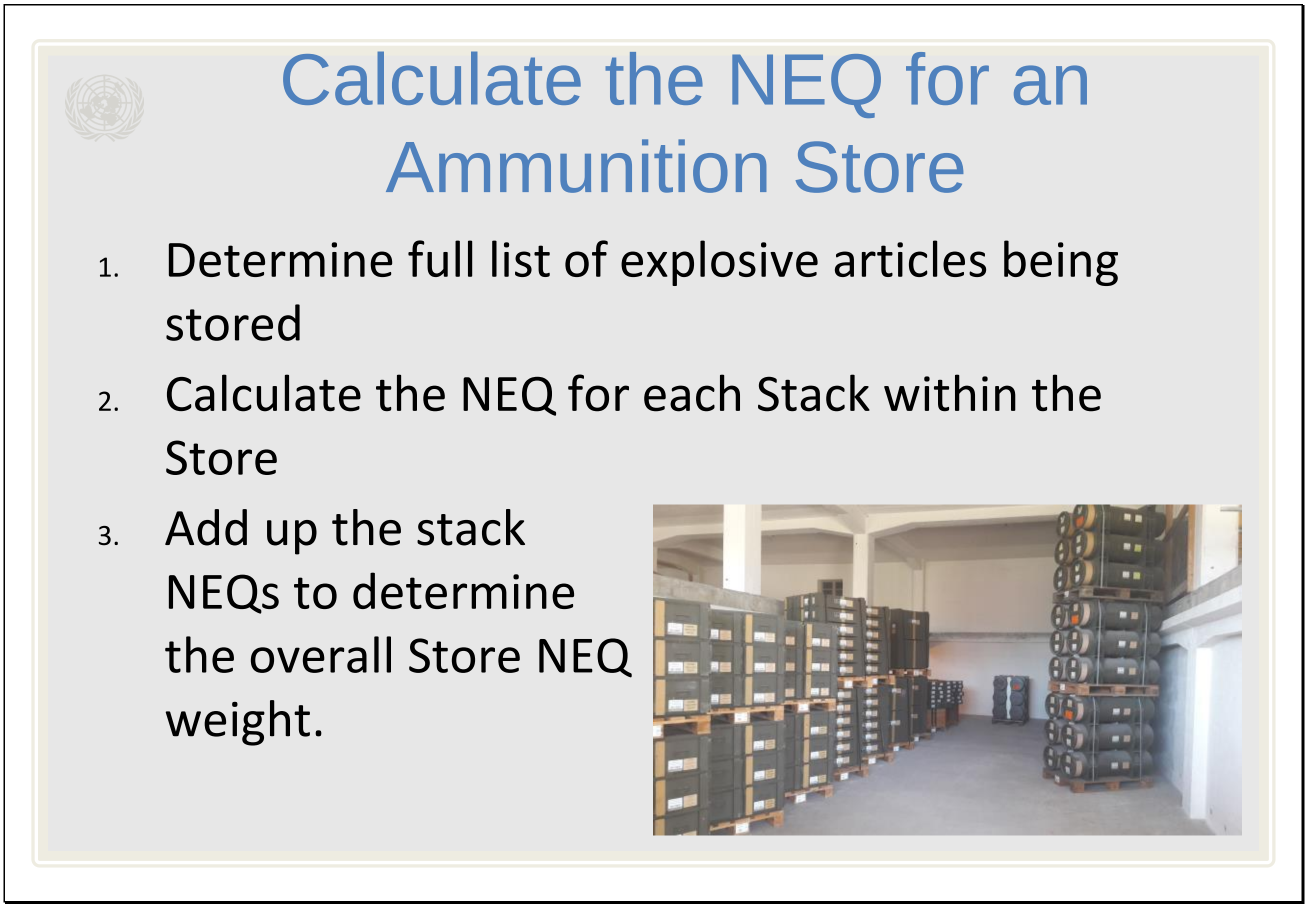
Slide 21



Calculating the NEQ for an ammunition store

**Phase 2. Development**
Stage 2 – Calculating the NEQ for an ammunition store

Slide 22



# Calculate the NEQ for an Ammunition Store

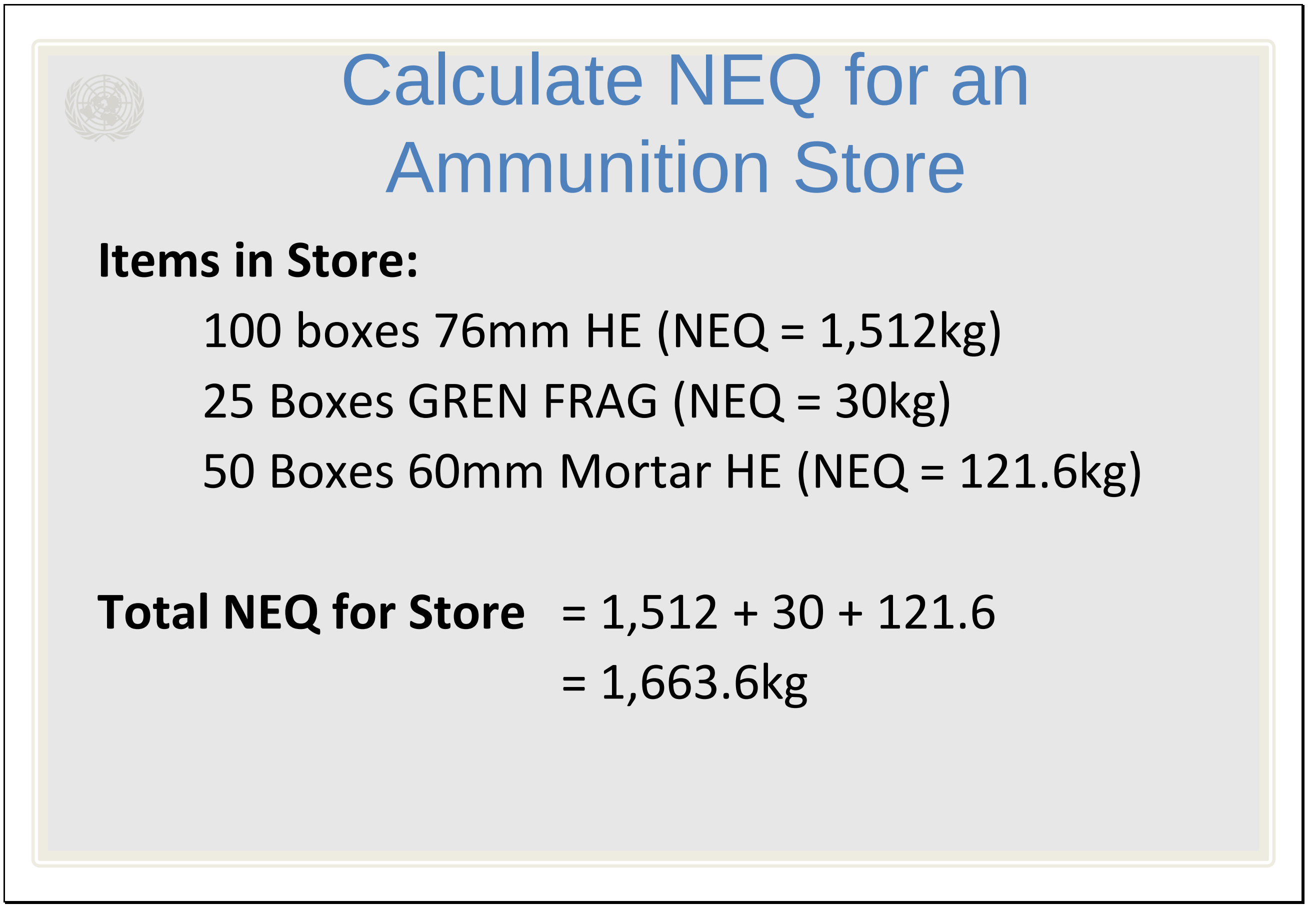
1. Determine full list of explosive articles being stored
2. Calculate the NEQ for each Stack within the Store
3. Add up the stack NEQs to determine the overall Store NEQ weight.

**<u>Main idea/objective for slide:</u>**
**Introduce the participants to calculating the NEQ for an ammunition Store**

<u>What the instructor should cover (in addition to slide content)</u>
Outline to the participants how important it is to have accurate calculations of how much NEQ is in each explosive storehouse,

**Photograph is © AMAT/GICHD**

Slide 23



# Calculate NEQ for an Ammunition Store

**Items in Store:**

100 boxes 76mm HE (NEQ = 1,512kg)

25 Boxes GREN FRAG (NEQ = 30kg)

50 Boxes 60mm Mortar HE (NEQ = 121.6kg)

**Total NEQ for Store** = 1,512 + 30 + 121.6

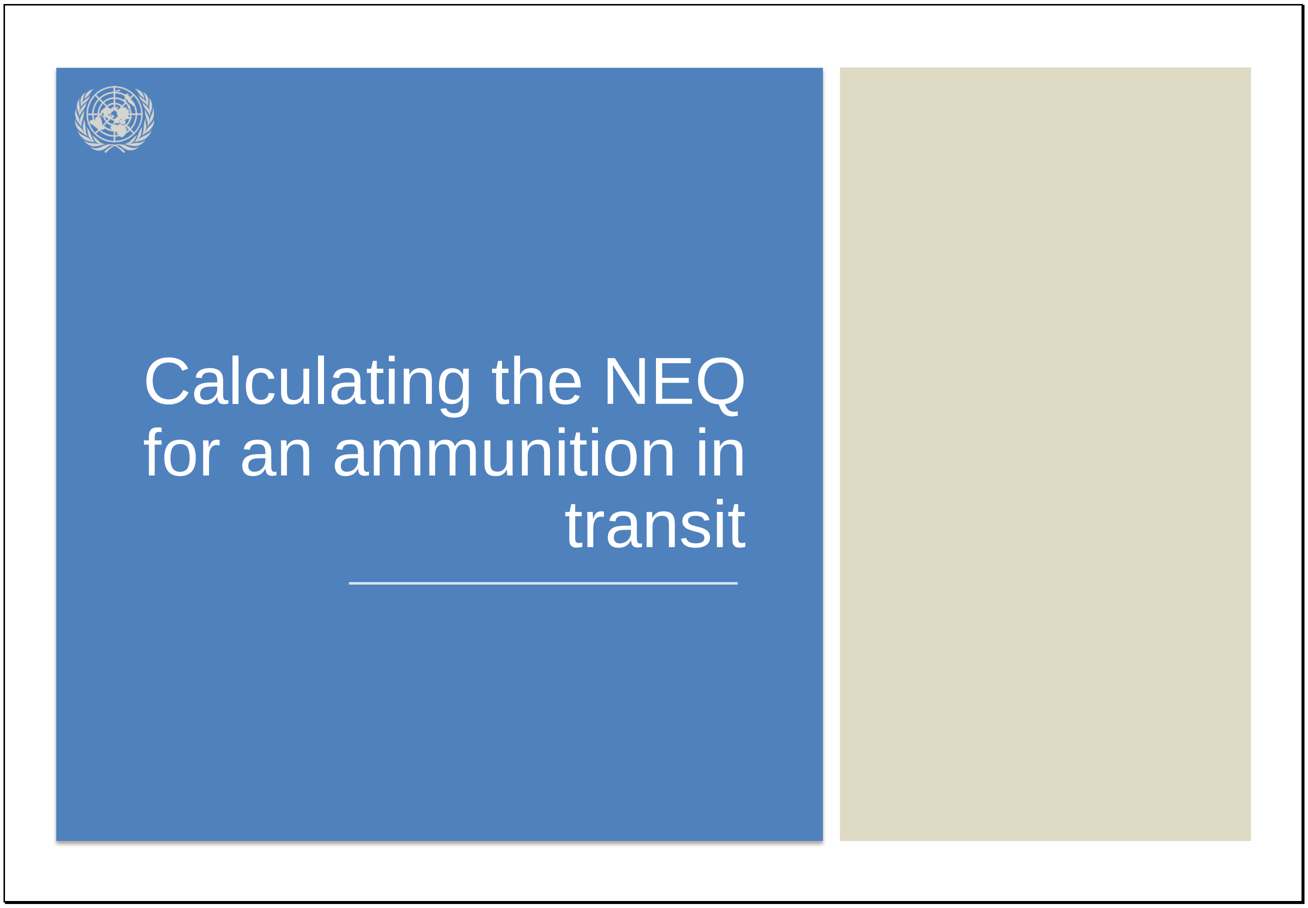
= 1,663.6kg

**Main idea/objective for slide:**
**Introduce the participants to calculating the NEQ for an ammunition Store**

participant activity
Ask participants questions as this example is being prepared on the board, such as 'What next..?'

What the instructor should cover (in addition to slide content)
Work out this example on a white board to ensure participants understanding.

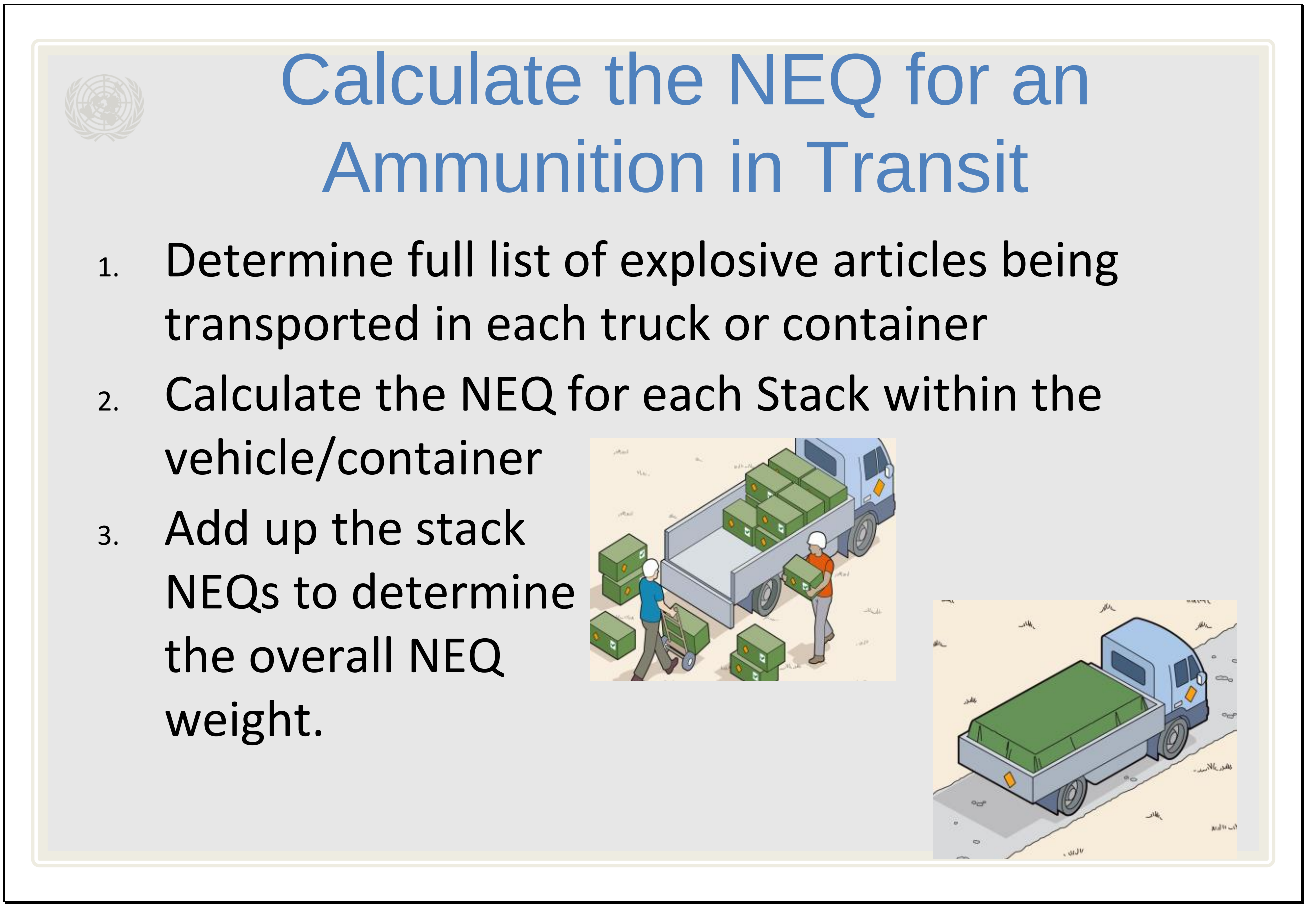
Slide 24



Calculating the NEQ for an ammunition in transit

**Phase 2. Development**
Stage 2 – Calculating the NEQ for an ammunition in transit

Slide 25



## Calculate the NEQ for an Ammunition in Transit

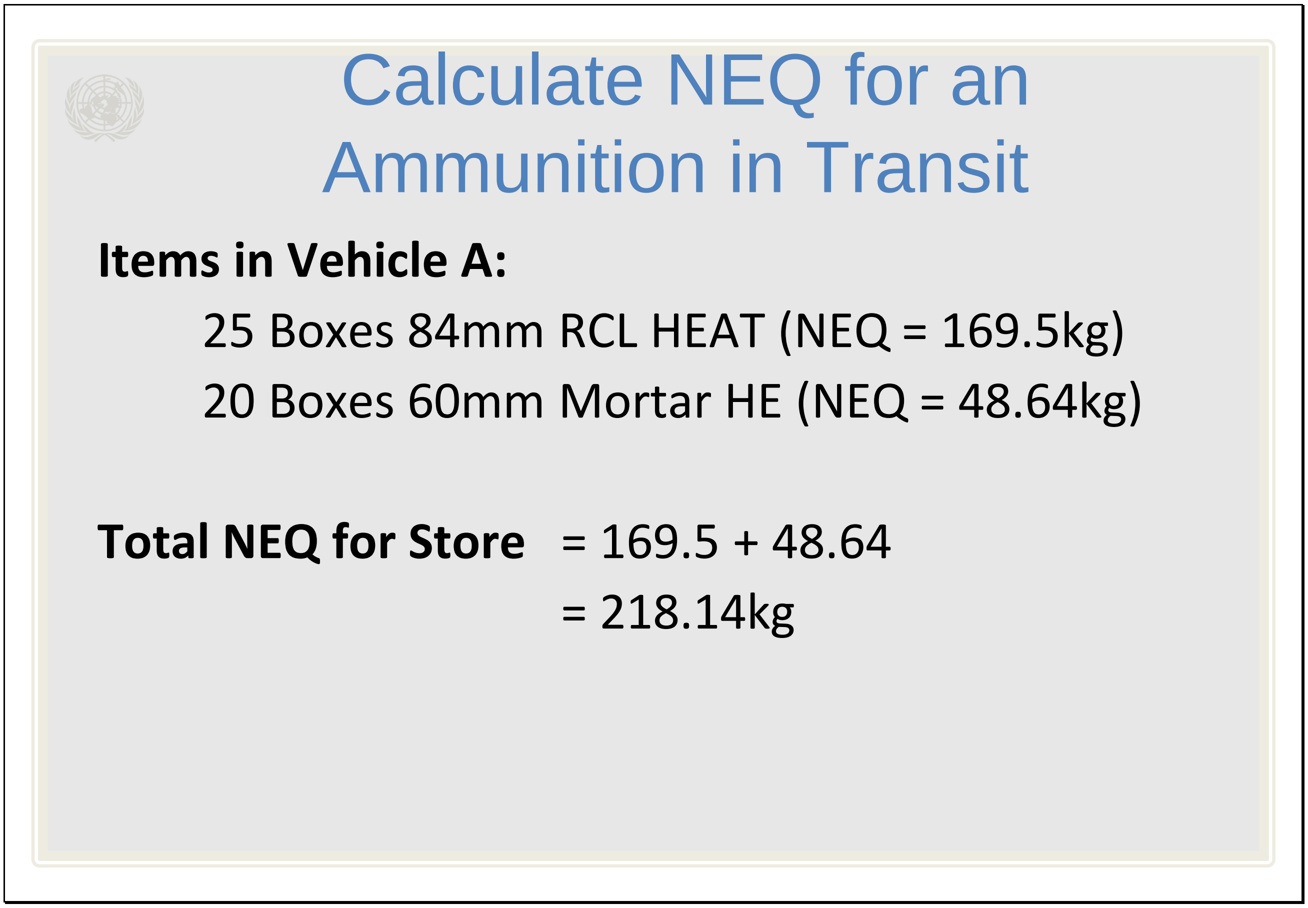
1. Determine full list of explosive articles being transported in each truck or container
2. Calculate the NEQ for each Stack within the vehicle/container
3. Add up the stack NEQs to determine the overall NEQ weight.

**Main idea/objective for slide:**
**Introduce the participants to calculating the NEQ for an ammunition in transit**

participant activity

What the instructor should cover (in addition to slide content)
Outline to the participants how important it is to have accurate calculations of how much NEQ is in each truck/vehicle

**Images are © AMAT/GICHD**



## Calculate NEQ for an Ammunition in Transit

**Items in Vehicle A:**

25 Boxes 84mm RCL HEAT (NEQ = 169.5kg)

20 Boxes 60mm Mortar HE (NEQ = 48.64kg)

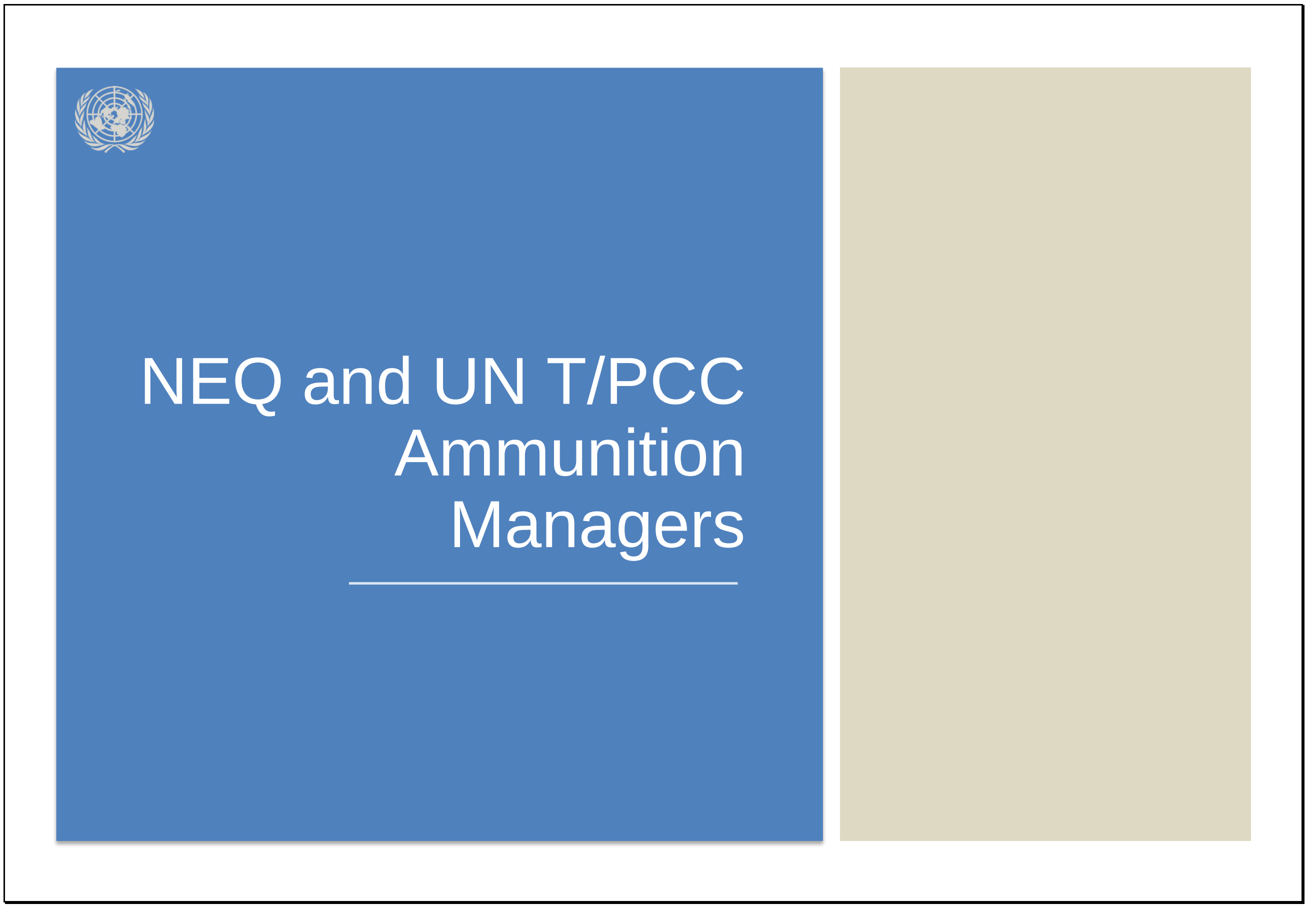
**Total NEQ for Store** = 169.5 + 48.64

= 218.14kg

**<u>Main idea/objective for slide:</u>**
**Introduce the participants to calculating the NEQ for an ammunition in transit**

<u>participant activity</u>
Ask participants questions as this example is being prepared on the board, such as 'What next..?'

<u>What the instructor should cover (in addition to slide content)</u>
Work out this example on a white board to ensure participants understanding.

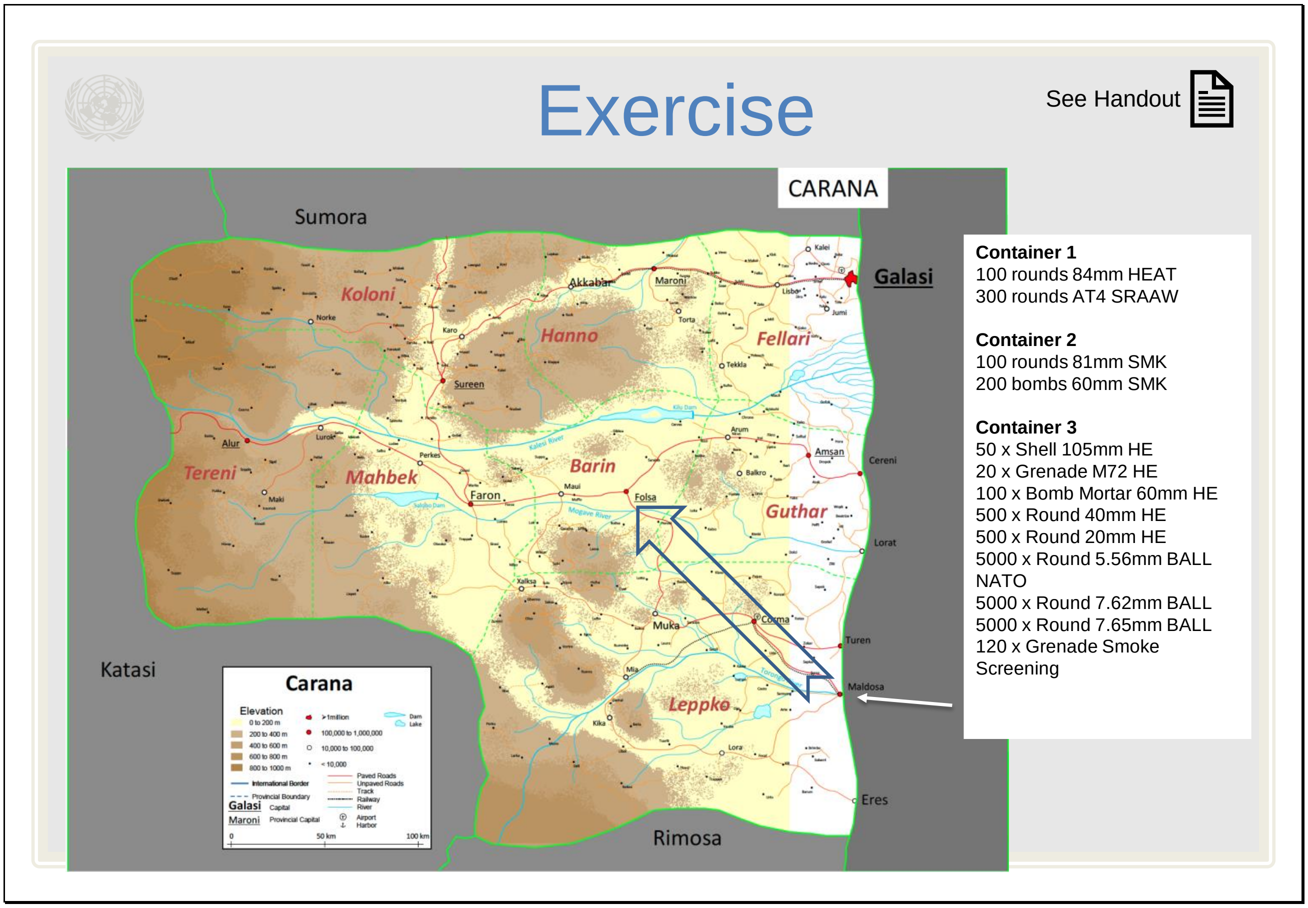


NEQ and UN T/PCC Ammunition Managers

**Phase 2. Development**

Stage 3 – participant exercise: NEQ and UN T/PCC Ammunition Managers

Slide 28



Exercise

See Handout

**Container 1**
100 rounds 84mm HEAT
300 rounds AT4 SRAAW

**Container 2**
100 rounds 81mm SMK
200 bombs 60mm SMK

**Container 3**
50 x Shell 105mm HE
20 x Grenade M72 HE
100 x Bomb Mortar 60mm HE
500 x Round 40mm HE
500 x Round 20mm HE
5000 x Round 5.56mm BALL NATO
5000 x Round 7.62mm BALL
5000 x Round 7.65mm BALL
120 x Grenade Smoke Screening

<u>**Main idea/objective for slide:**</u>

**participant exercise to calculate the required NEQ for a convoy of vehicles moving by road while deployed on a UN mission.**

<u>participant activity</u>

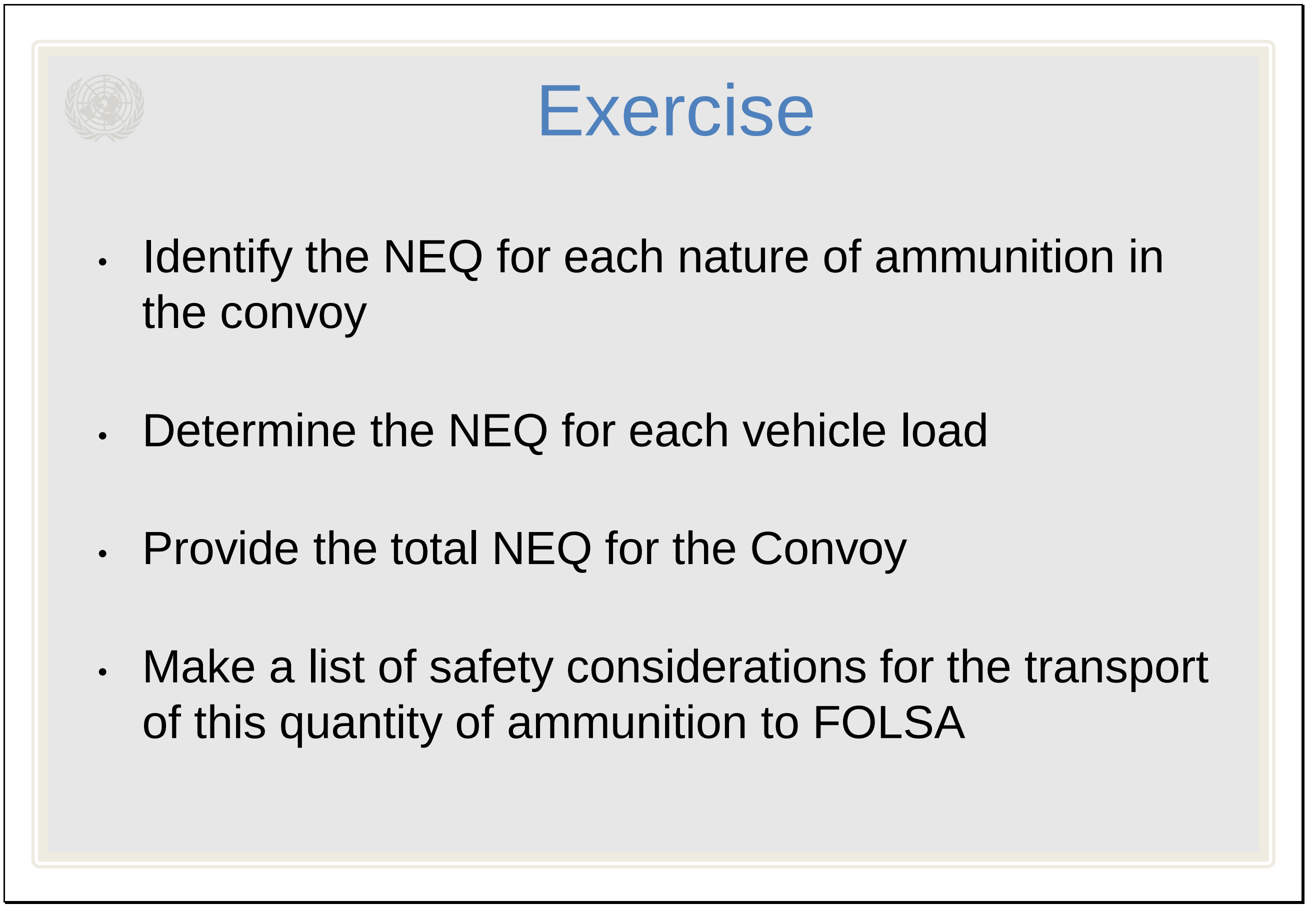
Calculate the NEQs using the information provided in the Lesson Handout (Word doc 'Lesson 06a - NEQ Calculation_practical exercise') (see lesson spec L06)

<u>What the instructor should cover (in addition to slide content)</u>

Instructors are to move around the class and help participants where required.

Teamwork is permitted where preferred.

When complete, work through the answers with the class and ask questions.



## Exercise

- Identify the NEQ for each nature of ammunition in the convoy
- Determine the NEQ for each vehicle load
- Provide the total NEQ for the Convoy
- Make a list of safety considerations for the transport of this quantity of ammunition to FOLSA

**Main idea/objective for slide:**
**participant exercise to calculate the required NEQ for a convoy of vehicles moving by road while deployed on a UN mission.**

participant activity
Calculate the NEQs using the information provided in the Lesson Handout (Word doc 'Lesson 06a - NEQ Calculation practical exercise')

What the instructor should cover (in addition to slide content)
Instructors are to move around the class and help participants where required.
Teamwork is permitted where preferred.
**When complete, work through the answers with the class and ask questions**.

Solution:

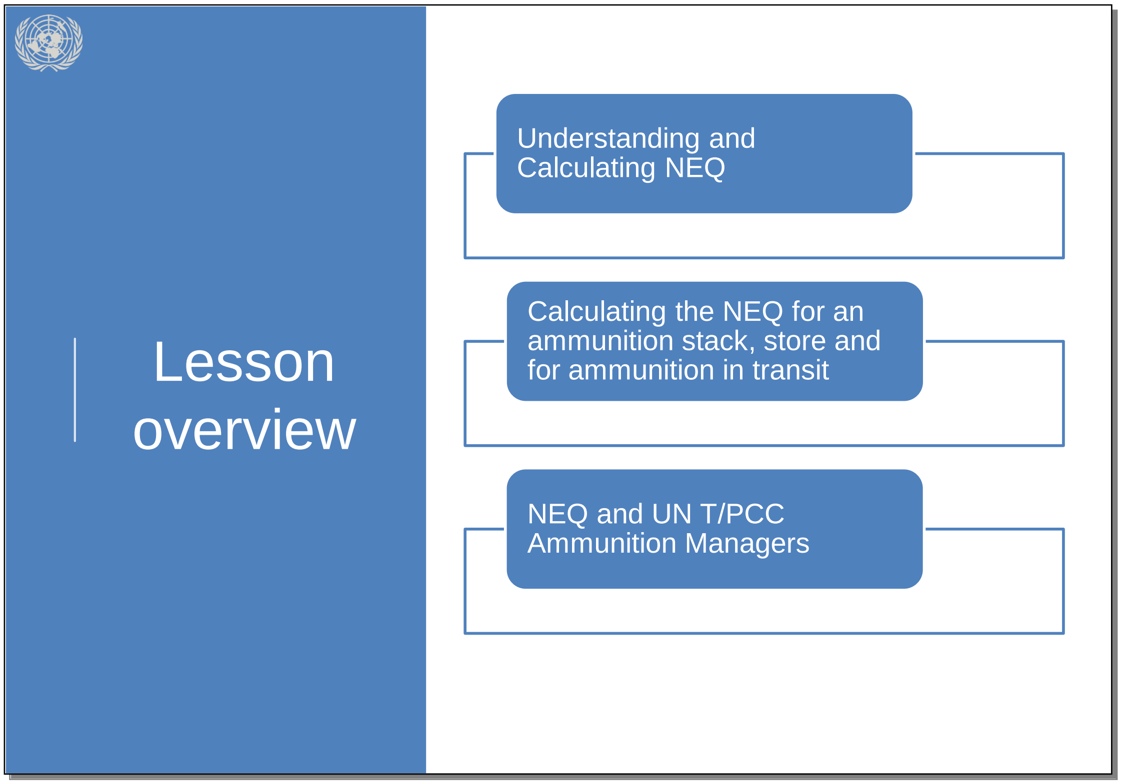
**Container 1 = 233kg**
100 rounds 84mm HEAT. 100 x 1.13kg = 113kg
300 rounds AT4 SRAAW. 300 x 0.4kg = 120kg

**Container 2 = 129.6kg**
100 rounds 81mm SMK 100 x 0.68kg = 68kg
200 rounds 60mm SMK 200 x 0.303kg = 60.6kg

Container 3 =

**Total Convoy NEQ** 233kg + 128.6kg = 362.6 kg

Slide 30



# Lesson overview

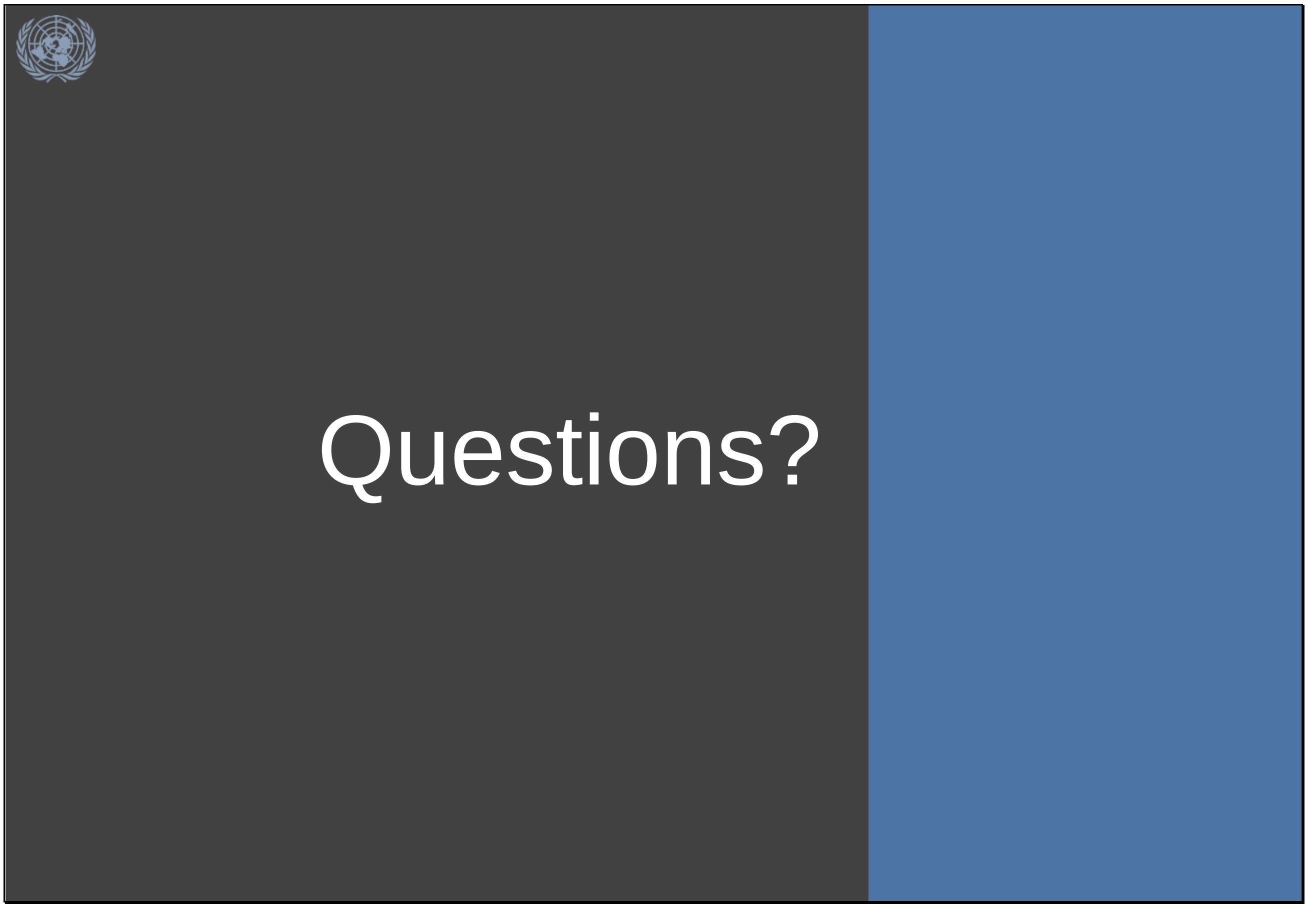
- Understanding and Calculating NEQ
- Calculating the NEQ for an ammunition stack, store and for ammunition in transit
- NEQ and UN T/PCC Ammunition Managers

## Summary

This lesson focused on teaching participants how to calculate the Net Explosive Quantity (NEQ) for various ammunition and explosive items. The aim was to enable participants to determine the total explosive quantity in different scenarios, aiding in the preparation for Explosive Risk Assessments. The key learning points included:

- Review and remember the fundamental principles and formulas used in NEQ calculations.
- Engage in discussions to deepen understanding of NEQ calculation methods and their importance.
- Practice calculating the NEQ for individual units of ammunition.
- Learn to compute the NEQ for stacks of ammunition, considering multiple units stored together.
- Apply NEQ calculations to entire ammunition storage facilities to understand the total explosive potential.
- Calculate the NEQ for ammunition in transit, ensuring safety and compliance with transport regulations.
- Discuss and analyse the role of NEQ calculations in the duties of a UN T/PCC Ammunition Manager, emphasizing practical application and risk management.

Slide 31



Questions?

**<u>Main idea/objective for slide:</u>**

**Give participants opportunity to ask any questions**

Slide 32

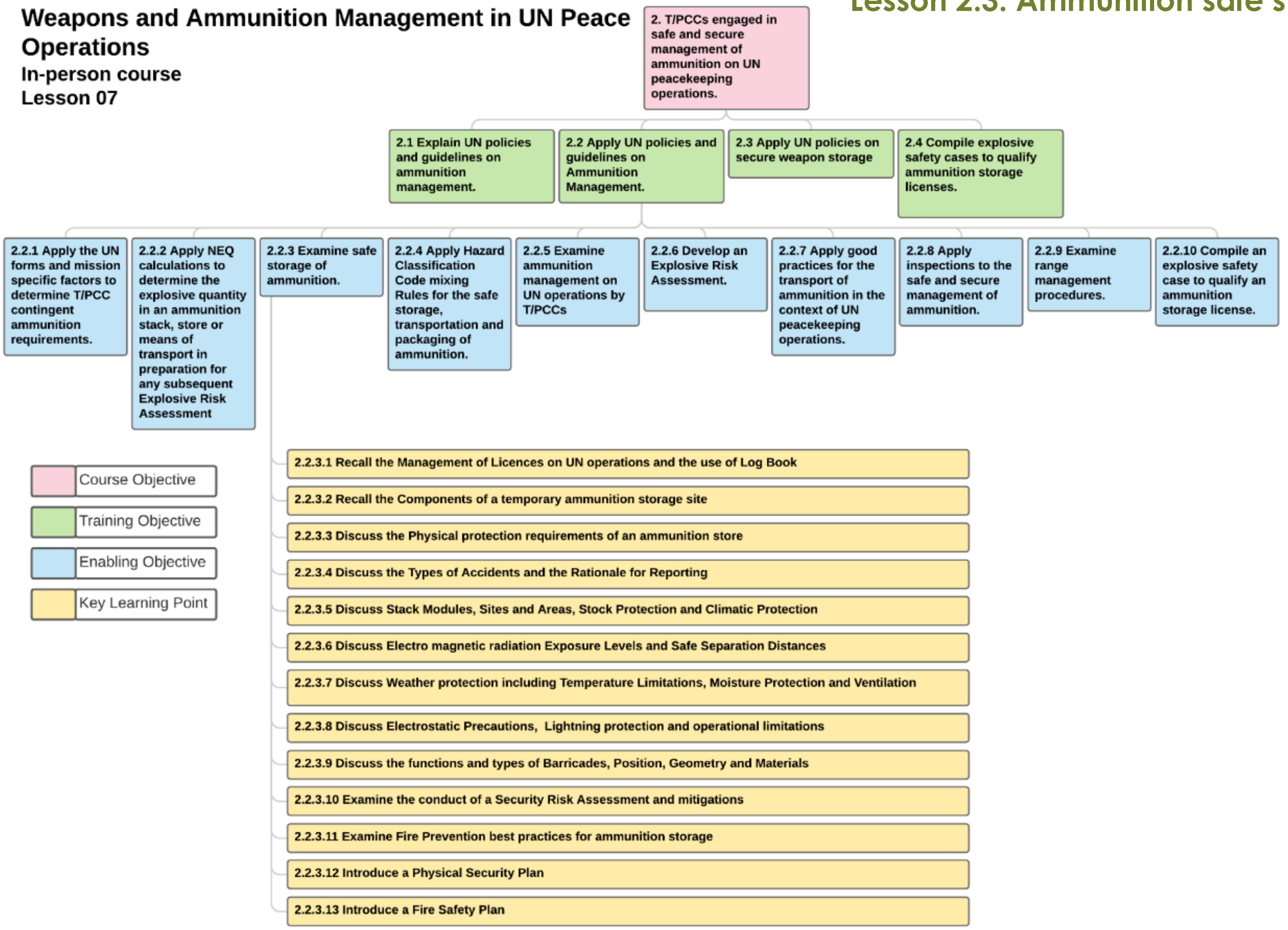
Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Ammunition Safe Storage

**Main idea/objective for slide:**
Look ahead to the next lesson of the course:
Ammunition Safe Storage

# Lesson 2.3

## Lesson 2.3: Ammunition safe storage



**Weapons and Ammunition Management in UN Peace Operations**
**In-person course**
**Lesson 07**

**2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.**

**2.1 Explain UN policies and guidelines on ammunition management.**

**2.2 Apply UN policies and guidelines on Ammunition Management.**

**2.3 Apply UN policies on secure weapon storage**

**2.4 Compile explosive safety cases to qualify ammunition storage licenses.**

**2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.**

**2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment**

**2.2.3 Examine safe storage of ammunition.**

**2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.**

**2.2.5 Examine ammunition management on UN operations by T/PCCs**

**2.2.6 Develop an Explosive Risk Assessment.**

**2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.**

**2.2.8 Apply inspections to the safe and secure management of ammunition.**

**2.2.9 Examine range management procedures.**

**2.2.10 Compile an explosive safety case to qualify an ammunition storage license.**

**2.2.3.1 Recall the Management of Licences on UN operations and the use of Log Book**

**2.2.3.2 Recall the Components of a temporary ammunition storage site**

**2.2.3.3 Discuss the Physical protection requirements of an ammunition store**

**2.2.3.4 Discuss the Types of Accidents and the Rationale for Reporting**

**2.2.3.5 Discuss Stack Modules, Sites and Areas, Stock Protection and Climatic Protection**

**2.2.3.6 Discuss Electro magnetic radiation Exposure Levels and Safe Separation Distances**

**2.2.3.7 Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation**

**2.2.3.8 Discuss Electrostatic Precautions, Lightning protection and operational limitations**

**2.2.3.9 Discuss the functions and types of Barricades, Position, Geometry and Materials**

**2.2.3.10 Examine the conduct of a Security Risk Assessment and mitigations**

**2.2.3.11 Examine Fire Prevention best practices for ammunition storage**

**2.2.3.12 Introduce a Physical Security Plan**

**2.2.3.13 Introduce a Fire Safety Plan**

🟥 Course Objective
🟩 Training Objective
🟦 Enabling Objective
🟨 Key Learning Point

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L07. Ammunition safe storage. |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 180 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.3 Examine safe storage of ammunition. | 2.2.3.1 Recall the Management of Licenses on UN operations and the use of Log Books<br>2.2.3.2 Recall the Components of a temporary ammunition storage site<br>2.2.3.3 Discuss the Physical protection requirements of an ammunition store<br>2.2.3.4 Discuss the Types of Accidents and the Rationale for Reporting<br>2.2.3.5 Discuss Stack Modules, Sites and Areas, Stock Protection and Climatic Protection<br>2.2.3.6 Discuss Electro magnetic radiation Exposure Levels and Safe Separation Distances<br>2.2.3.7 Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation<br>2.2.3.8 Discuss Electrostatic Precautions, Lightning protection and operational limitations<br>2.2.3.9 Discuss the functions and types of Barricades, Position, Geometry and Materials<br>2.2.3.10 Examine the conduct of a Security Risk Assessment and mitigations<br>2.2.3.11 Examine Fire Prevention best practices for ammunition storage<br>2.2.3.12 Develop a Physical Security Plan |

| | |
|---|---|
| | 2.2.3.13 Develop a Fire Safety Plan |
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Develop the safe storage of ammunition management. |
| **Assessment Criteria:** | There is no final assessment for this exercise, however, Instructors will use informal class discussion, questioning of participants and review the work by the participants to enable a positive feedback loop to be established to enhance the effectiveness of the learning. |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | 1:6 in syndicates. Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom, projector and screen, flipchart, whiteboard |
| **Instructional tools & materials** | • Photo book of images for climatic protection of emanation containers<br>• Images of explosive accidents and relevant case studies |
| **Participant Resources:** | • Exercise handout (word doc 'WAMUNPOC L7 Exercise Handout')<br>• UN CARANA Scenario narrative<br>• WAMUNPOC L7 Definitions Handout<br>• WAMUNPOC L7 Security Plan Handout |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here:<br>Health and safety checklist for classrooms (hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

# SECTION 2: LESSON PLAN

## Executive summary:

During this lesson participants will look at the safe storage of ammunition. This will include the UN policies and guidelines on ammunition management in order that the participants can develop Physical Security and Fire Safety Plans.

## Setup:

Phase 1, Phase 2 (stages 1,2 & 3) and Phase 3 will be delivered to the class as a single collective.

Phase 3 (stage 4) will be conducted in small groups (6-8 participants) each with a dedicated instructor.

## Conduct:

### Phase 1. Introduction (Time allocation - 10 min)

- Introduce the objectives of the lesson.
- Using a relevant case study, discuss with the class the impact of conducting poor management processes on a Temporary Storage Area.
- Ask the participants to give examples of what they consider to be poor storage management practices that could lead to an accident – write these on a flipchart and place onto the wall.

### Phase 2. Development

Stage 1 (Time allocation 40 mins) – Considerations for safe storage of ammunition

- Discuss and outline the various components that are found in a typical Temporary Storage Area, putting emphasis on the differences between an ammunition stack, module and storage area. Highlight the use of ISO containers in ammunition storage.
- Using images (and potentially models) of good examples, provide the participants with an understanding of a barricade and a traverse and how they should be employed in a Temporary Storage Area.
- Outline the reasons and mechanisms available for the control of climatic conditions and particularly their effect on ammunition and explosives. Use images to provide the participants with good examples.
- Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation
- Introduce the Security Risk Assessment, paying particular emphasis to the integration of the camp security plan, the type and quality of fencing used around the Temporary Storage Area and the methods by which access control is managed i.e. keys and locks etc.

- Examine Fire Prevention best practices for ammunition storage. Discuss the requirement to develop a Fire Safety Plan which will include the necessary fire alarm systems, firefighting signs and equipment, the management of vegetation and contraband items.
- Discuss radio-frequency hazards and Safe Separation Distances
- Highlight the need to ensure suitable lightning protection on all ammunition storage containers. Include a discussion on the effects that electrostatic discharge and electronic RF hazards can have on ammunition and explosives.

Stage 2 (Time allocation 40 mins) – Accidents with ammunition and explosives

- Explain and illustrate to the participants the impact of explosive accidents using images of case studies and emphasise the need to mitigate all risks to ammunition and explosives.
- Discuss the activities and the reports to be completed in the event of an accident paying particular attention to maintaining safety.
- Indicate the information that must be provided in an Explosive Accident Report.

Stage 3 (Time allocation 40 mins) – Licensing of Temporary Storage Area

- Revise the definitions associated with Explosives Limit Licencing (ELL).
- Outline and discuss the various types of ELL and what is meant by Authorised Quantity.
- Discuss the management of ELLs with emphasis on their visibility and duration of validity.
- Introduce the participants to the ELL Matrix and using a suitable scenario, the instructor will complete the matrix, inputting all relevant information.

Stage 4 (Time allocation 40 mins) – Participant exercise

- Participant exercise to Identify what geographic risks are surrounding a proposed Temporary Storage Area, and develop a security and fire safety plan using the provided template.
- Participants to use the CARANA scenario background narrative
- Participants to read and review the Exercise handout (word doc 'WAMUNPOC L7 Exercise Handout') and read through the requirements.
- Instructor should point out FOLSA to participants
- Instructor to break class into groups of three participants.

**Phase 3. Consolidation (Time allocation - 10 min)**

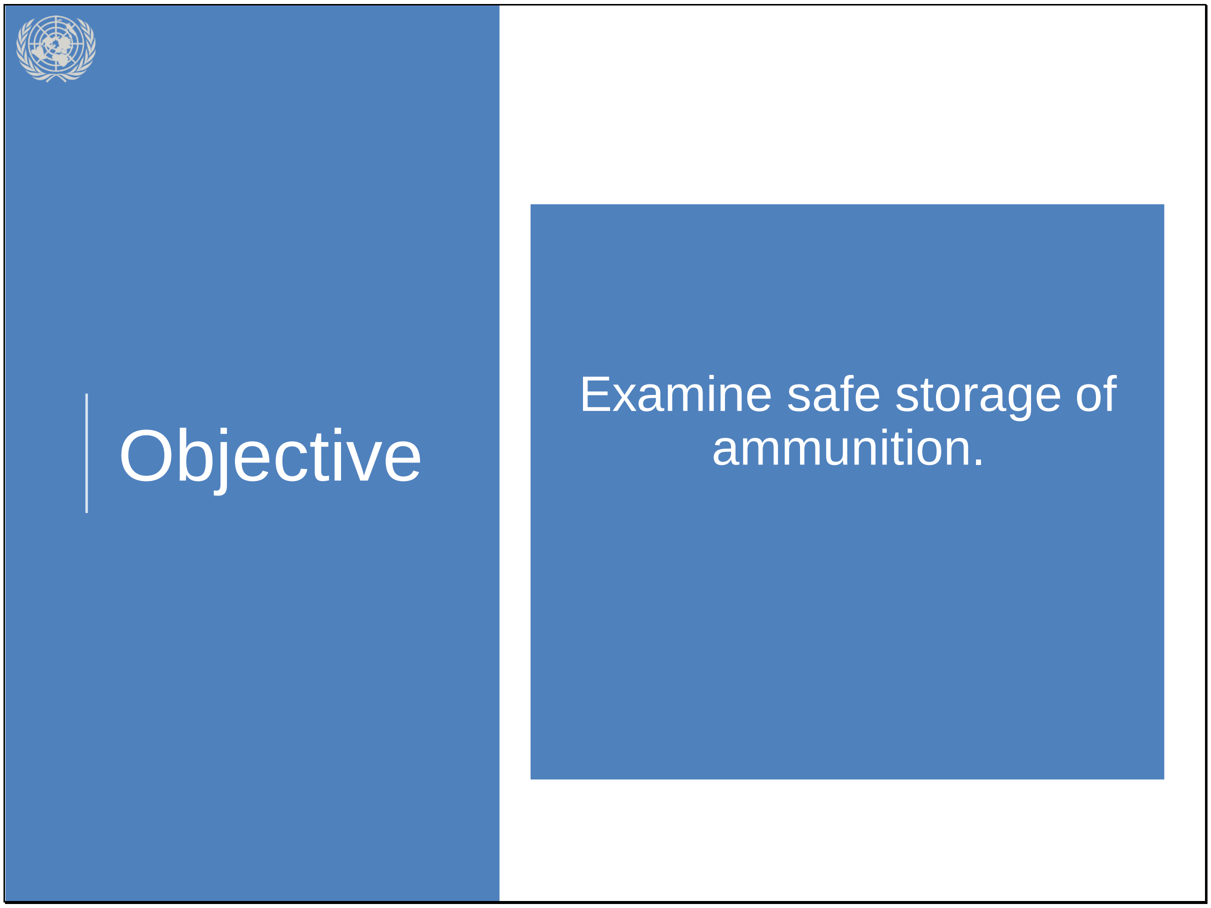
- Review Enabling objective and Key Learning Points (see Section 1), drawing out any common themes in the participant.
- Look ahead to the next lesson of the course:
    - UN Hazard Class Code Mixing Rules

# Weapons and Ammunition Management in UN Peace Operations

## Ammunition Safe Storage

**Key Reference Documents for this lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)



Objective

Examine safe storage of ammunition.

**<u>Main idea/objective for slide:</u>**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.3 Examine safe storage of ammunition.)

<u>What the instructor should cover (in addition to slide content)</u>
By the end of this training session the participant will Examine safe storage of ammunition.

Slide 3

## Lesson overview

- Examine safety considerations for a temporary ammunition storage site
- Discuss the impact of poor ammunition management practices and explosive accidents
- Describe licensing of a temporary ammunition storage site
- Apply Safe Storage practices to a scenario

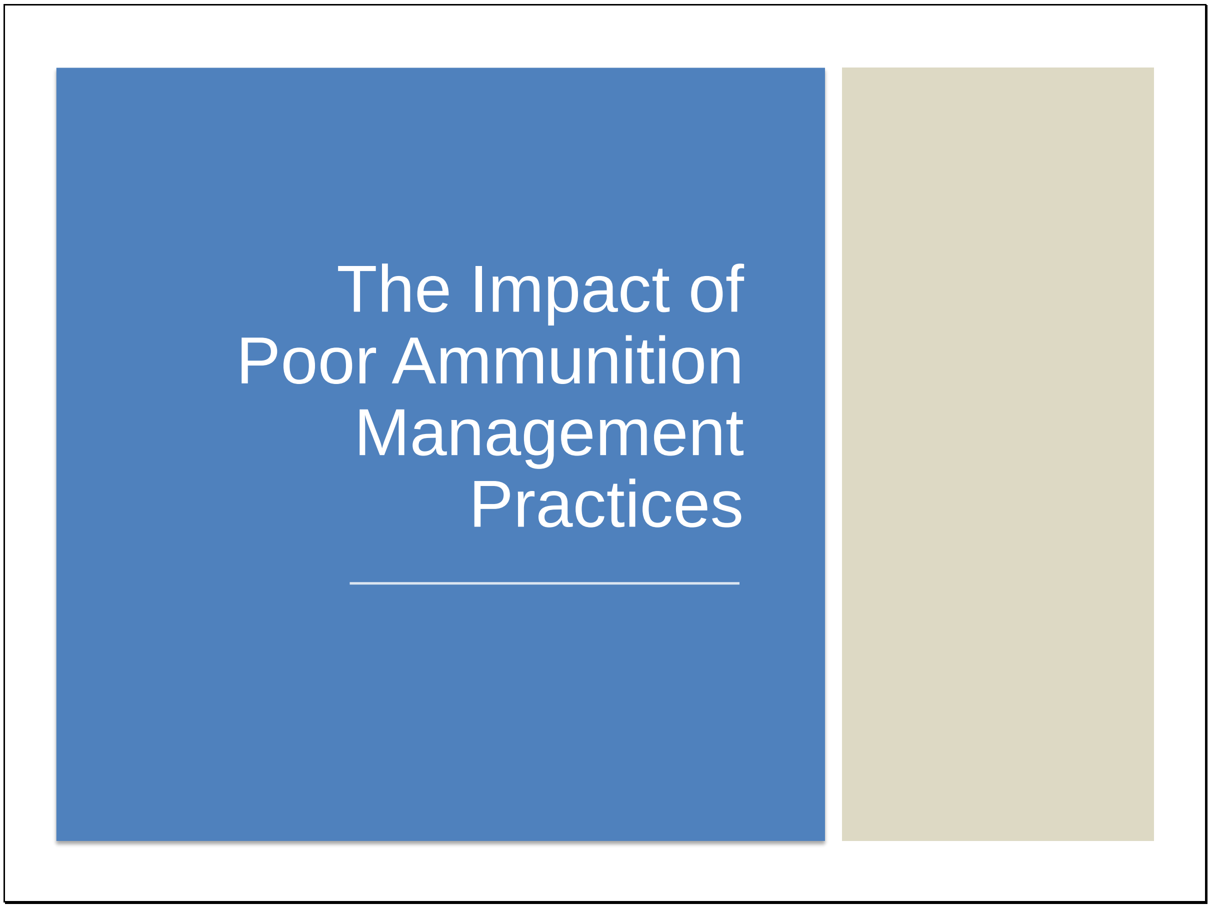
**<u>Main idea/objective for slide:</u>**
**Introduce the Key Learning Points**

<u>What the instructor should cover (in addition to slide content)</u>

Key Learning Points
2.2.3.1 Recall the Management of Licenses on UN operations and the use of Log Books
2.2.3.2 Recall the Components of a temporary ammunition storage site
2.2.3.3 Discuss the Physical protection requirements of an ammunition store
2.2.3.4 Discuss the Types of Accidents and the Rationale for Reporting
2.2.3.5 Discuss Stack Modules, Sites and Areas, Stock Protection and Climatic Protection
2.2.3.6 Discuss Electro magnetic radiation Exposure Levels and Safe Separation Distances

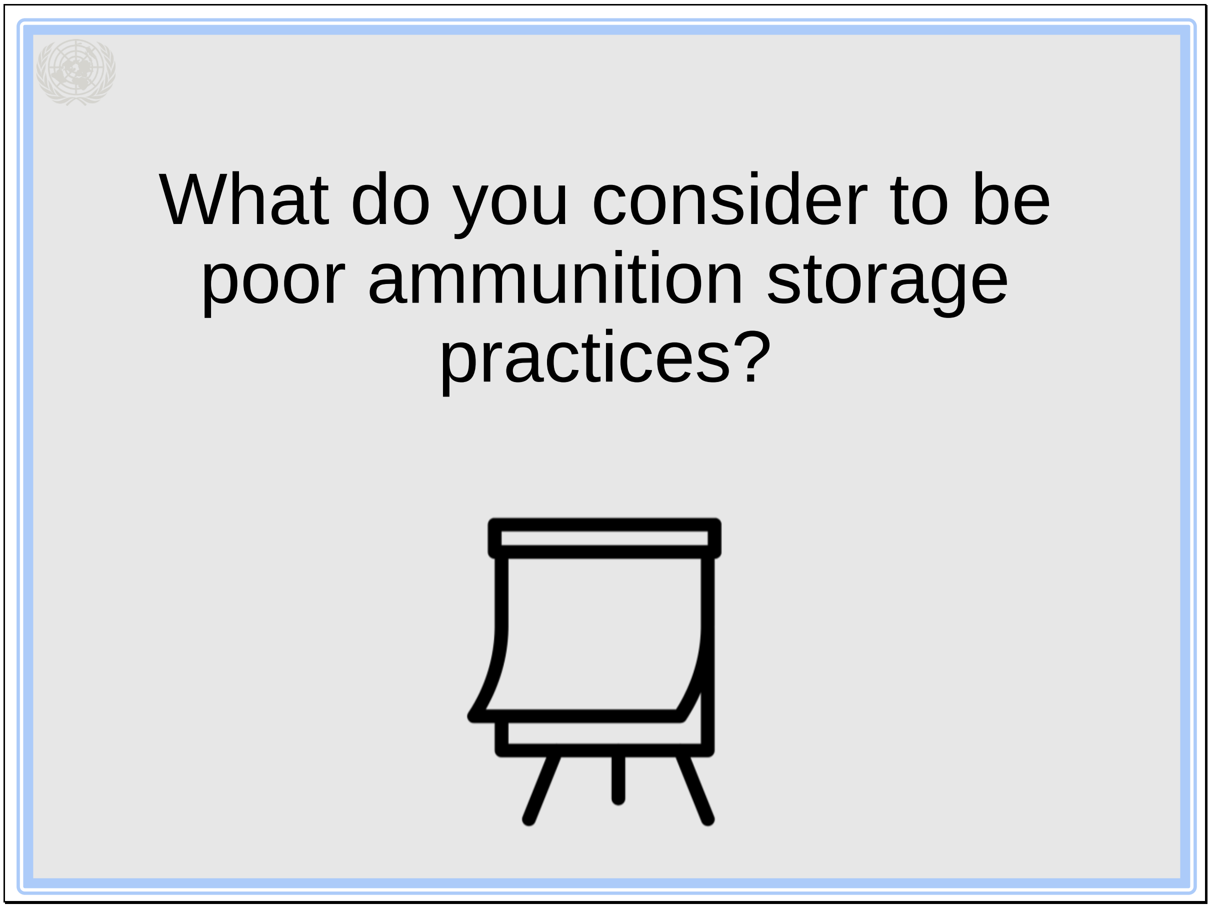
2.2.3.7 Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation
2.2.3.8 Discuss Electrostatic Precautions, Lightning protection and operational limitations
2.2.3.9 Discuss the functions and types of Barricades, Position, Geometry and Materials
2.2.3.10 Examine the conduct of a Security Risk Assessment and mitigations
2.2.3.11 Examine Fire Prevention best practices for ammunition storage
2.2.3.12 Develop a Physical Security Plan
2.2.3.13 Develop a Fire Safety Plan

Slide 4



The Impact of Poor Ammunition Management Practices

**Phase 1. Introduction (**Time allocation - 10 min**)**



What do you consider to be poor ammunition storage practices?

**<u>Main idea/objective for slide:</u>**
**Discuss examples of poor ammunition storage practices**

<u>participant activity</u>
Ask the participants to give examples of what they consider to be poor storage management practices that could lead to an accident
Write these on a flipchart and place onto the wall.

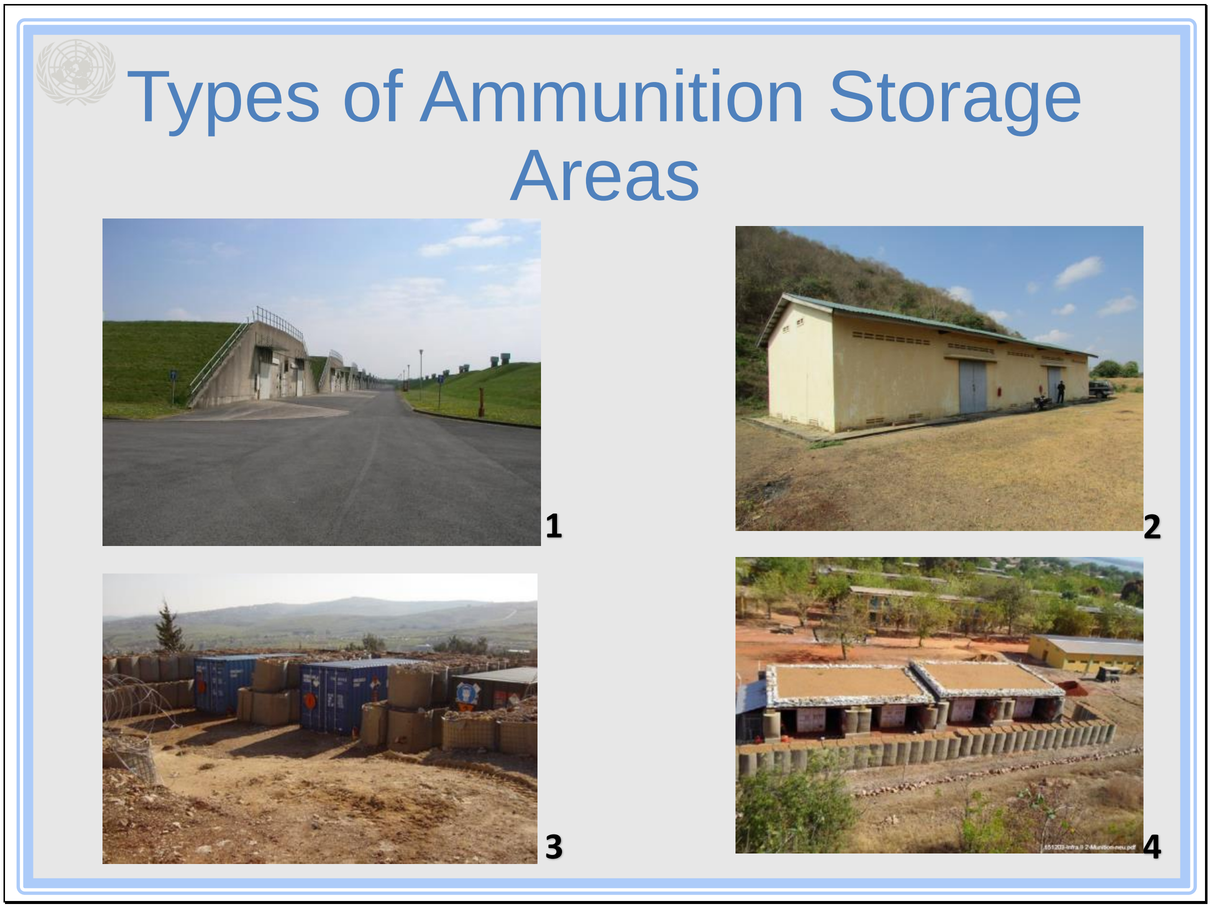
Slide 6

Considerations for safe storage of ammunition

**Phase 2. Development (**Time allocation - 160 min**)**

Stage 1 (Time allocation 40 mins) – Considerations for safe storage of ammunition

Slide 7



Types of Ammunition Storage Areas

**Main idea/objective for slide:**
**Discuss and outline the various components of Ammunition Storage Areas**

participant activity
Ask the participants to explain what they see in each image.
What are  the differences between the various types of storage areas?

What the instructor should cover (in addition to slide content)
Emphasise the differences between an ammunition stack, module and storage area.
Highlight the use of ISO containers in ammunition storage.

Permanent Storage

1. Earth Covered Magazine (ECM referred to as an "Igloo")

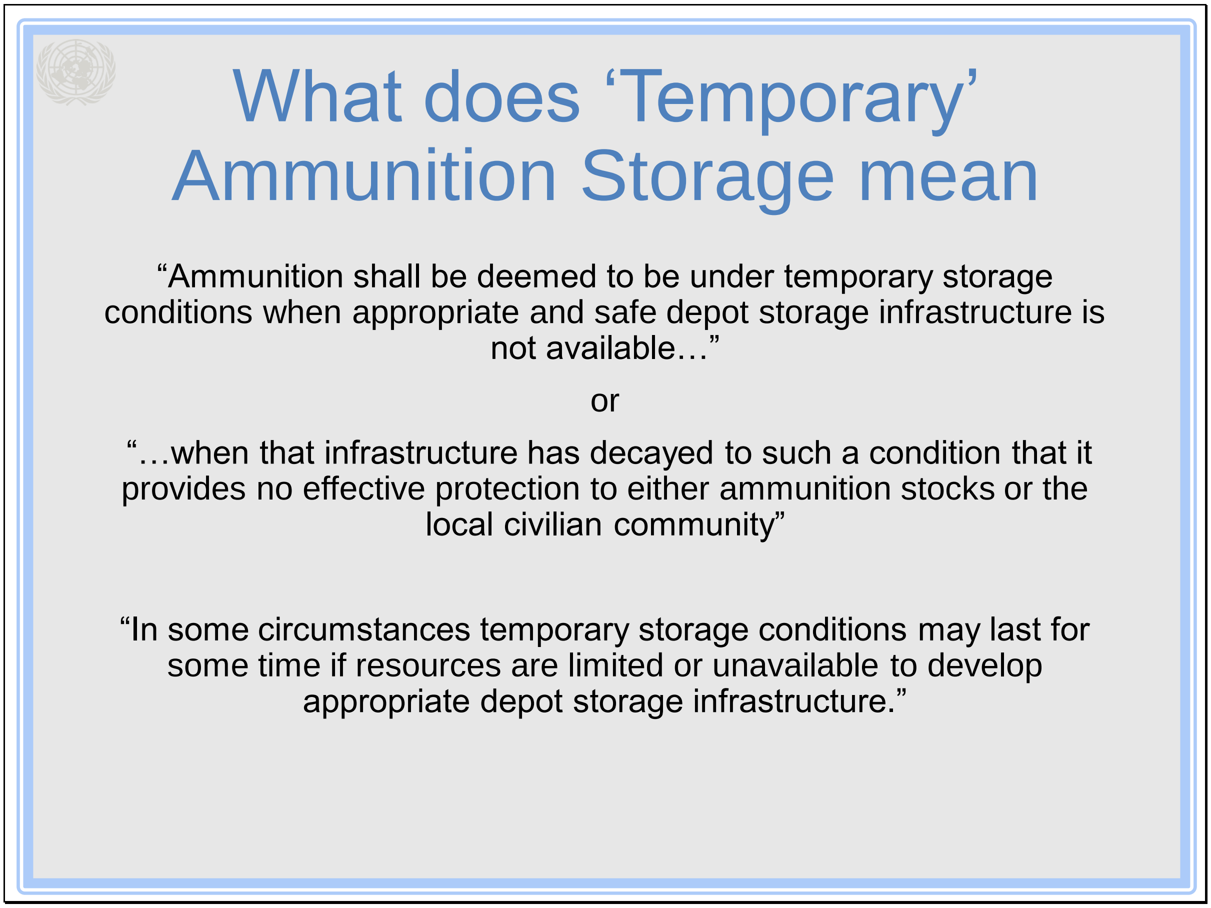
2. Depending of Construction: Light Structured Building - Medium Walled Building - Heavy walled building

Temporary storage:

3. and 4. Open bay or site with Container storage and over head protection (for 4.)

- Images from UNDPO DDR WAM Course, AMAT/GICHD, open source.

Slide 8



## What does ‘Temporary’ Ammunition Storage mean

“Ammunition shall be deemed to be under temporary storage conditions when appropriate and safe depot storage infrastructure is not available…”

or

“…when that infrastructure has decayed to such a condition that it provides no effective protection to either ammunition stocks or the local civilian community”

“In some circumstances temporary storage conditions may last for some time if resources are limited or unavailable to develop appropriate depot storage infrastructure.”

**Main idea/objective for slide:**

**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

References/further reading

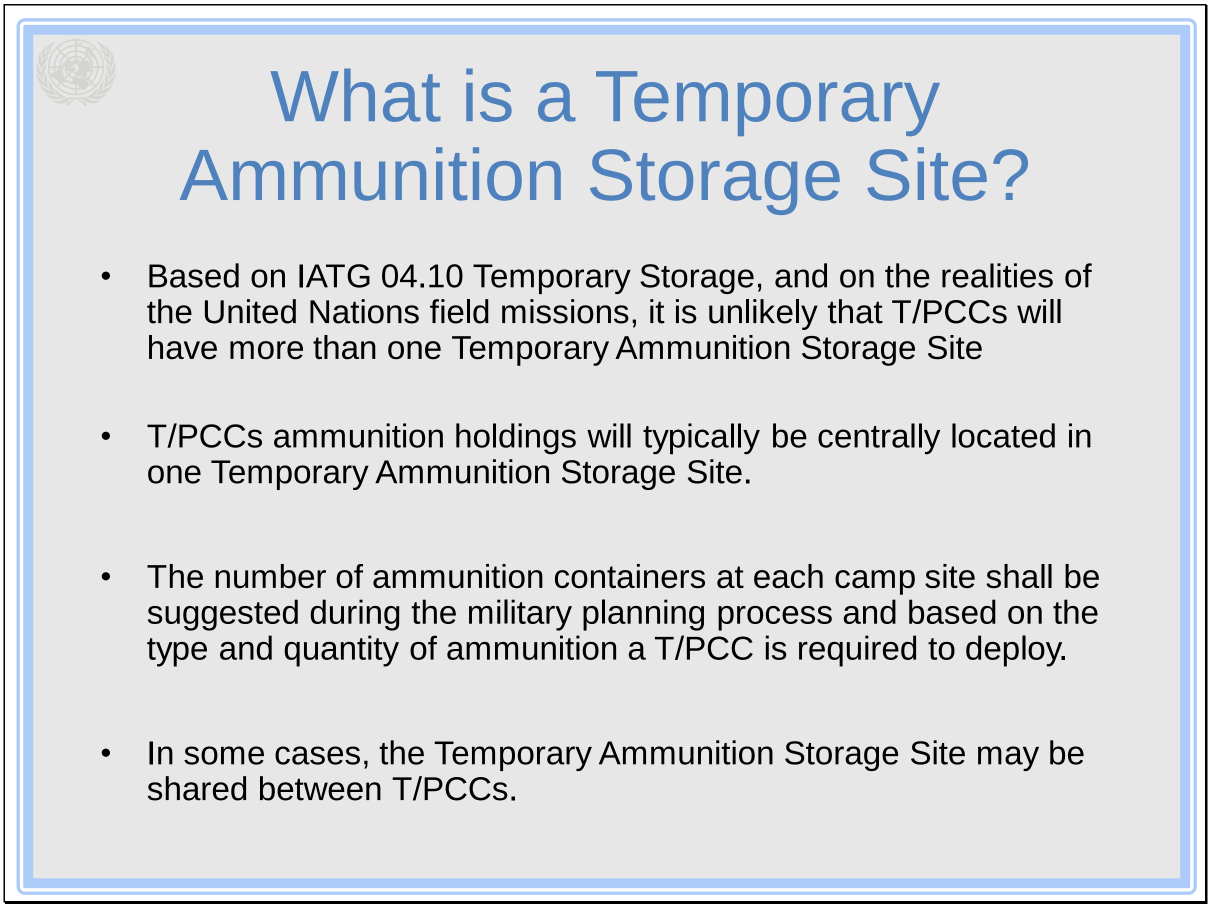
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- The unstable nature of UNPO also imposes the requirement for mobility and flexibility for operational deployment of the military and police units. For this reason, in the context of United Nations field missions, storage of ammunition and explosives shall be required to conform with guidance provided in International Ammunition Technical Guidelines (IATG) 04.10 for Temporary Storage.
- Temporary ammunition storage during patrolling is not covered in this manual, pending development of standards. Missions must develop these standards in the meantime

- Each T/PCC will be responsible for controlling and managing their own ammunition storage facilities. In accordance with the UN COE Manual, contingents that are responsible for minor engineering capabilities under the self-sustainment category should provide the fortification plan and work in close coordination with the United Nations on the construction of ammunition storage fortification.
- Substandard storage facilities substantially affect the shelf life of ammunition and pose a threat to persons and material in the surrounding area. Containers used as temporary storage shall be barricaded in accordance with IATG 04.10 and include overhead protection (OHP) as appropriate or when necessary, based on the risk assessment

**IATG 04.10 – Temporary Storage**

- Unless specifically stated within this IATG, the requirements of all other IATG shall be observed in order to retain the most stringent safety standards and preservation of assets during temporary storage conditions.
- While the ideal and most efficient method of storing ammunition is in purpose built ammunition depots to ensure explosive safety, conventional ammunition can be stored safely, effectively and efficiently under temporary conditions. There may be, however, disadvantages to temporary storage in that the service life of ammunition could be significantly reduced.
- Ammunition that is stored under temporary storage conditions for prolonged periods of time should be subjected to an effective technical surveillance and in-service proof programme. This is the only way to ensure that the ammunition does not deteriorate to a condition that compromises performance or safety in storage.
- Temporary storage should usually not be utilised for operations of a long period or in post conflict environments. Ammunition should not normally remain under temporary storage conditions for more than five years, before being moved into permanent storage facilities.
- Temporary storage conditions permit the use of reduced Quantity Distances but this means an increased risk to local civilian communities and own staff deployed on operations. The reduced Quantity Distances should be used sparingly, and all efforts shall be made to ensure that normal Quantity Distances in accordance with IATG 02.20] *Quantity and separation distances* are applied.
- Should the reduced Quantity Distances not be achievable then an Explosion Safety Case shall be compiled in accordance with IATG 02.10
- During the planning of Temporary Storage Areas, decisions are made that may be difficult to rectify at a later date. Planning should therefore be focussed and conducted by highly qualified personnel.
- During the planning process, provision should be made to involve those personnel responsible for the storage and management of the ammunition that will be stored in the site. Engineers should cooperate closely in the planning phase, as they will be responsible for any construction works that may be required.



## What is a Temporary Ammunition Storage Site?

- Based on IATG 04.10 Temporary Storage, and on the realities of the United Nations field missions, it is unlikely that T/PCCs will have more than one Temporary Ammunition Storage Site
- T/PCCs ammunition holdings will typically be centrally located in one Temporary Ammunition Storage Site.
- The number of ammunition containers at each camp site shall be suggested during the military planning process and based on the type and quantity of ammunition a T/PCC is required to deploy.
- In some cases, the Temporary Ammunition Storage Site may be shared between T/PCCs.

**<u>Main idea/objective for slide:</u>**
**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

<u>References/further reading</u>
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- In many cases, military/police camps will have not more than one Temporary Ammunition Store (one 20’ ammunition container) at each camp site.
- A final decision on the required number of ammunition containers depends on the results of the licensing process, based on the actual distances to Exposed Sites (ES) (structures) at the camp site.

## Ammunition Stack: Ammunition Storage Container

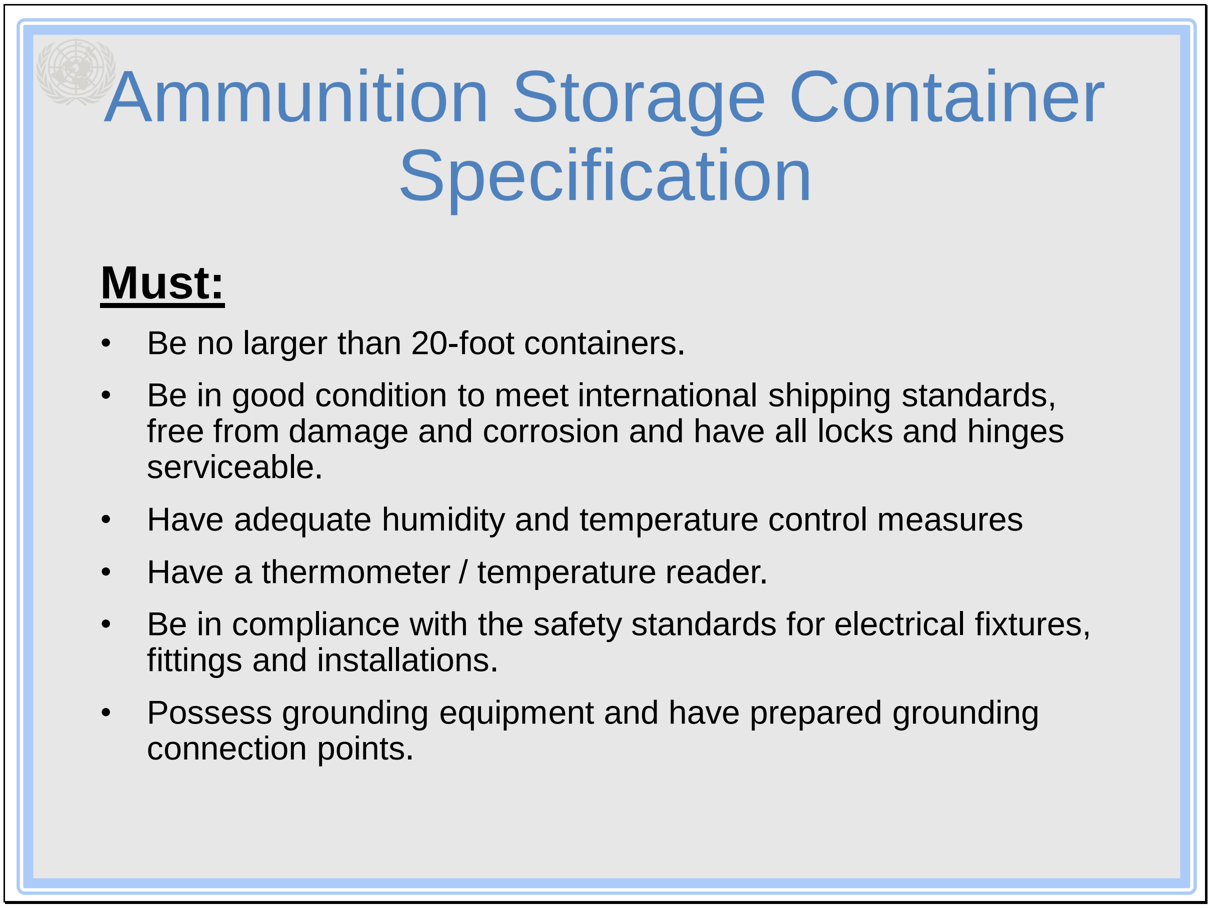
- The standard and preferred location for ammunition storage during deployment on UN missions.
- Considered as a light/open stack when unbarricaded.
- Ammunition to be correctly stored within the container.

**<u>Main idea/objective for slide:</u>**
**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

<u>References/further reading</u>
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- An ammunition storage container is the standard and preferred location where all ammunition should be kept during deployment in United Nations field missions.
- It shall be the T/PCC's responsibility to deploy the required quantity of ammunition containers, based on the Statement of Unit Requirements (SUR) and the Memorandum of Understanding (MOU).
- The number of containers will be based on the unit's concept of employment and the types and quantities of ammunition required for the deployment taking into account the mixing rules and Net Explosive Quantity (NEQ) limits.

- Due to the temporary nature of any UN mission, it is not always feasible to construct purpose-built ammunition storage buildings. Therefore, a container which is up to 20ft long with standardized modification to hold ammunition is the recommended location for primary storage of ammunition and explosives.
- An unbarricaded ammunition container is considered as a light/open stack structure. Overpressure and primary fragmentation protection are low or non-existent.
- As a potential explosive site (PES) and depending on the Net Explosive Quantity (NEQ) Hazard Division (HD) 1.1 stored, the container can disintegrate and produce debris with damage potential. Therefore, all ammunition containers deployed in the field must be appropriately barricaded according to Barricades (Level 2), IATG 4.10.
- The construction of ammunition storage shades under temporary storage conditions falls under minor engineering capability of T/PCCs. The responsibility for ammunition storage is with the T/PCCs as per the COE Manual.
- More complex ammunition storage using temporary storage conditions, especially when overhead protection may be used, may exceed minor engineering capabilities and may have to be constructed with support from mission engineers.
- The field defense stores (FDS) required for the security of the ammunition storage area will be provided by the United Nations when the United Nations takes the self-sustainment responsibility for FDS in accordance with the MOU.



# Ammunition Storage Container Specification

**Must:**

- Be no larger than 20-foot containers.
- Be in good condition to meet international shipping standards, free from damage and corrosion and have all locks and hinges serviceable.
- Have adequate humidity and temperature control measures
- Have a thermometer / temperature reader.
- Be in compliance with the safety standards for electrical fixtures, fittings and installations.
- Possess grounding equipment and have prepared grounding connection points.

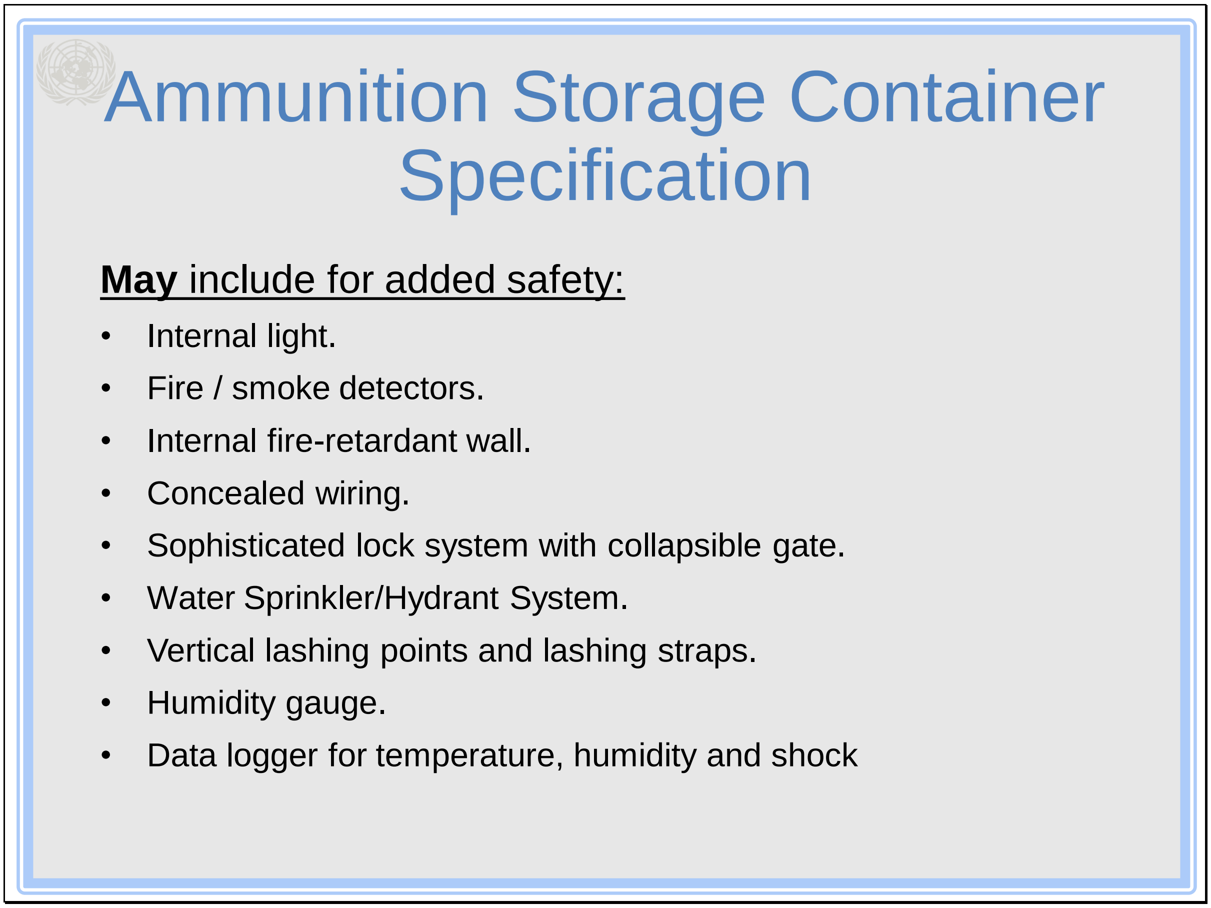
**Main idea/objective for slide:**

**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed – Annex A**

- Due to the temporary nature of any United Nations mission, it is not always feasible to construct a purpose-built ammunition storehouse. Troop/Police Contributing Countries (T/PCCs) are thus required to deploy ammunition containers as part of the Memorandum of Understanding (MOU)/ Statement of Unit Requirements (SUR).



## Ammunition Storage Container Specification

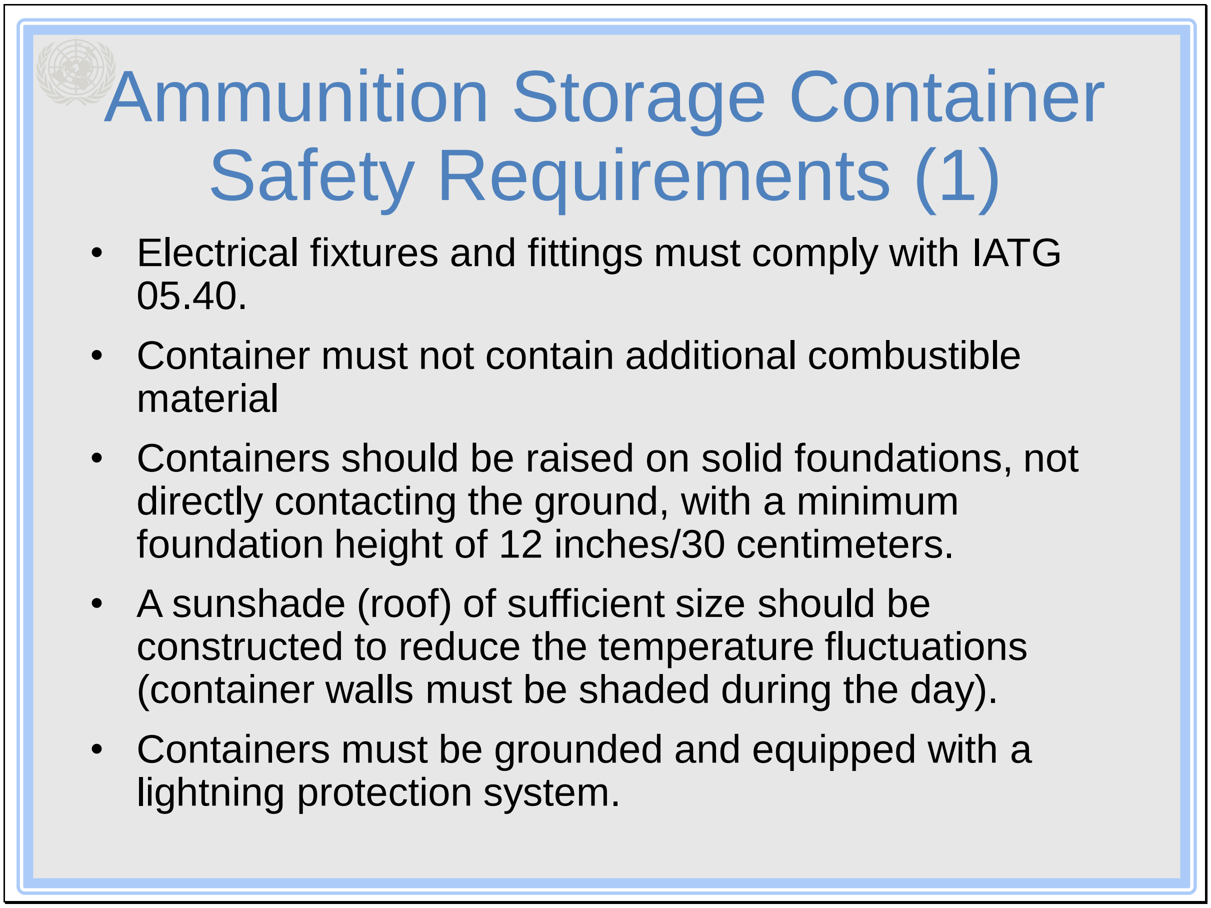
**May** include for added safety:

- Internal light.
- Fire / smoke detectors.
- Internal fire-retardant wall.
- Concealed wiring.
- Sophisticated lock system with collapsible gate.
- Water Sprinkler/Hydrant System.
- Vertical lashing points and lashing straps.
- Humidity gauge.
- Data logger for temperature, humidity and shock

**Main idea/objective for slide:**
**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed – Annex A**

- Due to the temporary nature of any United Nations mission, it is not always feasible to construct a purpose-built ammunition storehouse. Troop/Police Contributing Countries (T/PCCs) are thus required to deploy ammunition containers as part of the Memorandum of Understanding (MOU)/ Statement of Unit Requirements (SUR).



## Ammunition Storage Container Safety Requirements (1)

- Electrical fixtures and fittings must comply with IATG 05.40.
- Container must not contain additional combustible material
- Containers should be raised on solid foundations, not directly contacting the ground, with a minimum foundation height of 12 inches/30 centimeters.
- A sunshade (roof) of sufficient size should be constructed to reduce the temperature fluctuations (container walls must be shaded during the day).
- Containers must be grounded and equipped with a lightning protection system.

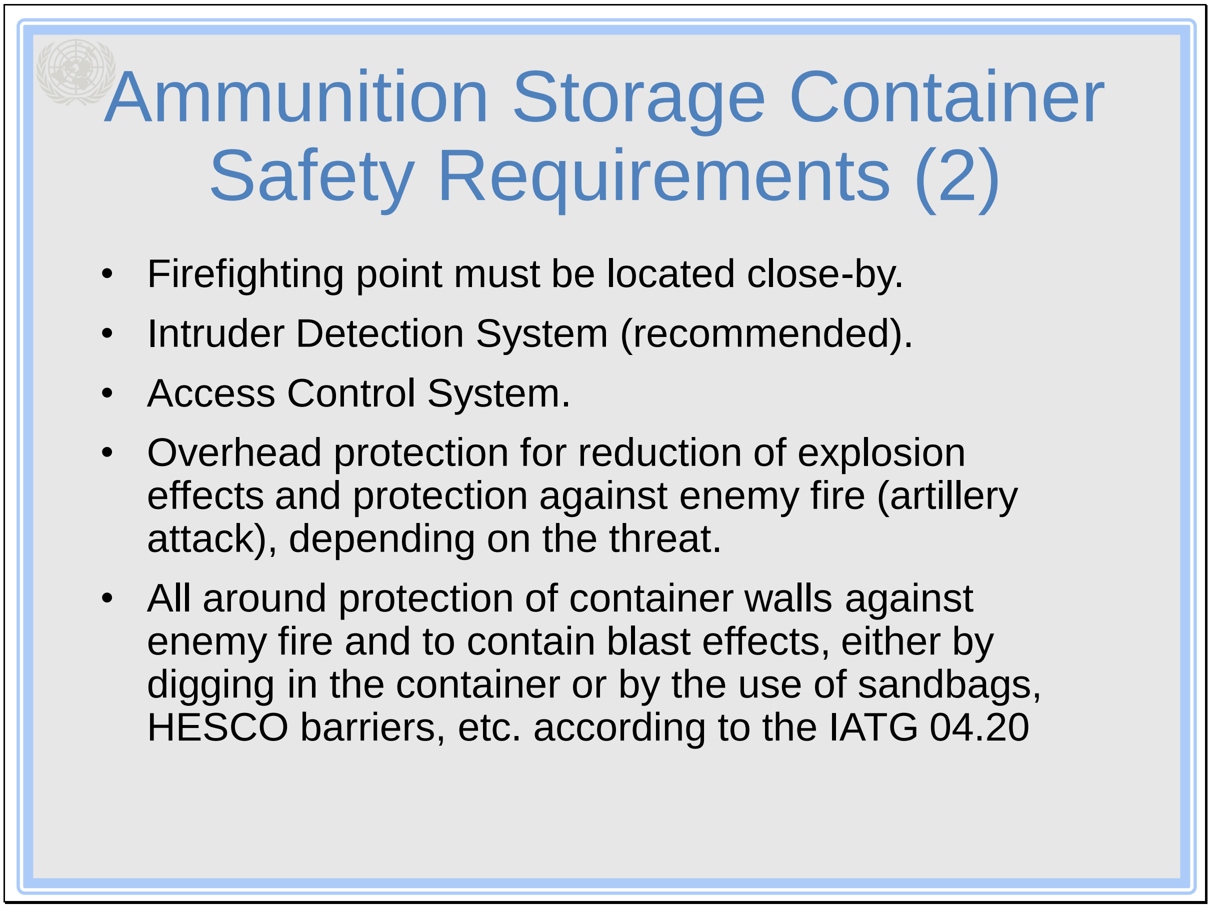
**Main idea/objective for slide:**

**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed – Annex A**

- Due to the temporary nature of any United Nations mission, it is not always feasible to construct a purpose-built ammunition storehouse. Troop/Police Contributing Countries (T/PCCs) are thus required to deploy ammunition containers as part of the Memorandum of Understanding (MOU)/ Statement of Unit Requirements (SUR).



# Ammunition Storage Container Safety Requirements (2)

- Firefighting point must be located close-by.
- Intruder Detection System (recommended).
- Access Control System.
- Overhead protection for reduction of explosion effects and protection against enemy fire (artillery attack), depending on the threat.
- All around protection of container walls against enemy fire and to contain blast effects, either by digging in the container or by the use of sandbags, HESCO barriers, etc. according to the IATG 04.20

**Main idea/objective for slide:**

**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed – Annex A**

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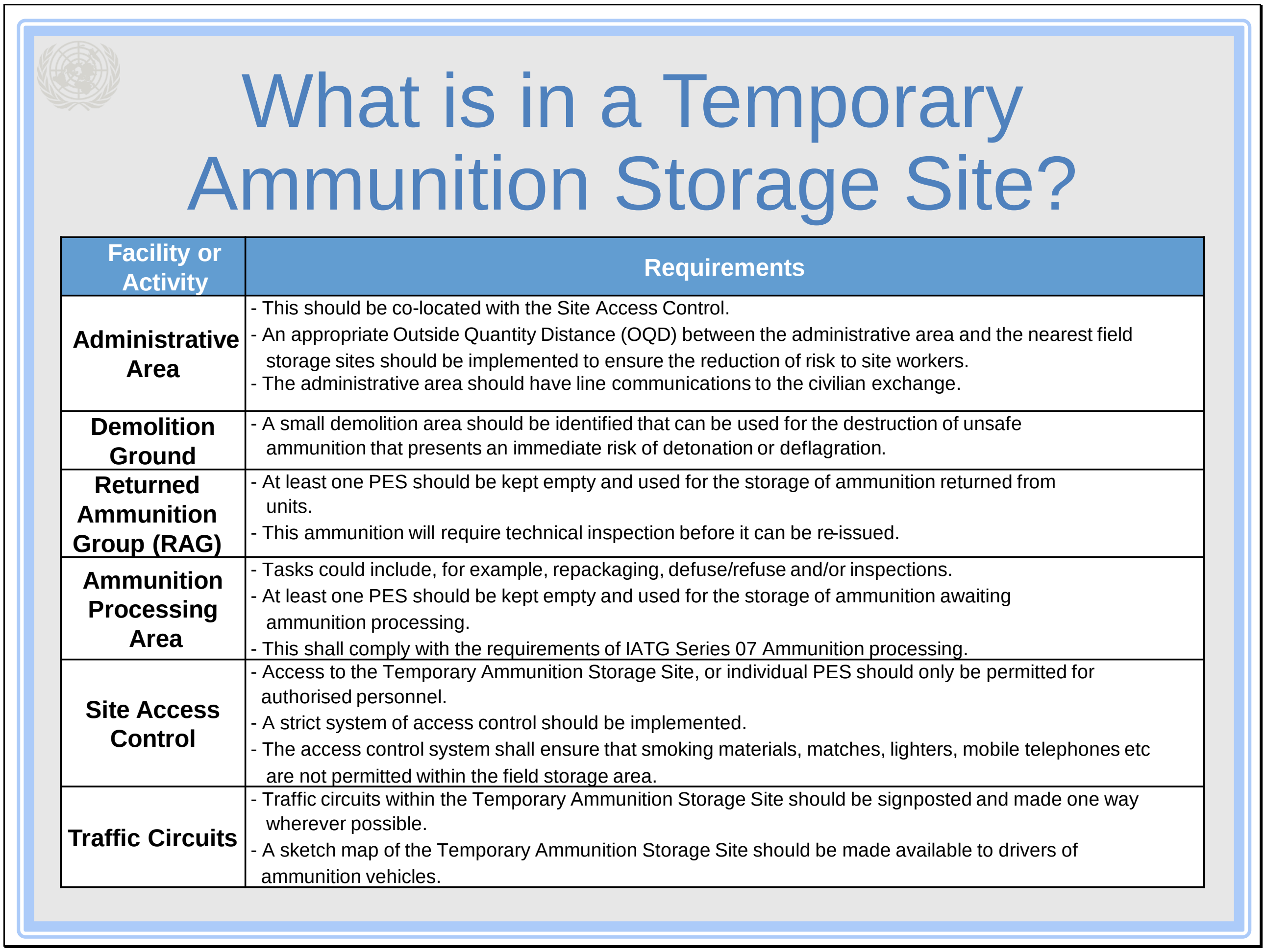


# What is in a Temporary Ammunition Storage Site?

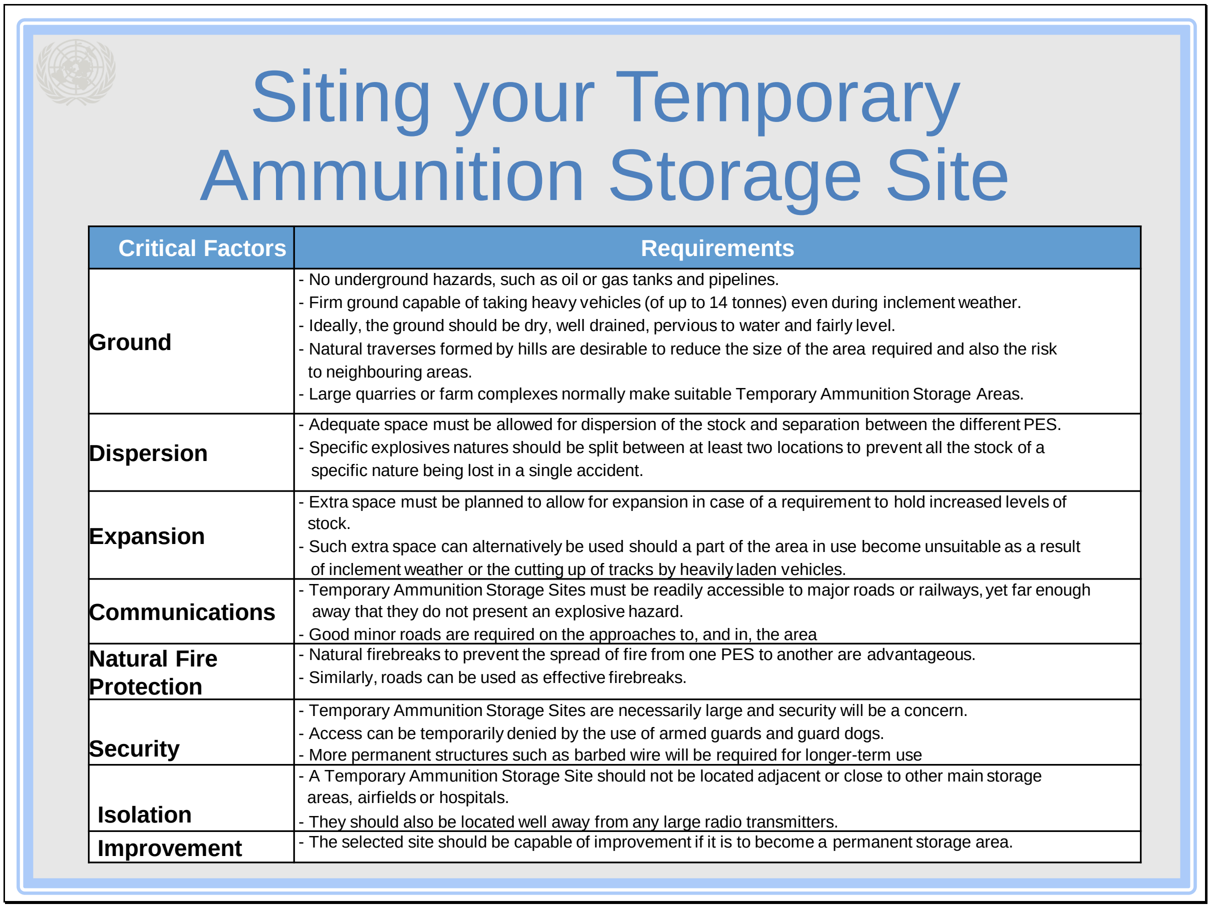
| Facility or Activity | Requirements |
|---|---|
| **Administrative Area** | - This should be co-located with the Site Access Control.<br>- An appropriate Outside Quantity Distance (OQD) between the administrative area and the nearest field storage sites should be implemented to ensure the reduction of risk to site workers.<br>- The administrative area should have line communications to the civilian exchange. |
| **Demolition Ground** | - A small demolition area should be identified that can be used for the destruction of unsafe ammunition that presents an immediate risk of detonation or deflagration. |
| **Returned Ammunition Group (RAG)** | - At least one PES should be kept empty and used for the storage of ammunition returned from units.<br>- This ammunition will require technical inspection before it can be re-issued. |
| **Ammunition Processing Area** | - Tasks could include, for example, repackaging, defuse/refuse and/or inspections.<br>- At least one PES should be kept empty and used for the storage of ammunition awaiting ammunition processing.<br>- This shall comply with the requirements of IATG Series 07 Ammunition processing. |
| **Site Access Control** | - Access to the Temporary Ammunition Storage Site, or individual PES should only be permitted for authorised personnel.<br>- A strict system of access control should be implemented.<br>- The access control system shall ensure that smoking materials, matches, lighters, mobile telephones etc are not permitted within the field storage area. |
| **Traffic Circuits** | - Traffic circuits within the Temporary Ammunition Storage Site should be signposted and made one way wherever possible.<br>- A sketch map of the Temporary Ammunition Storage Site should be made available to drivers of ammunition vehicles. |

**Main idea/objective for slide:**
**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

What the instructor should cover (in addition to slide content)
Provide this table to participants as a Handout, **IATG 04.10 – Temporary Storage, page 8**

References/further reading
**IATG 04.10 – Temporary Storage Page 8**

- A Temporary Storage Area may require a range of supporting facilities and activities to ensure its efficient operation



# Siting your Temporary Ammunition Storage Site

| Critical Factors | Requirements |
|---|---|
| Ground | - No underground hazards, such as oil or gas tanks and pipelines.<br>- Firm ground capable of taking heavy vehicles (of up to 14 tonnes) even during inclement weather.<br>- Ideally, the ground should be dry, well drained, pervious to water and fairly level.<br>- Natural traverses formed by hills are desirable to reduce the size of the area required and also the risk to neighbouring areas.<br>- Large quarries or farm complexes normally make suitable Temporary Ammunition Storage Areas. |
| Dispersion | - Adequate space must be allowed for dispersion of the stock and separation between the different PES.<br>- Specific explosives natures should be split between at least two locations to prevent all the stock of a specific nature being lost in a single accident. |
| Expansion | - Extra space must be planned to allow for expansion in case of a requirement to hold increased levels of stock.<br>- Such extra space can alternatively be used should a part of the area in use become unsuitable as a result of inclement weather or the cutting up of tracks by heavily laden vehicles. |
| Communications | - Temporary Ammunition Storage Sites must be readily accessible to major roads or railways, yet far enough away that they do not present an explosive hazard.<br>- Good minor roads are required on the approaches to, and in, the area |
| Natural Fire Protection | - Natural firebreaks to prevent the spread of fire from one PES to another are advantageous.<br>- Similarly, roads can be used as effective firebreaks. |
| Security | - Temporary Ammunition Storage Sites are necessarily large and security will be a concern.<br>- Access can be temporarily denied by the use of armed guards and guard dogs.<br>- More permanent structures such as barbed wire will be required for longer-term use |
| Isolation | - A Temporary Ammunition Storage Site should not be located adjacent or close to other main storage areas, airfields or hospitals.<br>- They should also be located well away from any large radio transmitters. |
| Improvement | - The selected site should be capable of improvement if it is to become a permanent storage area. |

**Main idea/objective for slide:**

**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

What the instructor should cover (in addition to slide content)

Provide this table to participants as a Handout, **IATG 04.10 – Temporary Storage, page 9**

References/further reading

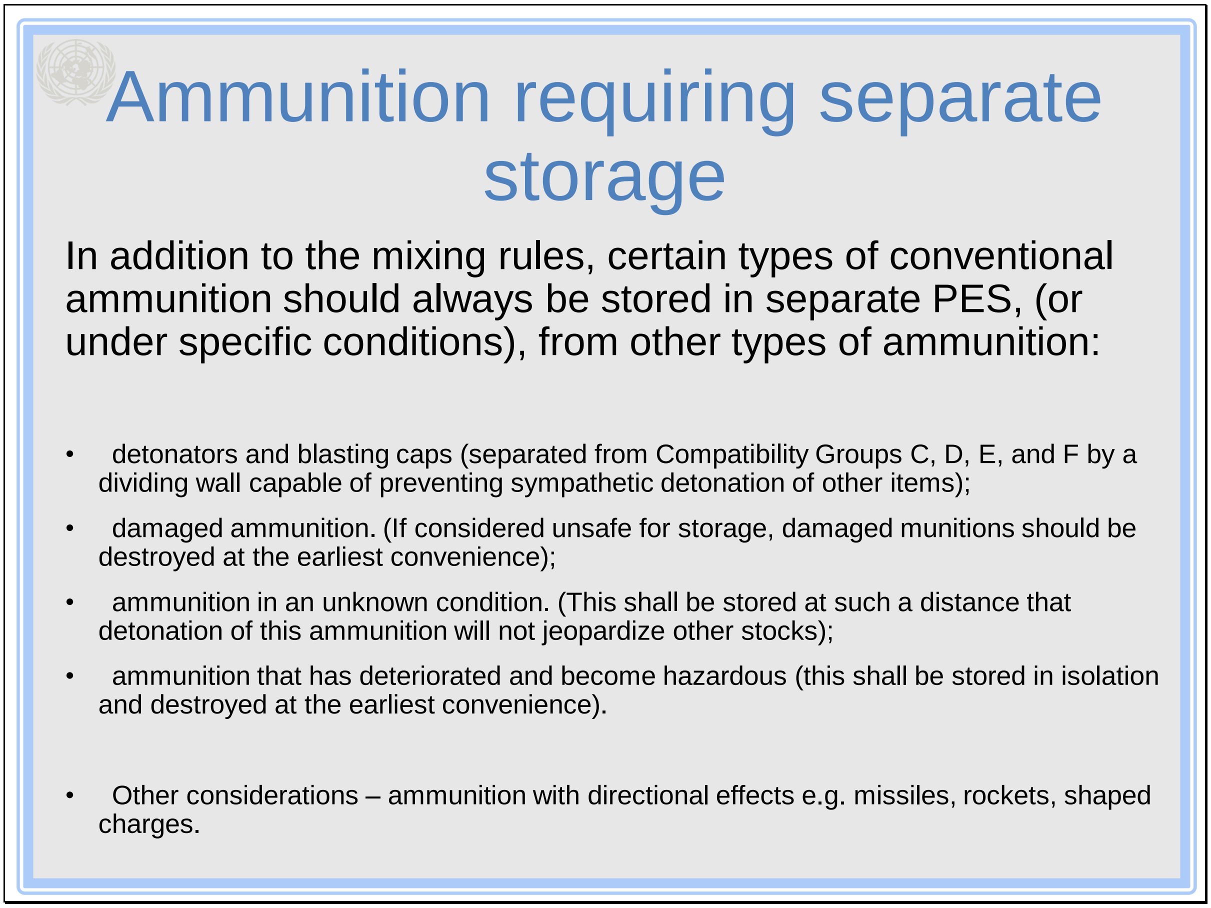
**IATG 04.10 – Temporary Storage, page 9**

- There are a range of factors that should be considered when selecting a location for a Temporary Storage Area as listed above

**United Nations Manual of Ammunition Management, 2020 1st Ed**

United Nations field missions shall adhere to the requirements stated in IATG 04.10 for the location of the ammunition storage sites within the military and police units' main bases.

- The WAAB of each field mission shall advise the T/PCCs during base construction on the most suitable location for ammunition storage.
- If the WAAB is not yet formed the SATO, UNMAS and UNDSS will advise the Engineering Section on ammunition storage site location.
- The existing concept and technical specifications for Camp Layout, developed by the United Nations Global Service Centre/Engineering Standardization and Design Center, shall be followed.
- The proper location of an ammunition storage site shall be decided according to the requirements and existing resources.
- Whenever large amounts of ammunition with HD 1.1 must be stored, a common and centralized ammunition storage site with greater distance to accommodation sites should be considered.
- The GPS coordinates of the ammunition storage areas should be shared with the Mission Support Environment Section to allow the management of an updated mission-wide mapping of all hazardous sites



## Ammunition requiring separate storage

In addition to the mixing rules, certain types of conventional ammunition should always be stored in separate PES, (or under specific conditions), from other types of ammunition:

- detonators and blasting caps (separated from Compatibility Groups C, D, E, and F by a dividing wall capable of preventing sympathetic detonation of other items);
- damaged ammunition. (If considered unsafe for storage, damaged munitions should be destroyed at the earliest convenience);
- ammunition in an unknown condition. (This shall be stored at such a distance that detonation of this ammunition will not jeopardize other stocks);
- ammunition that has deteriorated and become hazardous (this shall be stored in isolation and destroyed at the earliest convenience).

- Other considerations – ammunition with directional effects e.g. missiles, rockets, shaped charges.

**Main idea/objective for slide:**
**Discuss and outline the various components that are found in a typical Temporary Ammunition Storage Site**

What the instructor should cover (in addition to slide content)
Before showing this slide, ask the participants what ammunition would require its own separate storage?
Write these on a whiteboard

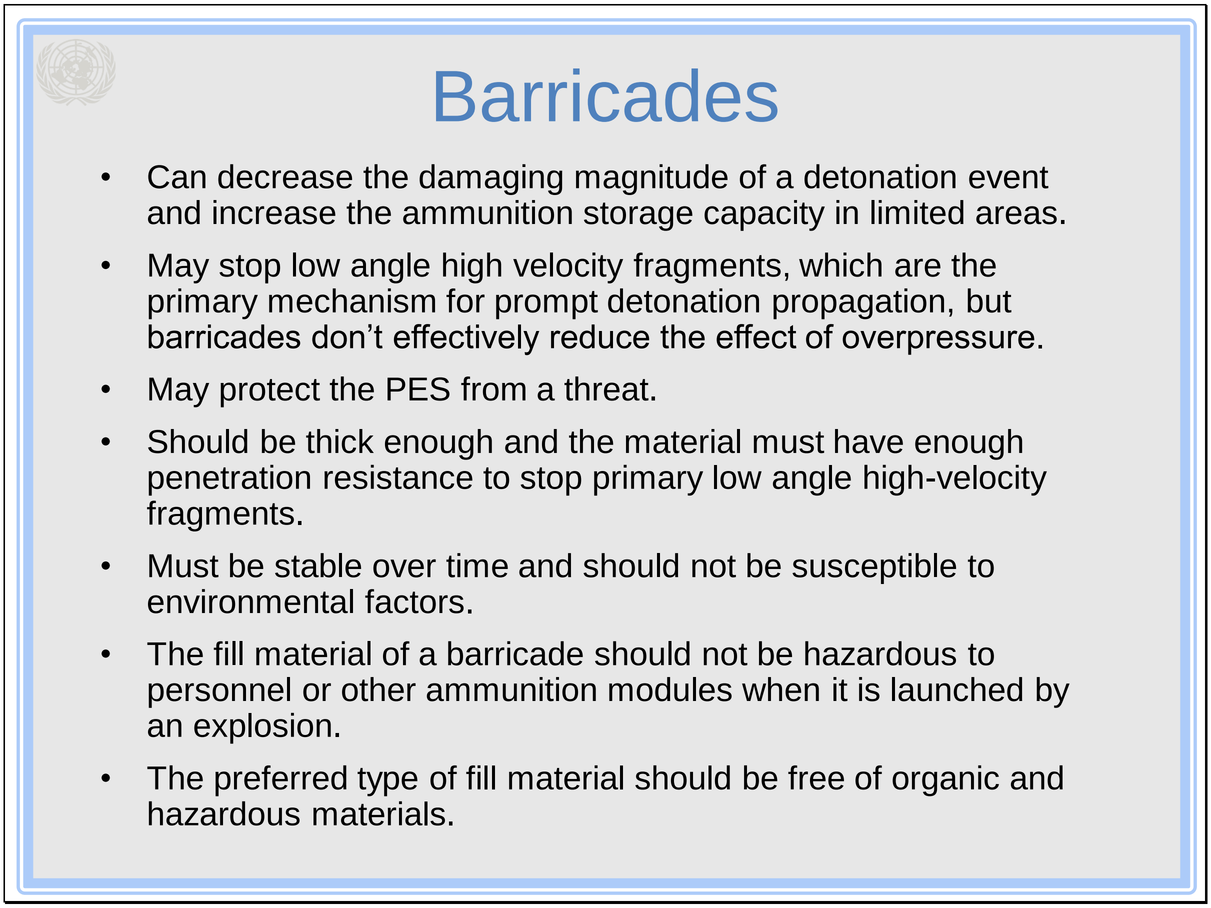
References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- White Phosphorous (WP).
  - This manual does not authorize T/PCCs to hold WP ammunition except munitions which may have minimal incendiary effects, such as illumination, tracers, smoke or signaling systems within caliber of small arms (within 26,5mm).

  - For seized/recovered WP ammunition, the PES for this ammunition shall be very near to a source of water or a water container large enough to fully fit the largest ammunition container should be on the site. The WP ammunition should be stored in an upright position with the base nearest the ground;
- <u>Missiles in a Propulsive State.</u>
  - These should be stored in a barricaded PES with the warheads pointing away from other ammunition stocks;
- <u>Damaged Ammunition.</u>
  - If considered unsafe for storage by a qualified assessment, damaged munitions should be destroyed at the earliest convenience;
- <u>Ammunition awaiting destruction or demilitarization</u>
- <u>Ammunition that has deteriorated and become hazardous.</u>
  - This shall be stored in isolation and destroyed at the earliest convenience.
- <u>Expired Ammunition.</u>
  - See Chapter 4 .

**IATG 04.10 – Temporary Storage**

- As per slide



## Barricades

- Can decrease the damaging magnitude of a detonation event and increase the ammunition storage capacity in limited areas.
- May stop low angle high velocity fragments, which are the primary mechanism for prompt detonation propagation, but barricades don't effectively reduce the effect of overpressure.
- May protect the PES from a threat.
- Should be thick enough and the material must have enough penetration resistance to stop primary low angle high-velocity fragments.
- Must be stable over time and should not be susceptible to environmental factors.
- The fill material of a barricade should not be hazardous to personnel or other ammunition modules when it is launched by an explosion.
- The preferred type of fill material should be free of organic and hazardous materials.

**Main idea/objective for slide:**

**Discuss characteristics and requirements of barricades and how they should be employed in a Temporary Ammunition Storage Site.**

References/further reading

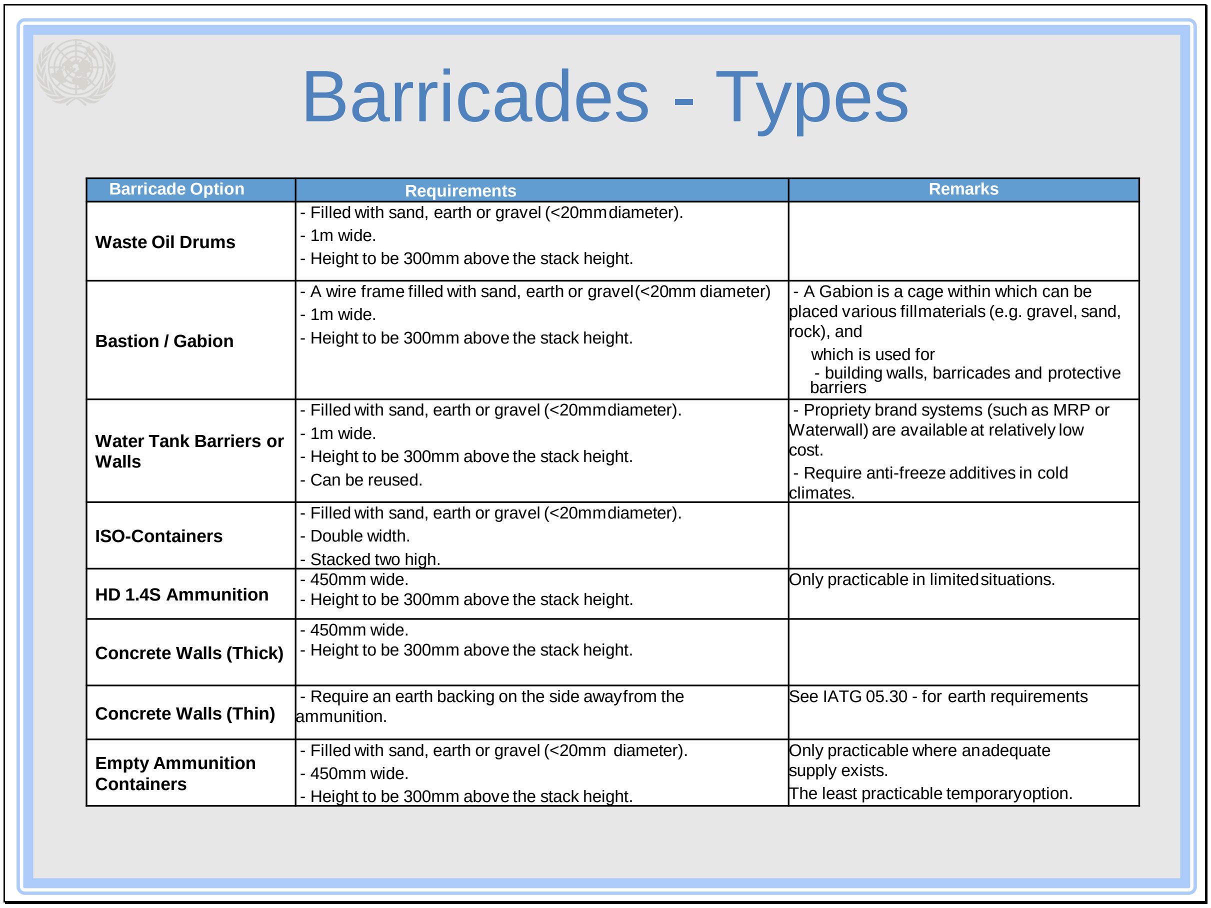
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- See IATG 4.10 for types and configuration of barricades.

**IATG 04.10 – Temporary Storage**

- An effective barricade at an Exposed Site will arrest high velocity projections at low elevations from an adjacent explosive event in a Potential Explosive Site (PES) and thereby reduce the risk of direct propagation. A vertical faced barricade sited close to a PES also reduces the projection of burning packages, explosives and debris.

- The main advantage of interposing barricades between explosives stacks is in the storage of explosives in HD 1.1. Significantly reduced IQD (TD) may be permitted compared to the un-barricaded situation, thus permitting much greater storage density. For this simple reason, all Temporary Storage Areas should be constructed on the principle of barricaded storage.
- Temporary barricades shall be used if the use of purpose built barricade is impracticable. The construction of proper barricades is a major civil engineering task, whereas temporary barricades can be installed relatively quickly. Temporary barricades should be maintained regularly to ensure that they remain effective
- Information on the requirements for purpose built effective barricades may be found in IATG 05.30 *Barricades*, which should be referred to before using the QD (TD) for Open/Light Un-Barricaded Stack



# Barricades - Types

| Barricade Option | Requirements | Remarks |
|---|---|---|
| **Waste Oil Drums** | - Filled with sand, earth or gravel (<20mm diameter).<br>- 1m wide.<br>- Height to be 300mm above the stack height. | |
| **Bastion / Gabion** | - A wire frame filled with sand, earth or gravel(<20mm diameter)<br>- 1m wide.<br>- Height to be 300mm above the stack height. | - A Gabion is a cage within which can be placed various fillmaterials (e.g. gravel, sand, rock), and which is used for<br>- building walls, barricades and protective barriers |
| **Water Tank Barriers or Walls** | - Filled with sand, earth or gravel (<20mm diameter).<br>- 1m wide.<br>- Height to be 300mm above the stack height.<br>- Can be reused. | - Propriety brand systems (such as MRP or Waterwall) are available at relatively low cost.<br>- Require anti-freeze additives in cold climates. |
| **ISO-Containers** | - Filled with sand, earth or gravel (<20mm diameter).<br>- Double width.<br>- Stacked two high. | |
| **HD 1.4S Ammunition** | - 450mm wide.<br>- Height to be 300mm above the stack height. | Only practicable in limited situations. |
| **Concrete Walls (Thick)** | - 450mm wide.<br>- Height to be 300mm above the stack height. | |
| **Concrete Walls (Thin)** | - Require an earth backing on the side away from the ammunition. | See IATG 05.30 - for earth requirements |
| **Empty Ammunition Containers** | - Filled with sand, earth or gravel (<20mm diameter).<br>- 450mm wide.<br>- Height to be 300mm above the stack height. | Only practicable where an adequate supply exists.<br>The least practicable temporary option. |

**Main idea/objective for slide:**

**Discuss different types of barricades and how they should be employed in a Temporary Ammunition Storage Site.**

What the instructor should cover (in addition to slide content)

Provide this table to participants as a Handout, **IATG 04.10 – Temporary Storage, page 14-15**

References/further reading

**IATG 04.10 – Temporary Storage**

- Realistic options for temporary barricades in ascending order of costs.
- A barricade does not necessarily prevent subsequent propagation or damage caused by blast, lobbed items, debris or secondary
- IATG does not specifically endorse these products, they are used to illustrate a protection concept.

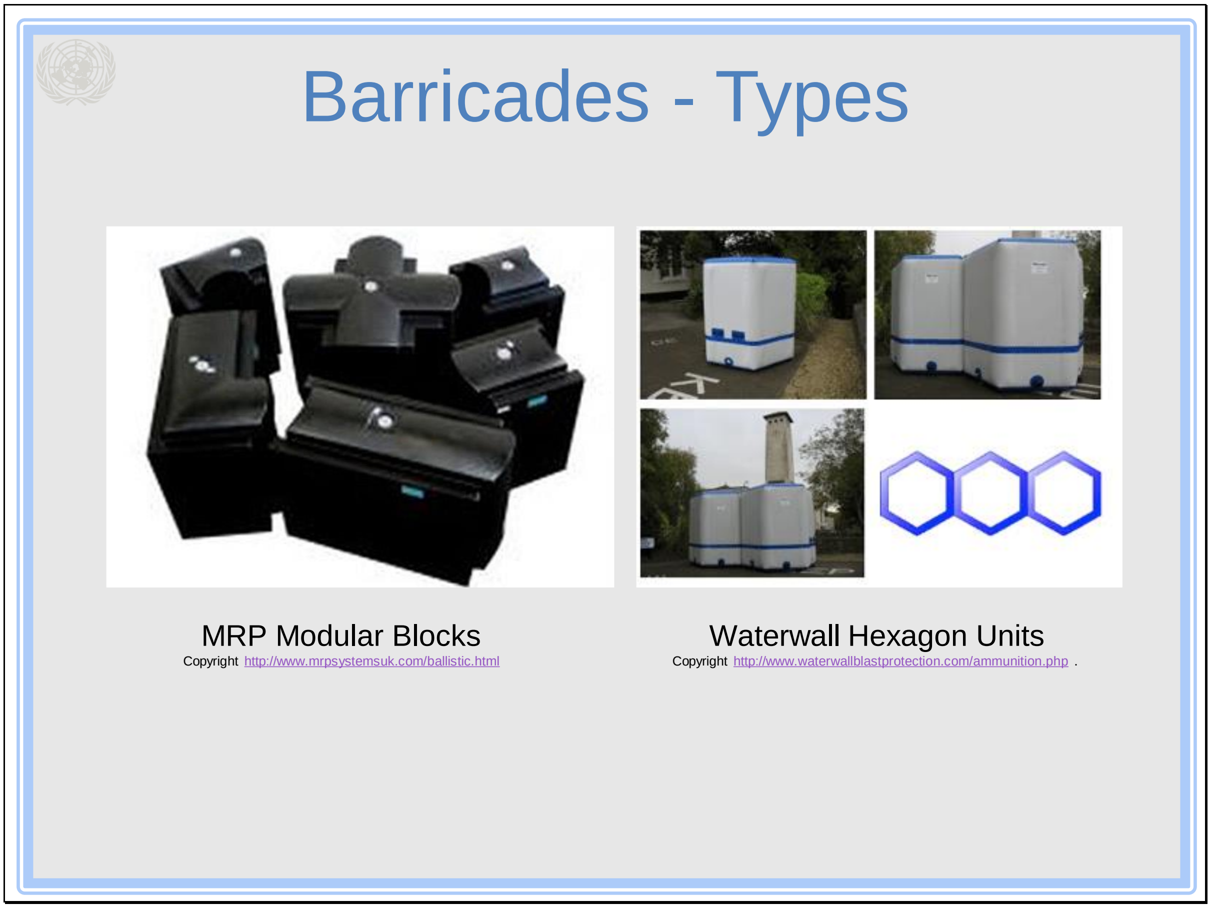
http://www.mrpsystemsuk.com/ballistic.html or http://www.waterwallblastprotection.com/ammunition.php.

Slide 20

# Barricades - Types

**<u>Main idea/objective for slide:</u>**
**Examine images of different types of barricades**

Walll Barricade (HESCO) - EARTH Barricade - Walll Barricade (sandbags)



## Barricades - Types

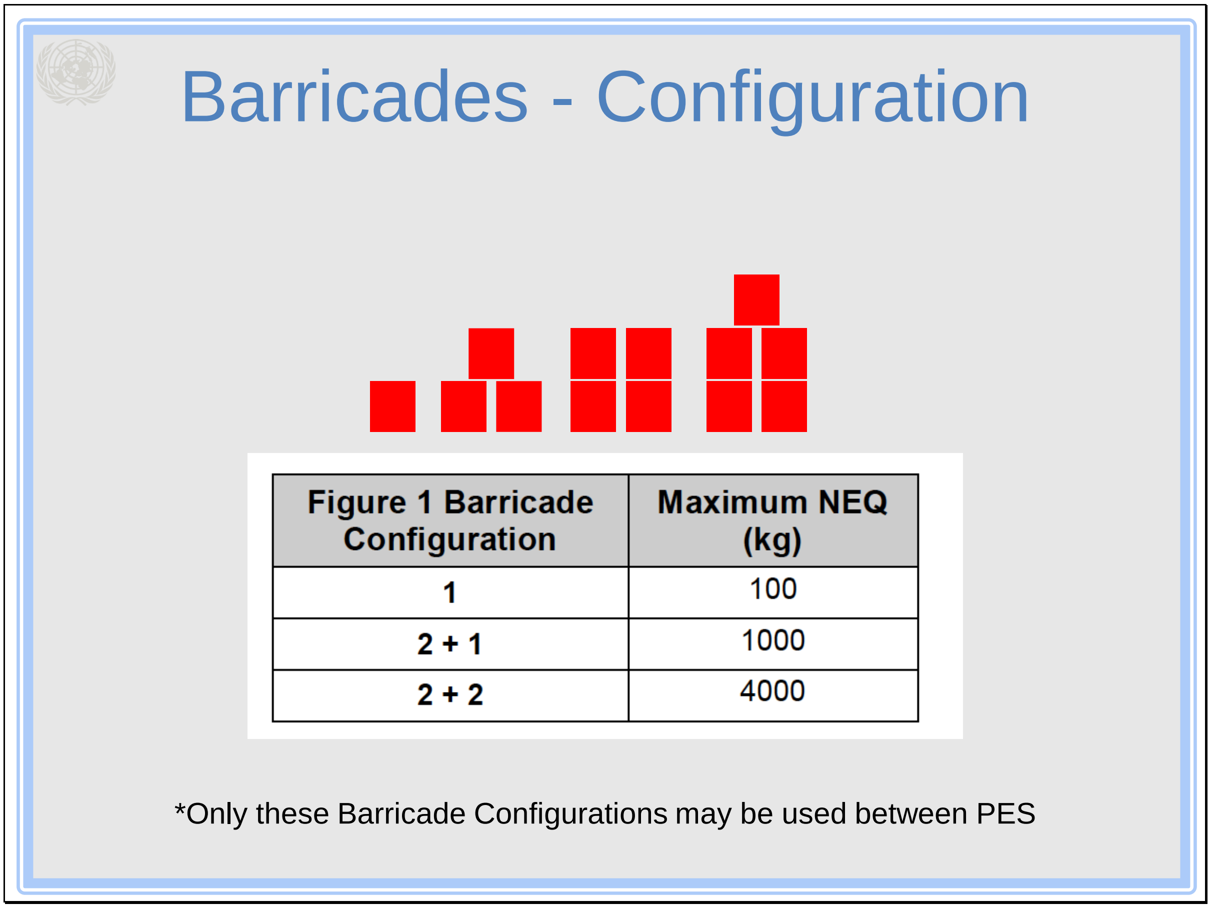
MRP Modular Blocks
Copyright http://www.mrpsystemsuk.com/ballistic.html

Waterwall Hexagon Units
Copyright http://www.waterwallblastprotection.com/ammunition.php .

**Main idea/objective for slide:**
**Examine images of different types of barricades**

What the instructor should cover (in addition to slide content)
Discuss how there are various additional options on the market that use water and are commercially available.
These are two examples that are mentioned in the IATG for reference purpsoses only. They are not exclusively endorsed by the IATG
This course does not suggest that these are the only options availablee, or the best on the market.

References/further reading
http://www.mrpsystemsuk.com/ballistic.html or
http://www.waterwallblastprotection.com/ammunition.php.



## Barricades - Configuration

| Figure 1 Barricade Configuration | Maximum NEQ (kg) |
|---|---|
| **1** | 100 |
| **2 + 1** | 1000 |
| **2 + 2** | 4000 |

*Only these Barricade Configurations may be used between PES

**Main idea/objective for slide:**

**Examine different barricade configurations**

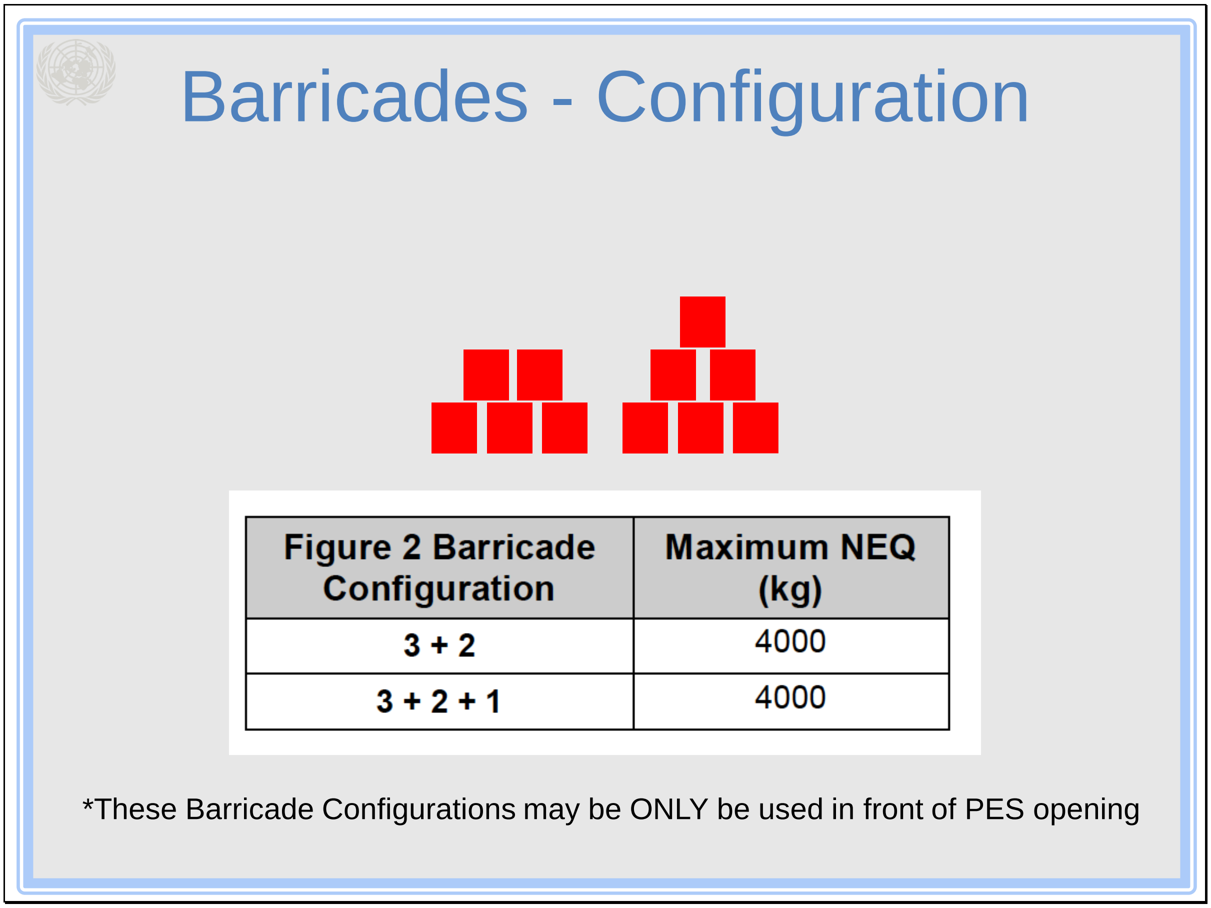
What the instructor should cover (in addition to slide content)

Explain to students how these barricades are built and named. Also highlight the maximum NEQ it will protect against provided the fill is correct

References/further reading

**IATG 04.10 – Temporary Storage**

- The maximum stock levels shown in the Table shall only be stored in each PES for Figure 1 configuration



## Barricades - Configuration

| Figure 2 Barricade Configuration | Maximum NEQ (kg) |
|---|---|
| 3 + 2 | 4000 |
| 3 + 2 + 1 | 4000 |

*These Barricade Configurations may be ONLY be used in front of PES opening

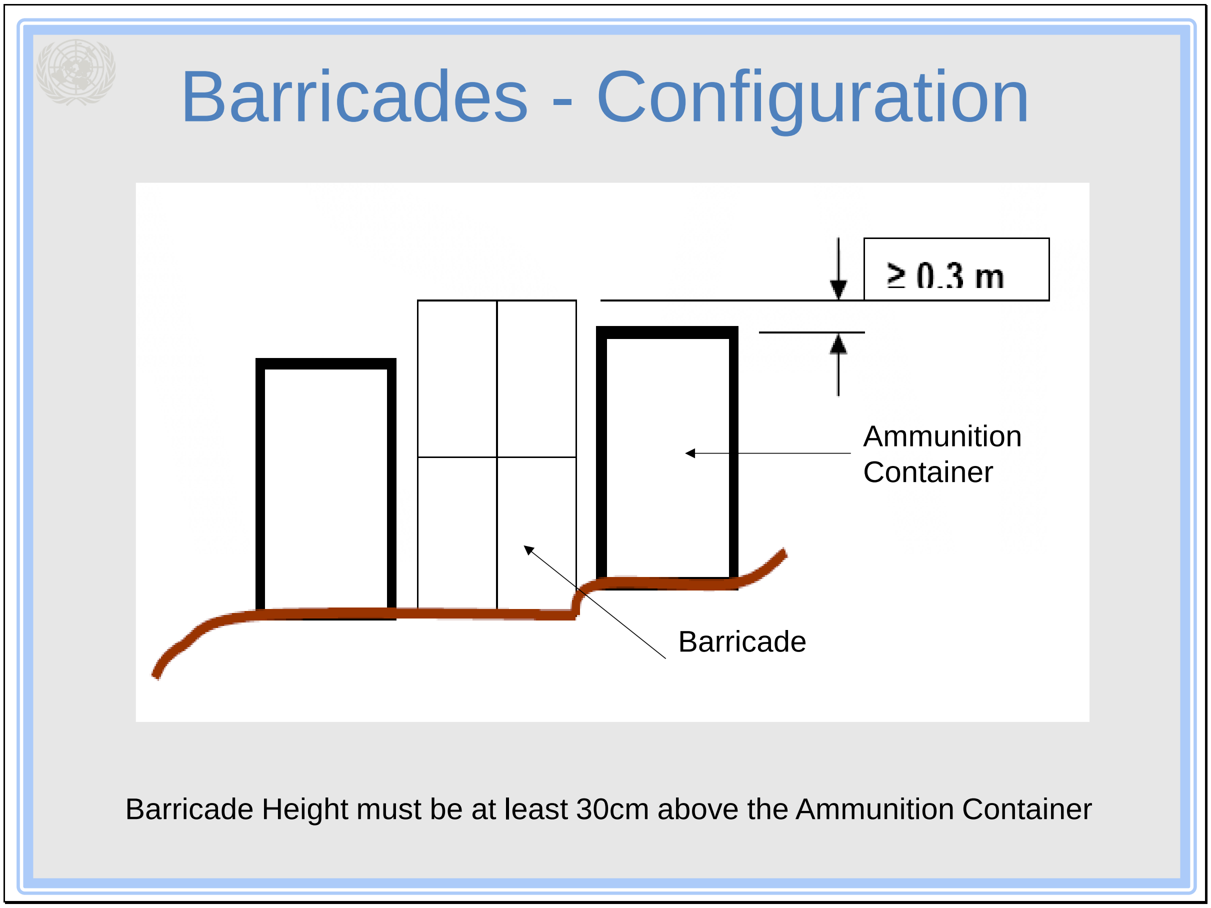
**Main idea/objective for slide:**
**Examine different barricade configurations**

What the instructor should cover (in addition to slide content)
Emphasise that a 3+2 or a 3+2+1 configuration will offer the same protection as a 2+1 as shown on the previous slide.

References/further reading
**IATG 04.10 – Temporary Storage**

- The barricade configurations shown here do not provide more protection than those configurations on the last slide, but they can produce more mass movement onto the adjacent storage container, which may not necessarily be advantageous.
- The configurations shown here should therefore only be used in front of the container opening.

- The maximum stock levels shown in the Table shall only be stored in each PES for Figure 2 configuration:

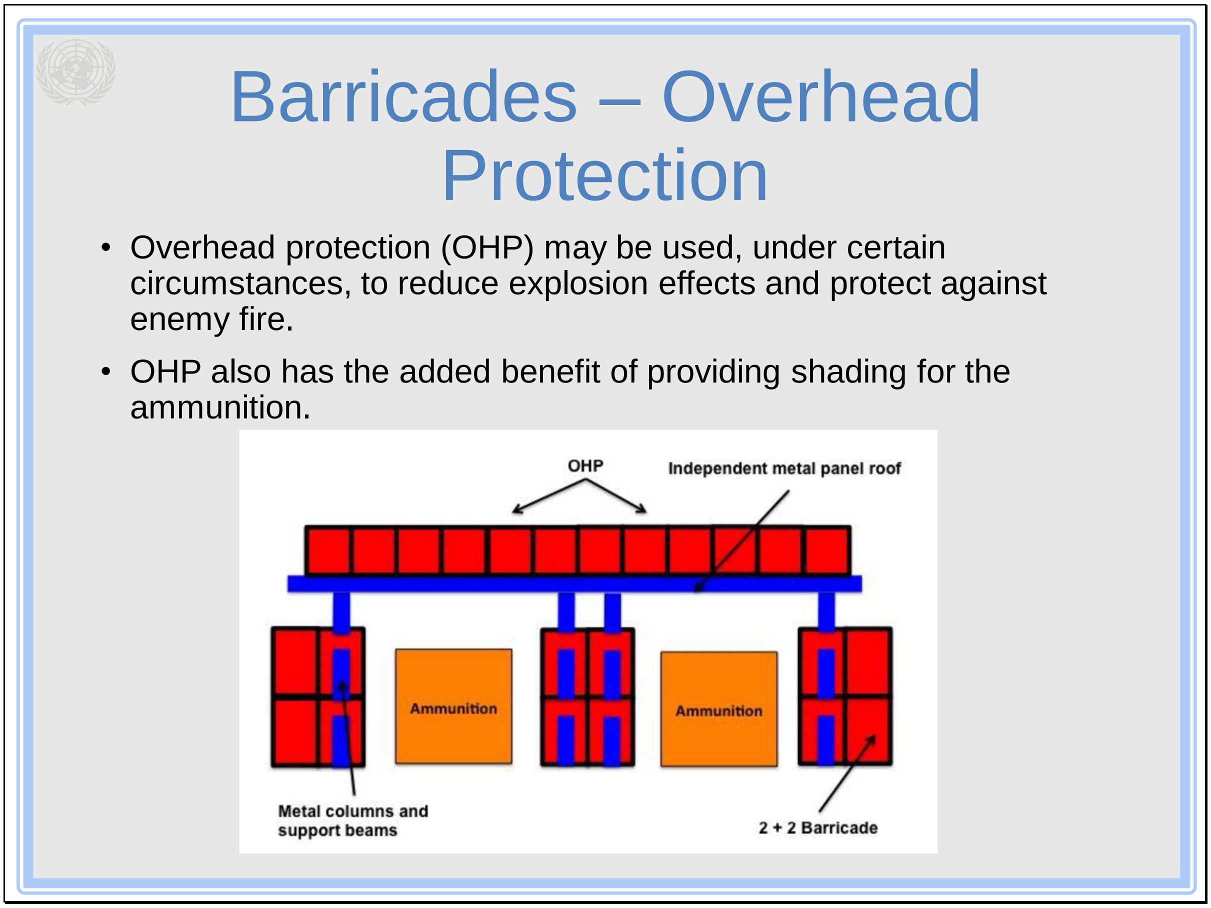


## Barricades - Configuration

Barricade Height must be at least 30cm above the Ammunition Container

**<u>Main idea/objective for slide:</u>**
**Examine different barricade configurations**

<u>References/further reading</u>
Barricades should be at least 0.3m above the height of the Ammunition Container or store to provide effective capture of fragmentation and to deflect blast



## Barricades – Overhead Protection

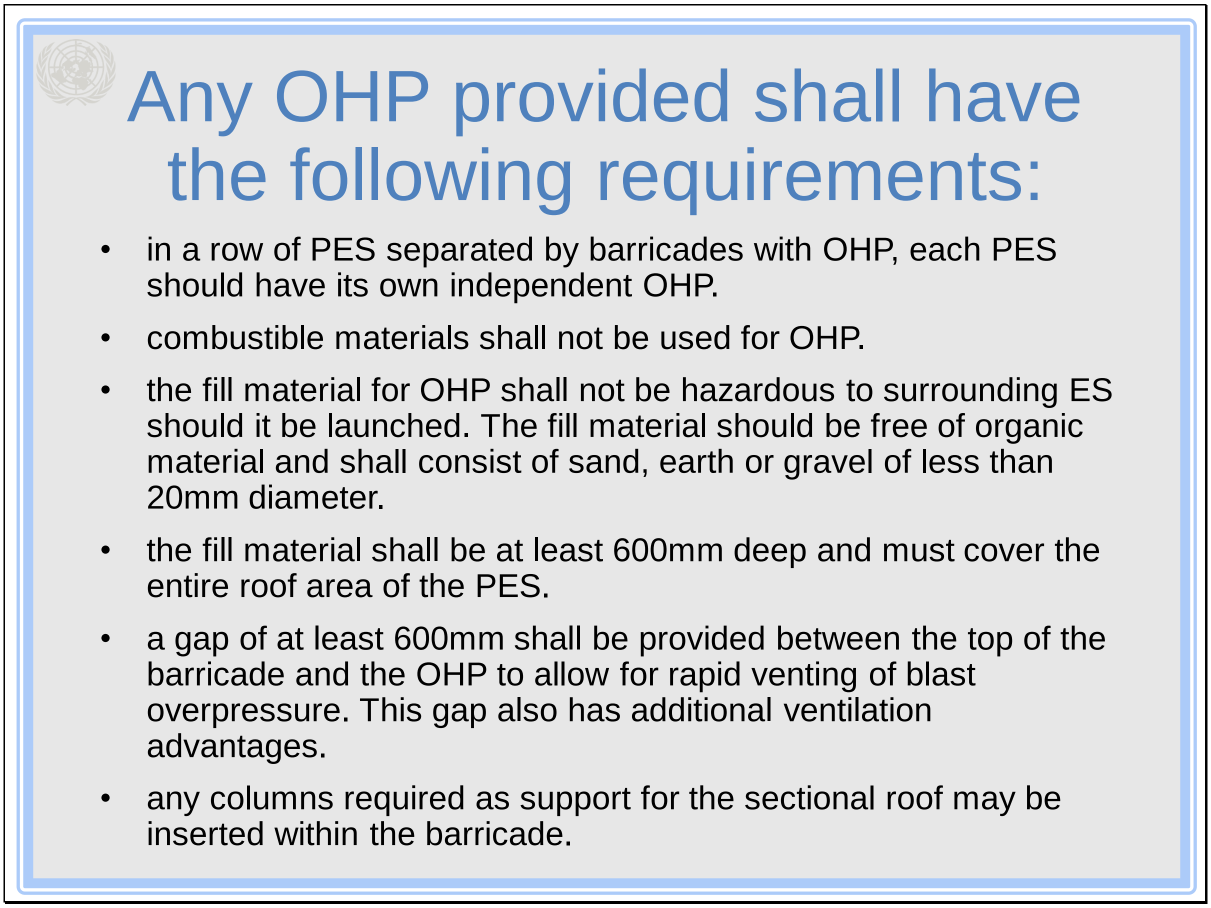
- Overhead protection (OHP) may be used, under certain circumstances, to reduce explosion effects and protect against enemy fire.
- OHP also has the added benefit of providing shading for the ammunition.

**<u>Main idea/objective for slide:</u>**
**Examine different barricade configurations**

<u>What the instructor should cover (in addition to slide content)</u>
Explain the component parts of this OHP construction, highlighting the importance of each part.

<u>References/further reading</u>
**IATG 04.10 – Temporary Storage, Page 17**

- As per slide



## Any OHP provided shall have the following requirements:

- in a row of PES separated by barricades with OHP, each PES should have its own independent OHP.
- combustible materials shall not be used for OHP.
- the fill material for OHP shall not be hazardous to surrounding ES should it be launched. The fill material should be free of organic material and shall consist of sand, earth or gravel of less than 20mm diameter.
- the fill material shall be at least 600mm deep and must cover the entire roof area of the PES.
- a gap of at least 600mm shall be provided between the top of the barricade and the OHP to allow for rapid venting of blast overpressure. This gap also has additional ventilation advantages.
- any columns required as support for the sectional roof may be inserted within the barricade.

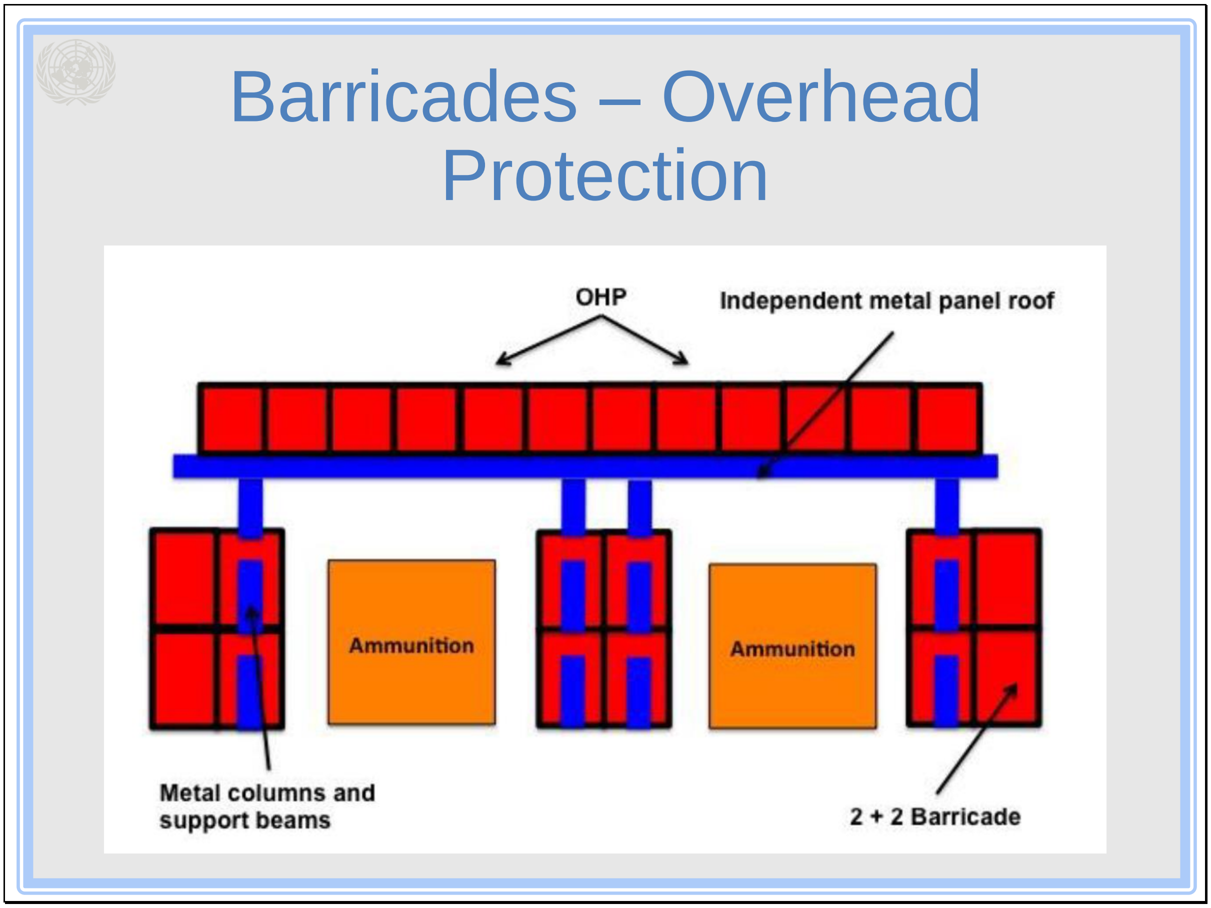
**Main idea/objective for slide:**
**Examine different barricade configurations**

What the instructor should cover (in addition to slide content)
Using the dimensions given on this slide, draw an OHP example on the whiteboard detailing the measurements etc.

References/further reading
**IATG 04.10 – Temporary Storage**

- As per slide

Slide 27



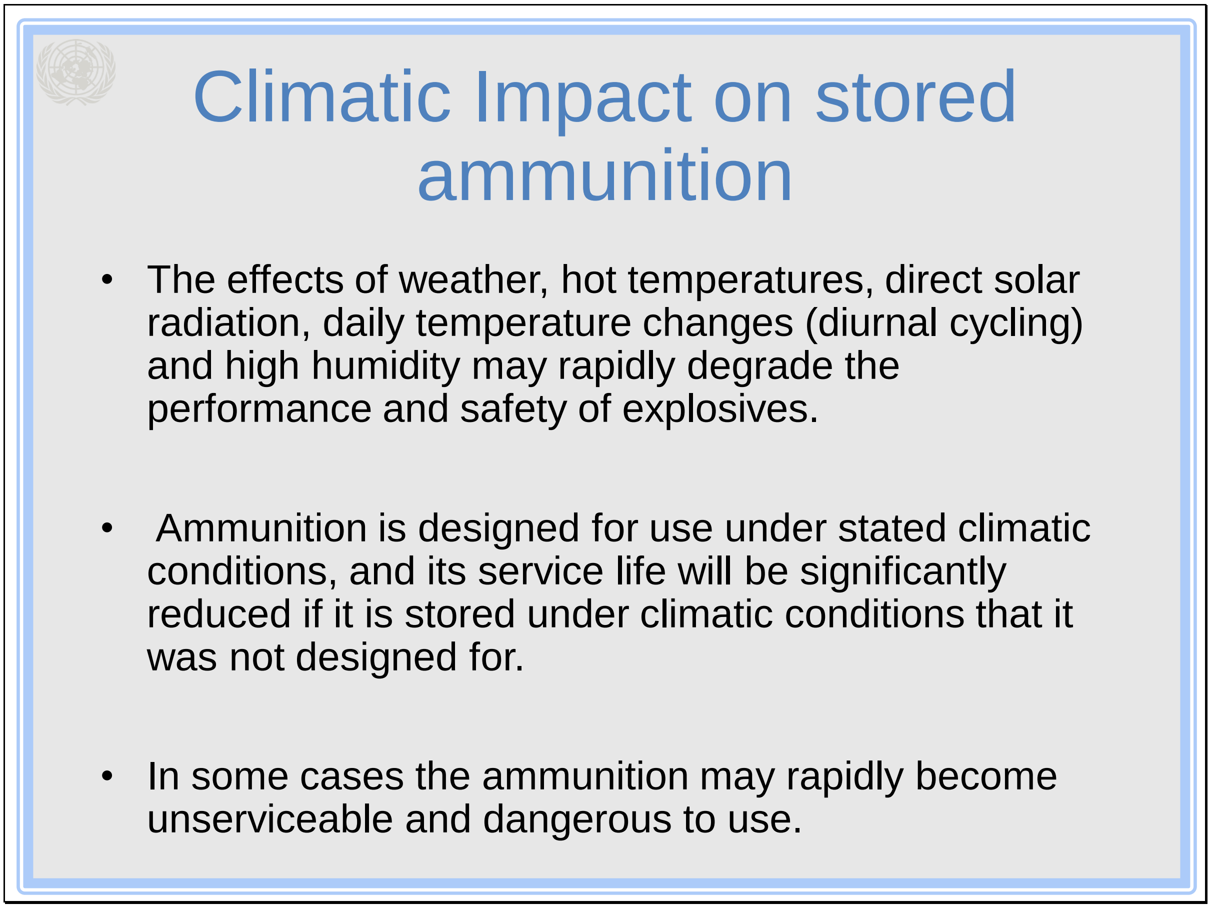
# Barricades – Overhead Protection

**Main idea/objective for slide:**
**Examine different barricade configurations**

What the instructor should cover (in addition to slide content)
Ask participants to name each part, and explain the construction requirements

References/further reading
**IATG 04.10 – Temporary Storage**

- Recommended design for OHP



## Climatic Impact on stored ammunition

- The effects of weather, hot temperatures, direct solar radiation, daily temperature changes (diurnal cycling) and high humidity may rapidly degrade the performance and safety of explosives.
- Ammunition is designed for use under stated climatic conditions, and its service life will be significantly reduced if it is stored under climatic conditions that it was not designed for.
- In some cases the ammunition may rapidly become unserviceable and dangerous to use.

**Main idea/objective for slide:**
**Outline the reasons and mechanisms available for the control of climatic conditions and particularly their effect on ammunition and explosives**

What the instructor should cover (in addition to slide content)
Ask the participants how weather and climatic conditions can affect stored ammunition
Write their answers on a white board

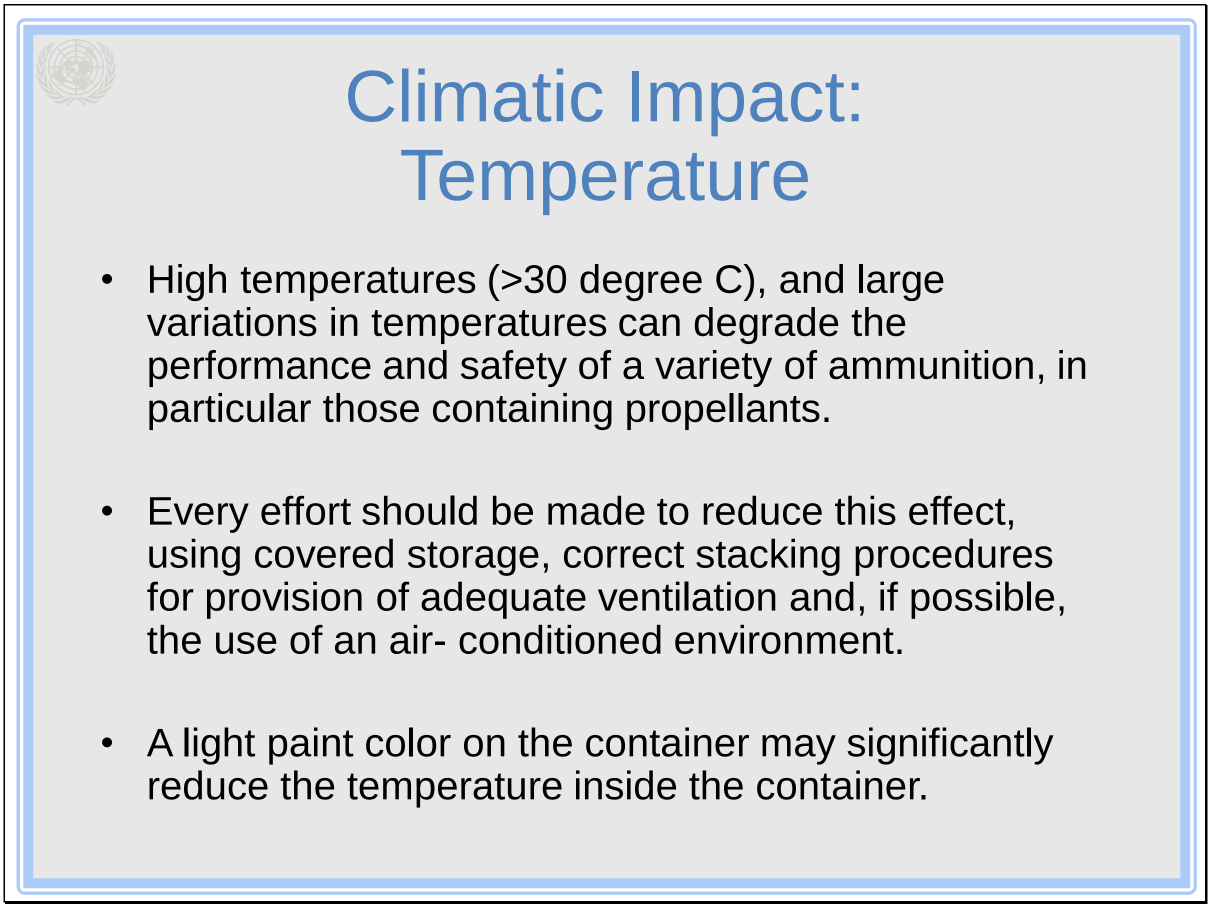
References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- Every effort shall be made to reduce the effects of high temperatures and moisture on explosives held by units and in the ammunition storage areas.
- All excess vegetation and combustible material shall be removed from the storage sites within a radius of 20m of such sites when munitions are present.

- Ammunition shall not be located immediately adjacent to reservoirs or sewers.
- Ammunition should not to be stored directly on the ground except in tactical use, but should be placed on pallets that provide a minimum of 75 mm clear distance from the ground to ensure ventilation.

**IATG 04.10 – Temporary Storage**

- Although it is safe to store ammunition under field or temporary conditions, if appropriate conditions are met, it is unusual as it usually significantly reduces the safe service life of the ammunition.
- The worst condition for storing explosives under field or temporary conditions is where there is a considerable temperature fluctuation from day to night, combined with high humidity
- IATG 07.20 *Surveillance and proof* contains further technical information on the degradation of explosives due to climatic conditions and should be consulted prior to undertaking field or temporary storage of ammunition



## Climatic Impact: Temperature

- High temperatures (>30 degree C), and large variations in temperatures can degrade the performance and safety of a variety of ammunition, in particular those containing propellants.
- Every effort should be made to reduce this effect, using covered storage, correct stacking procedures for provision of adequate ventilation and, if possible, the use of an air- conditioned environment.
- A light paint color on the container may significantly reduce the temperature inside the container.

**<u>Main idea/objective for slide:</u>**
**Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation**

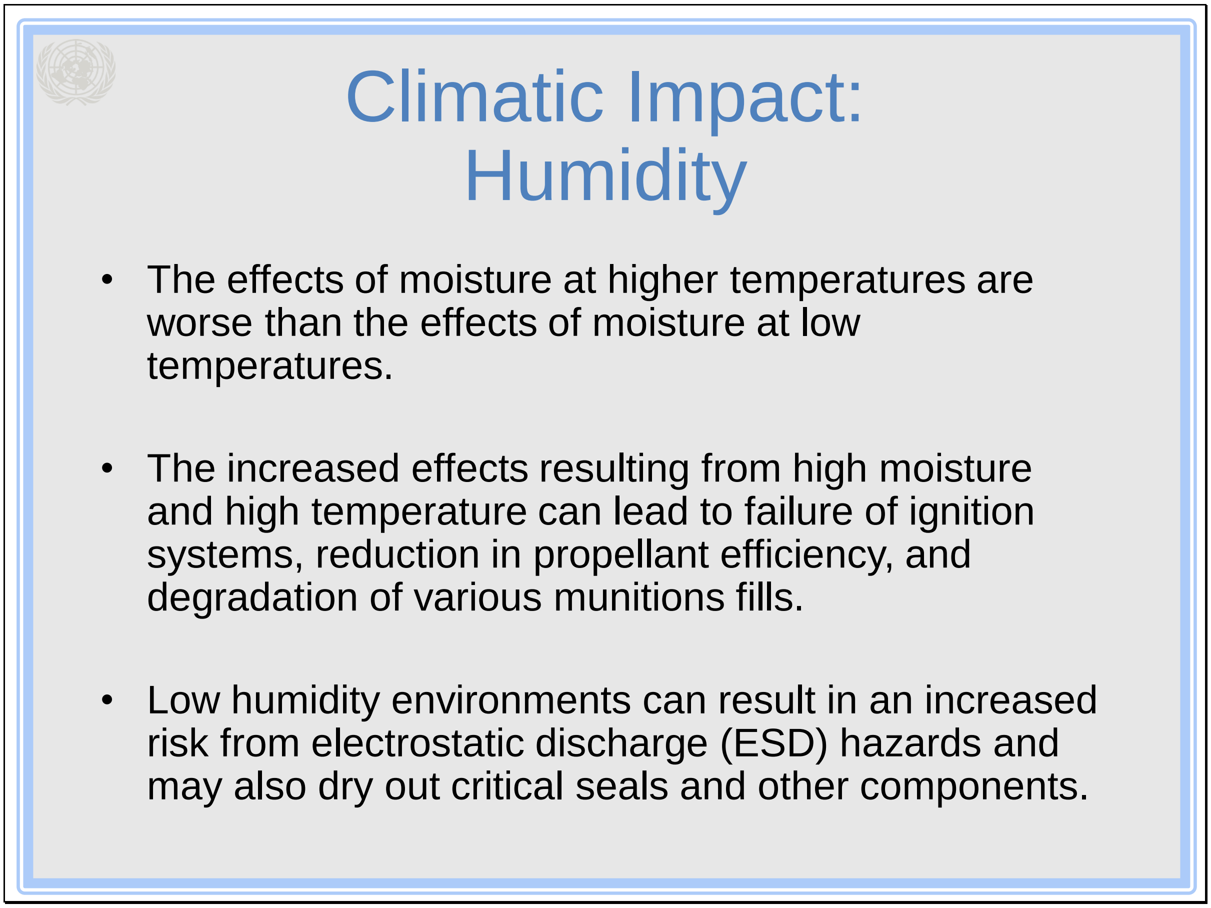
<u>References/further reading</u>
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- The construction of ammunition storage shades under temporary storage conditions (IATG 04.10) falls under minor engineering capability of T/PCCs.
- The responsibility for ammunition storage is with the T/PCCs as per the COE Manual.
- More complex ammunition storage using temporary storage conditions, especially when overhead protection may be used, may exceed minor engineering capabilities and may have to be constructed with support from mission engineers.

- The field defense stores (FDS) required for the security of the ammunition storage area will be provided by the United Nations when the United Nations takes the self-sustainment responsibility for FDS in accordance with the MOU.

**IATG 04.10 – Temporary Storage**

- As per slide



## Climatic Impact: Humidity

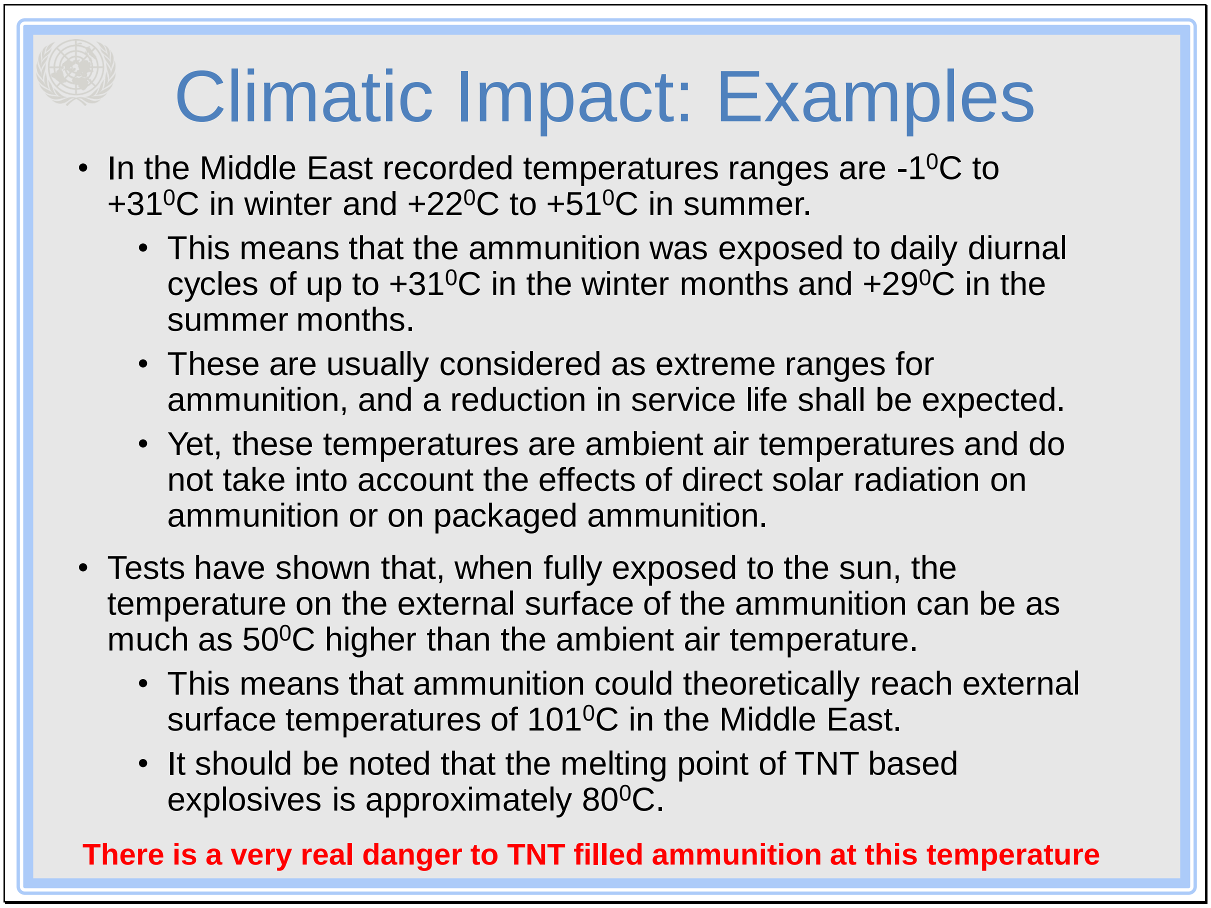
- The effects of moisture at higher temperatures are worse than the effects of moisture at low temperatures.
- The increased effects resulting from high moisture and high temperature can lead to failure of ignition systems, reduction in propellant efficiency, and degradation of various munitions fills.
- Low humidity environments can result in an increased risk from electrostatic discharge (ESD) hazards and may also dry out critical seals and other components.

**Main idea/objective for slide:**
**Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation**

References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**
As per slide

**IATG 04.10 – Temporary Storage**

- As per slide



# Climatic Impact: Examples

- In the Middle East recorded temperatures ranges are -1$^0$C to +31$^0$C in winter and +22$^0$C to +51$^0$C in summer.
    - This means that the ammunition was exposed to daily diurnal cycles of up to +31$^0$C in the winter months and +29$^0$C in the summer months.
    - These are usually considered as extreme ranges for ammunition, and a reduction in service life shall be expected.
    - Yet, these temperatures are ambient air temperatures and do not take into account the effects of direct solar radiation on ammunition or on packaged ammunition.
- Tests have shown that, when fully exposed to the sun, the temperature on the external surface of the ammunition can be as much as 50$^0$C higher than the ambient air temperature.
    - This means that ammunition could theoretically reach external surface temperatures of 101$^0$C in the Middle East.
    - It should be noted that the melting point of TNT based explosives is approximately 80$^0$C.

**There is a very real danger to TNT filled ammunition at this temperature**

**Main idea/objective for slide:**

**Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation**

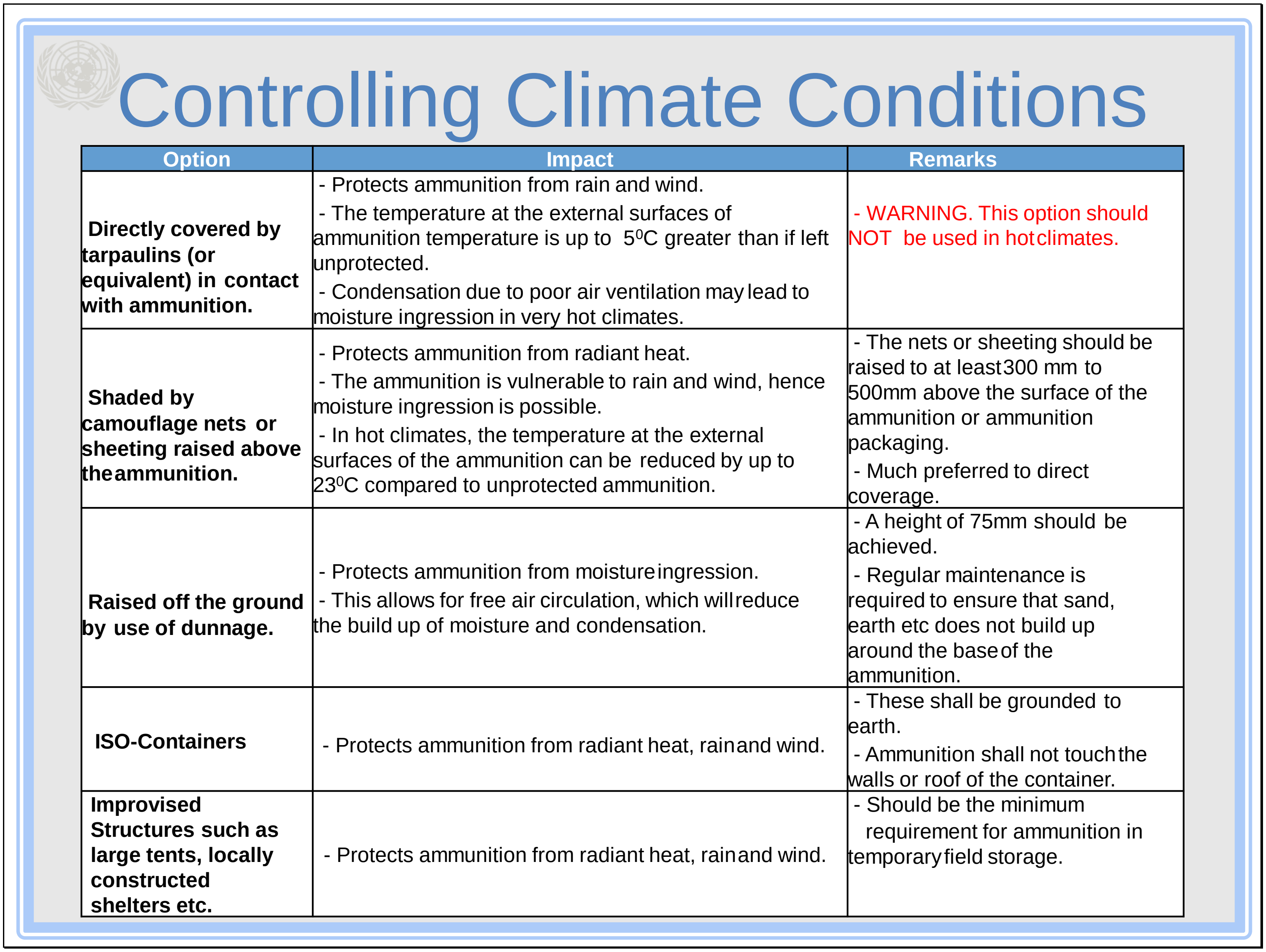
What the instructor should cover (in addition to slide content)

Reinforce the importance of this slide and ensure the participants understand what is meant by 'Auto-Ignition'

References/further reading

**IATG 04.10 – Temporary Storage**

- As per slide



# Controlling Climate Conditions

| Option | Impact | Remarks |
|---|---|---|
| **Directly covered by tarpaulins (or equivalent) in contact with ammunition.** | - Protects ammunition from rain and wind.<br>- The temperature at the external surfaces of ammunition temperature is up to 5⁰C greater than if left unprotected.<br>- Condensation due to poor air ventilation may lead to moisture ingression in very hot climates. | - WARNING. This option should NOT be used in hot climates. |
| **Shaded by camouflage nets or sheeting raised above the ammunition.** | - Protects ammunition from radiant heat.<br>- The ammunition is vulnerable to rain and wind, hence moisture ingression is possible.<br>- In hot climates, the temperature at the external surfaces of the ammunition can be reduced by up to 23⁰C compared to unprotected ammunition. | - The nets or sheeting should be raised to at least 300 mm to 500mm above the surface of the ammunition or ammunition packaging.<br>- Much preferred to direct coverage. |
| **Raised off the ground by use of dunnage.** | - Protects ammunition from moisture ingression.<br>- This allows for free air circulation, which will reduce the build up of moisture and condensation. | - A height of 75mm should be achieved.<br>- Regular maintenance is required to ensure that sand, earth etc does not build up around the base of the ammunition. |
| **ISO-Containers** | - Protects ammunition from radiant heat, rain and wind. | - These shall be grounded to earth.<br>- Ammunition shall not touch the walls or roof of the container. |
| **Improvised Structures such as large tents, locally constructed shelters etc.** | - Protects ammunition from radiant heat, rain and wind. | - Should be the minimum requirement for ammunition in temporary field storage. |

**Main idea/objective for slide:**
**Discuss Weather protection including Temperature Limitations, Moisture Protection and Ventilation**

What the instructor should cover (in addition to slide content)
Provide this table to participants as a Handout, **IATG 04.10 – Temporary Storage, page 18**

References/further reading
**IATG 04.10 – Temporary Storage, page 18**

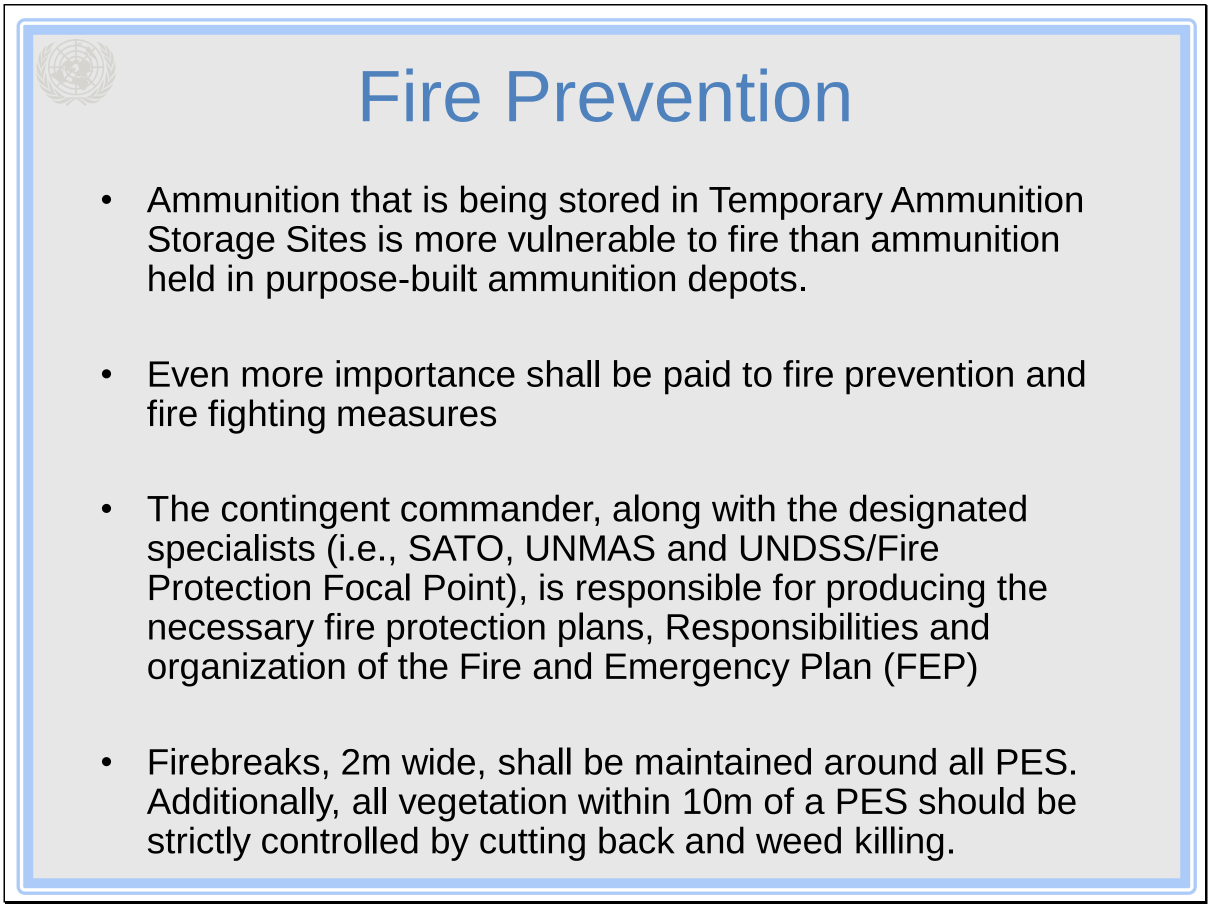
- The options for the protection of ammunition stocks in Temporary Storage Areas from climatic conditions are limited unless covered infrastructure is available.
- The table summarises the available options.
- The option selected should depend on what sort of protection is required
- When covered storage is not available for all the explosives in Temporary Storage Areas, priority should be given to the natures that are likely to deteriorate most rapidly.
- Assuming a normal standard of packaging, with no other requirements, the following order of priority for covered storage should be applied:
    a) water activated explosives;
    b) guided weapons and torpedoes
    c) anti-tank, ranging and spotting ammunition;
    d) propelling charges;
    e) pyrotechnics;
    f) mortar ammunition;
    g) grenades and mines;
    h) boxed shell;
    i) small arms ammunition (SAA); and
    j) loose shell.

Controlling Climate Conditions

**Main idea/objective for slide:**
**Use images to provide participants with good examples of climate controls**

What the instructor should cover (in addition to slide content)
Talk through the different methods of controlling temperature as shown in each image.

Use of small hesco, sandbags, tarpaulins, roof shelters and other means of controlling the effect of temperature and direct sun on Ammunition Containers
Use of pallets, dunnage and air gaps inside ESH



## Fire Prevention

- Ammunition that is being stored in Temporary Ammunition Storage Sites is more vulnerable to fire than ammunition held in purpose-built ammunition depots.
- Even more importance shall be paid to fire prevention and fire fighting measures
- The contingent commander, along with the designated specialists (i.e., SATO, UNMAS and UNDSS/Fire Protection Focal Point), is responsible for producing the necessary fire protection plans, Responsibilities and organization of the Fire and Emergency Plan (FEP)
- Firebreaks, 2m wide, shall be maintained around all PES. Additionally, all vegetation within 10m of a PES should be strictly controlled by cutting back and weed killing.

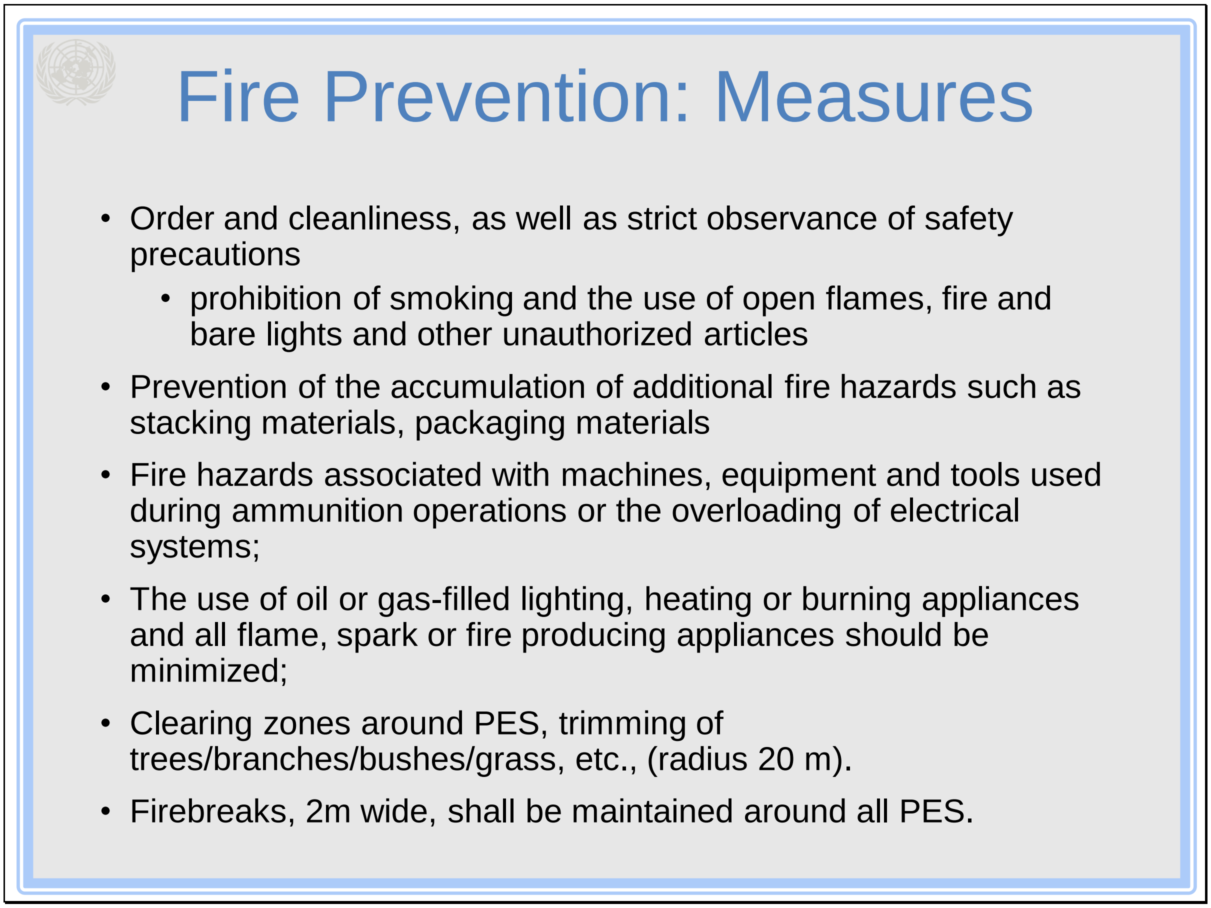
**Main idea/objective for slide:**
**Examine Fire Prevention best practices for ammunition storage.**
**Discuss the requirement to develop a Fire Safety Plan which will include the necessary fire alarm systems, firefighting signs and equipment, the management of vegetation and contraband items.**

References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**
- Fire is a major threat to ammunition storage sites.
- Protection against fire involves three important principles:
    - Prevention.
    - Hazard identification.
    - Firefighting capability and readiness.
- The contingent commander, along with the designated specialists (i.e., SATO, UNMAS and UNDSS/Fire Protection Focal Point), is responsible for producing the necessary fire protection plans.

- Responsibilities and organization of the Fire and Emergency Plan (FEP) are shown at Annex B

**IATG 04.10 – Temporary Storage**

- The fire precautions, fire-fighting principles and procedures contained within IATG 02.50 *Fire safety* shall be complied with as far as is reasonably practicable



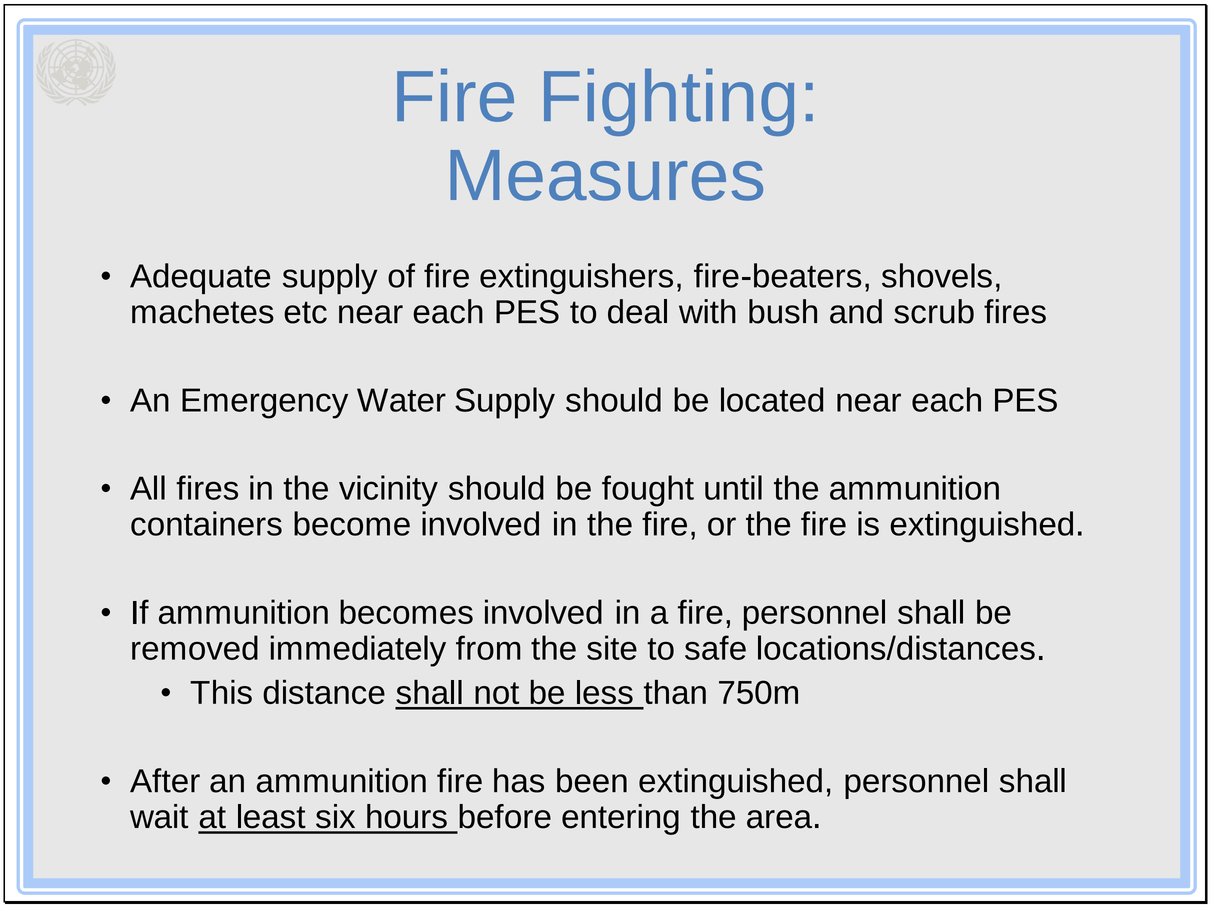
## Fire Prevention: Measures

- Order and cleanliness, as well as strict observance of safety precautions
  - prohibition of smoking and the use of open flames, fire and bare lights and other unauthorized articles
- Prevention of the accumulation of additional fire hazards such as stacking materials, packaging materials
- Fire hazards associated with machines, equipment and tools used during ammunition operations or the overloading of electrical systems;
- The use of oil or gas-filled lighting, heating or burning appliances and all flame, spark or fire producing appliances should be minimized;
- Clearing zones around PES, trimming of trees/branches/bushes/grass, etc., (radius 20 m).
- Firebreaks, 2m wide, shall be maintained around all PES.

**<u>Main idea/objective for slide:</u>**
**Examine Fire Prevention best practices for ammunition storage.**
**Discuss the requirement to develop a Fire Safety Plan which will include the necessary fire alarm systems, firefighting signs and equipment, the management of vegetation and contraband items.**

<u>References/further reading</u>
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- Fire prevention plans shall be included in the unit SOP. Fire prevention measures are to be organized considering the above.



## Fire Fighting: Measures

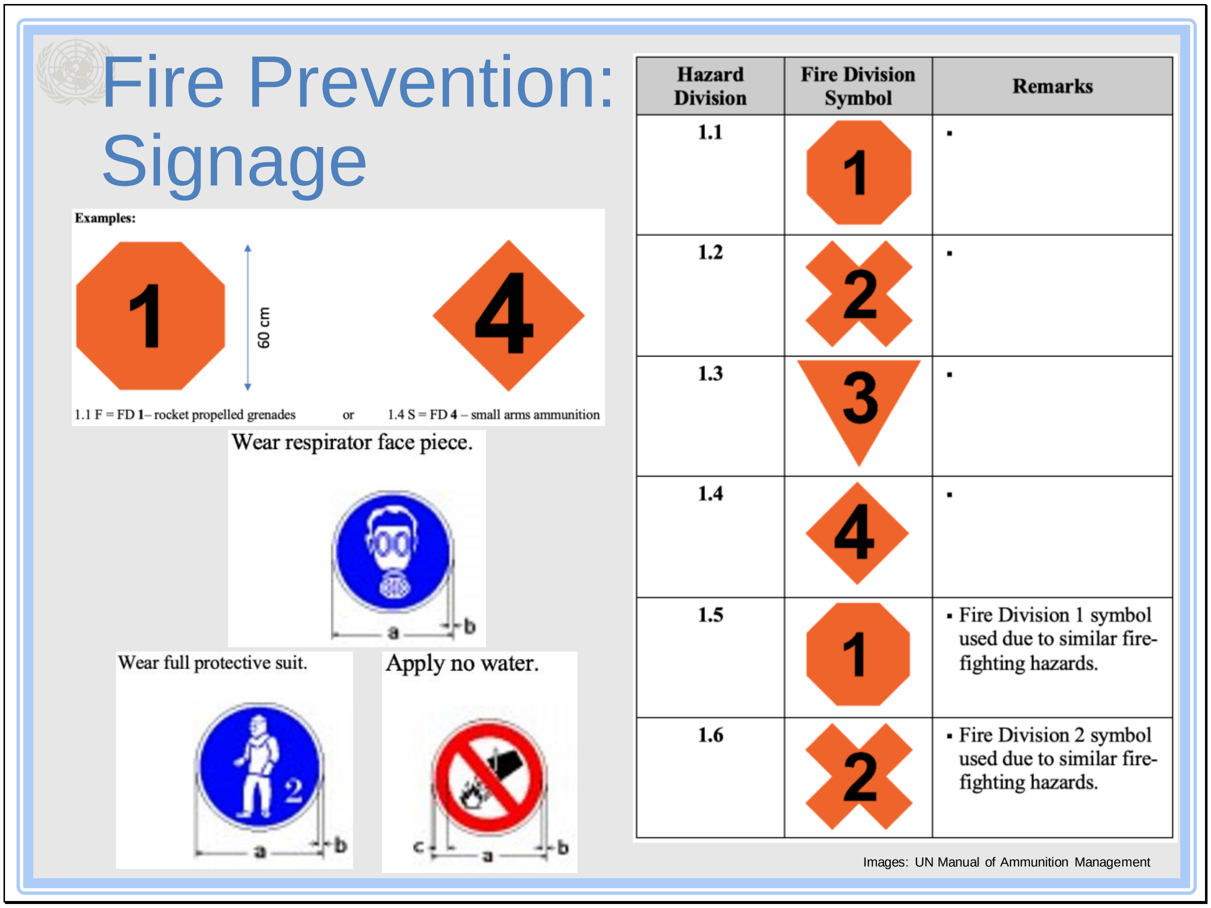
- Adequate supply of fire extinguishers, fire-beaters, shovels, machetes etc near each PES to deal with bush and scrub fires
- An Emergency Water Supply should be located near each PES
- All fires in the vicinity should be fought until the ammunition containers become involved in the fire, or the fire is extinguished.
- If ammunition becomes involved in a fire, personnel shall be removed immediately from the site to safe locations/distances.
  - This distance shall not be less than 750m
- After an ammunition fire has been extinguished, personnel shall wait at least six hours before entering the area.

**Main idea/objective for slide:**
**Examine Fire Prevention best practices for ammunition storage.**
**Discuss the requirement to develop a Fire Safety Plan which will include the necessary fire alarm systems, firefighting signs and equipment, the management of vegetation and contraband items.**

References/further reading
**IATG 04.10 – Temporary Storage**

- The equipment recommendations in IATG 02.50 *Fire safety* shall be supplemented with he above.
- The appropriate Fire Division Signs and Supplementary Fire Signs shall be displayed on posts at the approaches to each PES, although black and green tactical versions may be used if justified by the operational environment.
- Standard orange signs shall be used in Temporary Storage Areas after one year.

- All personnel shall be made aware of the appropriate emergency withdrawal safe distance that they shall place between themselves and the ammunition should immediate fire-fighting prove to be ineffective at controlling the spread of the fire
- Personnel whose duties require them to fight secondary fires shall not approach within 300 m of any fire involving ammunition and explosives other than Fire Division 4. They shall immediately withdraw to the designated safe distance, (at least 800m or to the IBD, whichever is greater), when the fire fighting teams at the ammunition site withdraw.



## Fire Prevention: Signage

**Examples:**

1.1 F = FD 1– rocket propelled grenades or 1.4 S = FD 4 – small arms ammunition

Wear respirator face piece.

Wear full protective suit.

Apply no water.

| Hazard Division | Fire Division Symbol | Remarks |
|---|---|---|
| 1.1 | 1 | ▪ |
| 1.2 | 2 | ▪ |
| 1.3 | 3 | ▪ |
| 1.4 | 4 | ▪ |
| 1.5 | 1 | ▪ Fire Division 1 symbol used due to similar fire-fighting hazards. |
| 1.6 | 2 | ▪ Fire Division 2 symbol used due to similar fire-fighting hazards. |

Images: UN Manual of Ammunition Management

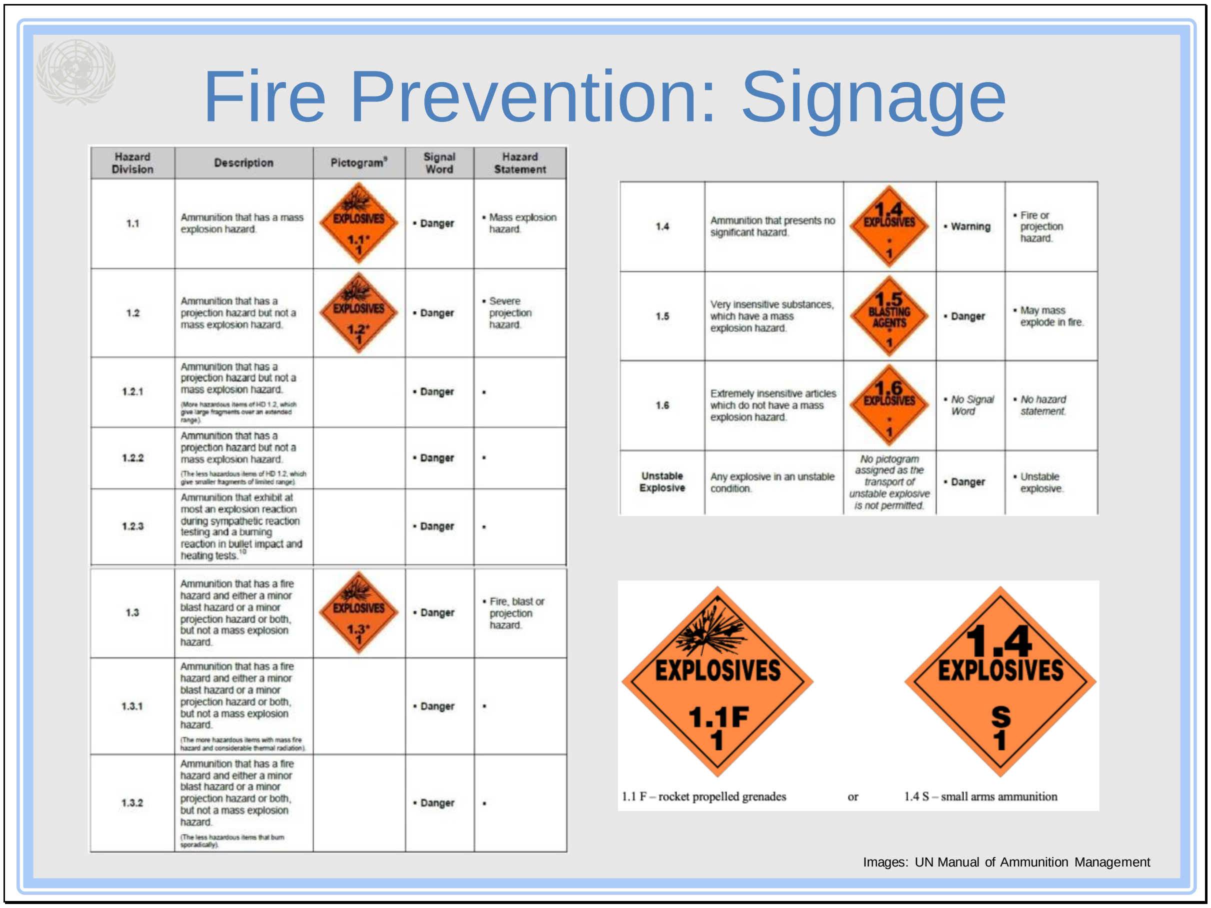
**<u>Main idea/objective for slide:</u>**
**Examine Fire prevention signage**

<u>What the instructor should cover (in addition to slide content)</u>
Provide this images as a handout to participants, United Nations Manual of Ammunition Management, 2020 1st Ed, page 9-10

<u>References/further reading</u>
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- The Hazard Division for a particular explosive or type of ammunition describes the specific danger from the ammunition
- In order to promote the safe transport and storage of ammunition, the United Nations hazard classification code (HCC) and fire divisions shall be used during storage and transportation for a simplified consequential hazard and risk assessment (see IATG 01.10, United Nations explosive hazard classification system and codes).

- The HCC for an explosive or type of ammunition consists of a combination of six hazard categories and fire divisions including:
    - its Hazard Division; and,
    - its Compatibility Group
- The four fire divisions, should be indicated during storage and transportation by one of four distinctive symbols in order to be recognized by the fire-fighting personnel approaching the fire scene.
- The four different Fire Division symbols are shown above.
- The number and shape of each symbol serves to identify its fire hazard for firefighting personnel approaching a possible fire.
- Each PES shall be marked on the outside of the storage facility according to the above figures:
    - Fire Division 1 - Mass explosion
    - Fire Division 2 - Explosion with fragment hazard
    - Fire Division 3 - Mass fire
    - Fire Division 4 - Moderate fire
- Supplementary symbols should be used to identify which containers and locations contain specific types of pyrotechnic material as these munitions pose supplementary hazards.
- The SATO should advise the fire protection officer (FPO) of any supplementary hazards and the specific emergency measures for such ammunition.
- Supplementary symbols shown above can be displayed at a PES to indicate the precautions that must be taken when fighting fires



## Fire Prevention: Signage

| Hazard Division | Description | Pictogram[9] | Signal Word | Hazard Statement |
|---|---|---|---|---|
| 1.1 | Ammunition that has a mass explosion hazard. | EXPLOSIVES<br>1.1*<br>1 | • Danger | • Mass explosion hazard. |
| 1.2 | Ammunition that has a projection hazard but not a mass explosion hazard. | EXPLOSIVES<br>1.2*<br>1 | • Danger | • Severe projection hazard. |
| 1.2.1 | Ammunition that has a projection hazard but not a mass explosion hazard.<br>(More hazardous items of HD 1.2, which give large fragments over an extended range). |  | • Danger | • |
| 1.2.2 | Ammunition that has a projection hazard but not a mass explosion hazard.<br>(The less hazardous items of HD 1.2, which give smaller fragments of limited range). |  | • Danger | • |
| 1.2.3 | Ammunition that exhibit at most an explosion reaction during sympathetic reaction testing and a burning reaction in bullet impact and heating tests.[10] |  | • Danger | • |
| 1.3 | Ammunition that has a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard. | EXPLOSIVES<br>1.3*<br>1 | • Danger | • Fire, blast or projection hazard. |
| 1.3.1 | Ammunition that has a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.<br>(The more hazardous items with mass fire hazard and considerable thermal radiation). |  | • Danger | • |
| 1.3.2 | Ammunition that has a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.<br>(The less hazardous items that burn sporadically). |  | • Danger | • |
| 1.4 | Ammunition that presents no significant hazard. | 1.4<br>EXPLOSIVES<br>*<br>1 | • Warning | • Fire or projection hazard. |
| 1.5 | Very insensitive substances, which have a mass explosion hazard. | 1.5<br>BLASTING AGENTS<br>*<br>1 | • Danger | • May mass explode in fire. |
| 1.6 | Extremely insensitive articles which do not have a mass explosion hazard. | 1.6<br>EXPLOSIVES<br>*<br>1 | • *No Signal Word* | • *No hazard statement.* |
| **Unstable Explosive** | Any explosive in an unstable condition. | *No pictogram assigned as the transport of unstable explosive is not permitted.* | • Danger | • Unstable explosive. |

1.1 F – rocket propelled grenades or 1.4 S – small arms ammunition

Images: UN Manual of Ammunition Management

**Main idea/objective for slide:**

**Examine Fire prevention signage**

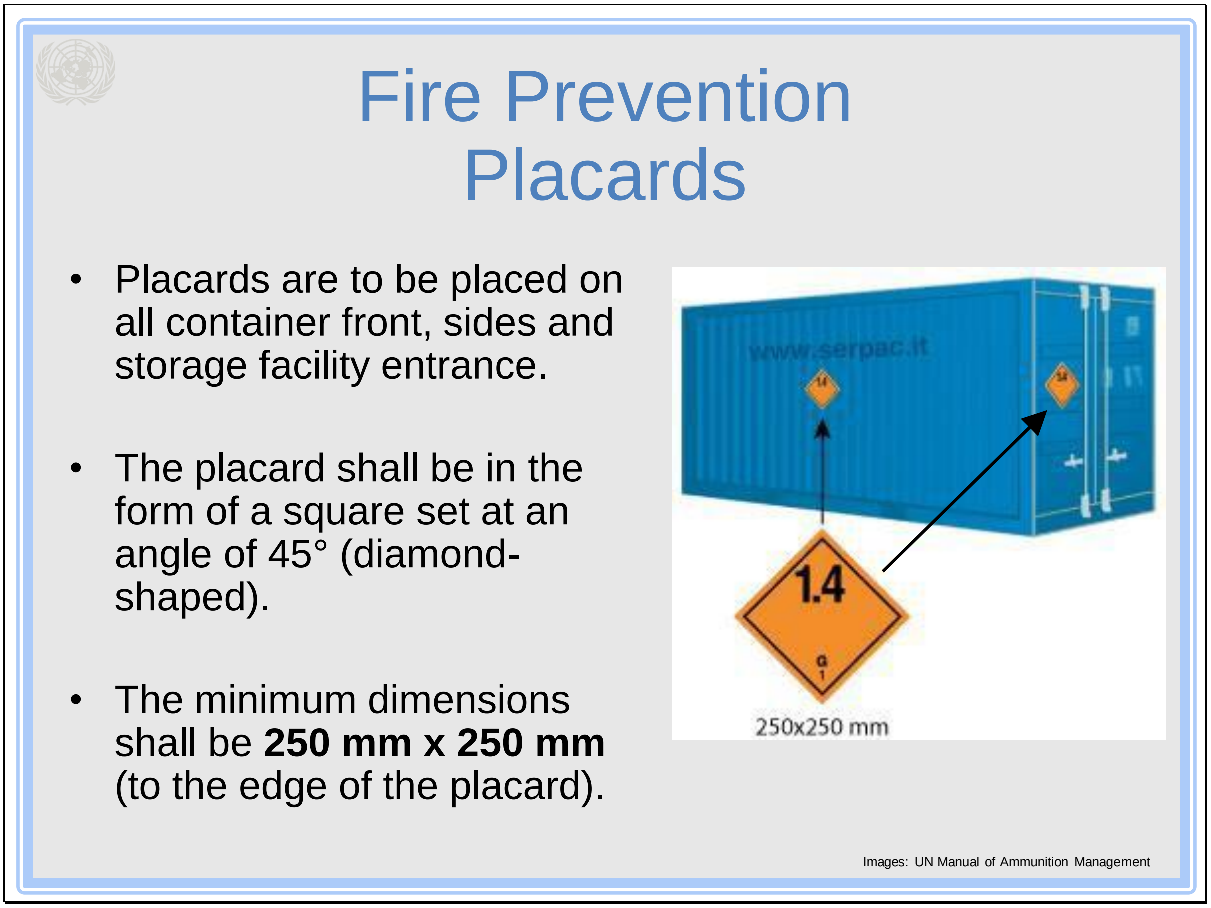
What the instructor should cover (in addition to slide content)

Provide this images as a handout to participants, United Nations Manual of Ammunition Management, 2020 1st Ed, page 11-12

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed**

- The Hazard Division for a particular explosive or type of ammunition describes the specific danger from the ammunition
- The * (star) is a placeholder for the compatibility group code



# Fire Prevention Placards

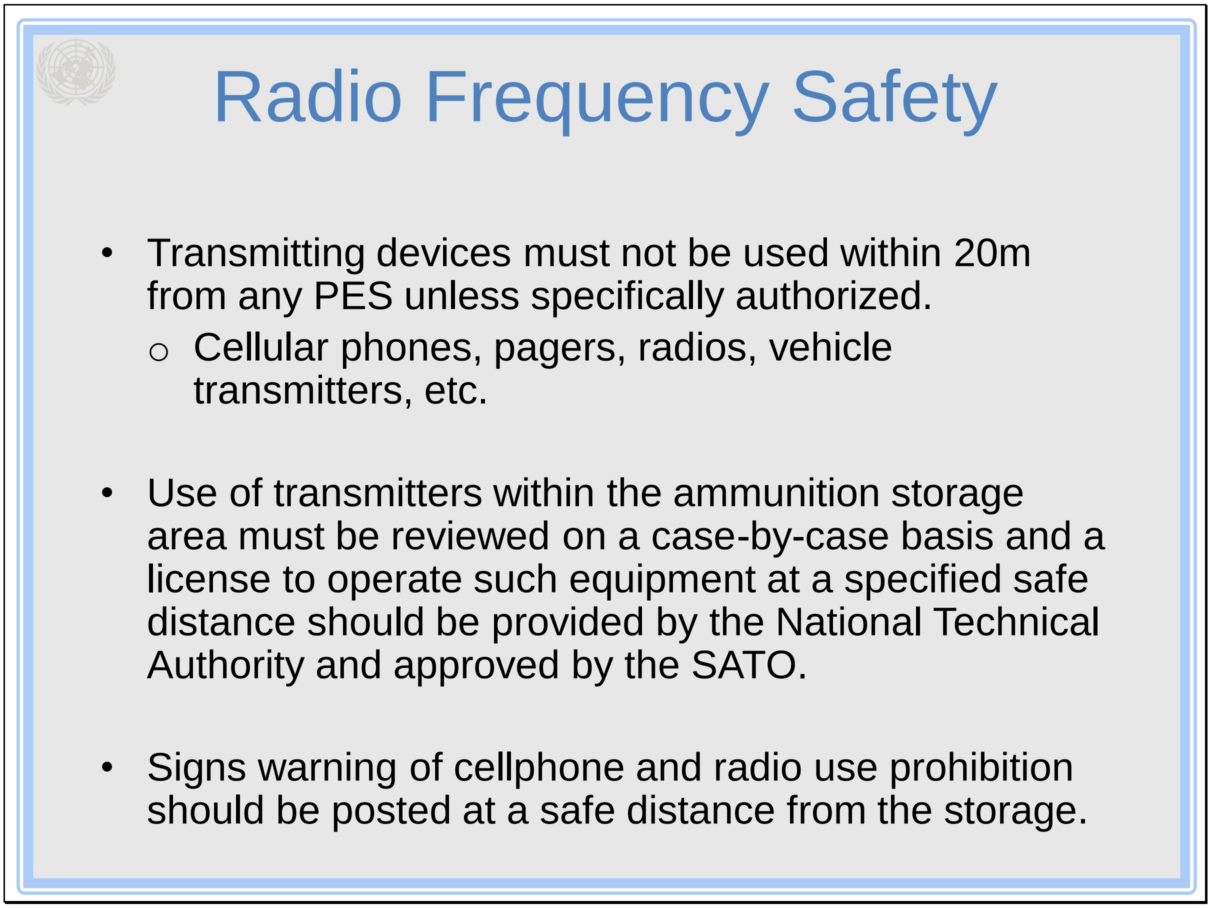
- Placards are to be placed on all container front, sides and storage facility entrance.
- The placard shall be in the form of a square set at an angle of 45° (diamond-shaped).
- The minimum dimensions shall be **250 mm x 250 mm** (to the edge of the placard).

Images: UN Manual of Ammunition Management

**Main idea/objective for slide:**
**Examine Fire prevention placards**

What the instructor should cover (in addition to slide content)
Discuss the importance of Placards
Security implications of placarding. Does it identify the ESH as a target? What does the security plan say?

References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**
- As per slide



## Radio Frequency Safety

- Transmitting devices must not be used within 20m from any PES unless specifically authorized.
    - Cellular phones, pagers, radios, vehicle transmitters, etc.
- Use of transmitters within the ammunition storage area must be reviewed on a case-by-case basis and a license to operate such equipment at a specified safe distance should be provided by the National Technical Authority and approved by the SATO.
- Signs warning of cellphone and radio use prohibition should be posted at a safe distance from the storage.

**Main idea/objective for slide:**

- **Discuss Radio Frequency hazards, Electro magnetic radiation Exposure Levels and Safe Separation Distances**

What the instructor should cover (in addition to slide content)

Include a discussion on the effects of electronic RF hazards can have on ammunition and explosives.

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed**

- As per slide

# Lightning Protection

- Where Temporary Ammunition Storage Sites are likely to be a mid-term (> 2 years) solution to ammunition storage appropriate lightning protection should be deployed.
- Protection should be fitted in accordance with the requirements of IATG 05.40 *Safety standards for electrical installations*.
- Ammunition Containers should be located no less than 15m from trees, telegraph poles, and pylons in order to reduce side flash should there be a lightning storm in the area.

**Main idea/objective for slide:**
**Highlight the need to ensure suitable lightning protection on all ammunition storage containers.**

What the instructor should cover (in addition to slide content)
Include a discussion on the effects that electrostatic discharge can have on ammunition and explosives.

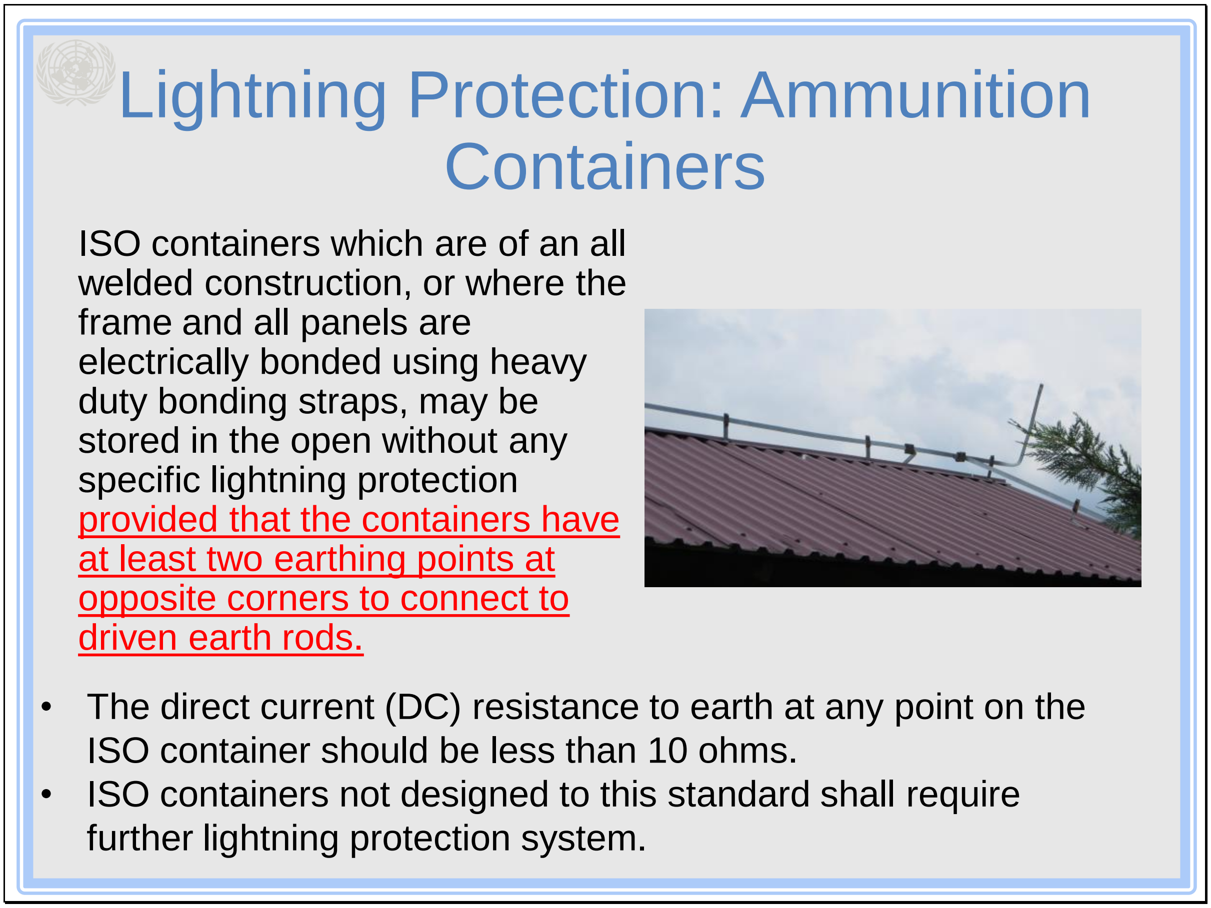
References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**
- In order to mitigate the adverse effects of a lightning strike (accidental ignition, damage), all PES should be provided with lightning protection.
- Ammunition containers used to store ammunition are to be considered a “Faraday cage” thereby not requiring additional lightning protection.
- However, they must be effectively grounded (also for ESD threats - see IATG 05.40).

## IATG 04.10 – Temporary Storage

- As per slide

## IATG 05.40 - Safety standards for electrical installations

- The probability of an explosives facility being struck by lightning is dependent upon the geographic location of the facility and the atmospheric and weather conditions prevalent at the time
- Ammunition is at risk from lightning as a strike could cause an explosive event by direct or indirect means such as by:
    - causing a surface flashover or electrical arcing between conducting surfaces. This in turn could initiate the explosives or any associated explosive devices directly by heat, sparking and molten metal created by the arc
    - arcing causing fires in electrical circuits and equipment
    - lightning strikes starting fires
    - spalling generated by the heat of the current flowing through the structural components of the facility impacting on and initiating unprotected exposed explosives and explosive devices



## Lightning Protection: Ammunition Containers

ISO containers which are of an all welded construction, or where the frame and all panels are electrically bonded using heavy duty bonding straps, may be stored in the open without any specific lightning protection provided that the containers have at least two earthing points at opposite corners to connect to driven earth rods.

- The direct current (DC) resistance to earth at any point on the ISO container should be less than 10 ohms.
- ISO containers not designed to this standard shall require further lightning protection system.

**Main idea/objective for slide:**

**Highlight the need to ensure suitable lightning protection on all ammunition storage containers.**

What the instructor should cover (in addition to slide content)

Include a discussion on the effects that electrostatic discharge and electronic RF hazards can have on ammunition and explosives.

References/further reading

**IATG 05.40 - Safety standards for electrical installations**

- ISO containers loaded with ammunition may be open stored with the following restrictions:
  - unpackaged explosives should not be stored in ISO containers. Ammunition packaging should provide a standoff distance from container walls;
  - the container meets the requirements of Clause 8.1.3; and
  - containers storing explosives should not be stacked.

Image supplied by AMAT/GICHD

## Physical Security Systems

- The security for Temporary Ammunition Storage Sites is always problematic due to the large ground area that they have to cover for explosive safety reasons.
- The security principles contained with IATG 09.10 Security principles and systems should be implemented where possible.
- All units shall provide a fire safety plan, entrance control plan and contingency plan in case of natural disaster affecting the ammunition storage site.
- This plan shall be validated by the contingent commander, SATO and UNDSS officer.

**Main idea/objective for slide:**

**Introduce the Security Risk Assessment, paying particular emphasis to the integration of the camp security plan, the type and quality of fencing used around the Temporary Ammunition Storage Site and the methods by which access control is managed i.e. keys and locks etc.**

What the instructor should cover (in addition to slide content)

Use the diagram to explain the importance of effective security fencing

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed**

- All ammunition storage areas or sites shall have the minimum measures for physical protection and security against fire, natural disasters and unauthorized entry.
- These plans should follow T/PCCs' national standards, but also IATG 09.10 technical specifications and UNDSS rules and regulations.

- All military and police units shall provide a fire safety plan, entrance control plan and contingency plan in case of natural disaster affecting the ammunition storage site.
- This plan shall be validated by the contingent commander, SATO and UNDSS officer.
- Perimeter security should be the highest priority, and this may be achieved by using a combination of armed guards, patrols and fencing/barricading

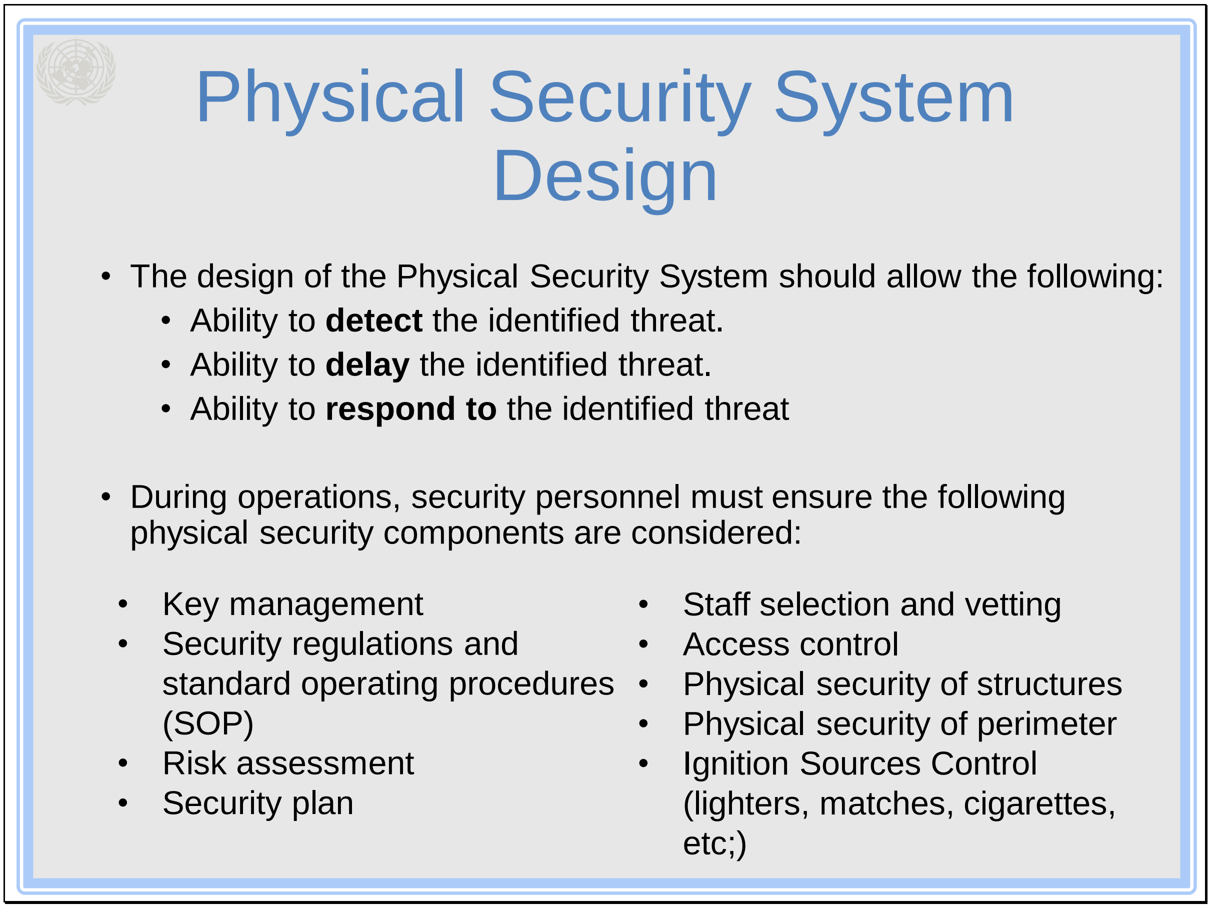
**IATG 04.10 – Temporary Storage**

- As per slide

**IATG 09.10 – Security principles and systems**

- It is important that the technical systems required for effective security are included during the resource allocation process of conventional ammunition stockpile management.
- The financial costs of security are minimal, when compared to the potential value of the ammunition stockpile, yet they have the potential for high impact on preventing the theft and illicit proliferation of conventional ammunition.
- Costs should be measured against the potential impact of poor security, (i.e. political impact, reputational consequences and overall financial costs), not just on simple financial loss accounting
- The following principles of physical security should be applied to ammunition storage and processing areas:
    - There shall be an effective accounting system for all ammunition stocks held in all APBs and ESH at all ASA and a system of regular stock checks;
    - Physical security systems should be derived from an effective risk assessment process;
    - Physical security should be built into new storage facilities at the design stage;
    - An effective perimeter security infrastructure shall be in place;
    - Access shall be controlled at all times;
    - Access shall be restricted to authorised personnel only;
    - Only trusted individuals, who have been security cleared, shall be nominated as authorised personnel to work within the facility; and
    - Temporary personnel shall be accompanied at all times.

Image supplied by AMAT/GICHD



## Physical Security System Design

- The design of the Physical Security System should allow the following:
  - Ability to **detect** the identified threat.
  - Ability to **delay** the identified threat.
  - Ability to **respond to** the identified threat

- During operations, security personnel must ensure the following physical security components are considered:

- Key management
- Security regulations and standard operating procedures (SOP)
- Risk assessment
- Security plan
- Staff selection and vetting
- Access control
- Physical security of structures
- Physical security of perimeter
- Ignition Sources Control (lighters, matches, cigarettes, etc;)

**Main idea/objective for slide:**

**Introduce the Security Risk Assessment, paying particular emphasis to the integration of the camp security plan, the type and quality of fencing used around the Temporary Ammunition Storage Site and the methods by which access control is managed i.e. keys and locks etc.**

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed**

- The Physical Security System shall protect the assets and facilities against theft, sabotage and other malevolent human acts.
- The Physical Security System shall be effective and consider the Design Basis Threat.
- The Design Basis Threat is the result of:
  - A characterization of the facility. Include the special conditions of its location, e.g., whether it is in a desert or in a jungle.

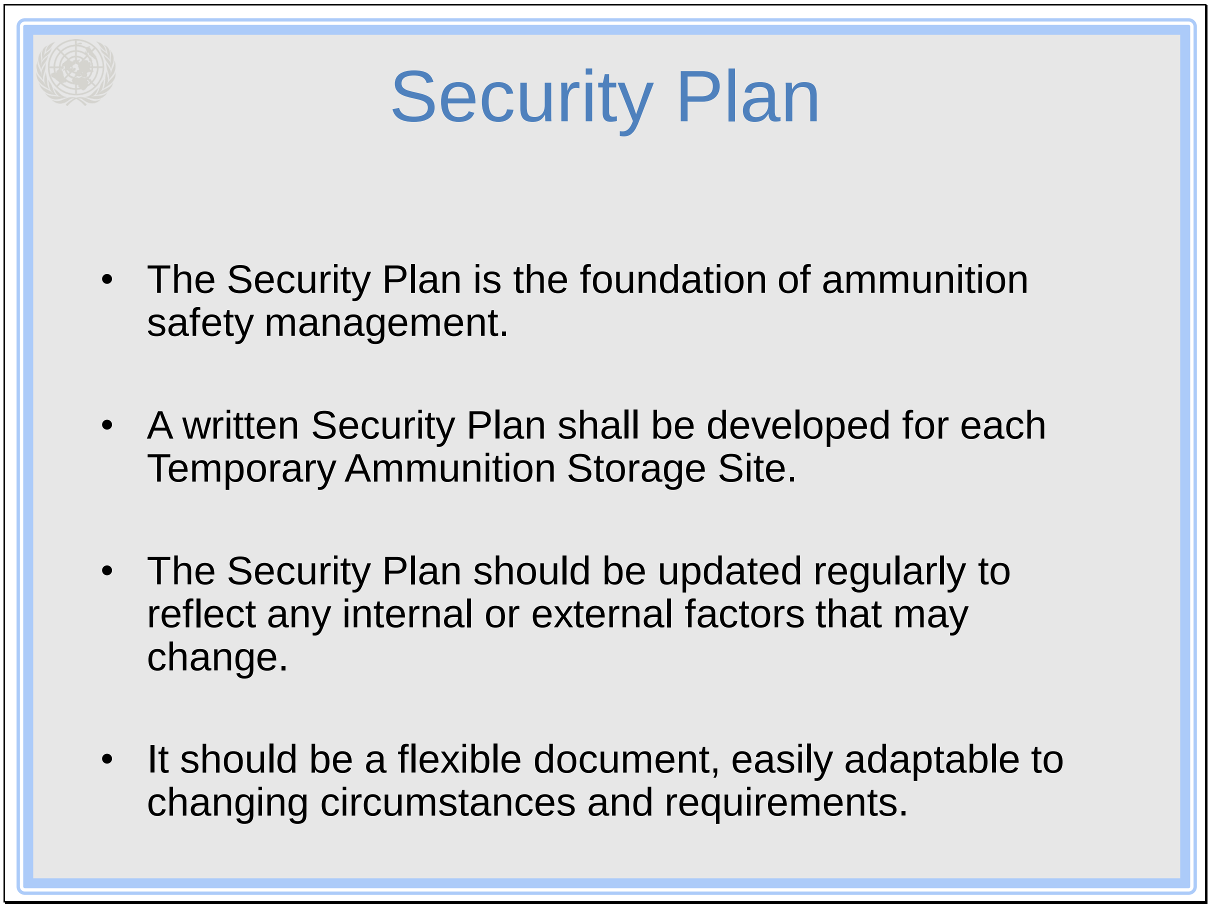
  - A threat assessment: Are you confronted with a regular armed group or quick response and light armoured groups?
  - Ammunition storage considerations. Man Portable Air Defense System (MANPADS) are stored differently than 90 mm guns or Surplus Ammo & Arms (SAA).

**IATG 04.10 – Temporary Storage**

- As per slide

**IATG 09.10 – Security principles and systems**

- The security requirements for each location should be determined by the assessment of criteria that shall include:
  - The type of assets to be protected and the role of the unit or users;
  - The value of assets (whether monetary or in terms of utility to illicit users) to be protected;
  - The threats to those assets,
  - The protection level desired against such threats, which may include cost benefit analysis
  - Any design constraints imposed by the organisation storing the conventional ammunition.
- The following components should be examined and considered during the development of a physical security system:
  - Security regulations and standard operating procedures (SOP);
  - Security plan;
  - Staff selection and vetting;
  - Access control;
  - Physical security of buildings and structures; and
  - Physical security of perimeter



## Security Plan

- The Security Plan is the foundation of ammunition safety management.
- A written Security Plan shall be developed for each Temporary Ammunition Storage Site.
- The Security Plan should be updated regularly to reflect any internal or external factors that may change.
- It should be a flexible document, easily adaptable to changing circumstances and requirements.

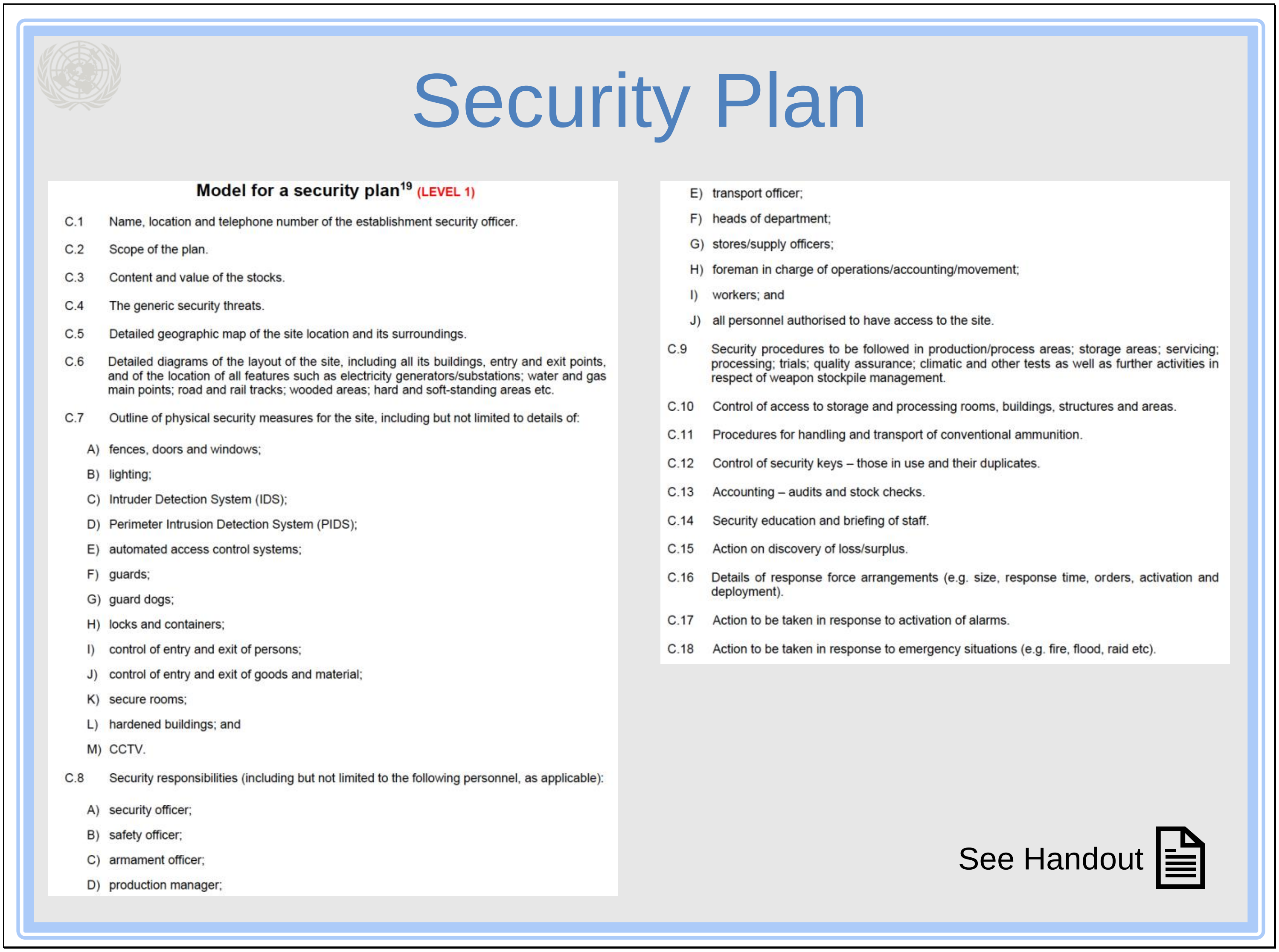
**Main idea/objective for slide:**

**Introduce the Security Risk Assessment, paying particular emphasis to the integration of the camp security plan, the type and quality of fencing used around the Temporary Ammunition Storage Site and the methods by which access control is managed i.e. keys and locks etc.**

References/further reading

**IATG 09.10 – Security principles and systems**

- Security classification of the plan shall be the responsibility of the designated security officer at the conventional ammunition storage facility.



# Security Plan

**Model for a security plan**[19] (LEVEL 1)

C.1 Name, location and telephone number of the establishment security officer.

C.2 Scope of the plan.

C.3 Content and value of the stocks.

C.4 The generic security threats.

C.5 Detailed geographic map of the site location and its surroundings.

C.6 Detailed diagrams of the layout of the site, including all its buildings, entry and exit points, and of the location of all features such as electricity generators/substations; water and gas main points; road and rail tracks; wooded areas; hard and soft-standing areas etc.

C.7 Outline of physical security measures for the site, including but not limited to details of:

- A) fences, doors and windows;
- B) lighting;
- C) Intruder Detection System (IDS);
- D) Perimeter Intrusion Detection System (PIDS);
- E) automated access control systems;
- F) guards;
- G) guard dogs;
- H) locks and containers;
- I) control of entry and exit of persons;
- J) control of entry and exit of goods and material;
- K) secure rooms;
- L) hardened buildings; and
- M) CCTV.

C.8 Security responsibilities (including but not limited to the following personnel, as applicable):

- A) security officer;
- B) safety officer;
- C) armament officer;
- D) production manager;
- E) transport officer;
- F) heads of department;
- G) stores/supply officers;
- H) foreman in charge of operations/accounting/movement;
- I) workers; and
- J) all personnel authorised to have access to the site.

C.9 Security procedures to be followed in production/process areas; storage areas; servicing; processing; trials; quality assurance; climatic and other tests as well as further activities in respect of weapon stockpile management.

C.10 Control of access to storage and processing rooms, buildings, structures and areas.

C.11 Procedures for handling and transport of conventional ammunition.

C.12 Control of security keys – those in use and their duplicates.

C.13 Accounting – audits and stock checks.

C.14 Security education and briefing of staff.

C.15 Action on discovery of loss/surplus.

C.16 Details of response force arrangements (e.g. size, response time, orders, activation and deployment).

C.17 Action to be taken in response to activation of alarms.

C.18 Action to be taken in response to emergency situations (e.g. fire, flood, raid etc).

See Handout

**Main idea/objective for slide:**

**Introduce the Security Risk Assessment, paying particular emphasis to the integration of the camp security plan, the type and quality of fencing used around the Temporary Ammunition Storage Site and the methods by which access control is managed i.e. keys and locks etc.**

What the instructor should cover (in addition to slide content)

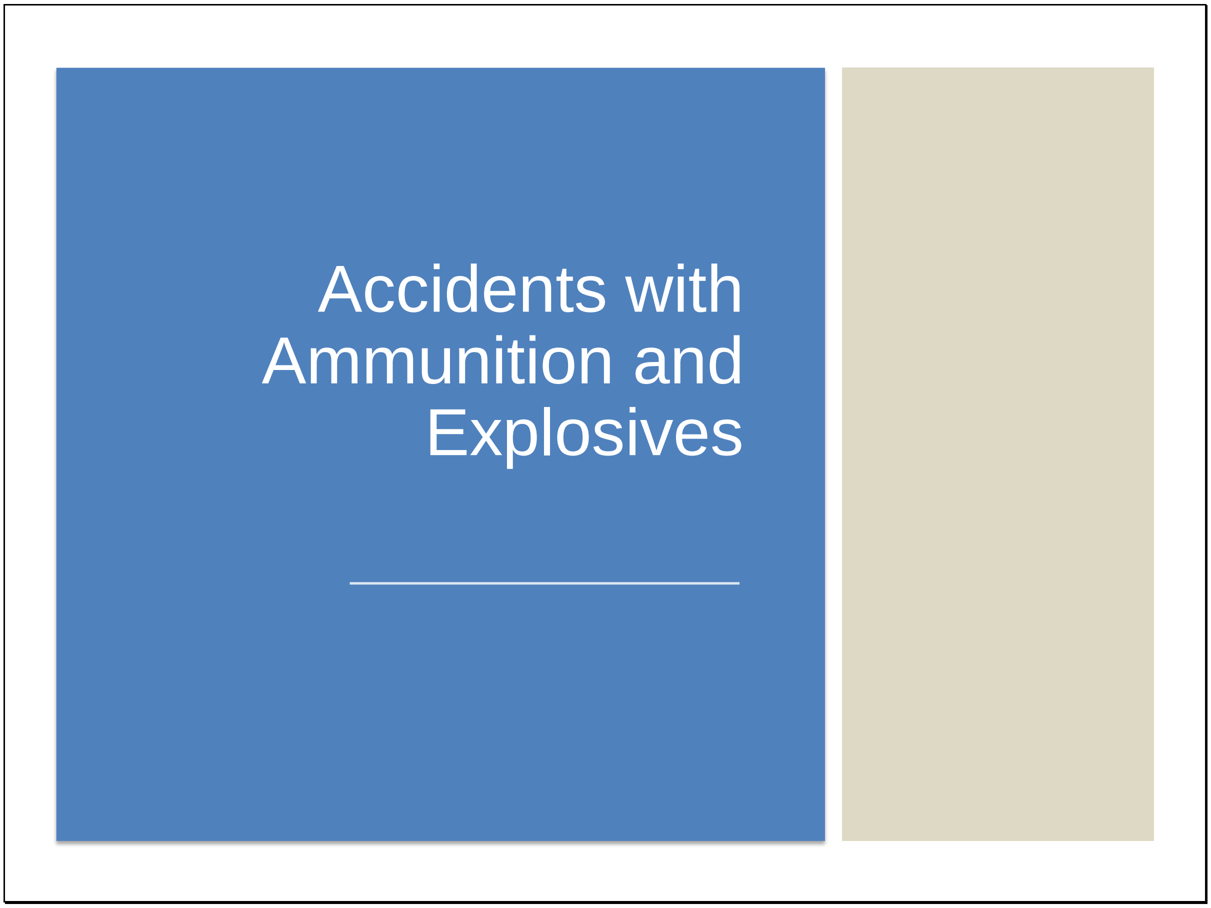
Provide this Security Plan template as a Handout

References/further reading

**IATG 09.10 – Security principles and systems - Annex C**

- A model plan that may be adopted by stockpile management organisations

Slide 47



Accidents with Ammunition and Explosives

**Phase 2. Development (**Time allocation - 160 min**)**

Stage 2 (Time allocation 40 mins) – Accidents with Ammunition and Explosives

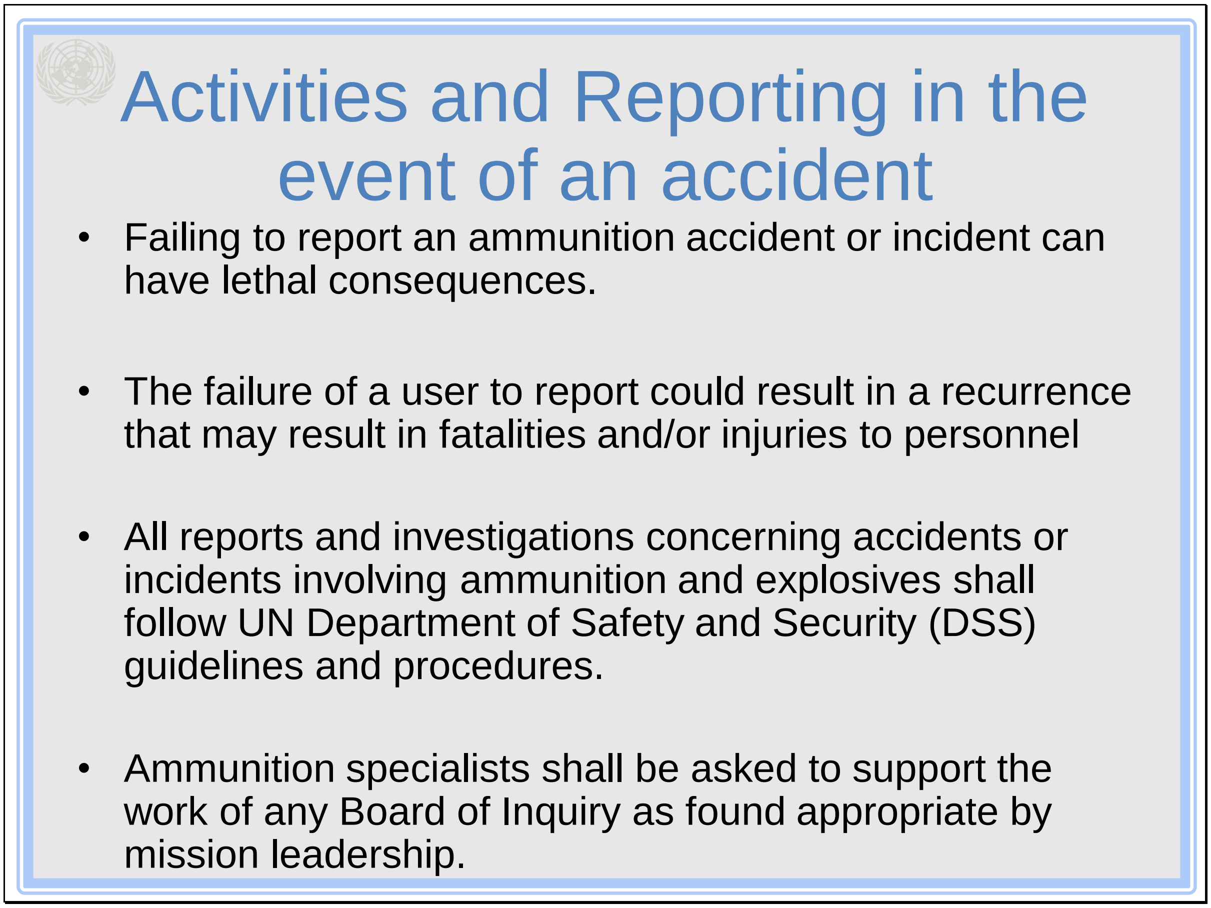
The impact of explosive accidents

**<u>Main idea/objective for slide:</u>**
**Explain and illustrate to the participants the impact of explosive accidents using images of case studies and emphasise the need to mitigate all risks to ammunition and explosives**

<u>What the instructor should cover (in addition to slide content)</u>
Talk through each image of an explosive event at an explosive storage area, and ask the participants to highlight the impact on the surrounding areas (buildings, people etc?)

Image: craters, ammunition scattered on a large area in an uncertain state, environmental pollution, population at risk

- Images supplied by AMAT/GICHD. (Equatorial Guinea 2021)



## Activities and Reporting in the event of an accident

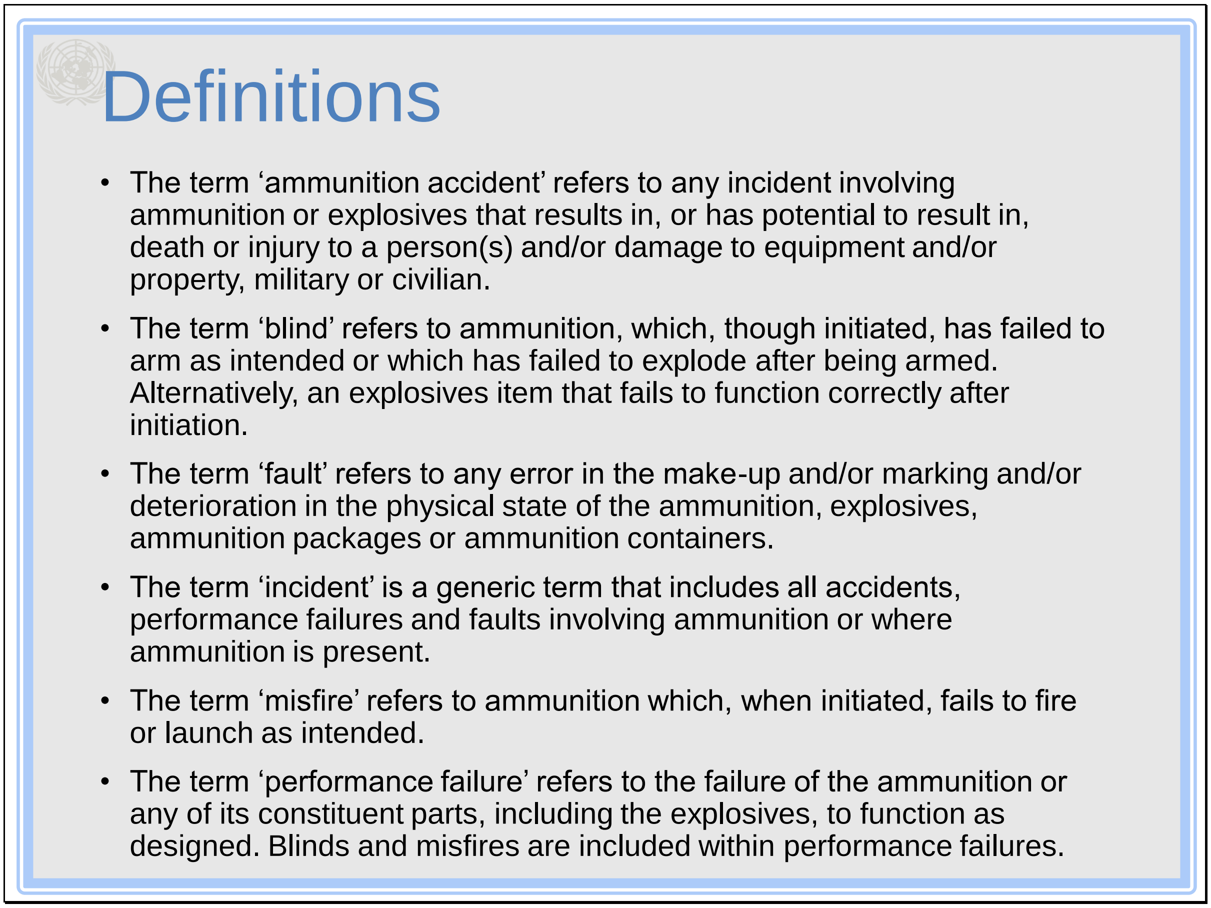
- Failing to report an ammunition accident or incident can have lethal consequences.
- The failure of a user to report could result in a recurrence that may result in fatalities and/or injuries to personnel
- All reports and investigations concerning accidents or incidents involving ammunition and explosives shall follow UN Department of Safety and Security (DSS) guidelines and procedures.
- Ammunition specialists shall be asked to support the work of any Board of Inquiry as found appropriate by mission leadership.

**Main idea/objective for slide:**
**Discuss the activities and the reports to be completed in the event of an accident paying particular attention to maintaining safety.**

References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**
- As per slide

**IATG 11.10 – Ammunition accidents and incidents**
- 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.
- The reporting and investigation of conventional ammunition accidents and incidents is a key component in ensuring the safety of the conventional ammunition stockpile during storage, handling and use.
- Reporting and investigating accidents and incidents will establish lessons for others to learn and ultimately contribute to improved safety for all



# Definitions

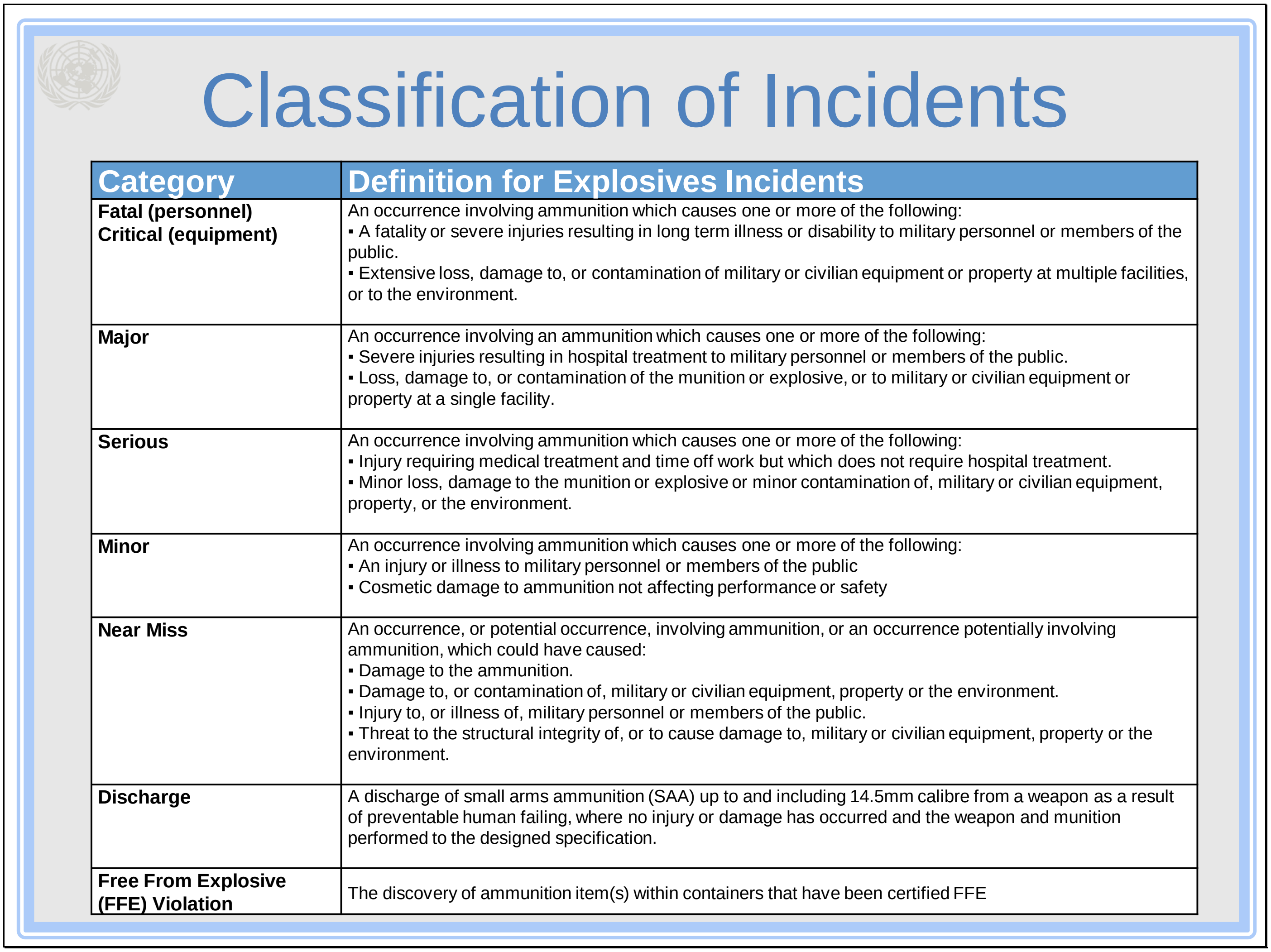
- The term ‘ammunition accident’ refers to any incident involving ammunition or explosives that results in, or has potential to result in, death or injury to a person(s) and/or damage to equipment and/or property, military or civilian.
- The term ‘blind’ refers to ammunition, which, though initiated, has failed to arm as intended or which has failed to explode after being armed. Alternatively, an explosives item that fails to function correctly after initiation.
- The term ‘fault’ refers to any error in the make-up and/or marking and/or deterioration in the physical state of the ammunition, explosives, ammunition packages or ammunition containers.
- The term ‘incident’ is a generic term that includes all accidents, performance failures and faults involving ammunition or where ammunition is present.
- The term ‘misfire’ refers to ammunition which, when initiated, fails to fire or launch as intended.
- The term ‘performance failure’ refers to the failure of the ammunition or any of its constituent parts, including the explosives, to function as designed. Blinds and misfires are included within performance failures.

**Main idea/objective for slide:**
**Discuss the activities and the reports to be completed in the event of an accident paying particular attention to maintaining safety.**

What the instructor should cover (in addition to slide content)
Explain the different terms used.

References/further reading
**IATG 01.60 – Ammunition faults and performance failures**

Slide 51



## Classification of Incidents

| Category | Definition for Explosives Incidents |
|---|---|
| **Fatal (personnel)**<br>**Critical (equipment)** | An occurrence involving ammunition which causes one or more of the following:<br>▪ A fatality or severe injuries resulting in long term illness or disability to military personnel or members of the public.<br>▪ Extensive loss, damage to, or contamination of military or civilian equipment or property at multiple facilities, or to the environment. |
| **Major** | An occurrence involving an ammunition which causes one or more of the following:<br>▪ Severe injuries resulting in hospital treatment to military personnel or members of the public.<br>▪ Loss, damage to, or contamination of the munition or explosive, or to military or civilian equipment or property at a single facility. |
| **Serious** | An occurrence involving ammunition which causes one or more of the following:<br>▪ Injury requiring medical treatment and time off work but which does not require hospital treatment.<br>▪ Minor loss, damage to the munition or explosive or minor contamination of, military or civilian equipment, property, or the environment. |
| **Minor** | An occurrence involving ammunition which causes one or more of the following:<br>▪ An injury or illness to military personnel or members of the public<br>▪ Cosmetic damage to ammunition not affecting performance or safety |
| **Near Miss** | An occurrence, or potential occurrence, involving ammunition, or an occurrence potentially involving ammunition, which could have caused:<br>▪ Damage to the ammunition.<br>▪ Damage to, or contamination of, military or civilian equipment, property or the environment.<br>▪ Injury to, or illness of, military personnel or members of the public.<br>▪ Threat to the structural integrity of, or to cause damage to, military or civilian equipment, property or the environment. |
| **Discharge** | A discharge of small arms ammunition (SAA) up to and including 14.5mm calibre from a weapon as a result of preventable human failing, where no injury or damage has occurred and the weapon and munition performed to the designed specification. |
| **Free From Explosive (FFE) Violation** | The discovery of ammunition item(s) within containers that have been certified FFE |

**Main idea/objective for slide:**
**Discuss the activities and the reports to be completed in the event of an accident paying particular attention to maintaining safety.**

What the instructor should cover (in addition to slide content)
Provide this table as a Handout, IATG 11.10 – Ammunition accidents and incident, page 5-6. http://data.unsaferguard.org/iatg/en/IATG-11.10-Ammunition-accidents-incidents-IATG-V.3.pdf

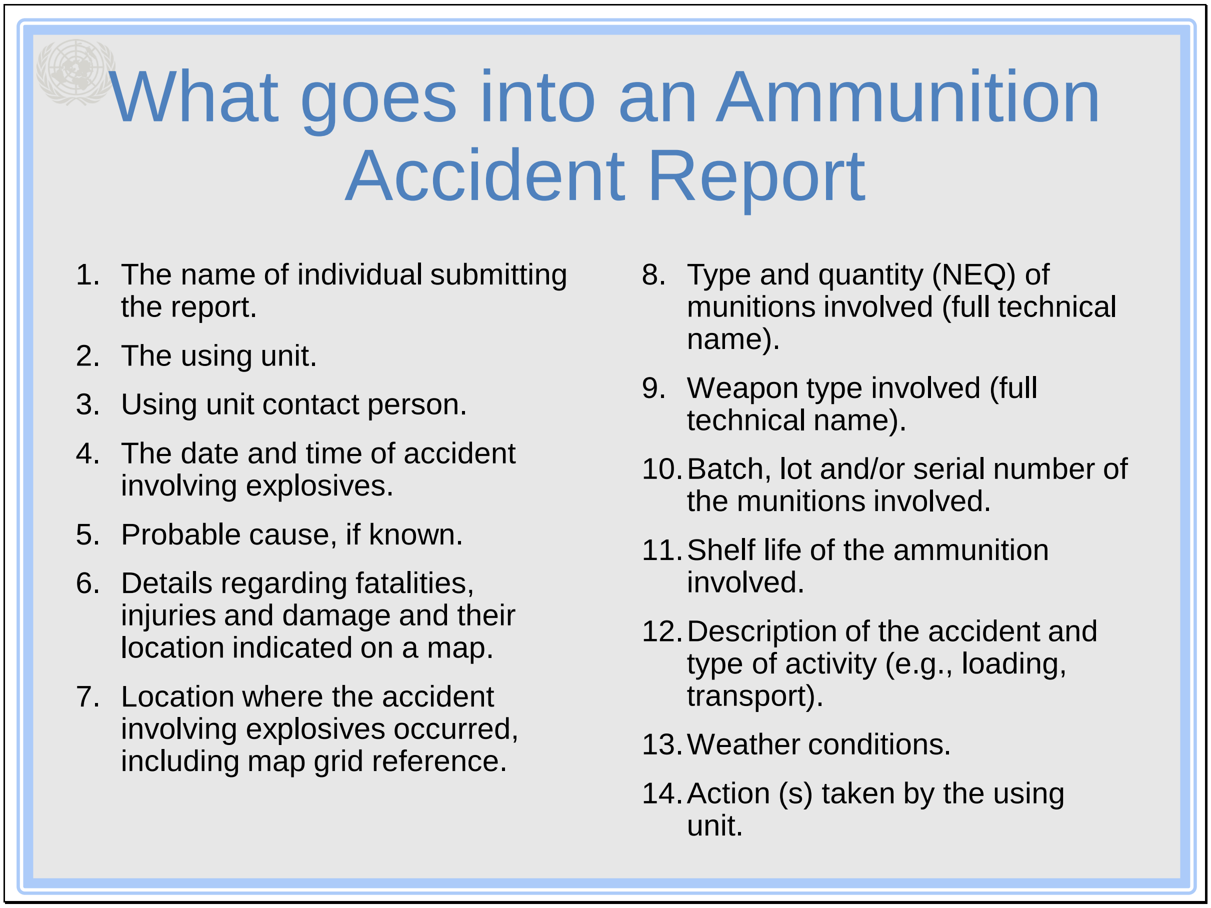
References/further reading
**IATG 11.10 – Ammunition accidents and incident,**

- The severity of an incident should be classified in accordance with the guidance in the above Table
- Any incident in which a munition ‘functions’ other than in design mode, and as intended by the operator, should be subject to a formal investigation and is to be classified as at least a major accident, irrespective of any lack of injury or damage.

What goes into an Ammunition Accident Report?

**<u>Main idea/objective for slide:</u>**
**Ask participants for ideas of what information goes into an Ammunition Accident report.**

<u>What the instructor should cover (in addition to slide content)</u>
Ask the participants what they believe goes into an Explosive Accident Report. Record ideas on a whiteboard



## What goes into an Ammunition Accident Report

1. The name of individual submitting the report.
2. The using unit.
3. Using unit contact person.
4. The date and time of accident involving explosives.
5. Probable cause, if known.
6. Details regarding fatalities, injuries and damage and their location indicated on a map.
7. Location where the accident involving explosives occurred, including map grid reference.
8. Type and quantity (NEQ) of munitions involved (full technical name).
9. Weapon type involved (full technical name).
10. Batch, lot and/or serial number of the munitions involved.
11. Shelf life of the ammunition involved.
12. Description of the accident and type of activity (e.g., loading, transport).
13. Weather conditions.
14. Action (s) taken by the using unit.

**Main idea/objective for slide:**

**Indicate the information that must be provided in an Ammunition Accident Report**

What the instructor should cover (in addition to slide content)

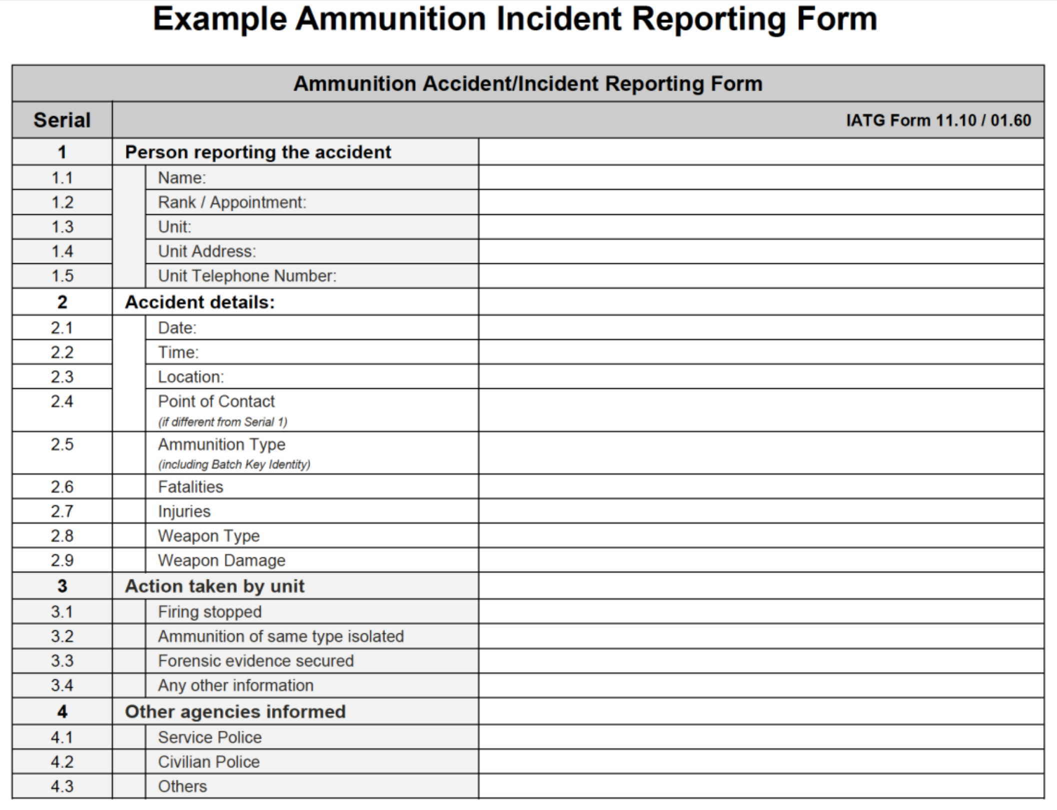
Talk through each heading with the participants, giving examples of what type of content would be included.

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed, page 15**

- The above information is provided as a guide for the initial report

# Ammunition Accident Report Example Template



**Example Ammunition Incident Reporting Form**

| | | |
|---|---|---|
| **Ammunition Accident/Incident Reporting Form** | | |
| **Serial** | **IATG Form 11.10 / 01.60** | |
| **1** | **Person reporting the accident** | |
| 1.1 | Name: | |
| 1.2 | Rank / Appointment: | |
| 1.3 | Unit: | |
| 1.4 | Unit Address: | |
| 1.5 | Unit Telephone Number: | |
| **2** | **Accident details:** | |
| 2.1 | Date: | |
| 2.2 | Time: | |
| 2.3 | Location: | |
| 2.4 | Point of Contact<br>*(if different from Serial 1)* | |
| 2.5 | Ammunition Type<br>*(including Batch Key Identity)* | |
| 2.6 | Fatalities | |
| 2.7 | Injuries | |
| 2.8 | Weapon Type | |
| 2.9 | Weapon Damage | |
| **3** | **Action taken by unit** | |
| 3.1 | Firing stopped | |
| 3.2 | Ammunition of same type isolated | |
| 3.3 | Forensic evidence secured | |
| 3.4 | Any other information | |
| **4** | **Other agencies informed** | |
| 4.1 | Service Police | |
| 4.2 | Civilian Police | |
| 4.3 | Others | |

See Handout 🗎

**Main idea/objective for slide:**

**Indicate the information that must be provided in an Ammunition Accident Report**

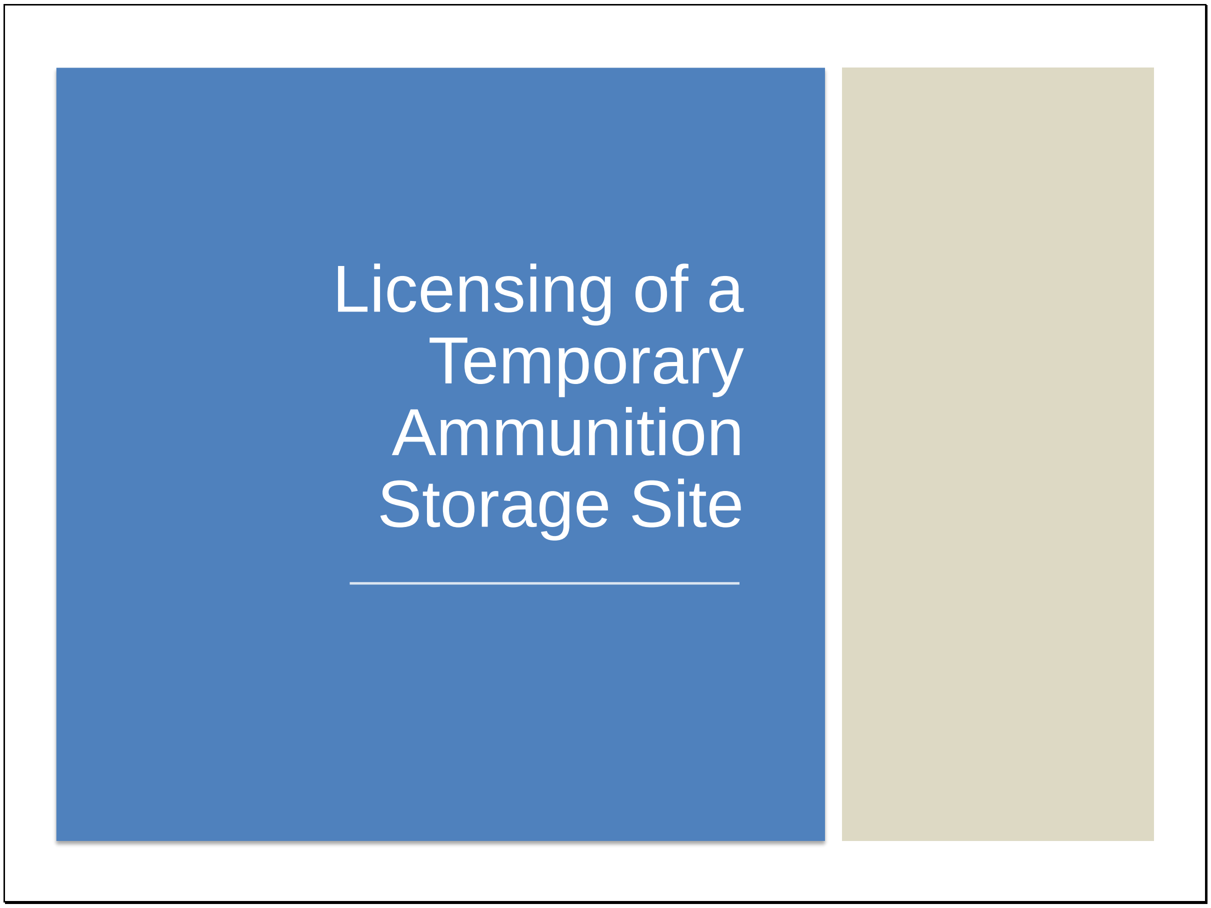
What the instructor should cover (in addition to slide content)

Provide a Handout of this template. http://data.unsaferguard.org/iatg/en/IATG-11.10-Ammunition-accidents-incidents-IATG-V.3.pdf

References/further reading

**IATG 11.10 – Ammunition accidents and incidents - Annex D**

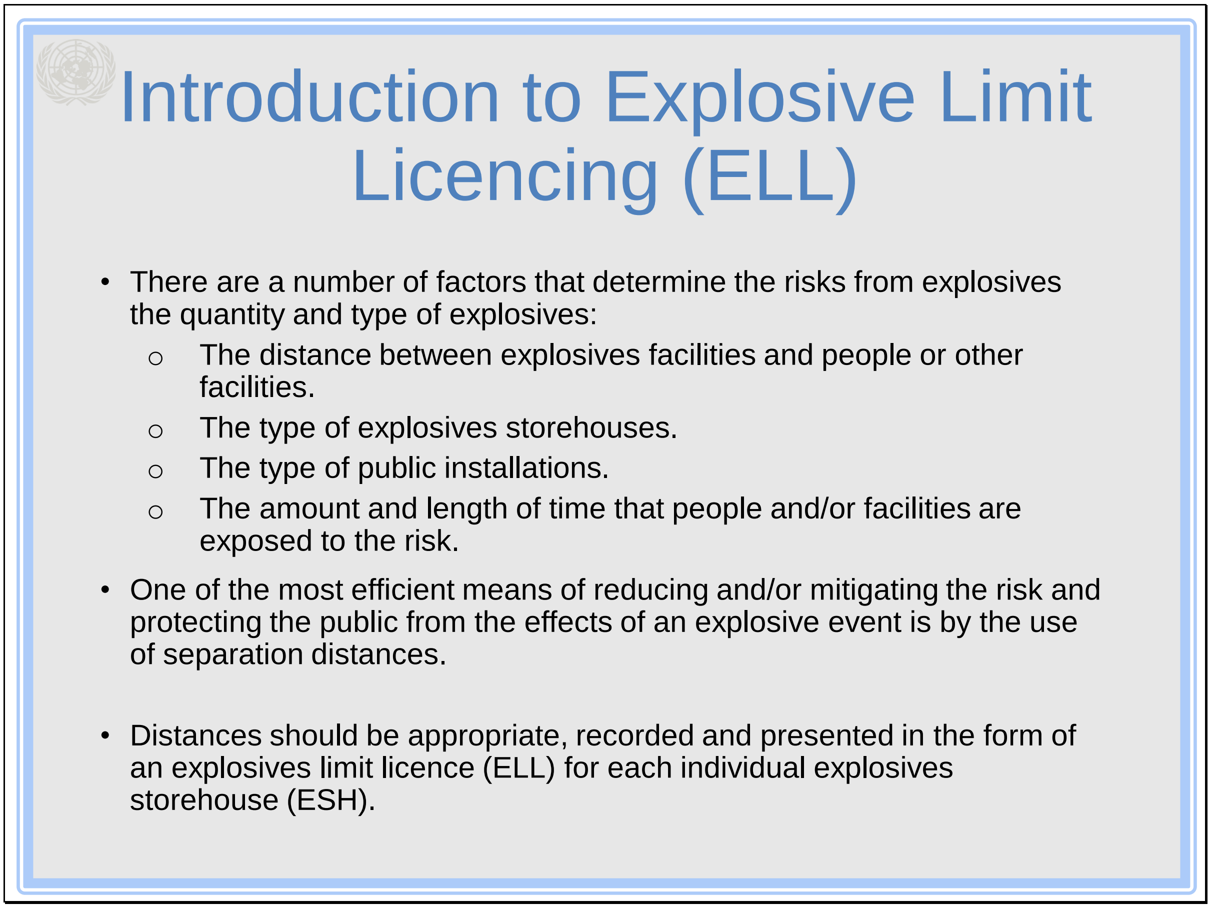
- As per slide



# Licensing of a Temporary Ammunition Storage Site

**Phase 2. Development (**Time allocation - 160 min**)**

Stage 3 (Time allocation 40 mins) – Licensing of a Temporary Ammunition Storage Site



# Introduction to Explosive Limit Licencing (ELL)

- There are a number of factors that determine the risks from explosives the quantity and type of explosives:
    - The distance between explosives facilities and people or other facilities.
    - The type of explosives storehouses.
    - The type of public installations.
    - The amount and length of time that people and/or facilities are exposed to the risk.
- One of the most efficient means of reducing and/or mitigating the risk and protecting the public from the effects of an explosive event is by the use of separation distances.
- Distances should be appropriate, recorded and presented in the form of an explosives limit licence (ELL) for each individual explosives storehouse (ESH).

**<u>Main idea/objective for slide:</u>**
**Revise the definitions associated with Explosives Limit Licencing (ELL).**

<u>participant activity</u>
Before revealing the text on the slide, ask participants for suggestions

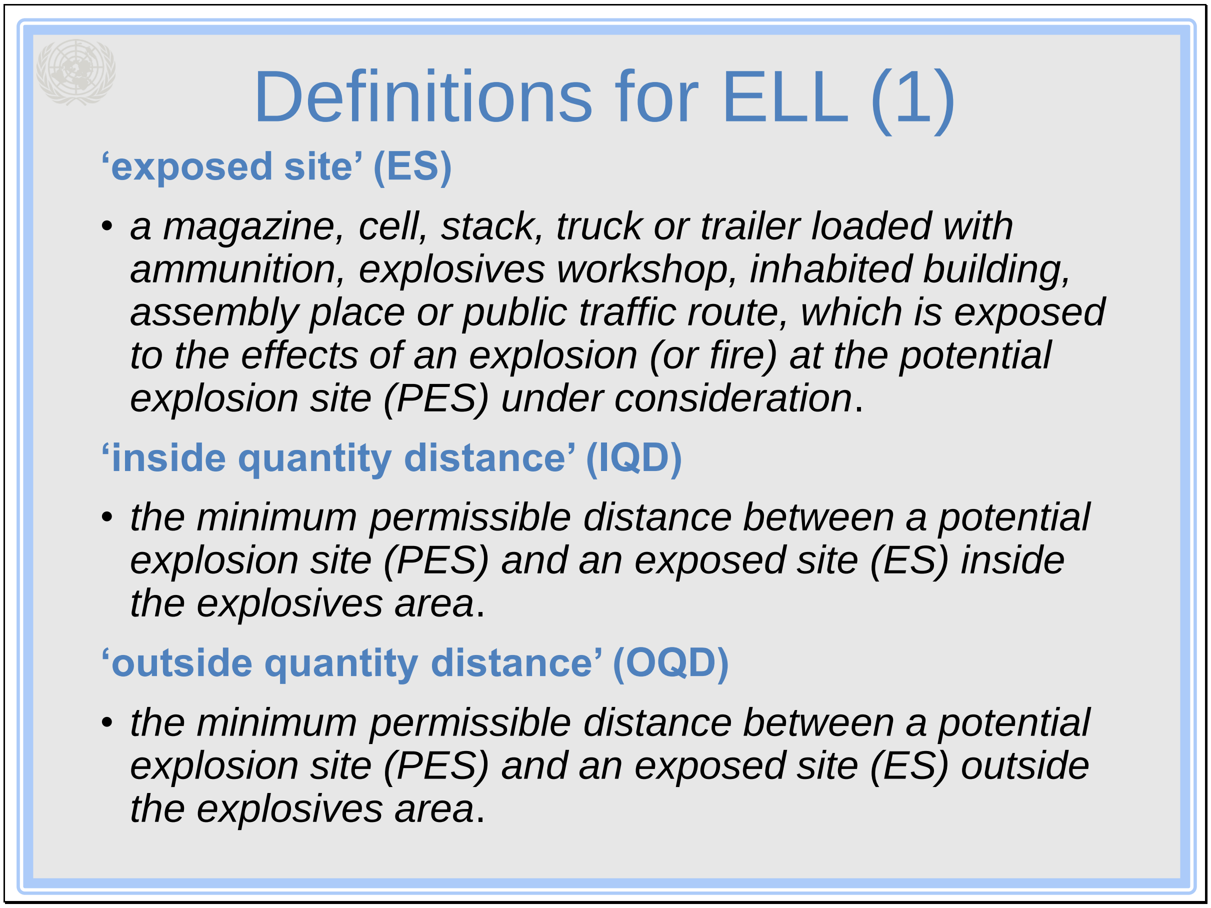
<u>References/further reading</u>
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- Explosive limits depend directly on the available distances between the PES and ES.
- There are two options for authorizing the explosive limits in NEQ at a PES regardless of the type of Explosive Limit Licenses (ELL) as explained in IATG 2.30:
    - The Site Potential Limit. This is the potential theoretical NEQ, by HD, which is achievable at a PES after calculating the QDs to the various ES and;

  - The Authorized Limit. This is the actual limit, authorized by the appropriate technical authority, and reflects the maximum quantity of explosives, by HD, that is permitted at that PES.
- In order to reduce explosive risk to a minimum, the PES should be licensed to an Authorized Limit, unless flexibility in storage is required over the short term.
- Over the long term, a PES could always be re-licensed to a higher authorized limit if necessary

**IATG 02.30 – Licensing of explosives facilities**

- The storage of ammunition and explosives presents inherent risks to nearby persons and property.
- A national authority shall therefore have a legal responsibility to ensure that during their storage the explosives present risks that are both tolerable and as low as reasonably practicable (the ALARP principle)
- All facilities used for storing and processing explosives should be licensed as suitable for the intended purpose with due regard to the following principles:
  - Only an authorised limit sufficient to meet predicted operational needs over the life of the licence should be considered. Due regard should be made to maintaining flexibility of the available storage, handling and processing assets;
  - Whenever reasonably practicable, the authorised limit should be less than the maximum potential limit identified using the system in IATG 02.20 *Separation and quantity distances;*
  - Exposure of the civilian population shall be avoided as far as is reasonably practicable;
  - Although the cost of appropriate storage facilities with effective separation distances will be a factor, it should not be used as a justification for a stockpile management organisation not to fulfil its ‘duty of care’ to ensure that the risks are ALARP
  - Any specific aspects of the licence that may require special management or review processes should be identified and given due consideration.



## Definitions for ELL (1)

**'exposed site' (ES)**

- *a magazine, cell, stack, truck or trailer loaded with ammunition, explosives workshop, inhabited building, assembly place or public traffic route, which is exposed to the effects of an explosion (or fire) at the potential explosion site (PES) under consideration*.

**'inside quantity distance' (IQD)**

- *the minimum permissible distance between a potential explosion site (PES) and an exposed site (ES) inside the explosives area*.

**'outside quantity distance' (OQD)**

- *the minimum permissible distance between a potential explosion site (PES) and an exposed site (ES) outside the explosives area*.

**Main idea/objective for slide:**

**Revise the definitions associated with Explosives Limit Licencing (ELL).**

participant activity

Before revealing the text on the slide, ask participants for definitions

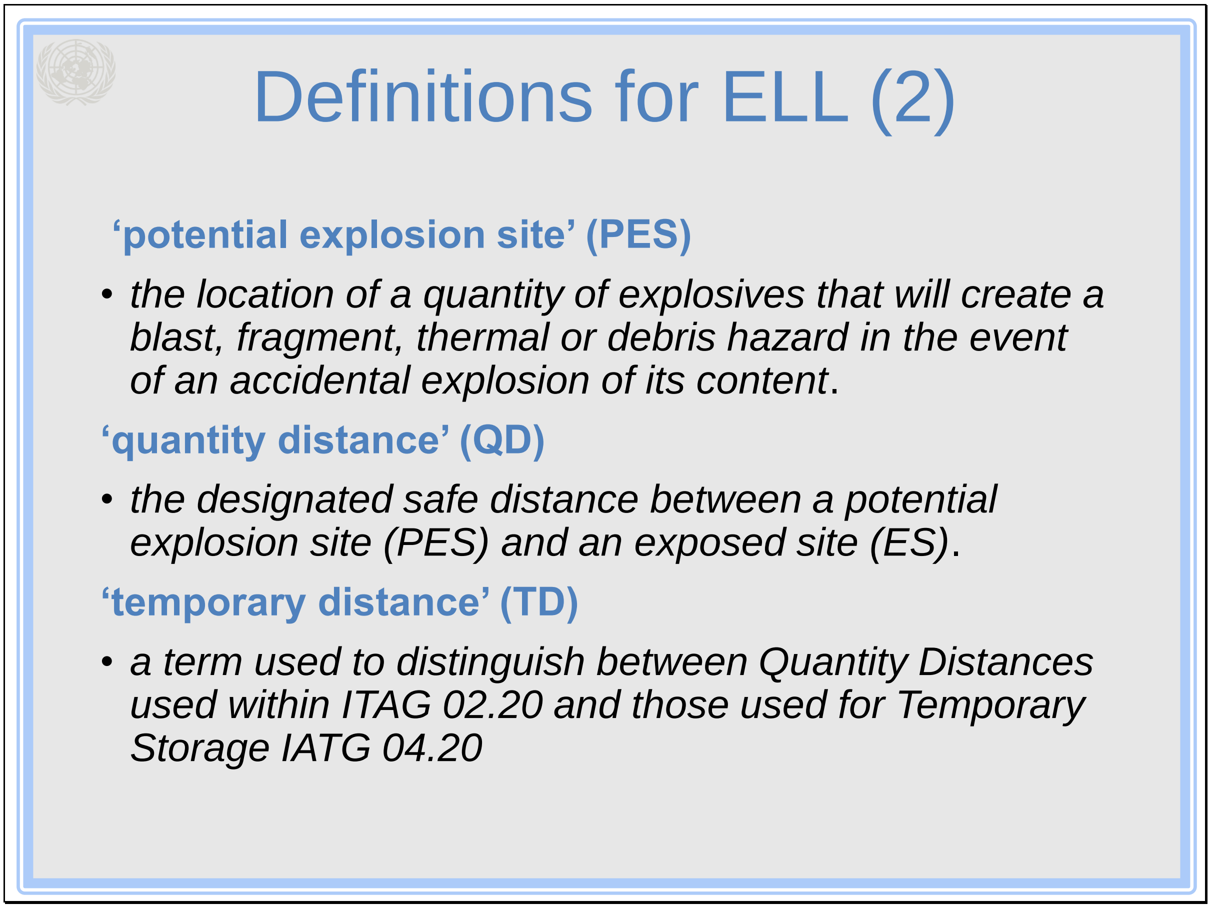
References/further reading

**IATG 04.10 – Temporary Storage.**

- As per slide

**IATG 02.30 – Licensing of explosives facilities**

- As per slide



## Definitions for ELL (2)

**‘potential explosion site’ (PES)**

- *the location of a quantity of explosives that will create a blast, fragment, thermal or debris hazard in the event of an accidental explosion of its content*.

**‘quantity distance’ (QD)**

- *the designated safe distance between a potential explosion site (PES) and an exposed site (ES)*.

**‘temporary distance’ (TD)**

- *a term used to distinguish between Quantity Distances used within ITAG 02.20 and those used for Temporary Storage IATG 04.20*

**Main idea/objective for slide:**
**Revise the definitions associated with Explosives Limit Licencing (ELL).**

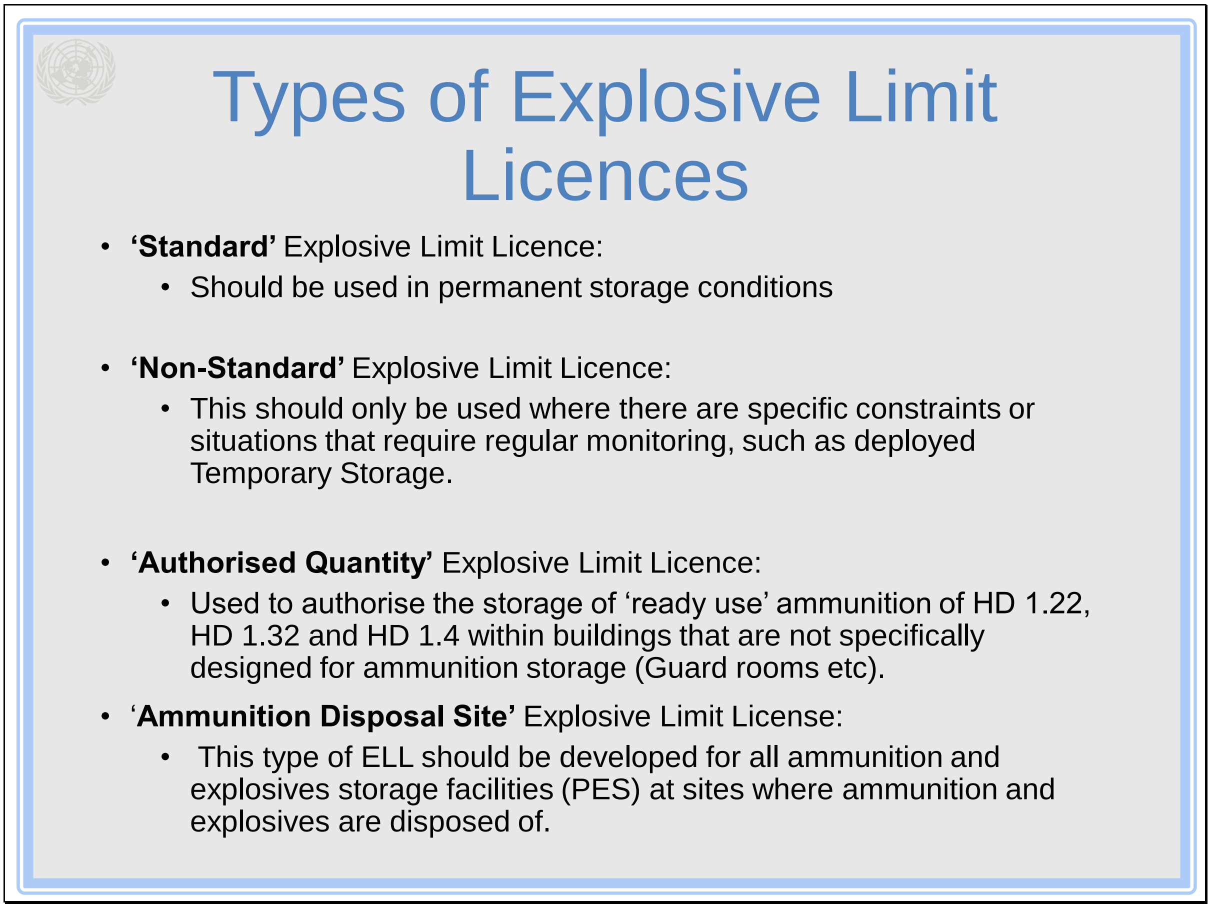
participant activity
Before revealing the text on the slide, ask participants for definitions

References/further reading
**IATG 04.10 – Temporary Storage.**

- As per slide

**IATG 02.30 – Licensing of explosives facilities**

- As per slide



## Types of Explosive Limit Licences

- **'Standard'** Explosive Limit Licence:
  - Should be used in permanent storage conditions
- **'Non-Standard'** Explosive Limit Licence:
  - This should only be used where there are specific constraints or situations that require regular monitoring, such as deployed Temporary Storage.
- **'Authorised Quantity'** Explosive Limit Licence:
  - Used to authorise the storage of 'ready use' ammunition of HD 1.22, HD 1.32 and HD 1.4 within buildings that are not specifically designed for ammunition storage (Guard rooms etc).
- '**Ammunition Disposal Site'** Explosive Limit License:
  - This type of ELL should be developed for all ammunition and explosives storage facilities (PES) at sites where ammunition and explosives are disposed of.

**Main idea/objective for slide:**

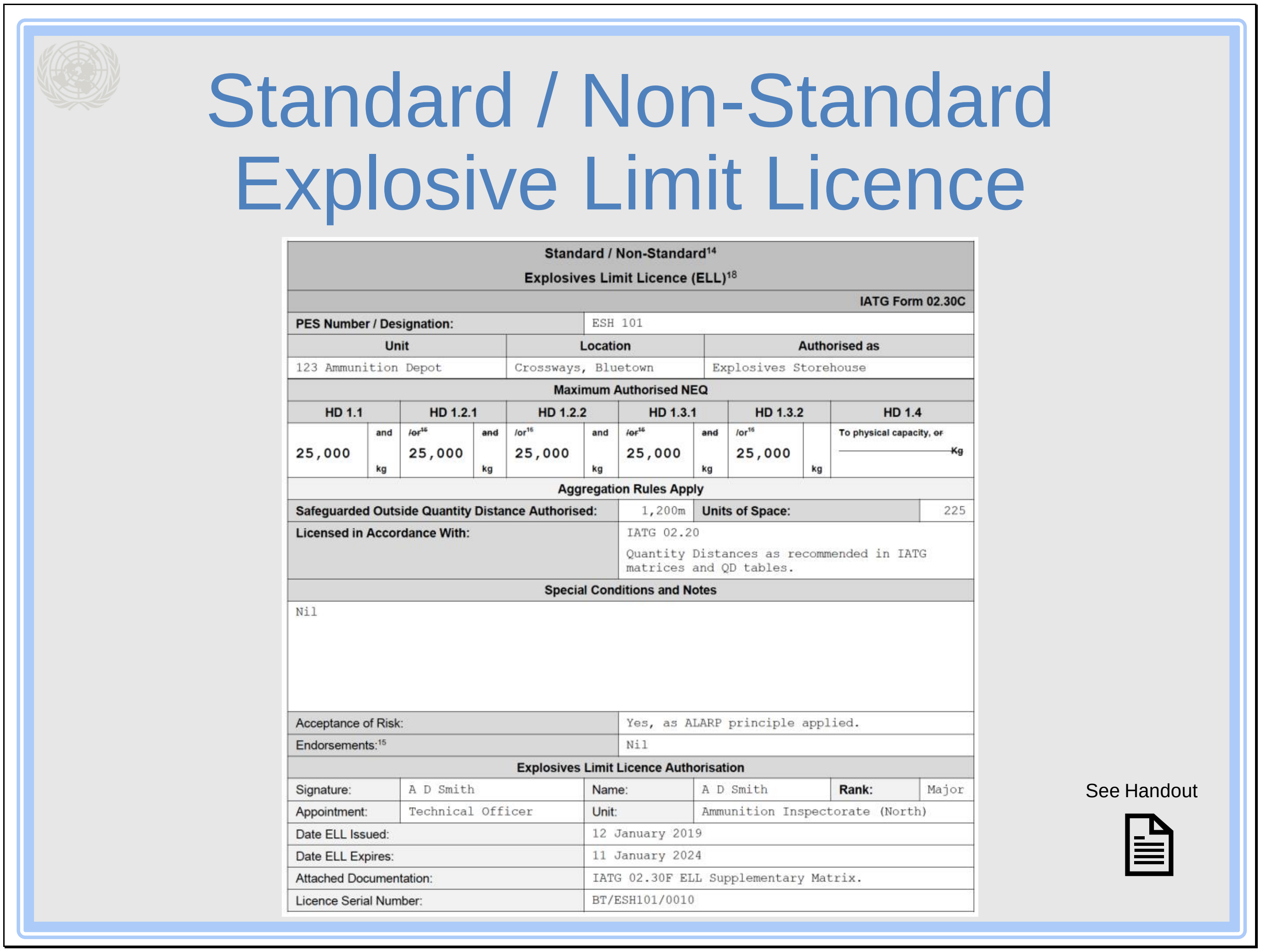
**Outline and discuss the various types of ELL and what is meant by Authorised Quantity.**

References/further reading

**IATG 02.30 – Licensing of explosives facilities**

- There are two options for authorising the explosives limits in NEQ at a particular PES regardless of the type of ELL:
  - The Site Potential Limit. This is the potential theoretical NEQ, by HD, which is achievable at a PES after calculating the QDs to the various ES; and
  - The Authorised Limit. This is the actual limit, authorised by the appropriate technical authority, and reflects the maximum quantity of explosives, by HD, that is actually permitted at that PES.

- In order to reduce or mitigate explosive risk to a minimum PES should be licensed to an Authorised Limit, unless flexibility in storage is required over the short term.
- Over the long term a PES could always be re-licensed to a higher authorised limit should it be necessary.
- This Standard ELL shall be used as a preference.
    - It shall be the appropriate ELL when the QD between the PES and ES can be achieved in line with the guidance provided in the QD matrices and tables in IATG 02.20 *Quantity and separation distances*
- The ‘non-standard’ ELL shall only be used in exceptional circumstances where the QD recommended at IATG 02.20 *Quantity and separation distances* cannot be met



# Standard / Non-Standard Explosive Limit Licence

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Standard / Non-Standard[14]**<br>**Explosives Limit Licence (ELL)[18]** | | | | | | | | | | |
| **IATG Form 02.30C** | | | | | | | | | | |
| **PES Number / Designation:** | | | | ESH 101 | | | | | | |
| **Unit** | | | | **Location** | | | | **Authorised as** | | |
| 123 Ammunition Depot | | | | Crossways, Bluetown | | | | Explosives Storehouse | | |
| **Maximum Authorised NEQ** | | | | | | | | | | |
| **HD 1.1** | | **HD 1.2.1** | | **HD 1.2.2** | | **HD 1.3.1** | | **HD 1.3.2** | | **HD 1.4** |
| 25,000 | **and**<br>**kg** | **~~/or~~[16]**<br>25,000 | **~~and~~**<br>**kg** | **/or[16]**<br>25,000 | **and**<br>**kg** | **~~/or~~[16]**<br>25,000 | **and**<br>**kg** | **/or[16]**<br>25,000 | **kg** | **To physical capacity, ~~or~~**<br>**Kg** |
| **Aggregation Rules Apply** | | | | | | | | | | |
| **Safeguarded Outside Quantity Distance Authorised:** | | | | | 1,200m | **Units of Space:** | | | | 225 |
| **Licensed in Accordance With:** | | | | | IATG 02.20<br>Quantity Distances as recommended in IATG matrices and QD tables. | | | | | |
| **Special Conditions and Notes** | | | | | | | | | | |
| Nil | | | | | | | | | | |
| Acceptance of Risk: | | | | | Yes, as ALARP principle applied. | | | | | |
| Endorsements:[15] | | | | | Nil | | | | | |
| **Explosives Limit Licence Authorisation** | | | | | | | | | | |
| Signature: | A D Smith | | | Name: | A D Smith | | | **Rank:** | Major | |
| Appointment: | Technical Officer | | | Unit: | Ammunition Inspectorate (North) | | | | | |
| Date ELL Issued: | | | | 12 January 2019 | | | | | | |
| Date ELL Expires: | | | | 11 January 2024 | | | | | | |
| Attached Documentation: | | | | IATG 02.30F ELL Supplementary Matrix. | | | | | | |
| Licence Serial Number: | | | | BT/ESH101/0010 | | | | | | |

See Handout

**Main idea/objective for slide:**

**Outline and discuss the various types of ELL and what is meant by Authorised Quantity.**

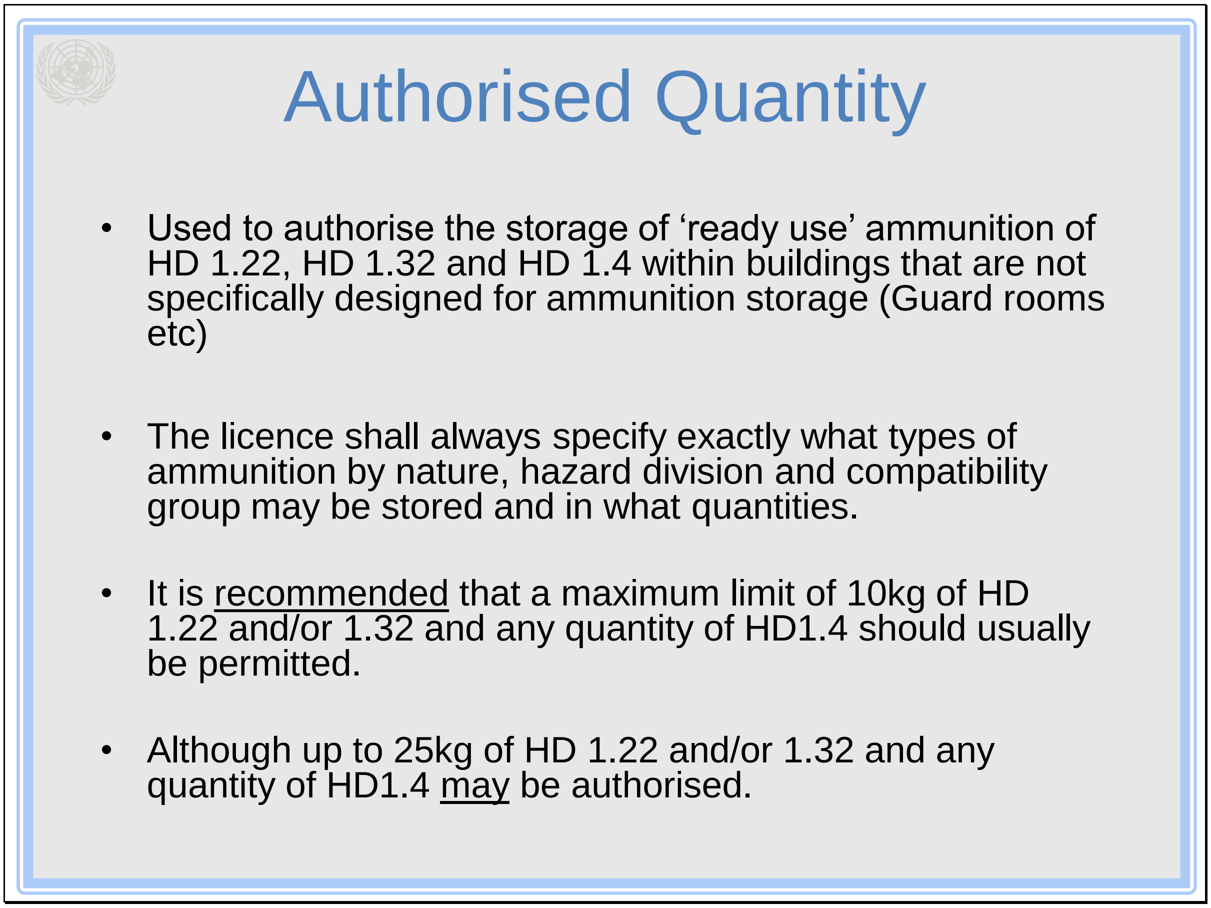
What the instructor should cover (in addition to slide content)

Provide a Handout of this template. http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf Annex C

References/further reading

**IATG 02.30 – Licensing of explosives facilities**

- As per slide



## Authorised Quantity

- Used to authorise the storage of ‘ready use’ ammunition of HD 1.22, HD 1.32 and HD 1.4 within buildings that are not specifically designed for ammunition storage (Guard rooms etc)
- The licence shall always specify exactly what types of ammunition by nature, hazard division and compatibility group may be stored and in what quantities.
- It is recommended that a maximum limit of 10kg of HD 1.22 and/or 1.32 and any quantity of HD1.4 should usually be permitted.
- Although up to 25kg of HD 1.22 and/or 1.32 and any quantity of HD1.4 may be authorised.

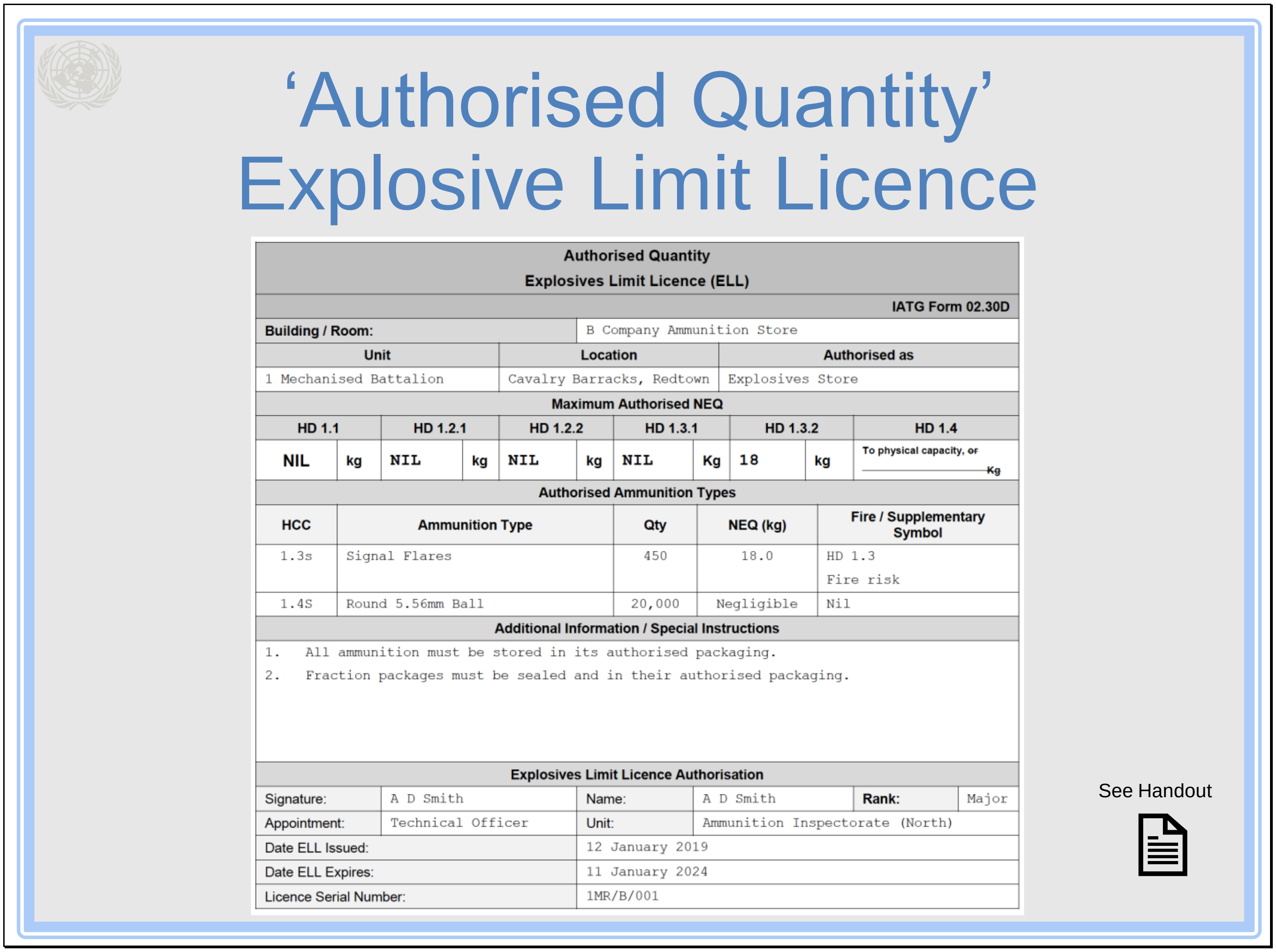
**Main idea/objective for slide:**

**Outline and discuss the various types of ELL and what is meant by Authorised Quantity.**

References/further reading

**IATG 02.30 – Licensing of explosives facilities**

- As per slide



# ‘Authorised Quantity’ Explosive Limit Licence

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Authorised Quantity**<br>**Explosives Limit Licence (ELL)** | | | | | | | | | | | |
| **IATG Form 02.30D** | | | | | | | | | | | |
| **Building / Room:** | | | | | | B Company Ammunition Store | | | | | |
| **Unit** | | | | **Location** | | | | **Authorised as** | | | |
| 1 Mechanised Battalion | | | | Cavalry Barracks, Redtown | | | | Explosives Store | | | |
| **Maximum Authorised NEQ** | | | | | | | | | | | |
| **HD 1.1** | | **HD 1.2.1** | | **HD 1.2.2** | | **HD 1.3.1** | | **HD 1.3.2** | | **HD 1.4** | |
| **NIL** | **kg** | **NIL** | **kg** | **NIL** | **kg** | **NIL** | **Kg** | **18** | **kg** | **To physical capacity, or** ________ **Kg** | |

**Authorised Ammunition Types**

| **HCC** | **Ammunition Type** | **Qty** | **NEQ (kg)** | **Fire / Supplementary Symbol** |
|---|---|---|---|---|
| 1.3s | Signal Flares | 450 | 18.0 | HD 1.3<br>Fire risk |
| 1.4S | Round 5.56mm Ball | 20,000 | Negligible | Nil |

**Additional Information / Special Instructions**

1. All ammunition must be stored in its authorised packaging.
2. Fraction packages must be sealed and in their authorised packaging.

**Explosives Limit Licence Authorisation**

| | | | | | |
|---|---|---|---|---|---|
| Signature: | A D Smith | Name: | A D Smith | **Rank:** | Major |
| Appointment: | Technical Officer | Unit: | Ammunition Inspectorate (North) | | |
| Date ELL Issued: | | 12 January 2019 | | | |
| Date ELL Expires: | | 11 January 2024 | | | |
| Licence Serial Number: | | 1MR/B/001 | | | |

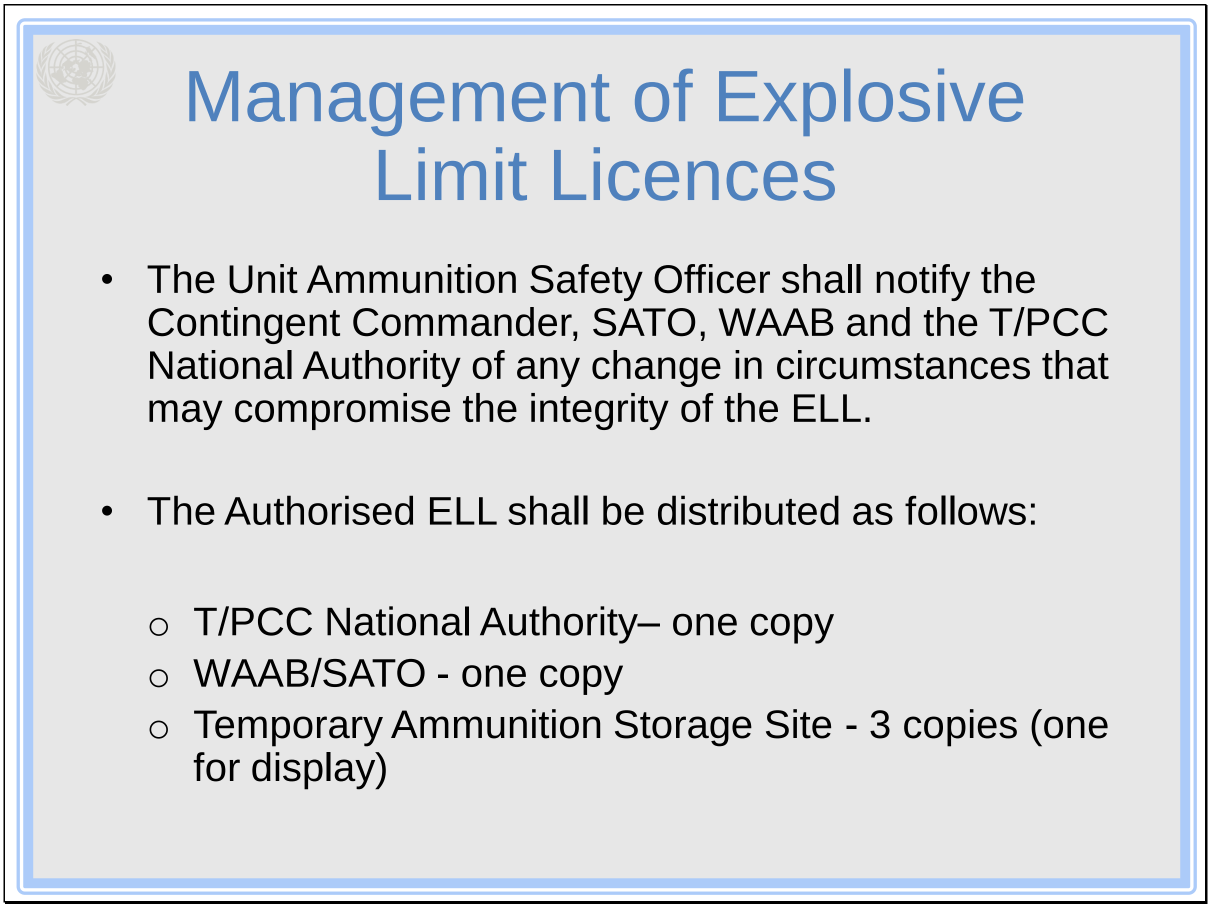
See Handout

**<u>Main idea/objective for slide:</u>**
**Outline and discuss the various types of ELL and what is meant by Authorised Quantity.**

<u>What the instructor should cover (in addition to slide content)</u>
Provide a Handout of this template. <u>http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf</u> Annex D

<u>References/further reading</u>
**IATG 02.30 – Licensing of explosives facilities**

- As per slide



## Management of Explosive Limit Licences

- The Unit Ammunition Safety Officer shall notify the Contingent Commander, SATO, WAAB and the T/PCC National Authority of any change in circumstances that may compromise the integrity of the ELL.

- The Authorised ELL shall be distributed as follows:

  - T/PCC National Authority– one copy
  - WAAB/SATO - one copy
  - Temporary Ammunition Storage Site - 3 copies (one for display)

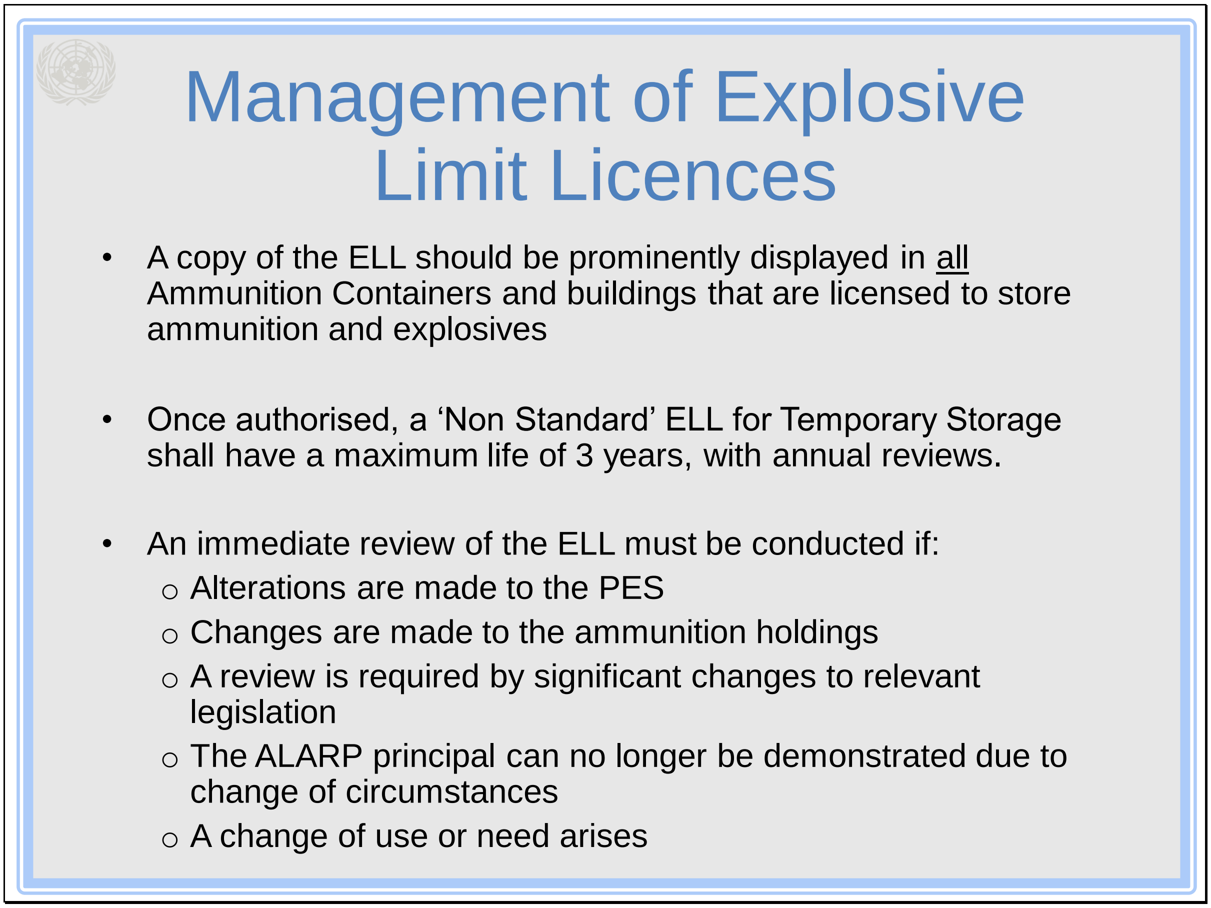
**Main idea/objective for slide:**

**Discuss the management of ELLs with emphasis on their visibility and duration of validity.**

References/further reading

**IATG 02.30 – Licensing of explosives facilities**

- As per slide



## Management of Explosive Limit Licences

- A copy of the ELL should be prominently displayed in all Ammunition Containers and buildings that are licensed to store ammunition and explosives
- Once authorised, a 'Non Standard' ELL for Temporary Storage shall have a maximum life of 3 years, with annual reviews.
- An immediate review of the ELL must be conducted if:
  - Alterations are made to the PES
  - Changes are made to the ammunition holdings
  - A review is required by significant changes to relevant legislation
  - The ALARP principal can no longer be demonstrated due to change of circumstances
  - A change of use or need arises

**Main idea/objective for slide:**

**Discuss the management of ELLs with emphasis on their visibility and duration of validity.**

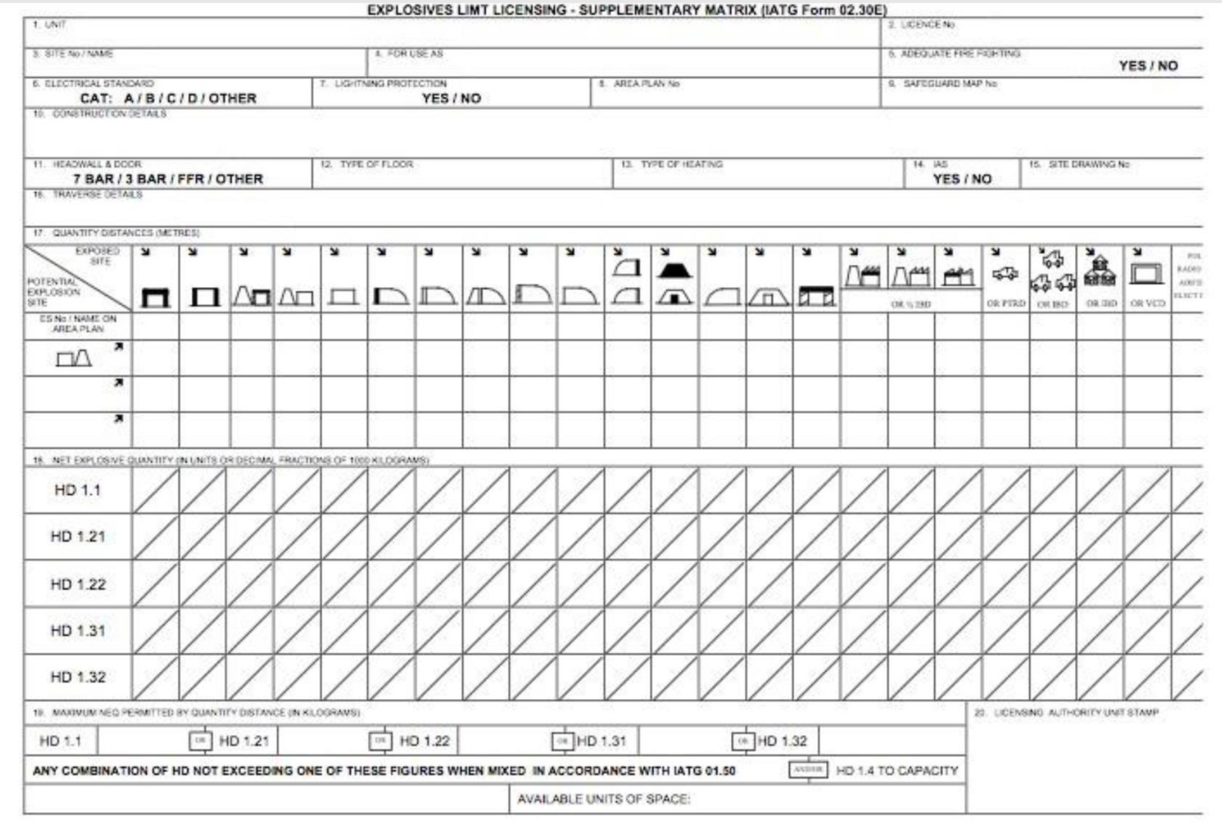
References/further reading

**IATG 02.30 – Licensing of explosives facilities**

- Although there is no requirement to display the supplementary pages, such as Annex E, they should be treated as an integral part of the ELL itself and may be displayed.
- During the year prior to the expiry date, the licence and its original supporting documentation should be reviewed by the appropriate national technical authority and re-validated against the regulations in force at the time of the review.
  - If the justification for the licence is still valid and the risks remain ALARP, a new licence should be issued.

- In exceptional circumstances the life of an ELL may be extended for a period of up to 12 months by the national technical authority.
    - Such circumstances may occur when it is believed that 12 months will not be sufficient for the formal re-validation and renewal process to be followed
- There may be occasions when a minor amendment to a licence is required but a new licence is not justified.
    - In these cases, a copy of the letter, e-mail or signal from the national technical authority should be attached to all copies of the licence pending issue of a new licence.
    - To avoid confusion such amendments should normally be limited to a maximum of three
- Only personnel specifically trained for the purpose shall complete and authorise the issue of ELL

# Explosive Limit Licence Supplementary Matrix



**EXPLOSIVES LIMT LICENSING - SUPPLEMENTARY MATRIX (IATG Form 02.30E)**

1. UNIT
2. LICENCE No
3. SITE No / NAME
4. FOR USE AS
5. ADEQUATE FIRE FIGHTING **YES / NO**
6. ELECTRICAL STANDARD **CAT: A / B / C / D / OTHER**
7. LIGHTNING PROTECTION **YES / NO**
8. AREA PLAN No
9. SAFEGUARD MAP No
10. CONSTRUCTION DETAILS
11. HEADWALL & DOOR **7 BAR / 3 BAR / FFR / OTHER**
12. TYPE OF FLOOR
13. TYPE OF HEATING
14. IAS **YES / NO**
15. SITE DRAWING No
16. TRAVERSE DETAILS
17. QUANTITY DISTANCES (METRES)

EXPOSED SITE / POTENTIAL EXPLOSION SITE

ES No / NAME ON AREA PLAN

OR ½ IBD

OR PTRD

OR IBD

OR IBD

OR VCD

18. NET EXPLOSIVE QUANTITY (IN UNITS OR DECIMAL FRACTIONS OF 1000 KILOGRAMS)

HD 1.1

HD 1.21

HD 1.22

HD 1.31

HD 1.32

19. MAXIMUM NEQ PERMITTED BY QUANTITY DISTANCE (IN KILOGRAMS)

HD 1.1 | OR | HD 1.21 | OR | HD 1.22 | OR | HD 1.31 | OR | HD 1.32

**ANY COMBINATION OF HD NOT EXCEEDING ONE OF THESE FIGURES WHEN MIXED IN ACCORDANCE WITH IATG 01.50** AND/OR HD 1.4 TO CAPACITY

AVAILABLE UNITS OF SPACE:

20. LICENSING AUTHORITY UNIT STAMP

See Handout

**Main idea/objective for slide:**
**Introduce the participants to the ELL Matrix**

What the instructor should cover (in addition to slide content)
Provide handout to participants. http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf. Annex E
With the participant having a handout of this matrix, the instructor will briefly complete the matrix, inputting relevant information.

This matrix will be covered in much more detail later on in the course, so a generic introduction is suitable here.

References/further reading

**IATG 02.30 – Licensing of explosives facilities - Annex E**

- Whichever ELL is authorised it shall always be supported by the ELL Supplementary Matrix (see Annex F), or an explosion consequence analysis (ECA), which shall always be physically attached to the ELL.
- This matrix clearly explains how the explosives limits contained in the ELL have been determined. The supporting IATG software contains a copy of the ELL Matrix that will automatically calculate the appropriate explosives limits based on the distances entered

- Guidance on completion of the ELL Supplementary Matrix follows. (The paragraph numbers relate to the equivalent box on the ELL Matrix)
  F.1. Enter Unit in upper case.
  F.2. Enter ELL Ser No e.g. BLUETOWN/ESH/001 or REDTOWN/APB/003.
  F.3. Enter Site No e.g. ESH 1 or APB 3.
  F.4. Enter usage e.g. 'Explosives Storehouse', 'Ammunition Process Building'.
  F.5. Highlight 'YES' or 'NO', whichever is applicable. The criteria for 'Adequate' is 2 x fully manned fire engines within 5 minutes**).**
  F.6. Select appropriate electrical standard. **(IATG 05.40 *Safety standards for electrical installations*).**
  F.7. Highlight 'YES' or 'NO', whichever is applicable. **(IATG 05.40 *Safety standards for electrical installations*).**
  F.8. Enter No if applicable.
  F.9. As for Box 8. **(IATG 02.40 *Safeguarding of explosives storage areas (ESA)*).**
  F.10. Enter Details e.g.
    a. Walls: 280mm Cavity Brick
    b. Roof: 150mm RC
    c. Doors: 25mm Metal Faced Wood
  F.11. Select appropriate standard for ESH doors. **(IATG 05.20 *Types of building for explosives storage*).**
  F.12. Enter details e.g. Dust Free Concrete.
  F.13. As for Box 12 e.g. Hot Water Radiators.
  F.14. Intruder Alarm System (IAS). Highlight 'YES' or 'NO', whichever is applicable
  F.15. Enter No if applicable.
  F.16. Enter details.
  F.17. Enter appropriate symbols for PES.
  F.18. The top left half should contain the appropriate quantity distance based on the QD Function (e.g. D5). The bottom right half should contain the appropriate maximum NEQ for that distance. These should be

obtained from the appropriate tables within **IATG 02.20 *Quantity and separation distances.***

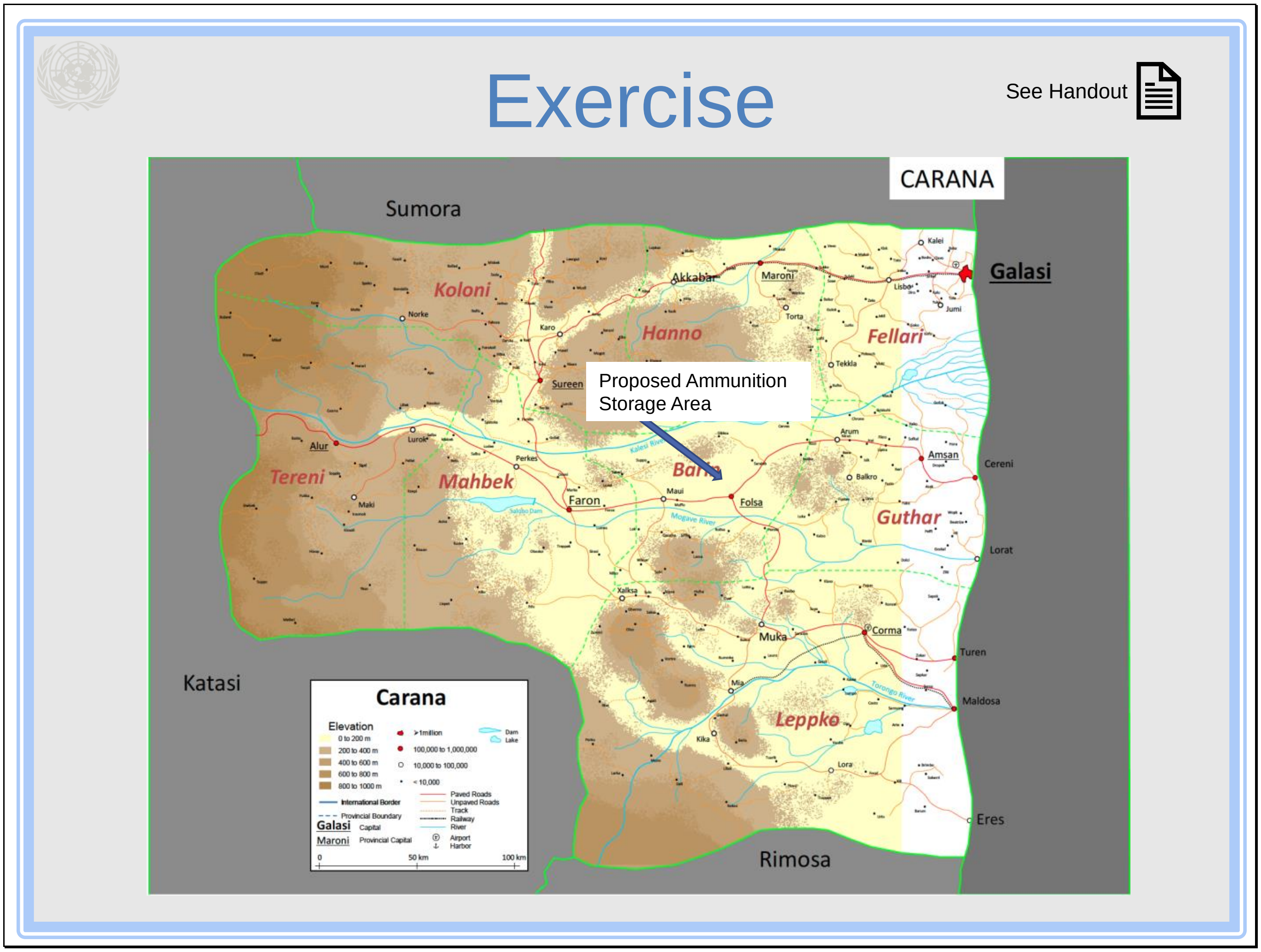
F.19. The **minimum NEQ from Box 18** should be selected for each HD.

F.20. Licensing Authority Unit Stamp (preferably date stamp), may be signed by Licence signatory.

participant
Exercise

**Phase 2. Development (**Time allocation - 160 min**)**

Stage 4 (Time allocation 40 mins) – participant Exercise



# Exercise

See Handout

Proposed Ammunition Storage Area

**Main idea/objective for slide:**

participant exercise to identify:

- Location of FOLSA
- Identify what geographic risks are surrounding the proposed area of the Temporary Storage Area

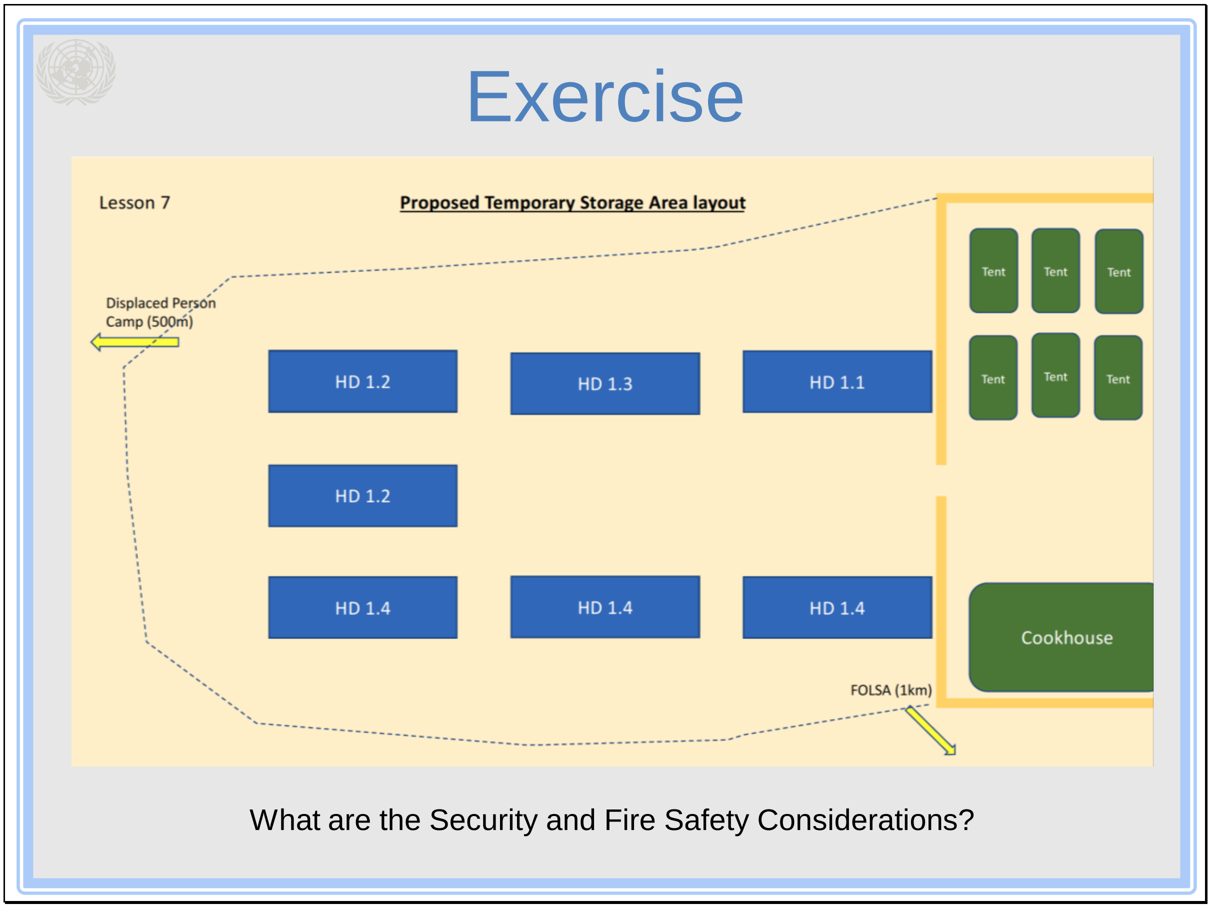
participant activity

participant to read and review the Exercise handout (word doc ‘Lesson 07 - Ammunition Safe Storage_practical exercise’) and read through the requirements.

What the instructor should cover (in addition to slide content)

The instructor should point out FOLSA to participants

Instructor to break class into groups of three participants.



# Exercise

What are the Security and Fire Safety Considerations?

**Main idea/objective for slide:**
participant exercise to identify:

- Location of the Proposed Temporary Storage Area
- Location and proximity of Camp FOLSA
- Identify that the Displaced Persons Camp and Folsa Town are close by

participant activity
participants to read the Handout (word doc 'Lesson 07 - Ammunition Safe Storage_practical exercise') and prepare a Security and Fire Safety plan using the suggested headings in the narrative

What the instructor should cover (in addition to slide content)
Instructors are to walk about and support participants where possible.
The aim is to provide details to each heading.
This plan can be drafted on a flipchart, whiteboard or on an A4 copy.

Solution Notes:

- Security Considerations
    - Fencing
    - IDP camp 500m from site
    - Security and gate at camp entrance
    - Security of containers – keys, locks etc
    - Proximity of HD1.1 to accommodation
    - Use of barricades
    - Foliage, fire breaks, water points, fire extinguishers
    - Layout of containers

Slide 69

Lesson overview

Examine safety considerations for a temporary ammunition storage site

Discuss the impact of poor ammunition management practices and explosive accidents

Describe licensing of a temporary ammunition storage site

Apply Safe Storage practices to a scenario

## Summary

This lesson focused on the safe storage of ammunition, encompassing UN policies and guidelines to aid participants in developing Physical Security and Fire Safety Plans. Key learning points included:

- Explore safety considerations specific to temporary ammunition storage sites, ensuring compliance with regulations and minimizing risks.
- Understand the consequences of inadequate ammunition management practices and the potential impact of explosive accidents on personnel, infrastructure, and mission objectives.
- Learn the process and requirements for licensing a temporary ammunition storage site to ensure legal compliance and operational readiness.
- Apply learned safe storage practices to a given scenario, demonstrating understanding and proficiency in implementing appropriate measures to safeguard ammunition.

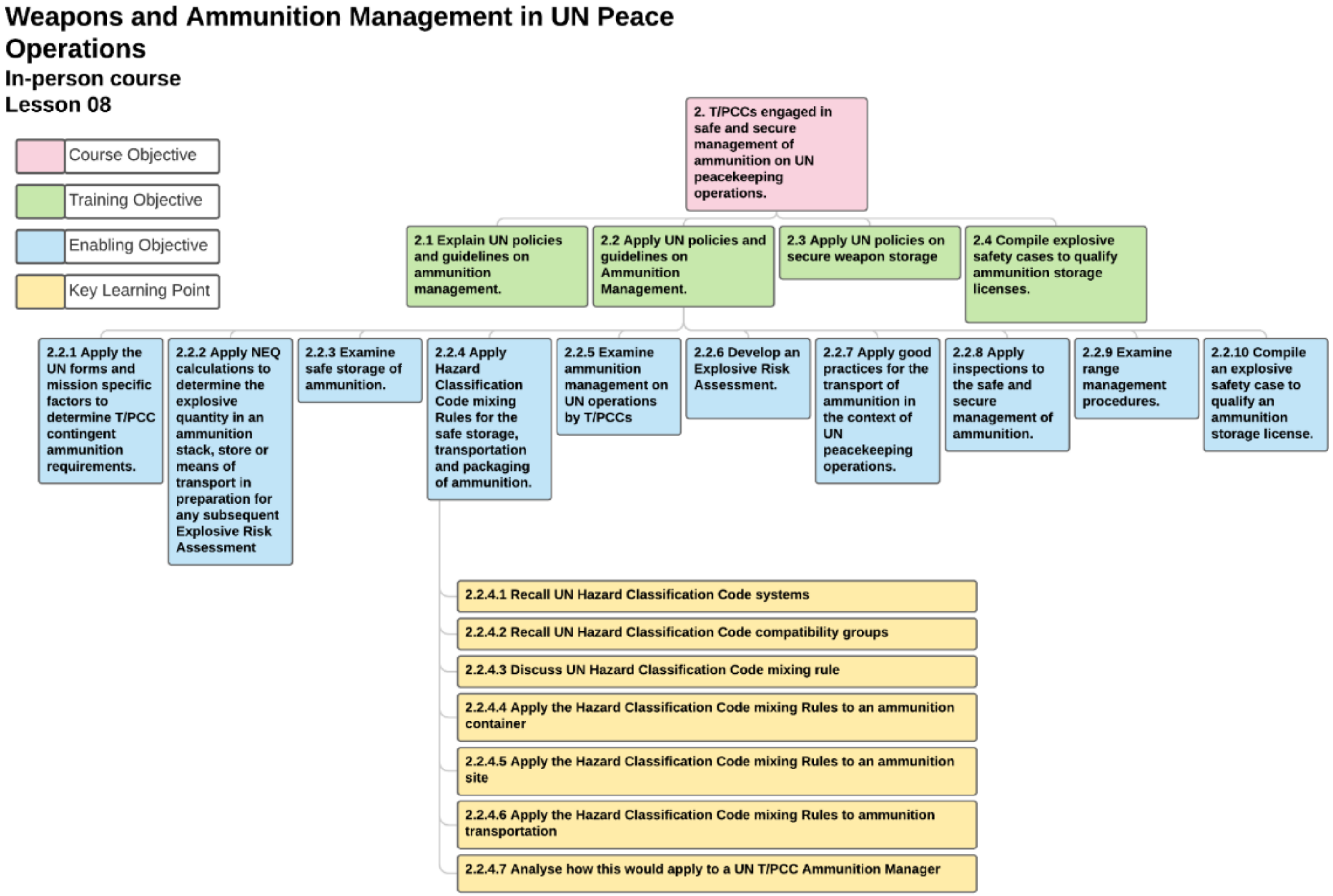
Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
UN Hazard Classification Code

**Main idea/objective for slide:**
Look ahead to the next lesson of the course:
UN Hazard Class Code Mixing Rules

# Lesson 2.4

## Lesson 2.4: UN HCC



**Weapons and Ammunition Management in UN Peace Operations**

**In-person course**

**Lesson 08**

- 🟥 Course Objective
- 🟩 Training Objective
- 🟦 Enabling Objective
- 🟨 Key Learning Point

**2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.**

**2.1 Explain UN policies and guidelines on ammunition management.**

**2.2 Apply UN policies and guidelines on Ammunition Management.**

**2.3 Apply UN policies on secure weapon storage**

**2.4 Compile explosive safety cases to qualify ammunition storage licenses.**

**2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.**

**2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment**

**2.2.3 Examine safe storage of ammunition.**

**2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.**

**2.2.5 Examine ammunition management on UN operations by T/PCCs**

**2.2.6 Develop an Explosive Risk Assessment.**

**2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.**

**2.2.8 Apply inspections to the safe and secure management of ammunition.**

**2.2.9 Examine range management procedures.**

**2.2.10 Compile an explosive safety case to qualify an ammunition storage license.**

**2.2.4.1 Recall UN Hazard Classification Code systems**

**2.2.4.2 Recall UN Hazard Classification Code compatibility groups**

**2.2.4.3 Discuss UN Hazard Classification Code mixing rule**

**2.2.4.4 Apply the Hazard Classification Code mixing Rules to an ammunition container**

**2.2.4.5 Apply the Hazard Classification Code mixing Rules to an ammunition site**

**2.2.4.6 Apply the Hazard Classification Code mixing Rules to ammunition transportation**

**2.2.4.7 Analyse how this would apply to a UN T/PCC Ammunition Manager**

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L08. Hazard Classification Codes |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 90 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition. | 2.2.4.1 Recall UN Hazard Classification Code systems<br>2.2.4.2 Recall UN Hazard Classification Code compatibility groups<br>2.2.4.3 Discuss UN Hazard Classification Code mixing rule<br>2.2.4.4 Apply the Hazard Classification Code mixing Rules to an ammunition container<br>2.2.4.5 Apply the Hazard Classification Code mixing Rules to an ammunition site<br>2.2.4.6 Apply the Hazard Classification Code mixing Rules to ammunition transportation<br>2.2.4.7 Analyse how this would apply to a UN T/PCC Ammunition Manager |
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Apply Hazard Classification Code mixing rules for the safe storage, transportation and packaging of ammunition. |
| **Assessment Criteria:** | N/A |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom, projector, Screen, Flipchart, Whiteboard |
| **Instructional tools & materials** | • Images of ammunition, pyrotechnics and explosives<br>• Images of examples of Compatibility Groups |
| **Participant Resources:** | • Full size printouts of some slides where required – see slide notes for details. e.g. Compatibility Groups Mixing Matrix<br>• UN CARANA Scenario narrative |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: Health and safety checklist for classrooms (hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

# SECTION 2: LESSON PLAN

## Executive summary:

By the end of this training session the participant will understand and be able to recognise the various Hazard Classification Codes associated with explosive materials. The participant will be able to correctly store, transport and package explosive and ammunition natures safely in line with the correct Hazard Classification Code mixing rules.

## Setup:

Phase 1, Phase 2 (Stage 1&2) and Phase 3 will all be delivered to the class as a single collective.

Phase 2 (Stage 3) – participants will work in small groups (6-8 participants) to complete a tabletop exercise based on the CARANA scenario. Groups will work to a dedicated instructor.

## Conduct:

### Phase 1. Introduction (Time allocation - 15 min)

- Introduce the objectives of the lesson.
- Discuss using images, the various components of ammunition, pyrotechnics, and explosives and how they are designed to function.
- Explore with the participants, the likelihood and the impact of a serious event, when no rules apply to mixing ammunition and explosives. Write these potential impacts on a flipchart.

### Phase 2. Development

Stage 1 (Time allocation 25 mins) – Understanding Hazard Classification Coding

- Discuss the origins and rationale of using Hazard Classification Codes.
- Introduce and explain the Hazard Divisions, give examples of each and get the participants to provide further examples. Using a flipchart, write examples under each HD and place it on the wall.
    - HD1.1, HD1.2, HD1.3, HD1.4, HD1.5, HD1.6
- Introduce and discuss the various Fire Divisions and where they are used.
- Ask the participants to provide ammunition examples and explain what Fire Division they are in and what considerations they would need to take in the event of a fire. Write these on a flipchart.

Stage 2 (Time allocation 25 mins) – Compatibility Groups

- Introduce the participants to the Compatibility Groups and explain their purpose. Ask questions to the class to ensure understanding.

- Provide examples of Compatibility Groups in images and discuss with the participants. Look for feedback.
- Explain what compatibility mixing rules are and how they are applied, using the 'Mixing Rules Table for Temporary Storage'.
- Provide a range of examples, highlighting how the mixing rules work.
- Complete a worked-out example on applying mixing rules for a storage container. Work through this example and ask questions to the participants regularly.

Stage 3 (Time allocation 20 mins) – Participant exercise

- Participant exercise to identify the various Hazard Classification Codes and Fire Divisions for a range of ammunition natures deployed on a UN mission.
- Using the task information on the slides, participants need to:
    - identify the compatibility groups and use the Mixing Rules Table for Temporary Storage for both ammunition natures that are currently being stored in their own camp and integrate the additional ammunition stores arriving from Camp MUKA
    - provide a rationale as to how they decided on the mixing of these ammunition natures and explain how many ammunition containers they will require to hold the complete stock.
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions.

**Phase 3. Consolidation (Time allocation - 5 min)**

- Review Enabling Objective and Key Learning Points (see Section 1), drawing out any common themes
- Look ahead to the next lesson of the course:
    - Understanding Ammunition Management

| Compatibility Group | A | B | C | D | E | F | G | H | J | K | L | N | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | 🟩 X | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 |
| **B** | 🟥 | 🟩 X | 🟨 X (1) | 🟨 X (1) | 🟨 X (1) | 🟨 X (1) | 🟨 X (1) | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟩 X |
| **C** | 🟥 | 🟨 X (1) | 🟩 X | 🟩 X | 🟩 X | 🟨 X (2) | 🟨 X (3) | 🟥 | 🟥 | 🟥 | 🟥 | 🟨 X (4) | 🟩 X |
| **D** | 🟥 | 🟨 X (1) | 🟩 X | 🟩 X | 🟩 X | 🟨 X (2) | 🟨 X (3) | 🟥 | 🟥 | 🟥 | 🟥 | 🟨 X (4) | 🟩 X |
| **E** | 🟥 | 🟨 X (1) | 🟩 X | 🟩 X | 🟩 X | 🟨 X (2) | 🟨 X (3) | 🟥 | 🟥 | 🟥 | 🟥 | 🟨 X (4) | 🟩 X |
| **F** | 🟥 | 🟨 X (1) | 🟨 X (2) | 🟨 X (2) | 🟨 X (2) | 🟩 X | 🟨 X (2,3) | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟩 X |
| **G** | 🟥 | 🟨 X (1) | 🟨 X (3) | 🟨 X (3) | 🟨 X (3) | 🟨 X (2,3) | 🟩 X | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟩 X |
| **H** | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟩 X | 🟥 | 🟥 | 🟥 | 🟥 | 🟩 X |
| **J** | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟩 X | 🟥 | 🟥 | 🟥 | 🟩 X |
| **K** | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟩 X | 🟥 | 🟥 | 🟥 |
| **L** | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟨 (5) | 🟥 | 🟥 |
| **N** | 🟥 | 🟥 | 🟨 X (4) | 🟨 X (4) | 🟨 X (4) | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟨 X (6) | 🟨 X (7) |
| **S** | 🟥 | 🟩 X | 🟩 X | 🟩 X | 🟩 X | 🟩 X | 🟩 X | 🟩 X | 🟩 X | 🟥 | 🟥 | 🟨 X (7) | 🟩 X |

**Table 4: Compatibility Group Mixing Rules**

| | |
|---|---|
| 🟥 | Cannot be stored together |
| 🟨 | Can be stored together under certain conditions (See Notes) |
| 🟩 | Can be stored together |

NOTE 1 Compatibility Group B fuzes may be stored with the articles to which they will be assembled, but the Net Explosive Quantity (NEQ) shall be aggregated and treated as Compatibility Group F.
NOTE 2 Storage in the same building may be permitted if effectively segregated to prevent propagation.
NOTE 3 Mixing of articles of Compatibility Group G with articles of other compatibility groups is at the discretion of the National Competent Authority.
NOTE 4 Articles of Compatibility Group N should not in general be stored with articles in other compatibility groups except S. However, if such articles are stored with articles of Compatibility Group C, D and E, the articles of Compatibility Group N should be considered as having the characteristics of Compatibility Group D and the compatibility groups mixing rules apply accordingly.
NOTE 5 Compatibility Group L articles shall always be stored separately from all articles of other compatibility groups as well as from all other articles of different types of Compatibility Group L.
NOTE 6 It is allowed to mix 1.6N munitions. The Compatibility Group of the mixed set remains N if the munitions belong to the same family or if it has been demonstrated that, in case of a detonation of one munition, there is no instant transmission to the munitions of another family (the families are then called 'compatible'). If it is not the case the whole set of munitions should be considered as having the characteristics of Compatibility Group D.
NOTE 7 A mixed set of munitions 1.6N and 1.4S may be considered as having the characteristics of Compatibility Group

In addition to the mixing rules (Clause 7.1) certain types of conventional ammunition should always be stored separately (or under specific conditions) from other types of ammunition:
a) detonators and blasting caps (separated from Compatibility Groups C, D, E, and F by a dividing wall capable of preventing sympathetic detonation of other items);
b) damaged ammunition. (If considered unsafe for storage, damaged munitions should be destroyed at the earliest convenience);
c) ammunition in an unknown condition. (This shall be stored at such a distance that detonation of this ammunition will not jeopardize other stocks);
d) ammunition that has deteriorated and become hazardous. (This shall be stored in isolation and destroyed at the earliest convenience).

## COMPATIBILITY GROUPS

**A ▪ Primary explosive substance.**

Examples are lead azide, lead styphnate, mercury fulminate, tetracene, dry RDX, and dry PETN.

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

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

**C ▪ Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance. ▪**

Examples are single-, double-, triple-based, and composite propellants, rocket motors (solid propellant), and ammunition with inert projectile.

**D ▪ Secondary detonating explosive substance or black powder or article containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features. ▪**

Examples are bulk TNT, Composition B, wet RDX, bombs, projectiles, warheads, or fuzes with two or more safety features.

**E ▪ Article containing a secondary detonating explosive substance without means of initiation, with propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids). ▪**

Examples are artillery ammunition, rockets, or guided missiles.

**F ▪ Article containing a secondary detonating explosive substance with its own means of initiation, with a propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids) or without a propelling charge. ▪**

An example is a rocket propelled grenade.

**G ▪ Pyrotechnic substance, or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating, incendiary, tear- or smoke-producing substance (other than a water activated article or one containing white phosphorus, phosphides, a pyrophoric substance, a flammable liquid or gel, or hypergolic liquids). ▪**

Examples are flares, signals, incendiary or illuminating ammunition, and other smoke and tear producing devices.

**H ▪ Article containing both an explosive substance and white phosphorus. ▪**

Examples are WP, plasticized white phosphorus (PWP), or other ammunition containing pyrophoric material.

**J ▪ Ammunition containing both an explosive substance and a flammable liquid or gel. ▪**

Examples include liquid- or gel-filled incendiary ammunition.

**K ▪ Articles containing both an explosive substance and a toxic chemical agent. ▪**

Examples are artillery or mortar ammunition (fuzed or unfuzed), grenades, and rockets or bombs filled with a lethal or incapacitating chemical agent.

**L ▪ Explosive substance or article containing an explosive substance and presenting a special risk (e.g. due to water activation or presence of hypergolic liquids, phosphides or a pyrophoric substance) and needing isolation of each type. ▪**

Examples are pre-packaged hypergolic liquid-fueled rocket engines, thickened pyrophoric agent (TPA) (thickened Triethylaluminium (TEA).

**N ▪ Articles containing only extremely insensitive detonating substance (EIDS). ▪**

Examples are bombs and warheads. ▪ If dissimilar Group N munitions, such as Mk 82 and Mk 84 Bombs, are mixed together and have not been tested to assure non- propagation; the mixed munitions are considered to be Hazard Division 1.2, Compatibility Group D for purposes of transportation and storage.

**S ▪ Substance or article so packed or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder or prohibit fire-fighting or other emergency response efforts in the immediate vicinity of the package. ▪**

Examples are small arms cartridges (ball), explosive switches or valves.

Weapons and Ammunition Management in UN Peace Operations

Hazard Classification Codes

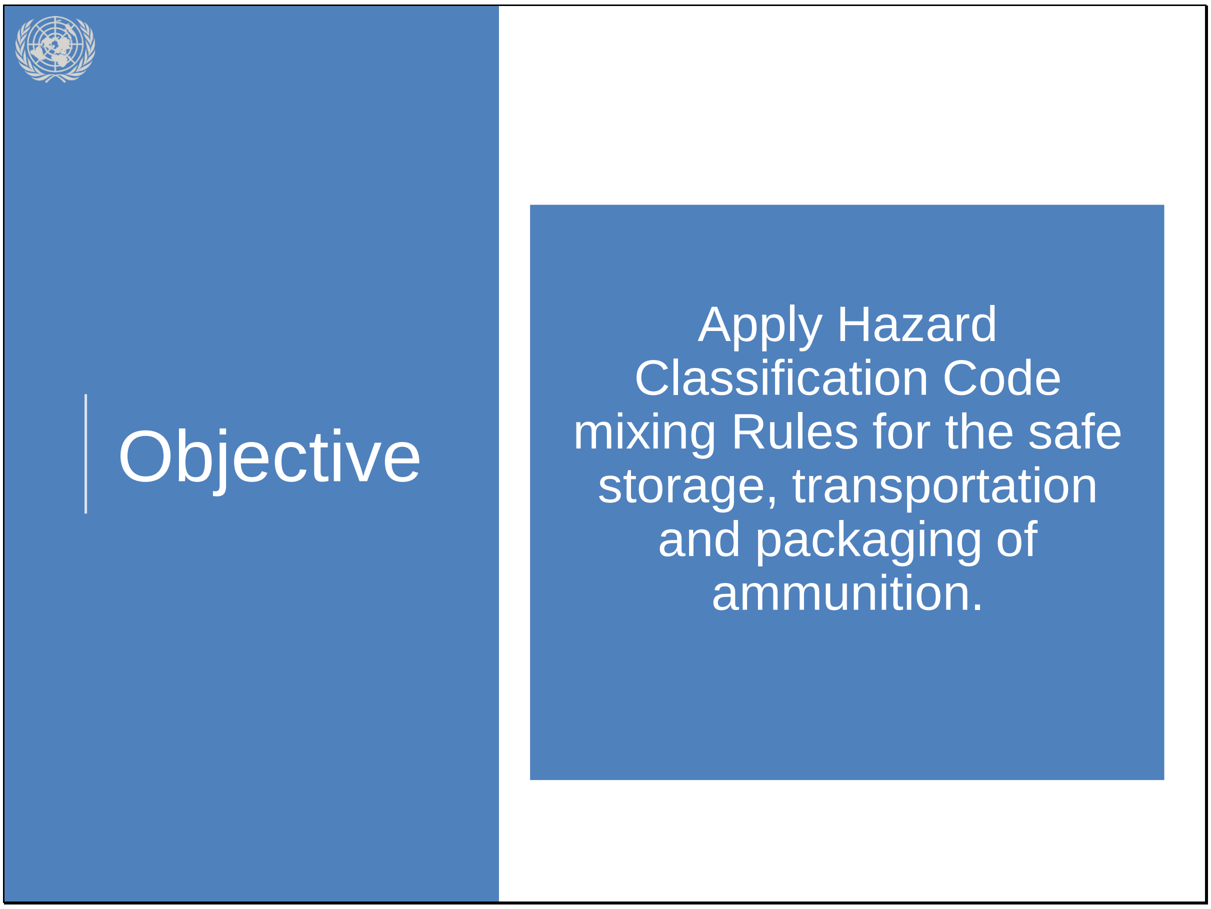
**Key Reference Documents for this lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

- http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2



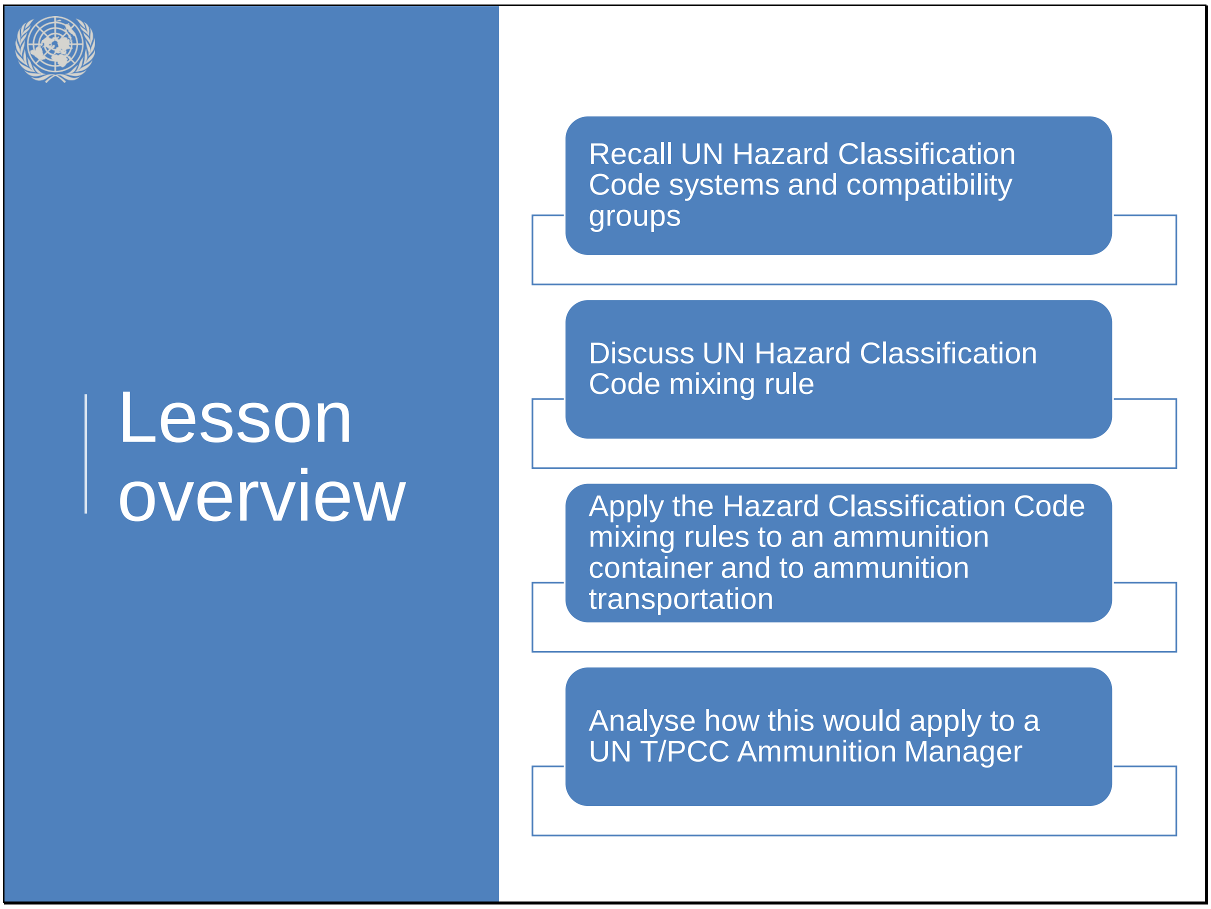
Objective

Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.

**<u>Main idea/objective for slide:</u>**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.4 Apply Hazard Classiciation Code mixing Rules for the safe storage, transportation and packaging of ammunition.)

<u>What the instructor should cover (in addition to slide content)</u>
By the end of this training session the participant will apply Hazard Classification Code mixing rules for the safe storage, transportation and packaging of ammunition.

Slide 3



# Lesson overview

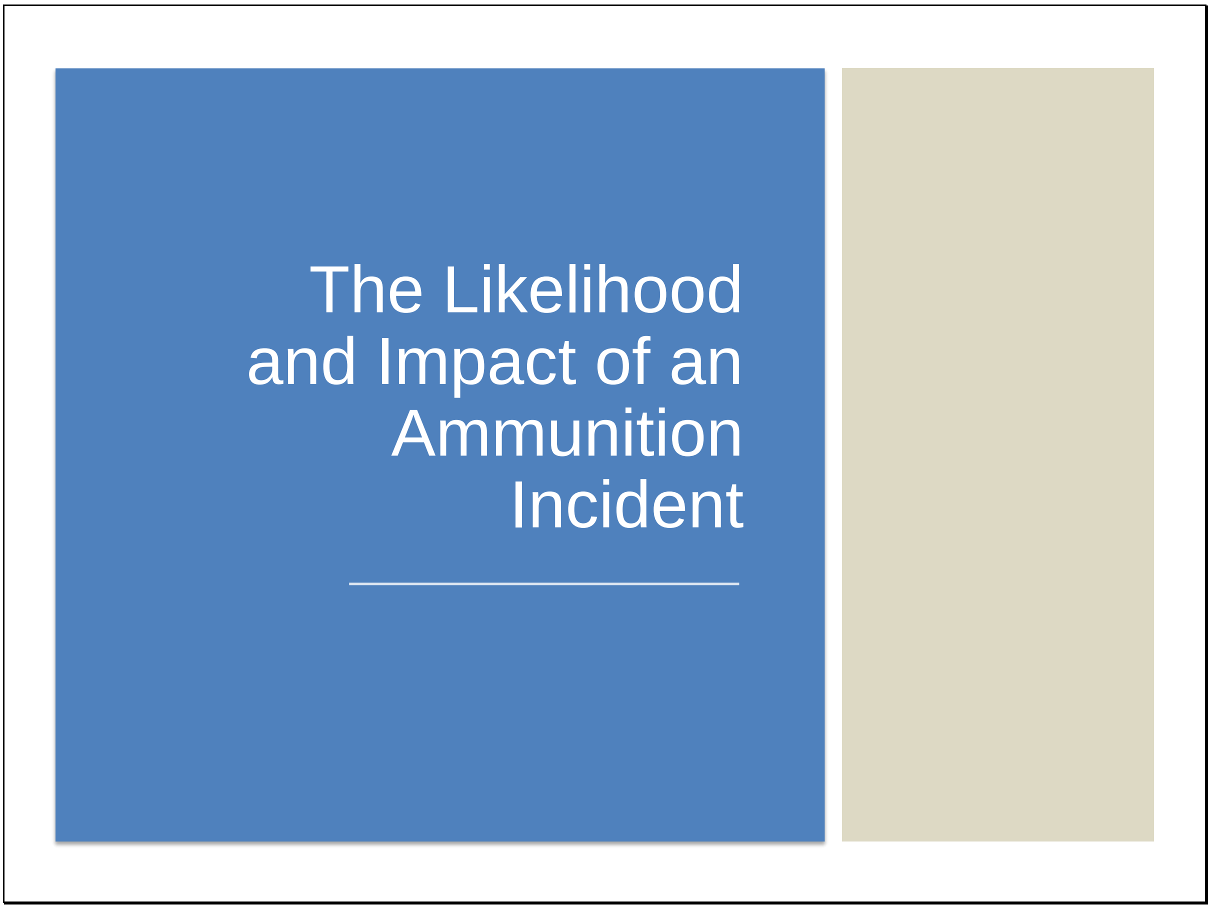
- Recall UN Hazard Classification Code systems and compatibility groups
- Discuss UN Hazard Classification Code mixing rule
- Apply the Hazard Classification Code mixing rules to an ammunition container and to ammunition transportation
- Analyse how this would apply to a UN T/PCC Ammunition Manager

**Main idea/objective for slide:**
**Introduce the Key Learning Points**

What the instructor should cover (in addition to slide content)
Emphasise 'recall' – this is revisiting/revising content covered in the workbook

Key Learning Points
2.2.4.1 Recall UN Hazard Classification Code systems
2.2.4.2 Recall UN Hazard Classification Code compatibility groups
2.2.4.3 Discuss UN Hazard Classification Code mixing rule
2.2.4.4 Apply the Hazard Classification Code mixing Rules to an ammunition container
2.2.4.5 Apply the Hazard Classification Code mixing Rules to an ammunition site
2.2.4.6 Apply the Hazard Classification Code mixing Rules to ammunition transportation
2.2.4.7 Analyse how this would apply to a UN T/PCC Ammunition Manager

Slide 4



# The Likelihood and Impact of an Ammunition Incident

**Phase 1. Introduction (**Time allocation - 15 min**)**

Slide 5

**<u>Main idea/objective for slide:</u>**
**Discuss using images, the various components of ammunition, pyrotechnics, and explosives and how they are designed to function.**

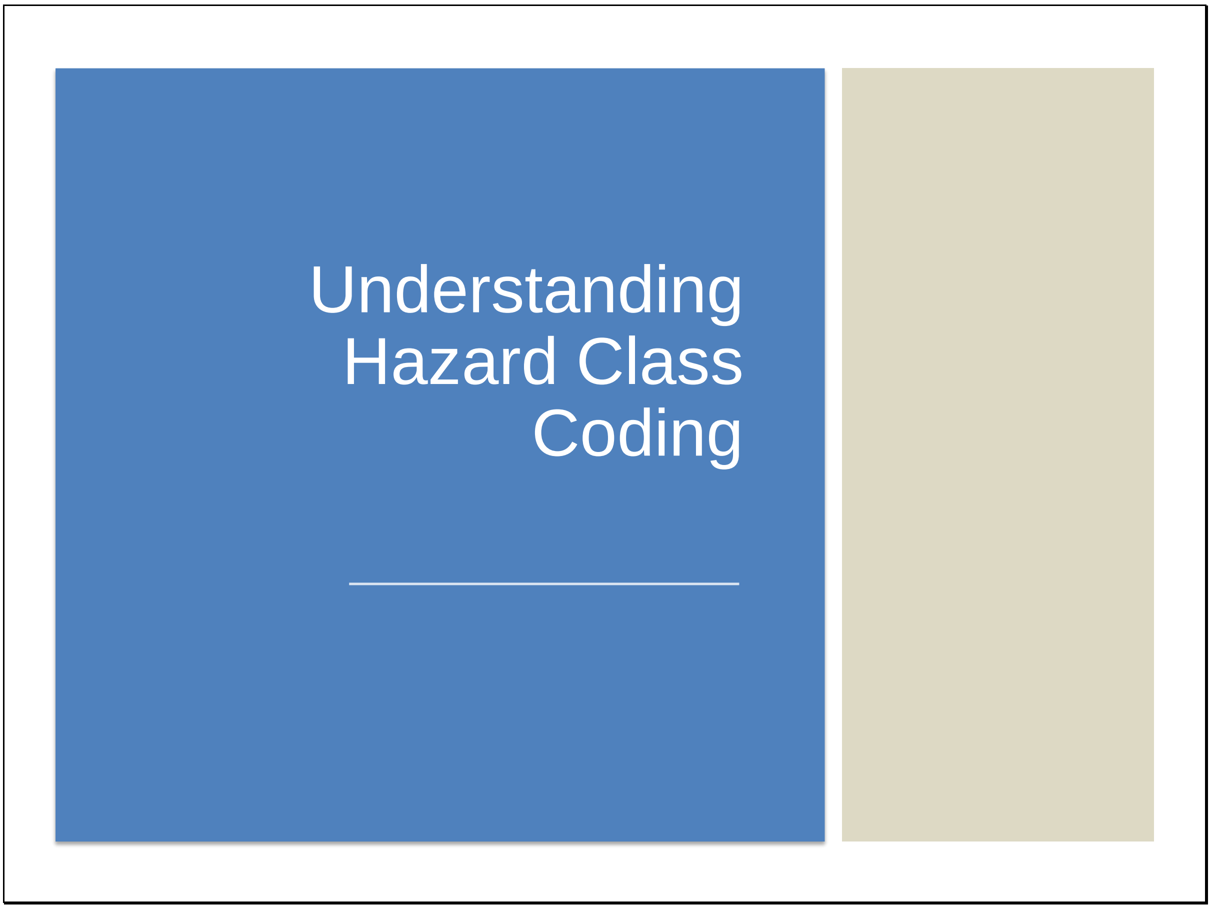
<u>What the instructor should cover (in addition to slide content)</u>
Ask the participants to describe, for each image, how these munition types function.
Explore with the participants, the likelihood and the impact of a serious event, when no rules apply to mixing of ammunition and explosive natures.
Write these potential impacts on a flipchart.

Images:

1. 9M133-1K: Kornet ATGM
2. Electric Detonator
3. 84mm M136 HEAT from AT-4
4. Small Arms Ammunition
5. 120mm HE Mortar Round (FR)

Images supplied by AMAT/GICHD and SWEDEC, Swedish Armed Forces.

Slide 6

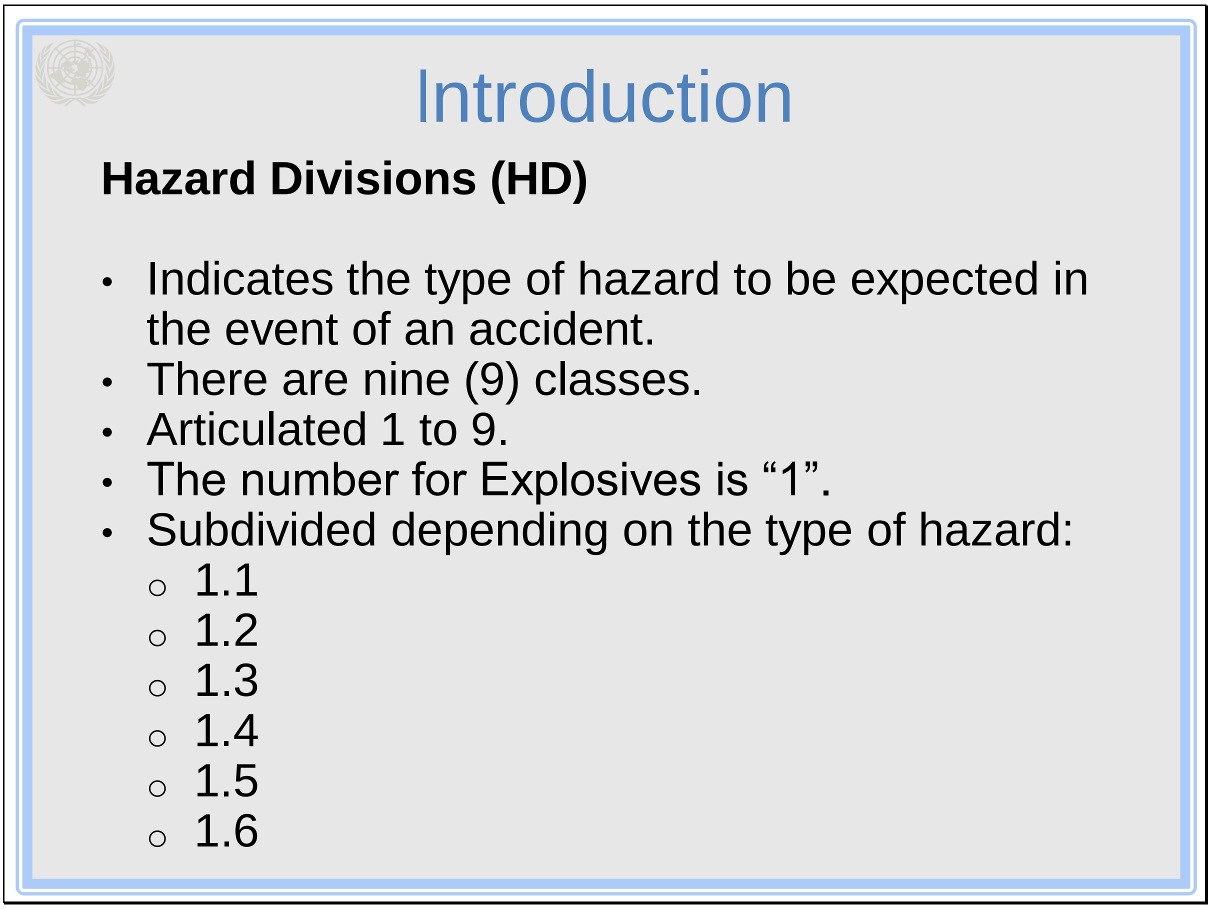


Understanding Hazard Class Coding

**Phase 2. Development (**Time allocation - 70 min**)**

Stage 1 (Time allocation 25 mins) – Understanding Hazard Class Coding

Slide 7



## Introduction

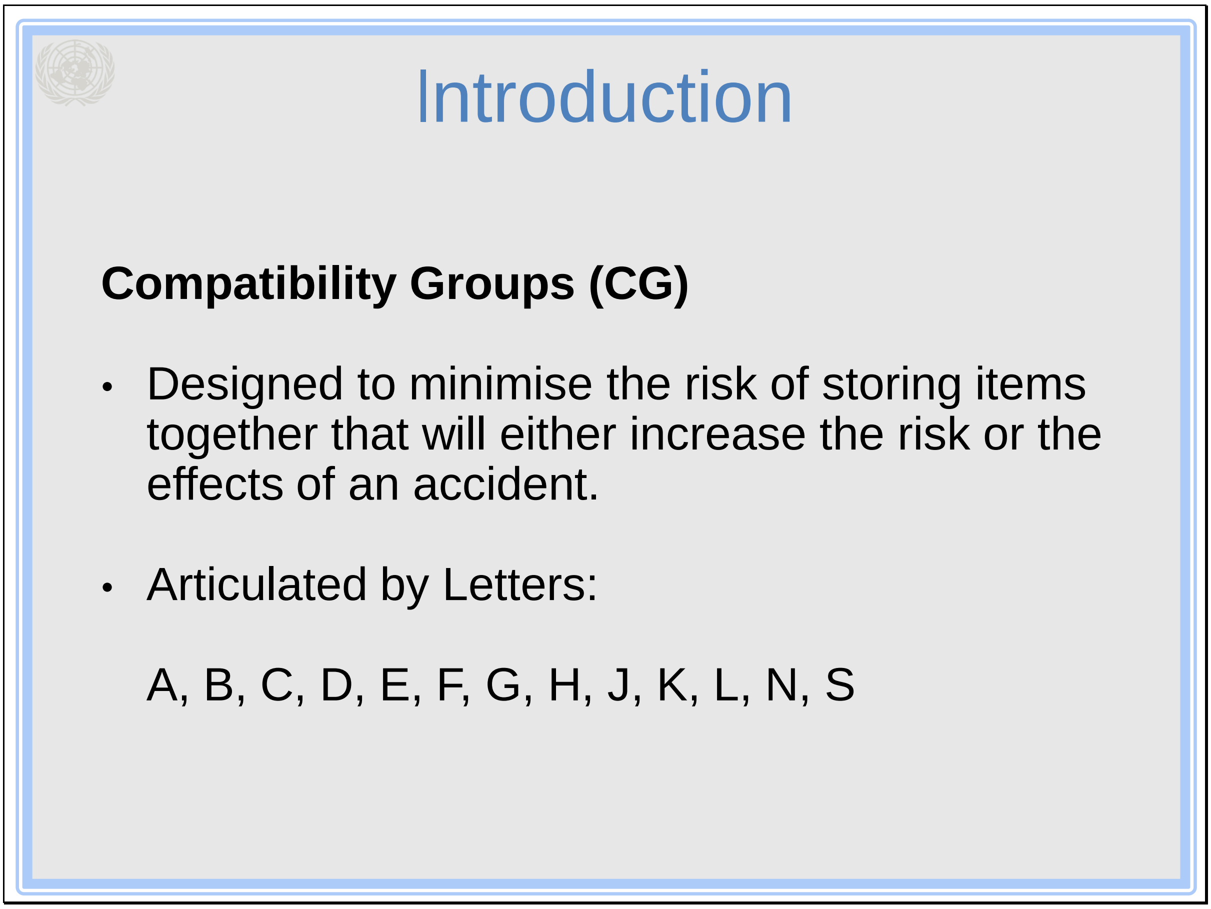
**Hazard Divisions (HD)**

- Indicates the type of hazard to be expected in the event of an accident.
- There are nine (9) classes.
- Articulated 1 to 9.
- The number for Explosives is “1”.
- Subdivided depending on the type of hazard:
  - 1.1
  - 1.2
  - 1.3
  - 1.4
  - 1.5
  - 1.6

**Main idea/objective for slide:**
**Revise Hazard Divisions.**

participant activity
Before revealing the text on the slide, ask participants what they can tell you about Hazard Divisions

References/further reading
This UN system covers all sorts of dangerous goods from chemicals to medical waste and are defined in nine (9) top-level classes
The Class Number for Explosives is “1”. This is then subdivided into explosives that present different types of hazard for example “1.1” or “1.2” which will be called a Hazard **DIVISION.**
**Hazard Division** indicate the type of hazard to be expected primarily in the event of an accident involving a quantity of ammunition. The divisions are articulated numerically.



## Introduction

**Compatibility Groups (CG)**

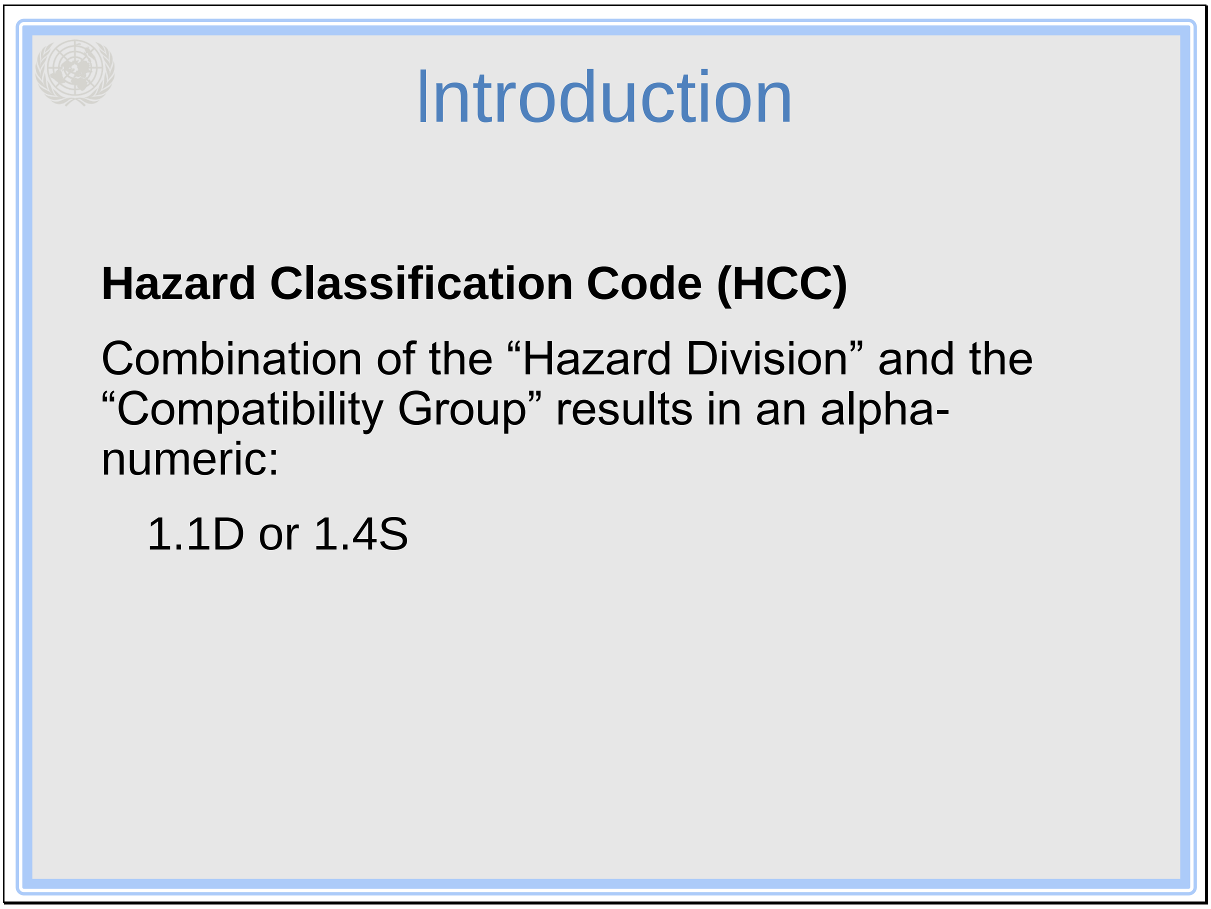
- Designed to minimise the risk of storing items together that will either increase the risk or the effects of an accident.
- Articulated by Letters:

  A, B, C, D, E, F, G, H, J, K, L, N, S

**Main idea/objective for slide:**
**Revise Compatibility Groups**

participant activity
Before revealing the text on the slide, ask participants what they can tell you about Compatibility Groups

References/further reading
**Compatibility Groups** are designed to minimise the risk of storing items together that will either increase the risk of an accident or, for a given quantity, the magnitude of the effects of such an accident. The Compatibility Groups are articulated alphabetically, for example “C” or “D



## Introduction

**Hazard Classification Code (HCC)**

Combination of the “Hazard Division” and the “Compatibility Group” results in an alpha-numeric:

1.1D or 1.4S

**<u>Main idea/objective for slide:</u>**
**Discuss the origins and rationale of using Hazard Class Codes.**

<u>participant activity</u>
Before revealing the text on the slide, ask participants what they can tell you about HCC

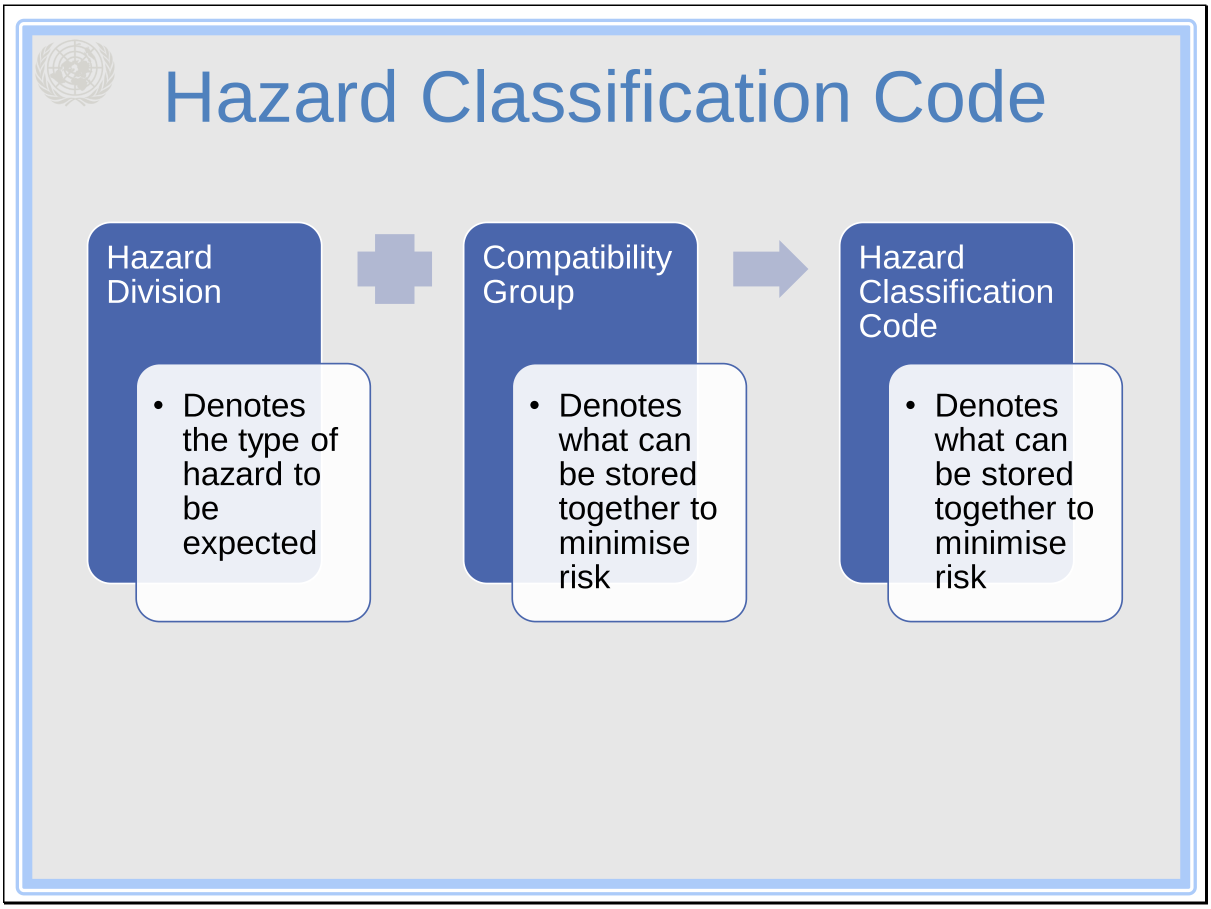
<u>What the instructor should cover (in addition to slide content)</u>
These codes, or a similar national system, are critical to the safe storage and movement of ammunition and explosives.

Note that the application of the Hazard Division and Compatibility Group does not take into account the probability of an incident. It assumes that if it can happen it will, and when it does, it identifies the extent of the hazards.

References/further reading

The combination of the “Hazard Division” and the “Compatibility Group” results in an alpha-numeric “**Hazard Classification Code**” for each item and type of ammunition and explosives. For example "1.1D" or "1.4S".

Slide 10



# Hazard Classification Code

**Hazard Division**

- Denotes the type of hazard to be expected

**Compatibility Group**

- Denotes what can be stored together to minimise risk

**Hazard Classification Code**

- Denotes what can be stored together to minimise risk

**<u>Main idea/objective for slide:</u>**
**Discuss the origins and rationale of using Hazard Class Codes.**

<u>What the instructor should cover (in addition to slide content)</u>
The system comprises:

•Hazard Divisions (HD)

•Compatibility Groups (CG)

•and, when these are combined together: Hazard Classification Codes (HCC)

Slide 11

## Hazard Divisions

The Hazard Division here is **1.4**

It is also shown with Compatibility Group, here it is ‘S’

Note that ammunition and its containers generally have many other types of markings as well.

**<u>Main idea/objective for slide:</u>**
**Introduce and explain the Hazard Divisions, using examples**

<u>What the instructor should cover (in addition to slide content)</u>
The Hazard Division for a particular explosive or type of ammunition shall be determined by its performance and test results according to Part I of the Manual of Tests and Criteria of the UN Recommendations on the Transport of Dangerous Goods.

Stockpile management organisations should ensure that the conventional ammunition and explosives in their possession is classified accordingly, although
alternative local systems may be utilised.

The Hazard Divisions are most often seen marked on orange diamonds on ammunition packaging. Note that these diamonds usually also include the Compatibility group, thus showing the complete Hazard Classification Code.

Note that ammunition packaging will generally have a number of other markings on it, all of which perform some useful function. However in this lesson we are only looking at the Hazard Classification Codes.

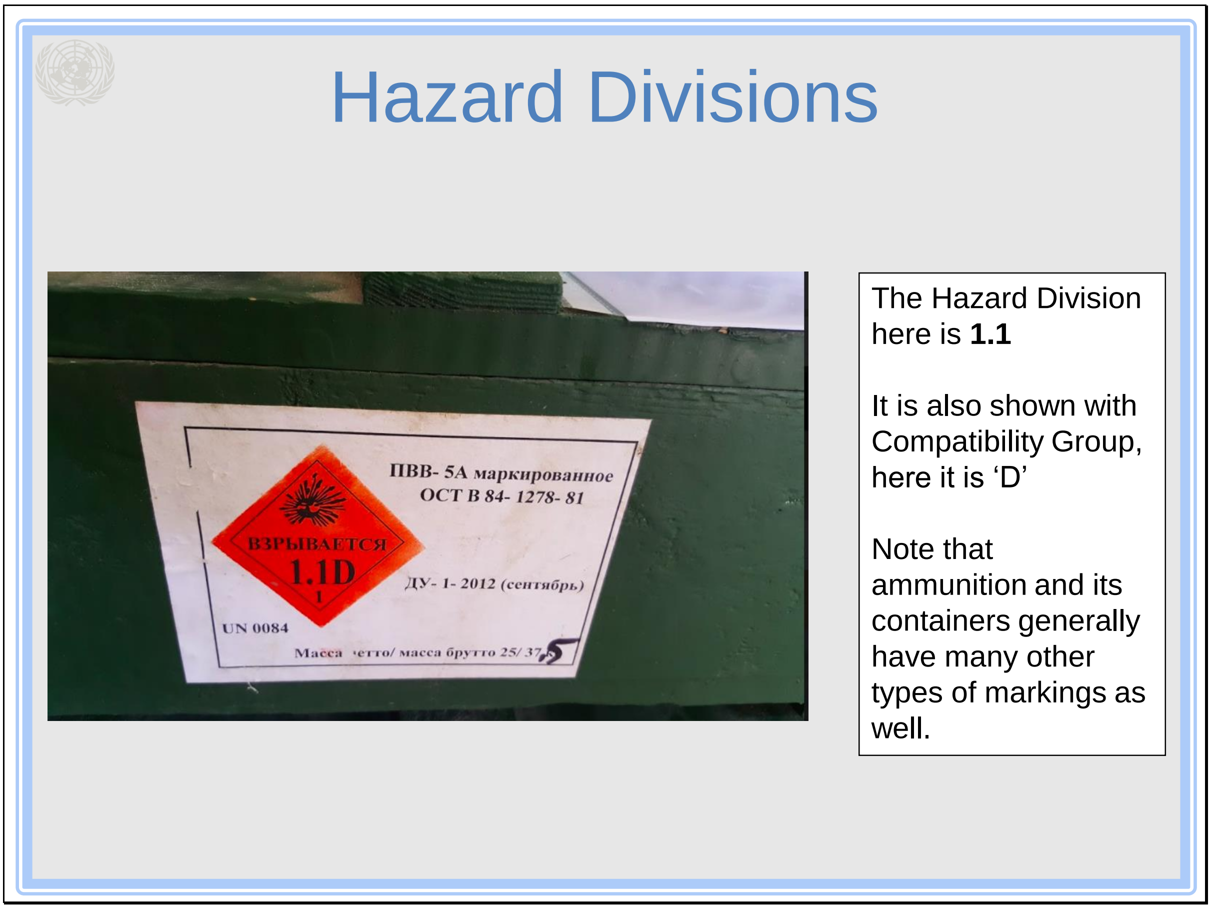
There are 6 Hazard Divisions for Class 1 Explosive Goods. These are 1.1, 1.2, 1.3, 1.4, 1.5, and 1.6. We will come onto these next.

Note that there is also an additional category which covers unstable explosives. There is no pictogram or HD for this type of ammunition, as unstable explosives are not allowed to be transported.

participant activity
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

**Photograph is © AMAT/GICHD**

Slide 12



## Hazard Divisions

The Hazard Division here is **1.1**

It is also shown with Compatibility Group, here it is ‘D’

Note that ammunition and its containers generally have many other types of markings as well.

**<u>Main idea/objective for slide:</u>**

**Introduce and explain the Hazard Divisions, using examples**

<u>What the instructor should cover (in addition to slide content)</u>

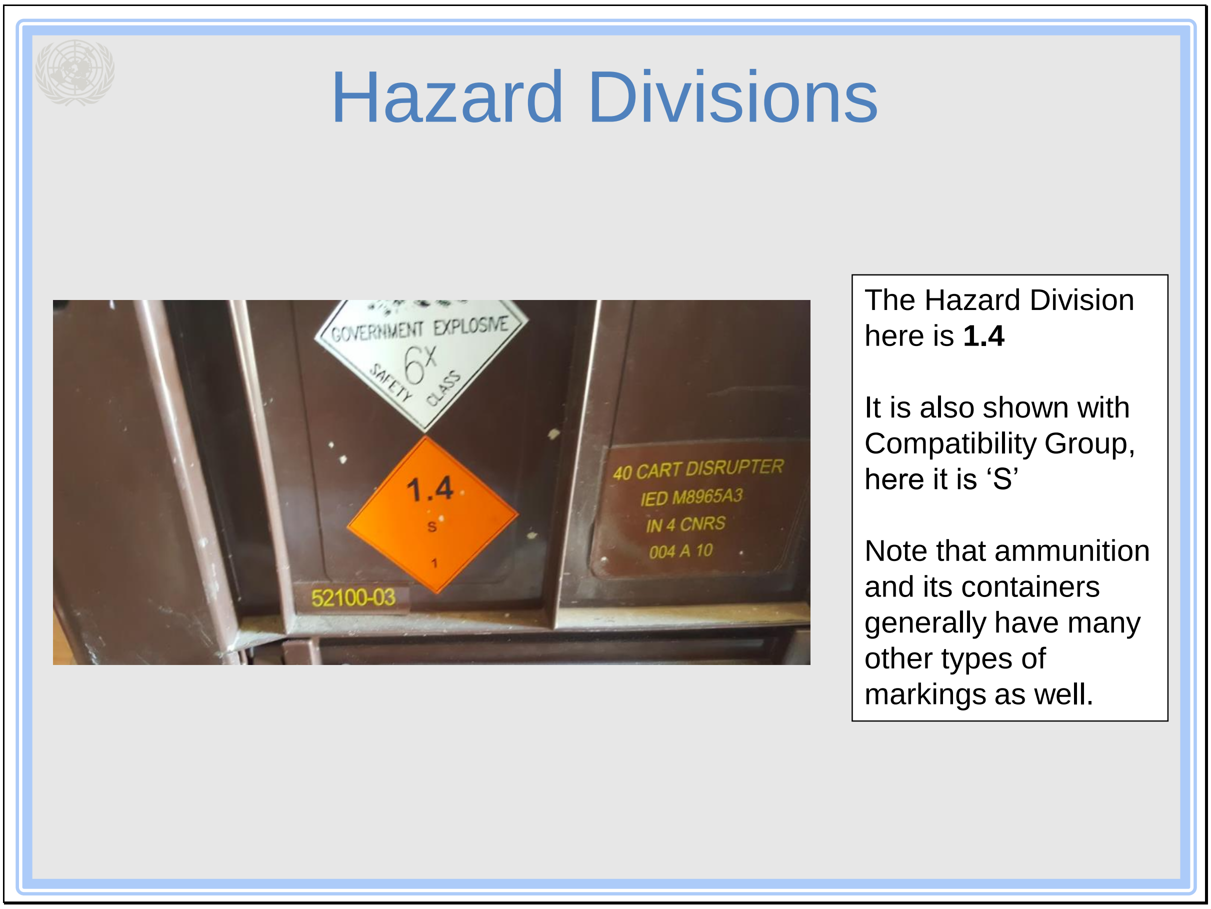
The photo of the box of PE4 Plastic Explosive cartridges has an orange diamond on it. This shows that this type or store is HD 1.1.

<u>participant activity</u>

Ask participants to provide further examples

Using a flipchart, write examples under each HD and place it on the wall.

Slide 13



# Hazard Divisions

The Hazard Division here is **1.4**

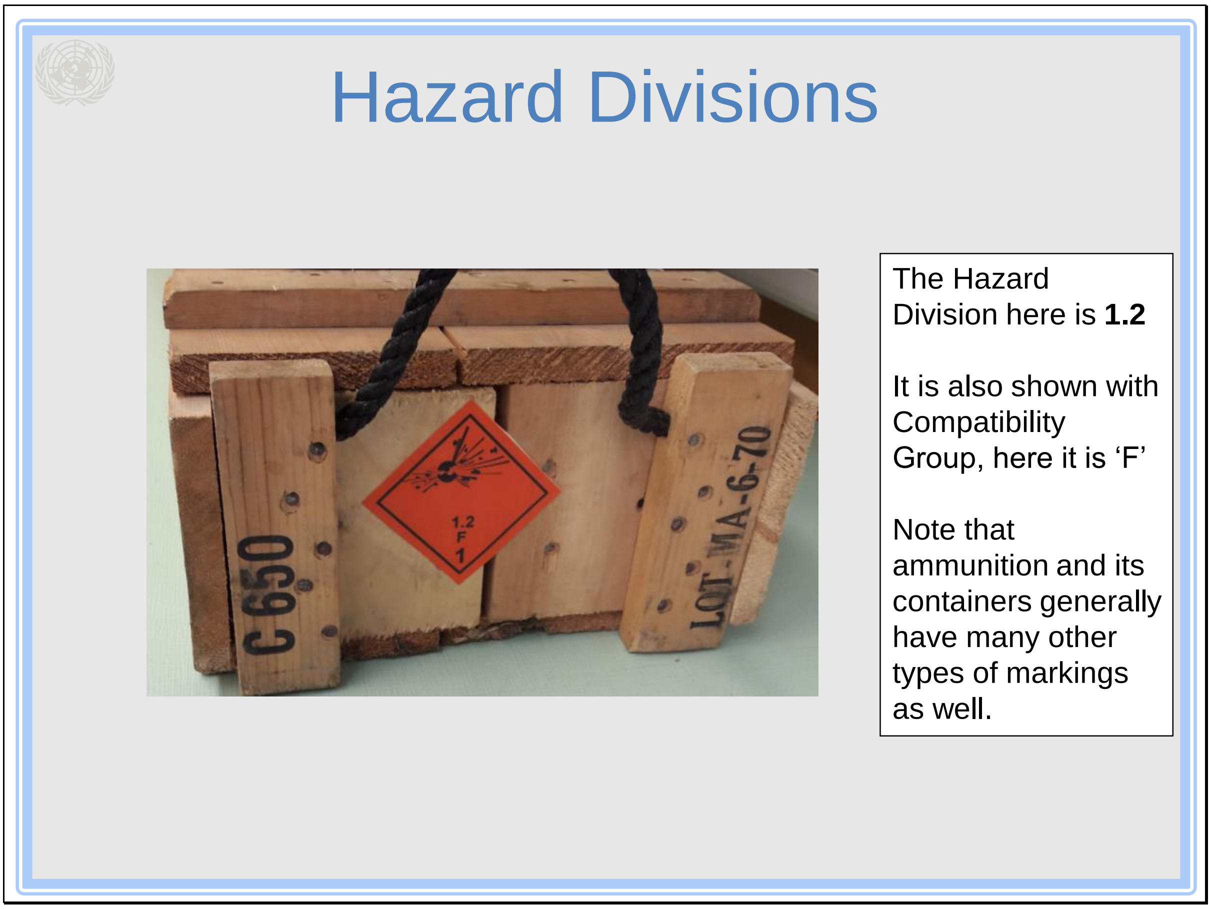
It is also shown with Compatibility Group, here it is ‘S’

Note that ammunition and its containers generally have many other types of markings as well.

**<u>Main idea/objective for slide:</u>**
**Introduce and explain the Hazard Divisions, using examples**

<u>Participant activity</u>
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

Slide 14



## Hazard Divisions

The Hazard Division here is **1.2**

It is also shown with Compatibility Group, here it is ‘F’

Note that ammunition and its containers generally have many other types of markings as well.

**Main idea/objective for slide:**
**Introduce and explain the Hazard Divisions, using examples**

Participant activity
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

# Hazard Divisions

The Hazard Division here is **1.2**

It is also shown with Compatibility Group, here it is ‘E’

Note that ammunition and its containers generally have many other types of markings as well.

**<u>Main idea/objective for slide:</u>**
**Introduce and explain the Hazard Divisions, using examples**

<u>Participant activity</u>
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

Slide 16

Class 1 Hazard Division

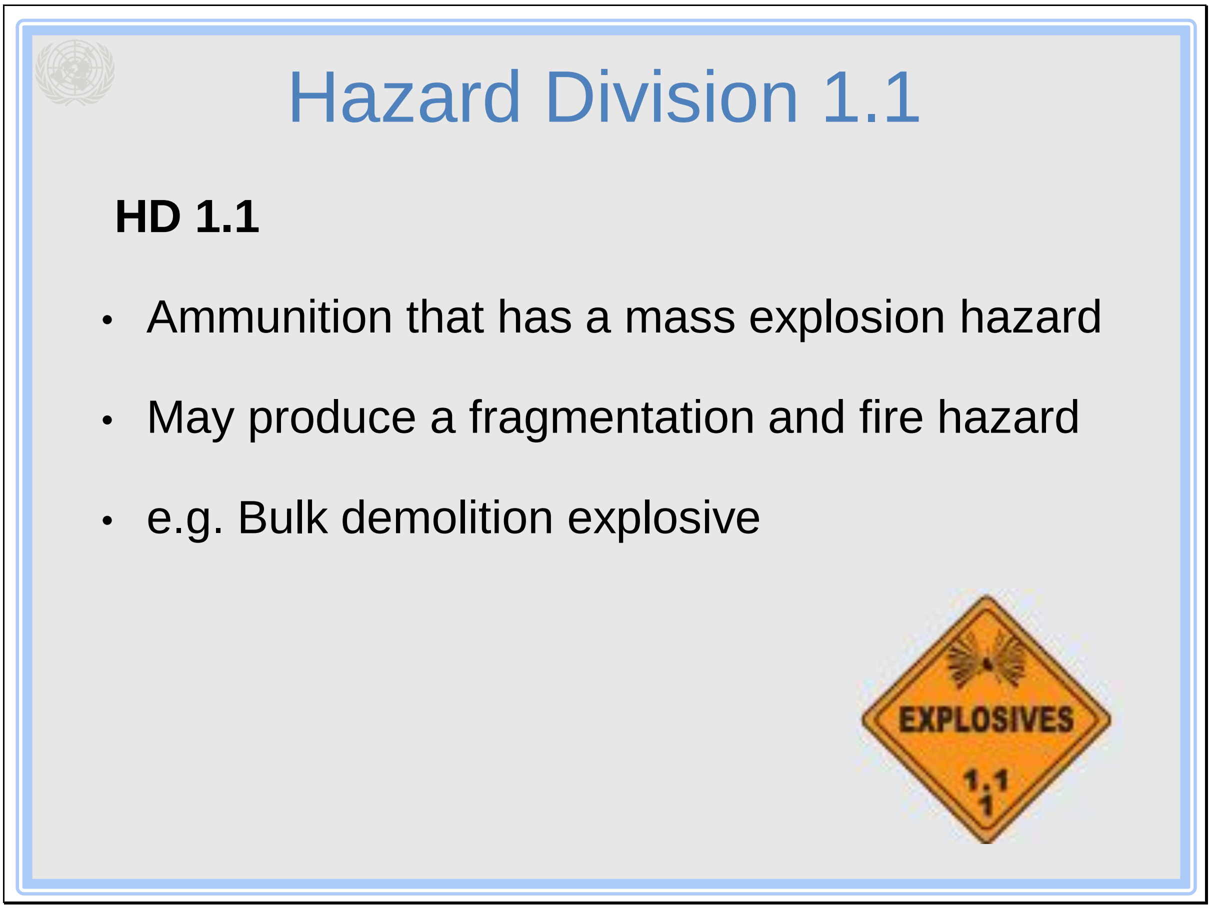
1.1, 1.2, 1.3

** Place for Division
* Compatibility Group

**<u>Main idea/objective for slide:</u>**
**Introduce and explain the Hazard Divisions, using examples**

<u>participant activity</u>
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

Slide 17



## Hazard Division 1.1

**HD 1.1**

- Ammunition that has a mass explosion hazard
- May produce a fragmentation and fire hazard
- e.g. Bulk demolition explosive

**Main idea/objective for slide:**
**Introduce and explain the Hazard Divisions, using examples**

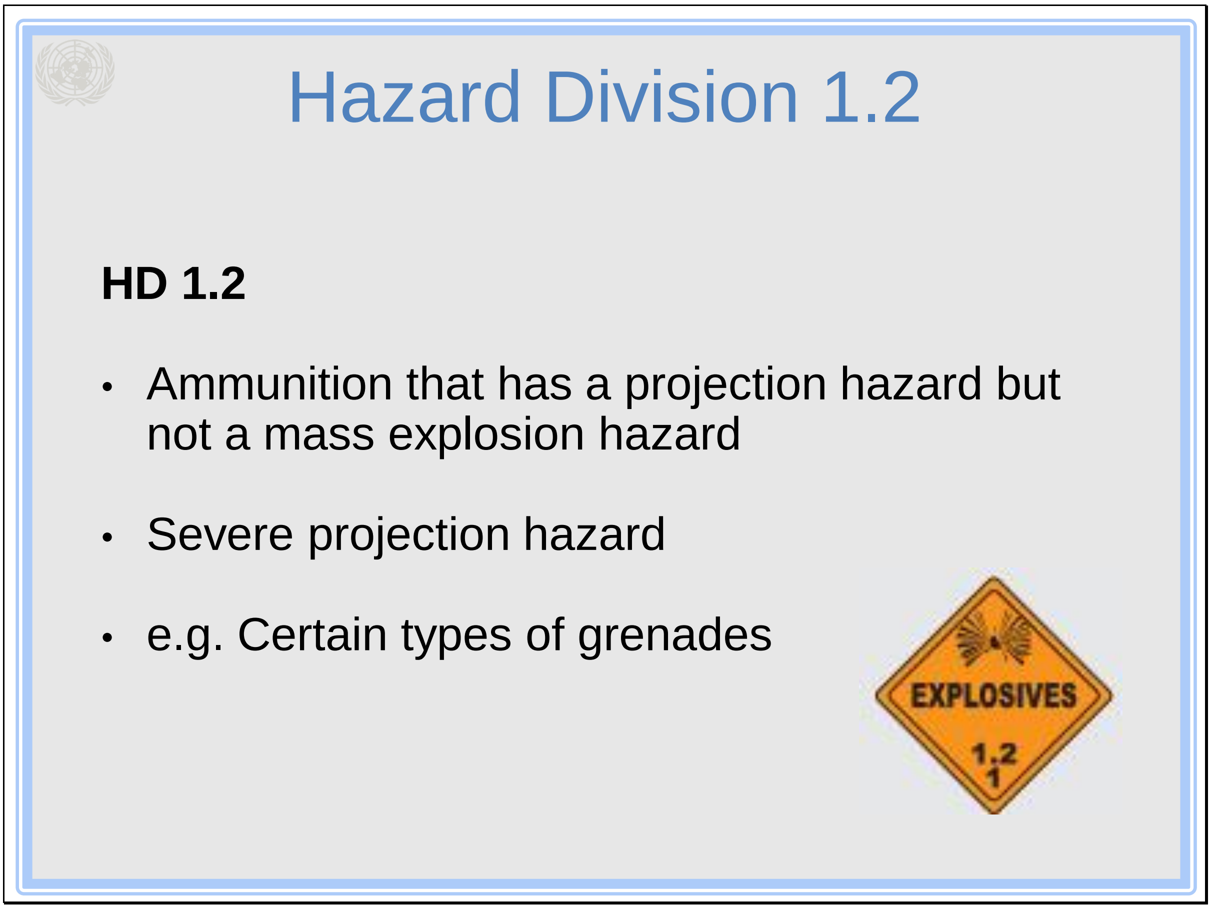
What the instructor should cover (in addition to slide content)
Hazard Division 1.1 has a mass explosion hazard. Note that ammunition in this HD may also produce a fragmentation and fire hazard as well. The main hazard is that of the blast though. An example of a HD 1.1 store might be bulk demolition explosive.

participant activity
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

References/further reading
http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Images found at https://www.airseacontainers.com/blog/hazard-class-101-know-how-to-categorize-your-hazardous-materials/

Slide 18



# Hazard Division 1.2

**HD 1.2**

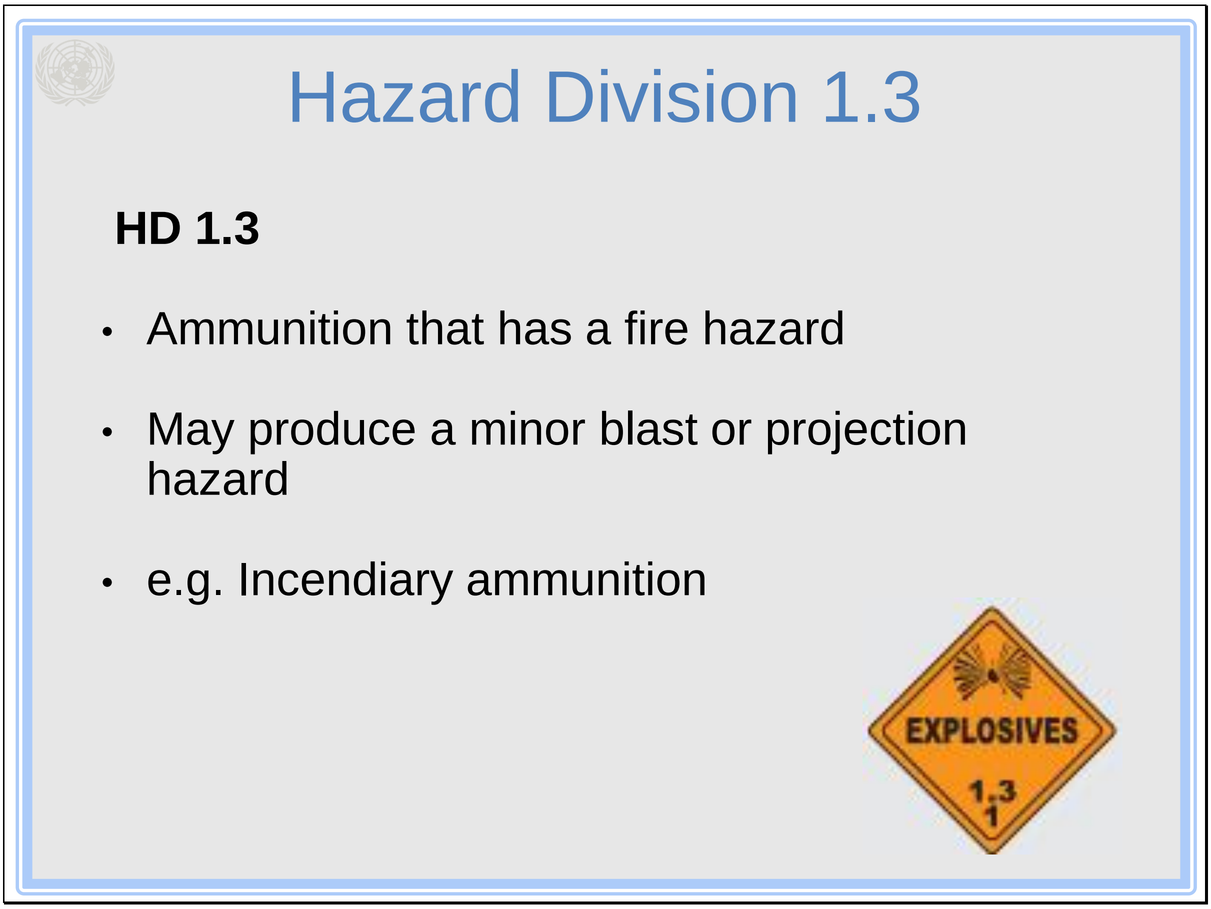
- Ammunition that has a projection hazard but not a mass explosion hazard
- Severe projection hazard
- e.g. Certain types of grenades

**Main idea/objective for slide:**
**Introduce and explain the Hazard Divisions, using examples**

What the instructor should cover (in addition to slide content)
Hazard Division 1.2 has a projection hazard. This means it may produce fragmentation if it functions in an accident. There is no mass explosion hazard though. An example of a HD 1.2 store might be some kinds of grenade.

participant activity
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

References/further reading
http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf



## Hazard Division 1.3

**HD 1.3**

- Ammunition that has a fire hazard
- May produce a minor blast or projection hazard
- e.g. Incendiary ammunition

**Main idea/objective for slide:**
**Introduce and explain the Hazard Divisions, using examples**

What the instructor should cover (in addition to slide content)
Hazard Division 1.3 has a fire hazard. It will also have a minor blast or projection hazard. It does not have a mass explosion hazard though.

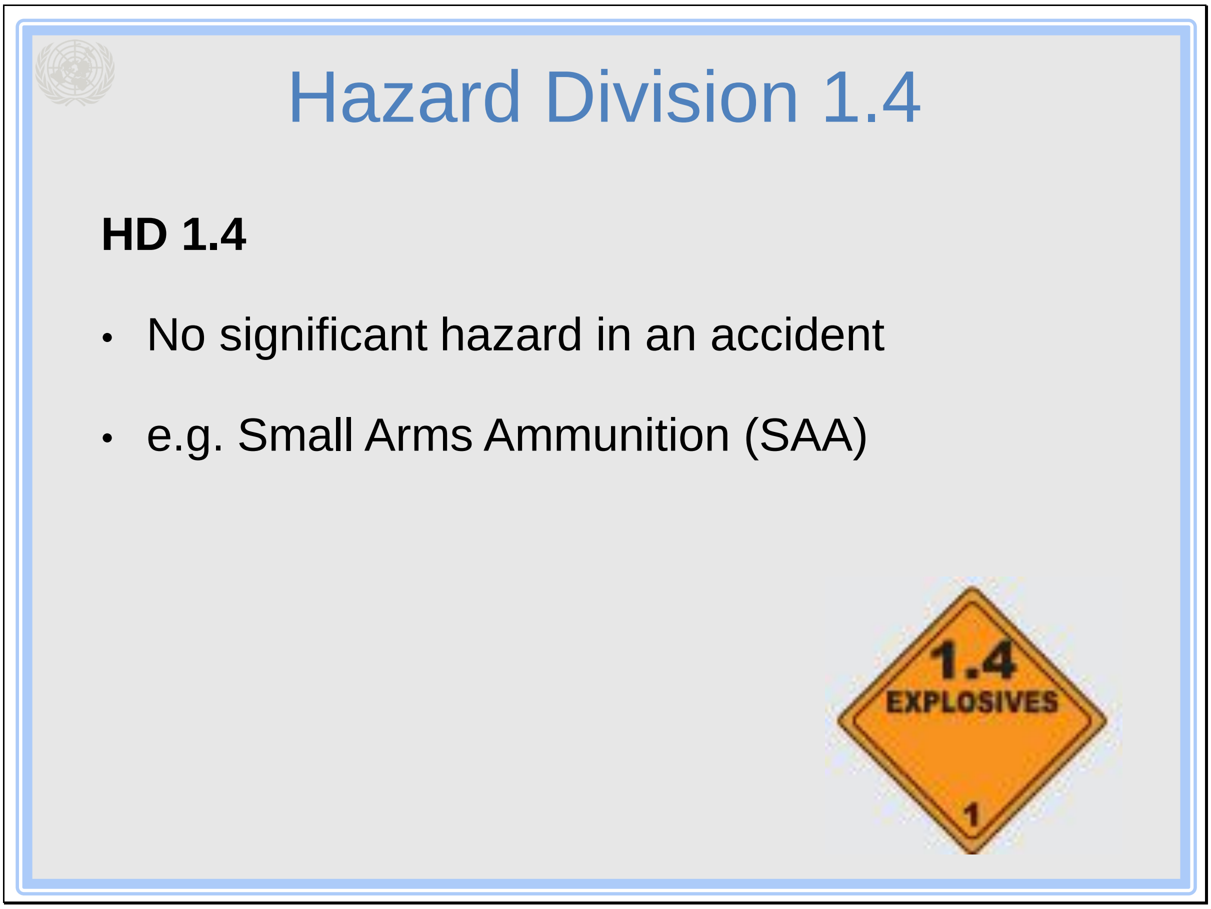
The main hazard however is that of fire. An example of a HD 1.3 store might be some kinds of incendiary ammunition.

Note that NATO further subdivide this Hazard Division into 1.3.1 and 1.3.2, to add further granularity to the description based on the type of fire/flash hazard.

participant activity
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

References/further reading
http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Slide 20



## Hazard Division 1.4

**HD 1.4**

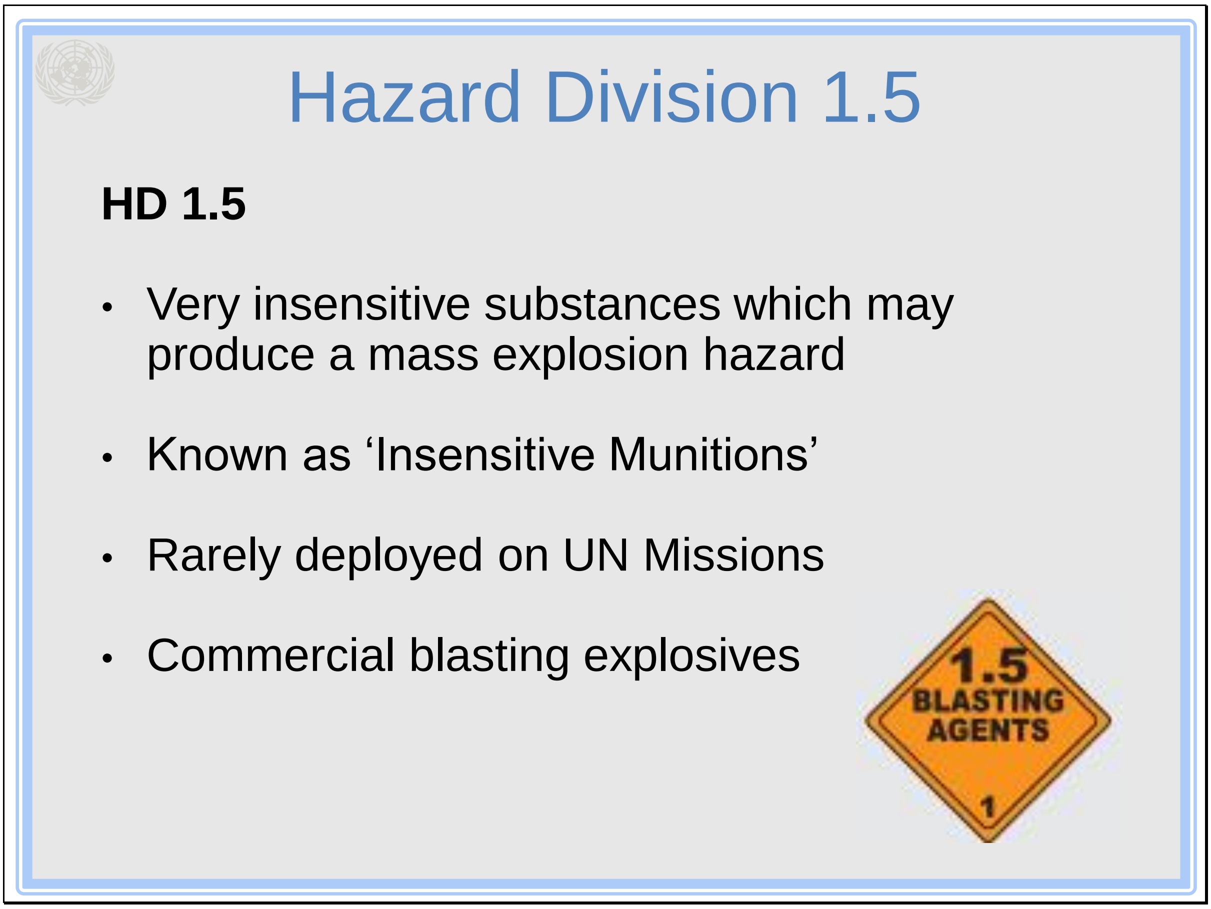
- No significant hazard in an accident
- e.g. Small Arms Ammunition (SAA)

**<u>Main idea/objective for slide:</u>**
**Introduce and explain the Hazard Divisions, using examples**

<u>What the instructor should cover (in addition to slide content)</u>
Hazard Division 1.4 presents no significant hazard in an accident. The usual example of a HD 1.4 stores would be many types of conventional small arms ammunition.

<u>participant activity</u>
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

<u>References/further reading</u>
http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf



## Hazard Division 1.5

**HD 1.5**

- Very insensitive substances which may produce a mass explosion hazard
- Known as 'Insensitive Munitions'
- Rarely deployed on UN Missions
- Commercial blasting explosives

**Main idea/objective for slide:**
**Introduce and explain the Hazard Divisions, using examples**

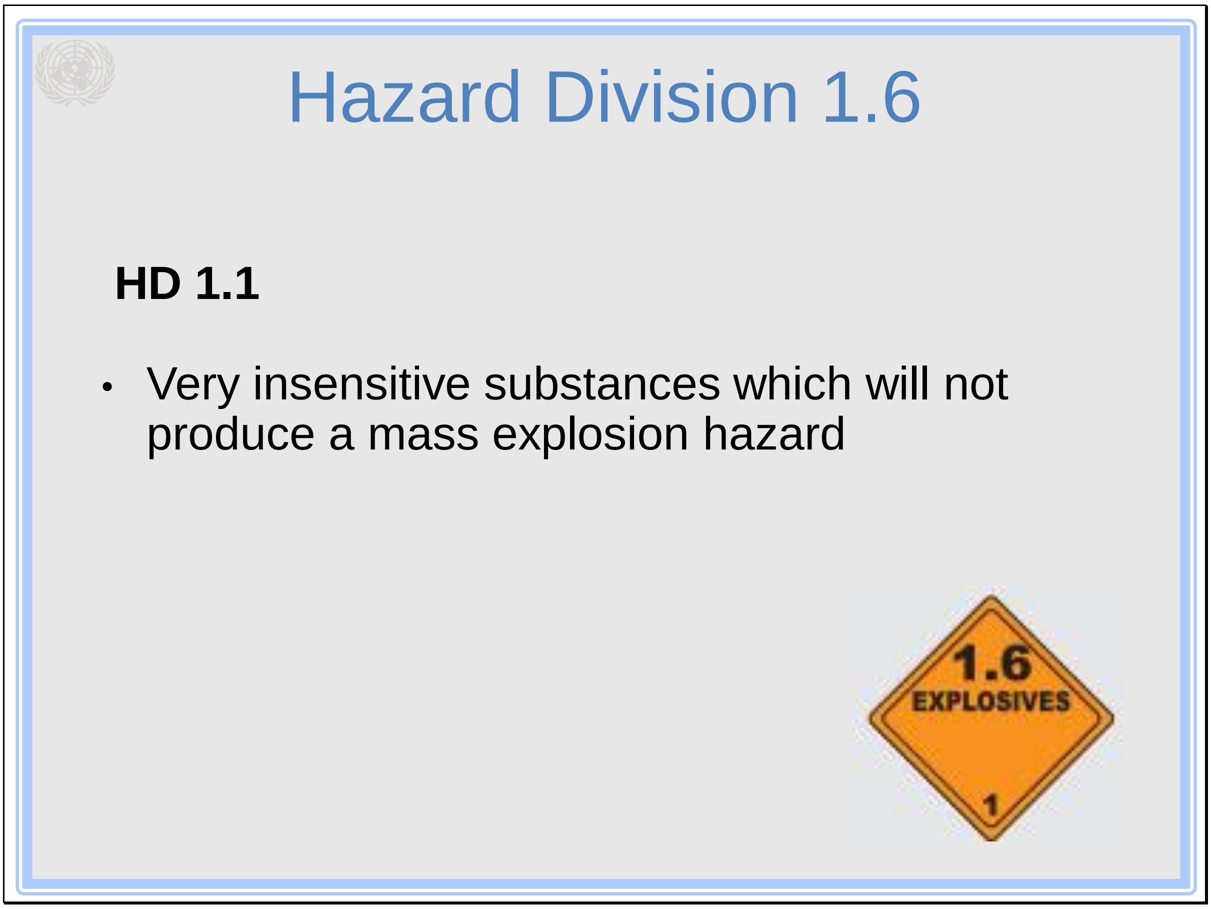
What the instructor should cover (in addition to slide content)
Hazard Division 1.5 relates to very insensitive substances, but which if they do actually initiate will produce a mass explosion hazard.

This Hazard Division may become more widely used as more technologically developed nations develop what are known as "Insensitive Munitions", also known as "IM". This type of ammunition may also be known by its French abbreviation "MURAT" These are items of ammunition which are very, very difficult to initiate accidently. For example, a polymer bonded high explosive which is highly unlikely to initiate because of fire or other unplanned stimulus. However, if the IM explosive does initiate, then there will still be a mass explosion hazard.

participant activity

Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

<u>References/further reading</u>
http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf



## Hazard Division 1.6

**HD 1.1**

- Very insensitive substances which will not produce a mass explosion hazard

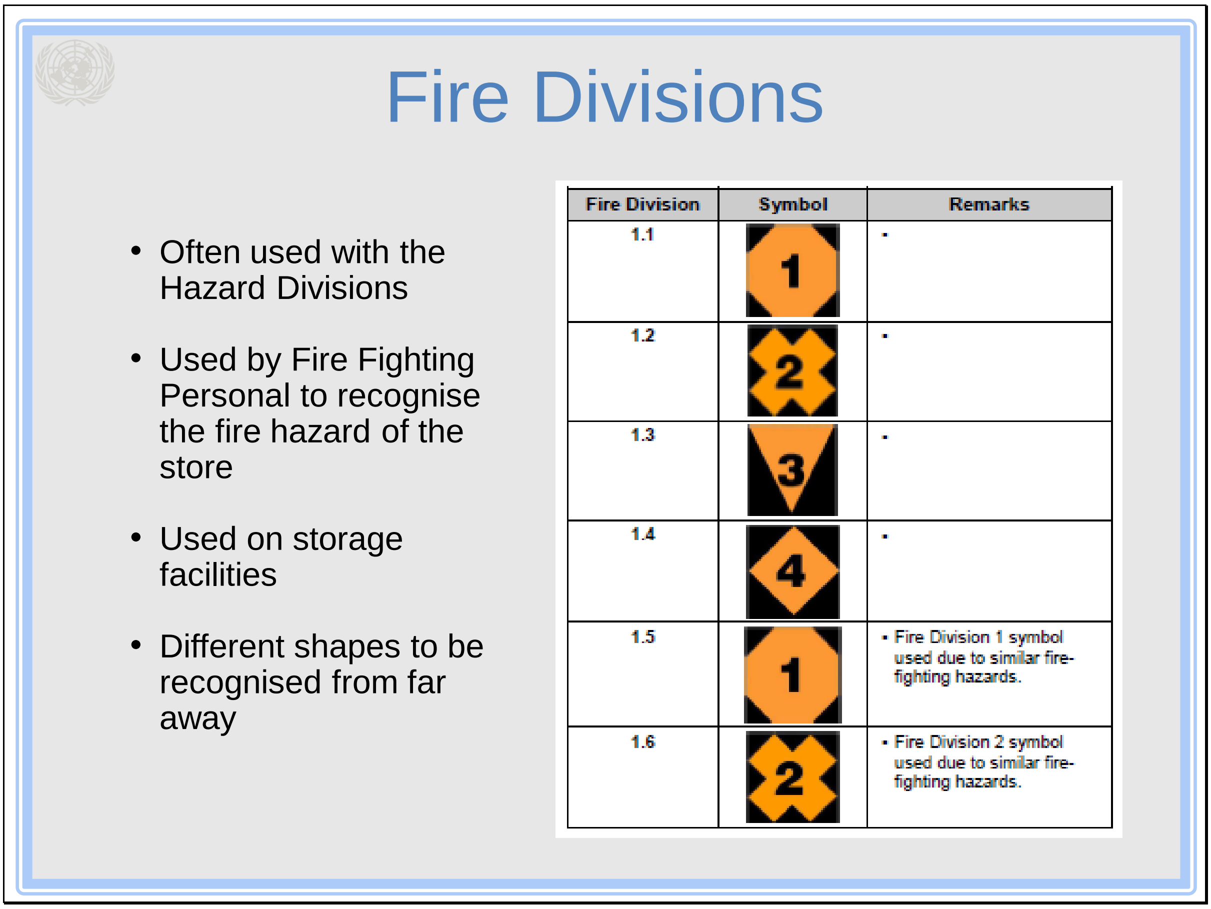
**<u>Main idea/objective for slide:</u>**
**Introduce and explain the Hazard Divisions, using examples**

<u>What the instructor should cover (in addition to slide content)</u>
Hazard Division 1.6 ammunition is also extremely insensitive (as for HD 1.5), however even if it does initiate it will not produce a mass explosion hazard.

<u>participant activity</u>
Ask participants to provide further examples
Using a flipchart, write examples under each HD and place it on the wall.

<u>References/further reading</u>
- http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Slide 23



# Fire Divisions

- Often used with the Hazard Divisions
- Used by Fire Fighting Personal to recognise the fire hazard of the store
- Used on storage facilities
- Different shapes to be recognised from far away

| Fire Division | Symbol | Remarks |
|---|---|---|
| 1.1 | 1 | ▪ |
| 1.2 | 2 | ▪ |
| 1.3 | 3 | ▪ |
| 1.4 | 4 | ▪ |
| 1.5 | 1 | ▪ Fire Division 1 symbol used due to similar fire-fighting hazards. |
| 1.6 | 2 | ▪ Fire Division 2 symbol used due to similar fire-fighting hazards. |

**Main idea/objective for slide:**

**Introduce and discuss the various Fire Divisions and where they are used.**

What the instructor should cover (in addition to slide content)

There are six fire divisions. These equate to the Hazard Divisions.

Each Fire Division has a symbol that represents it. A fire division number is shown on each symbol. These are shown on the slide.

The symbol should be indicated during storage and transportation. This is to allow fire fighting personnel to recognise the fire hazard when approaching the scene of an incident. Hazard Division symbols may also be used for this purpose.

By way of clarification:

The Fire Division 1 fire symbol and number is also used for Fire Division 5 as the fire-fighting hazards are very similar.

The Fire Division 2 fire symbol and number is also used for Fire Division 6 for the same reason.

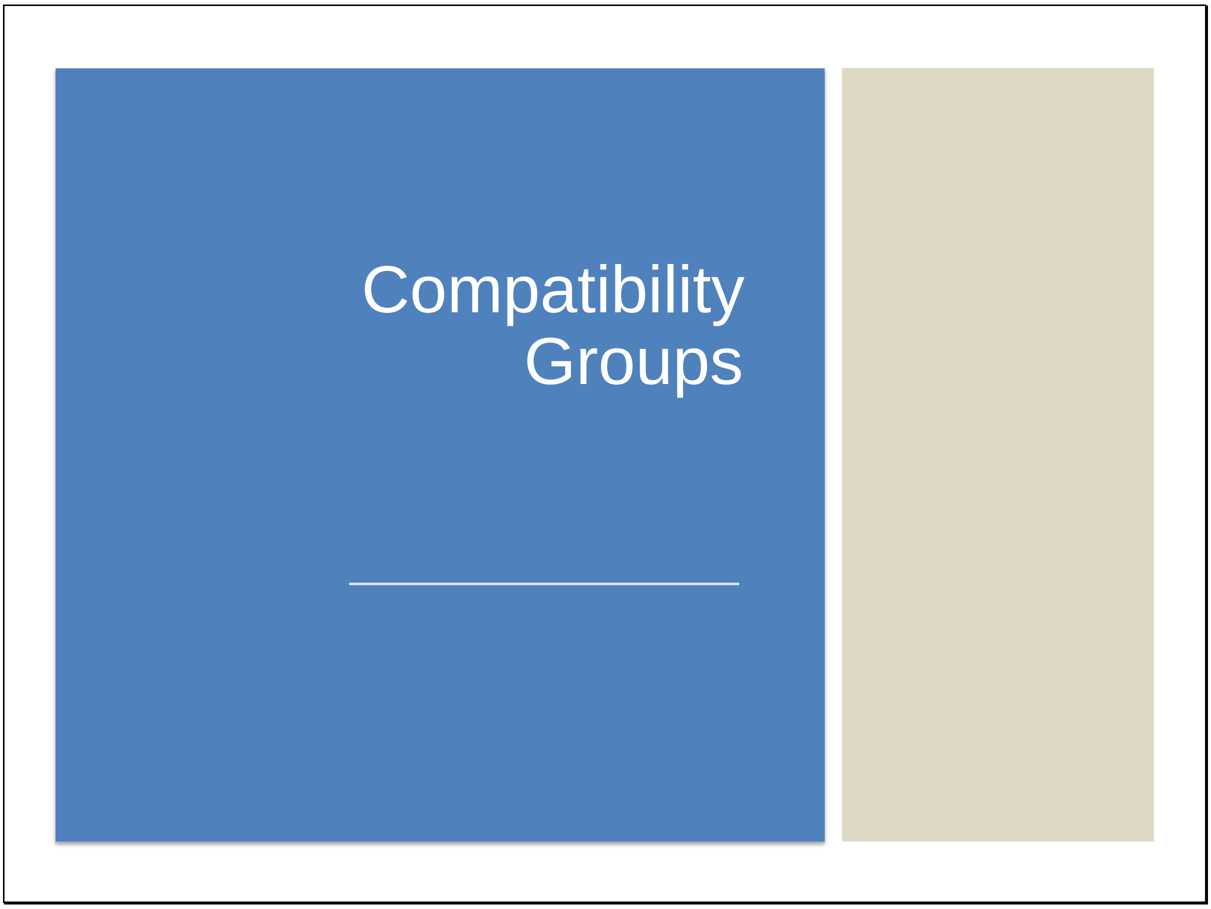
<u>participant activity</u>

- Ask the participants to provide ammunition examples, explain what Fire Division they are in and what considerations they would need to take in the event of a fire.
- Write these on a flipchart

<u>References/further reading</u>

- http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Slide 24

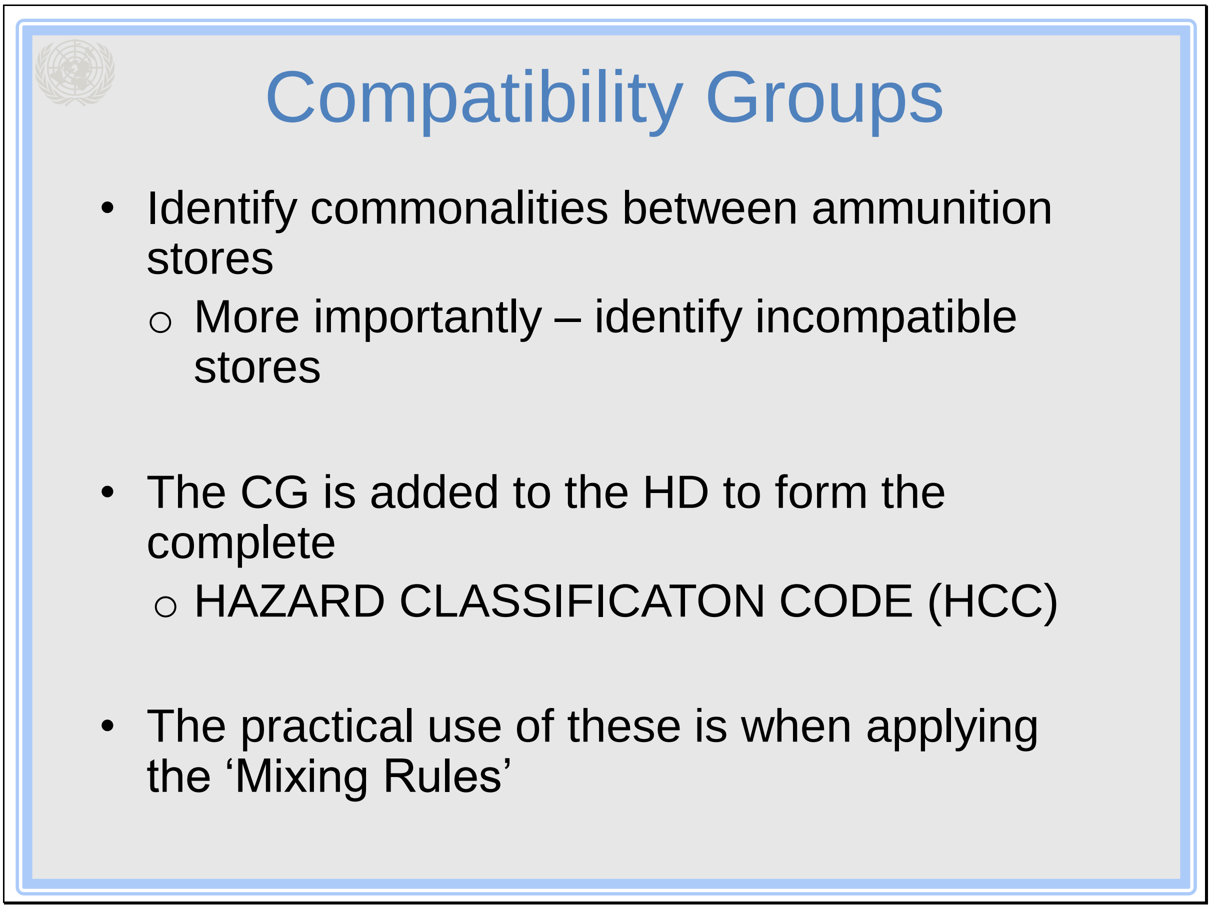


Compatibility Groups

**Phase 2. Development (**Time allocation - 70 min**)**

Stage 2 (Time allocation 25 mins) – Compatibility Groups

Slide 25



## Compatibility Groups

- Identify commonalities between ammunition stores
  - More importantly – identify incompatible stores
- The CG is added to the HD to form the complete
  - HAZARD CLASSIFICATON CODE (HCC)
- The practical use of these is when applying the ‘Mixing Rules’

**Main idea/objective for slide:**
**Introduce the participants to the Compatibility Groups and explain their purpose.**

What the instructor should cover (in addition to slide content)
Each specific type of conventional ammunition should be allocated a "Compatibility Group". This helps to store similar stores with each. More importantly however, it helps to identify stores which should not be stored together. For example, we would not want to store white phosphorous shells with bulk explosive. In the event of an accident, the combined effect of significant blast and white phosphorous would be much, much worse than an event involving only one of these types of store individually.

There may be hundreds of thousands of individual ammunition items, of many different types, stored in a single stockpile. The different types of ammunition will vary in purpose, calibre, explosive type and manufacturer, all with varying degrees of volatility.  Compatibility Groups help to identify commonalities between stores.

Thus, the Compatibility Groups are considered as important to aide safe stock management.  The "Compatibility Group" is added to the "Hazard Division" to form the complete "Hazard Classification Code".

The real practical use of the Compatibility Group is when we look at the “Mixing Rules” shortly.

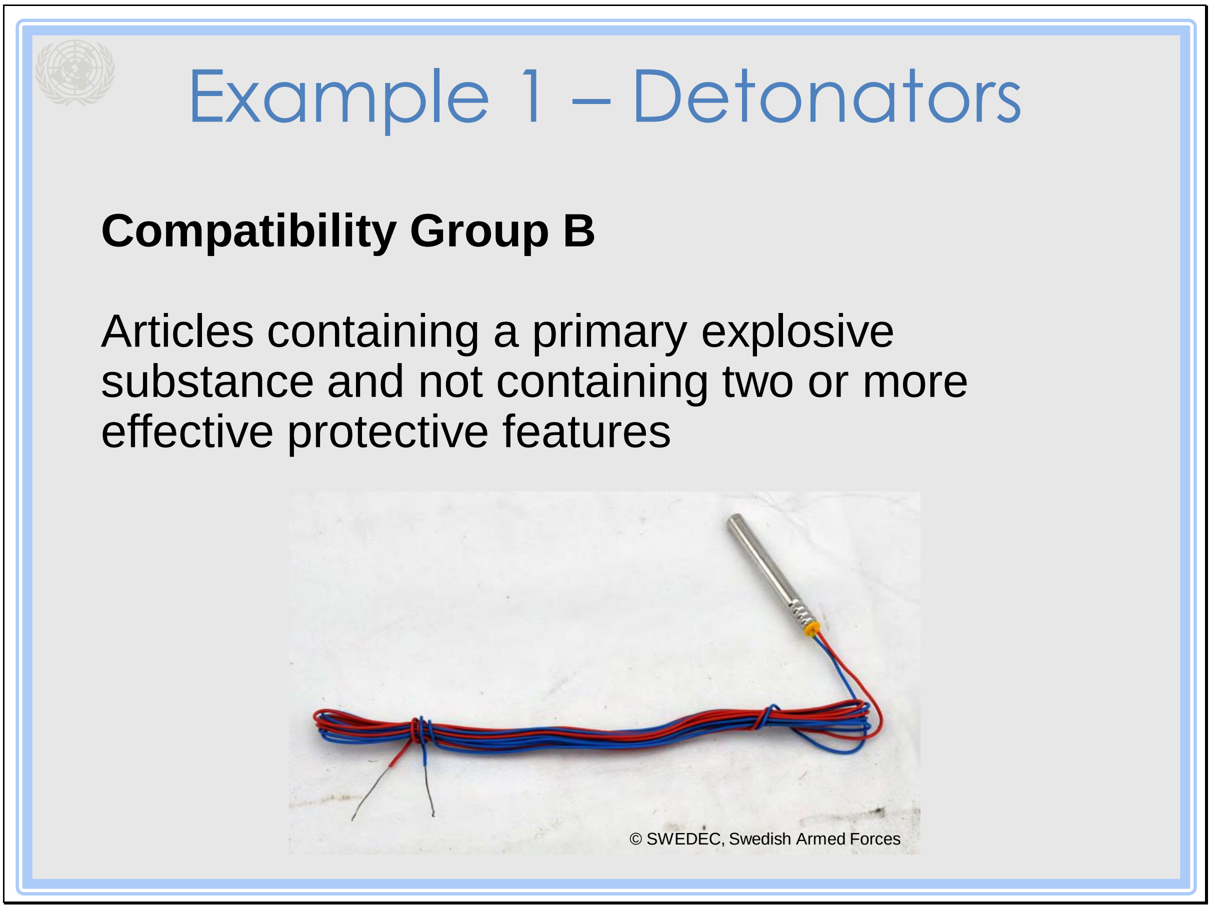
participant activity

- Ask questions to the class to ensure understanding.

References/further reading

http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Slide 26



# Example 1 – Detonators

**Compatibility Group B**

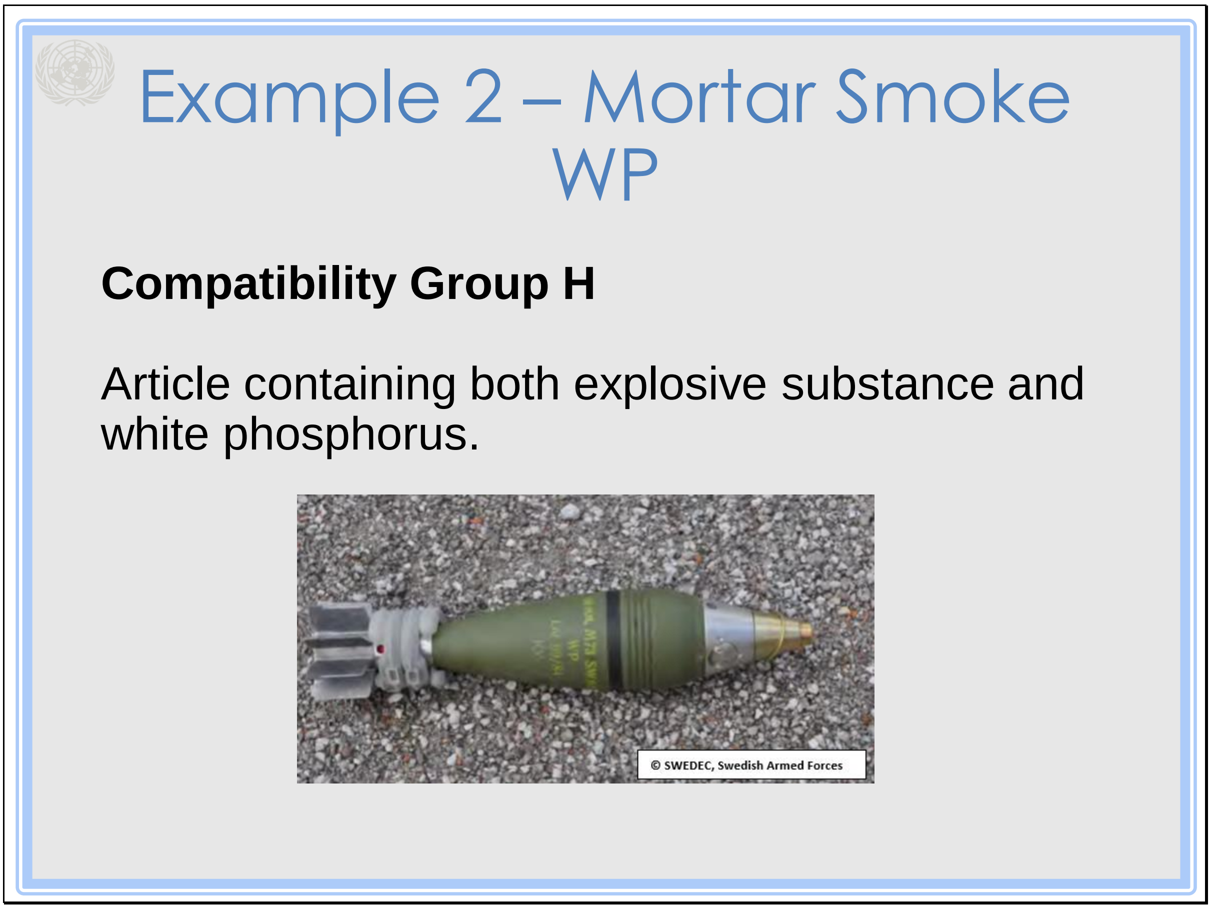
Articles containing a primary explosive substance and not containing two or more effective protective features

© SWEDEC, Swedish Armed Forces

**<u>Main idea/objective for slide:</u>**
**Provide examples of Compatibility Groups in images and discuss with the participants**

<u>What the instructor should cover (in addition to slide content)</u>
An example would be detonators, as they contain a primary explosive. Furthermore, they are unlikely to include two or more effective safety features.

<u>participant activity</u>
- Ask questions to the class to ensure understanding.



## Example 2 – Mortar Smoke WP

**Compatibility Group H**

Article containing both explosive substance and white phosphorus.

© SWEDEC, Swedish Armed Forces

**Main idea/objective for slide:**

**Provide examples of Compatibility Groups in images and discuss with the participants**

What the instructor should cover (in addition to slide content)

An example would be white phosphorous smoke mortar bombs which also include a bursting charge and a propelling charge. The notes to this CG also state "or other ammunition containing pyrophoric material", so items containing red phosphorous and thermite may well come under this CG.

participant activity

- Ask questions to the class to ensure understanding.

Slide 28

# Example 3 – Small Arms Ammunition

**Compatibility Group S**

Substance or article so packed or designed that any hazardous effects arising from accidental functioning are confined within the package

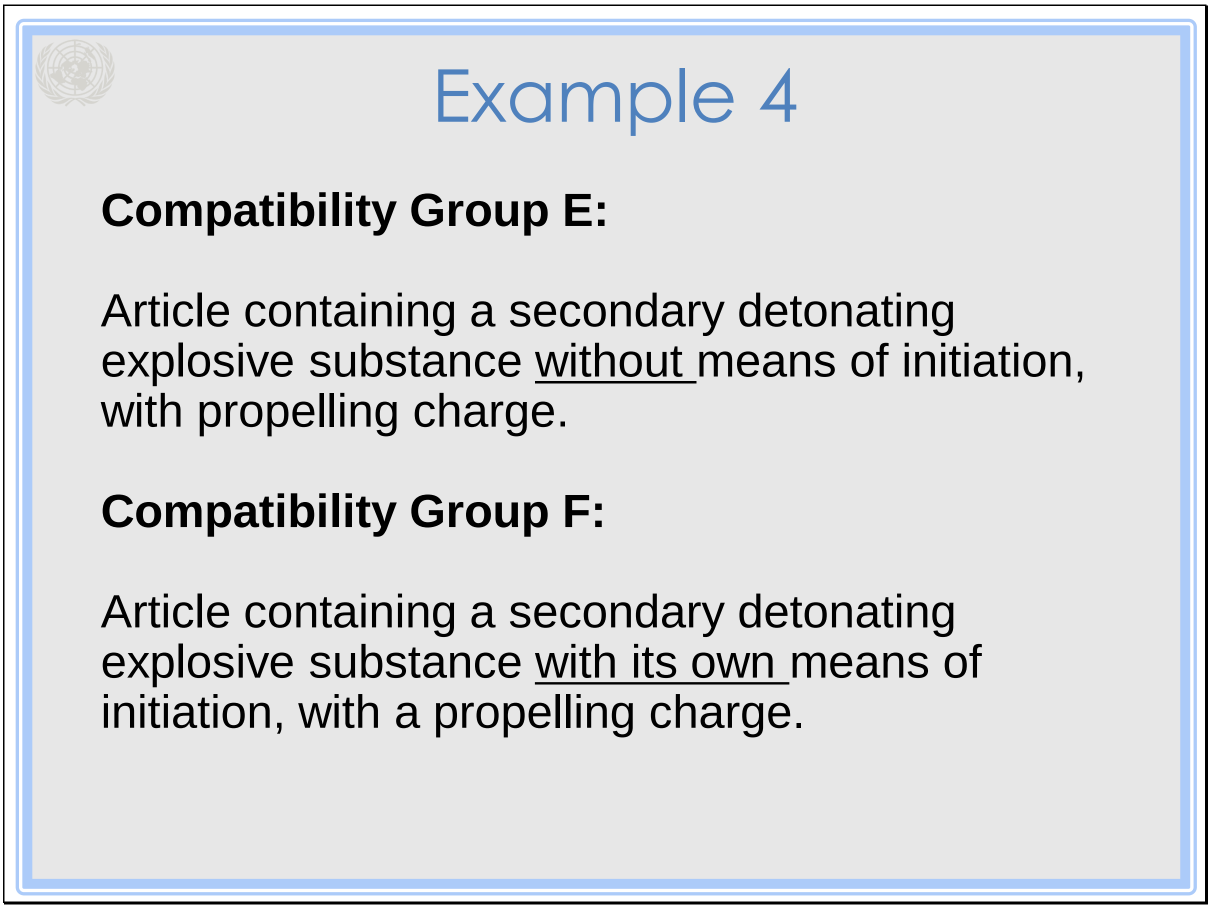
© SWEDEC, Swedish Armed Forces

**<u>Main idea/objective for slide:</u>**
**Provide examples of Compatibility Groups in images and discuss with the participants**

<u>What the instructor should cover (in addition to slide content)</u>
For example, if an appropriately packaged box of Small Arms Ammunition (SAA) (of the ball type) were involved in an accident, it would be expected that if one of the rounds functioned due to say, heat or unplanned percussion, the bullet upon leaving that round would be contained within the packaging

<u>participant activity</u>
- Ask questions to the class to ensure understanding.

Slide 29



## Example 4

**Compatibility Group E:**

Article containing a secondary detonating explosive substance without means of initiation, with propelling charge.

**Compatibility Group F:**

Article containing a secondary detonating explosive substance with its own means of initiation, with a propelling charge.

**Main idea/objective for slide:**
**Provide examples of Compatibility Groups in images and discuss with the participants**

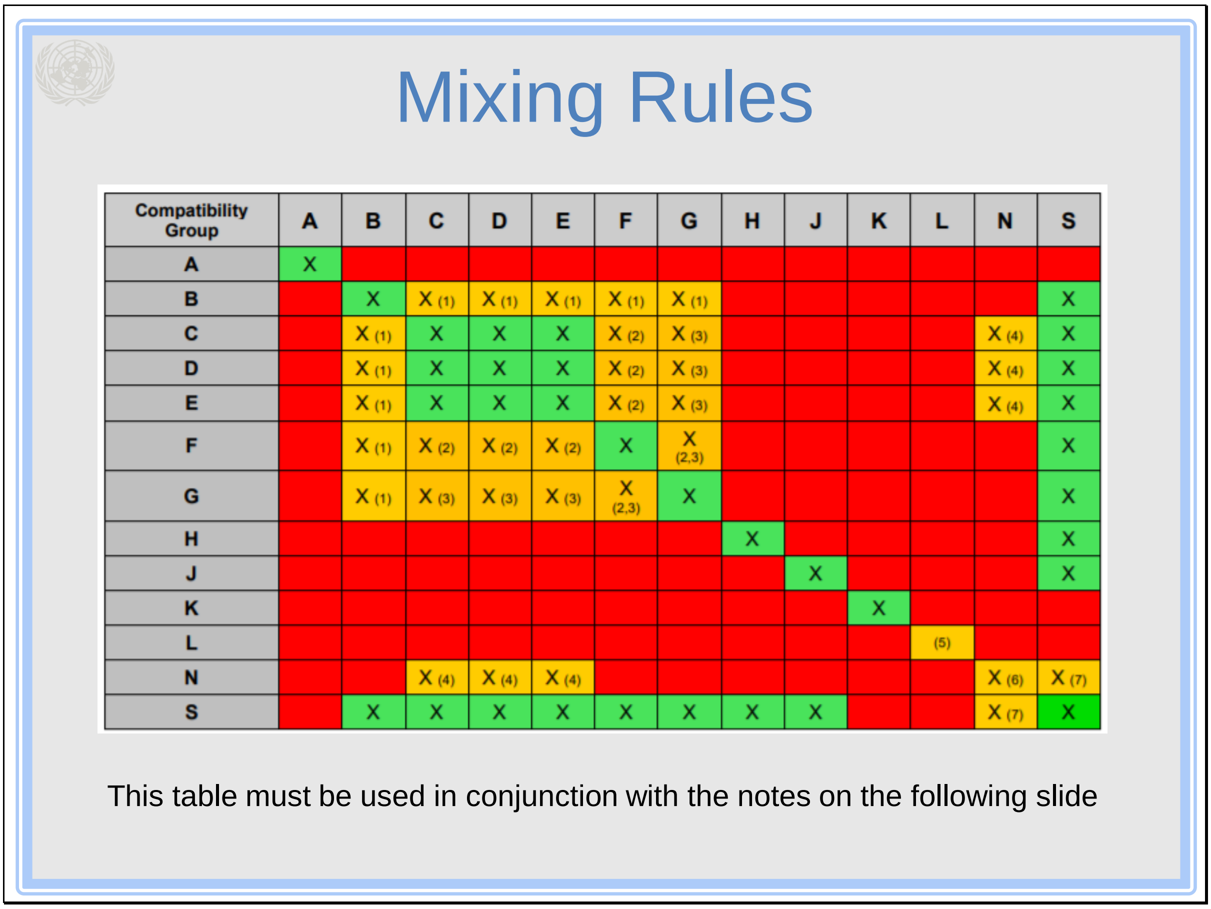
What the instructor should cover (in addition to slide content)
The difference is whether or not the ammunition has its own means of initiation.

"E" might include a guided missile, assuming that the item cannot be initiated without being attached to a launcher, for example.

"F" might include a rocket propelled grenade.

participant activity
- Ask questions to the class to ensure understanding.

Slide 30



# Mixing Rules

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

This table must be used in conjunction with the notes on the following slide

**<u>Main idea/objective for slide:</u>**
**Explain what compatibility mixing rules are and how they are applied, using the ‘Mixing Rules’.**

<u>What the instructor should cover (in addition to slide content)</u>
Conventional ammunition should be stored in accordance with these mixing rules.  This table is in the IATG, specifically at IATG 01:50.  Note that this applies to ‘fixed’ ammunition storage sites, for example a base ammunition depot, or similar.

Compatibility Group ‘B’ items are those like detonators.  Compatibility Group ‘S’ items are things like SAA Ball ammunition.

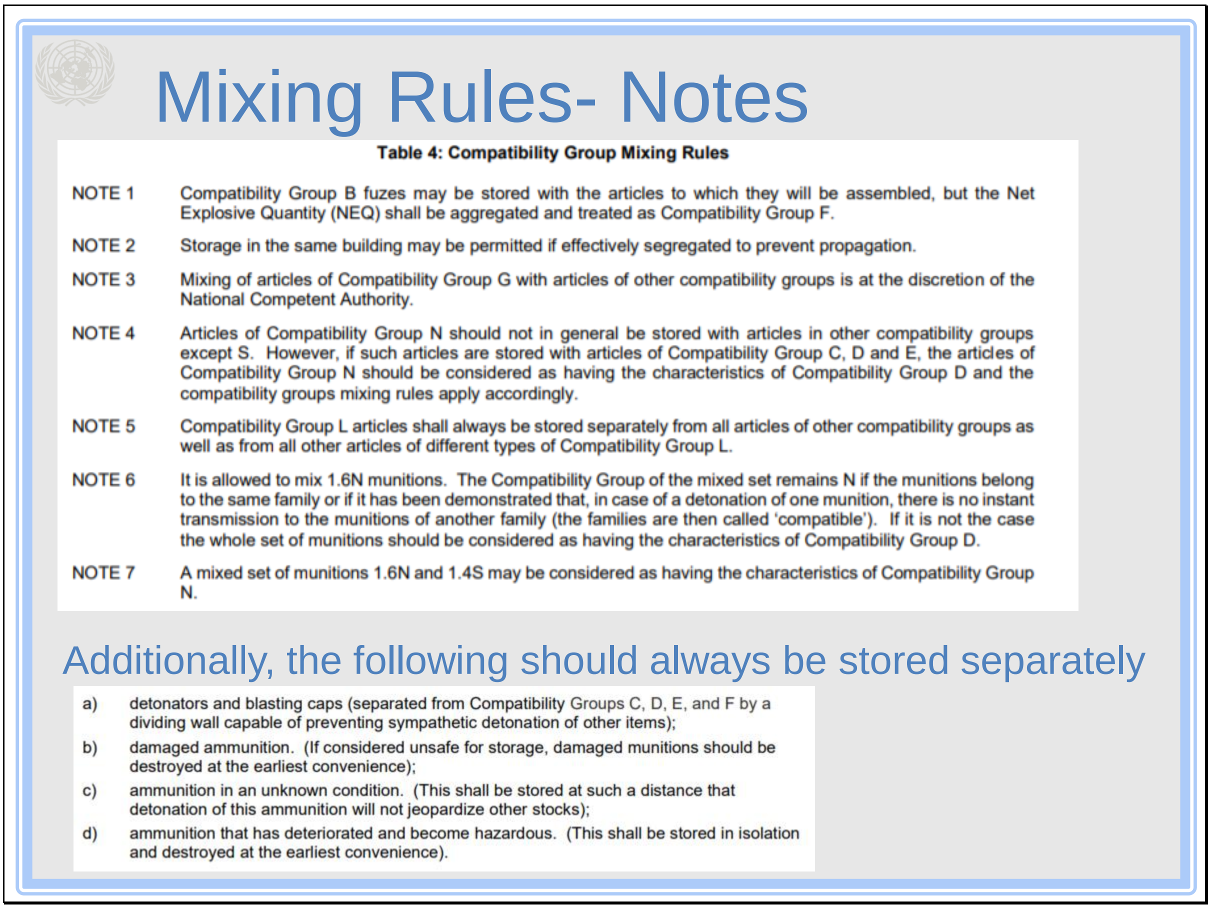
Compatibility Group ‘H’ items are incendiary items, for example mortar smoke bombs containing white phosphorous.

<u>participant activity</u>
- Ask questions to the class to ensure understanding.

References/further reading

http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Slide 31



# Mixing Rules- Notes

**Table 4: Compatibility Group Mixing Rules**

| | |
|---|---|
| NOTE 1 | Compatibility Group B fuzes may be stored with the articles to which they will be assembled, but the Net Explosive Quantity (NEQ) shall be aggregated and treated as Compatibility Group F. |
| NOTE 2 | Storage in the same building may be permitted if effectively segregated to prevent propagation. |
| NOTE 3 | Mixing of articles of Compatibility Group G with articles of other compatibility groups is at the discretion of the National Competent Authority. |
| NOTE 4 | Articles of Compatibility Group N should not in general be stored with articles in other compatibility groups except S. However, if such articles are stored with articles of Compatibility Group C, D and E, the articles of Compatibility Group N should be considered as having the characteristics of Compatibility Group D and the compatibility groups mixing rules apply accordingly. |
| NOTE 5 | Compatibility Group L articles shall always be stored separately from all articles of other compatibility groups as well as from all other articles of different types of Compatibility Group L. |
| NOTE 6 | It is allowed to mix 1.6N munitions. The Compatibility Group of the mixed set remains N if the munitions belong to the same family or if it has been demonstrated that, in case of a detonation of one munition, there is no instant transmission to the munitions of another family (the families are then called 'compatible'). If it is not the case the whole set of munitions should be considered as having the characteristics of Compatibility Group D. |
| NOTE 7 | A mixed set of munitions 1.6N and 1.4S may be considered as having the characteristics of Compatibility Group N. |

## Additionally, the following should always be stored separately

a) detonators and blasting caps (separated from Compatibility Groups C, D, E, and F by a dividing wall capable of preventing sympathetic detonation of other items);

b) damaged ammunition. (If considered unsafe for storage, damaged munitions should be destroyed at the earliest convenience);

c) ammunition in an unknown condition. (This shall be stored at such a distance that detonation of this ammunition will not jeopardize other stocks);

d) ammunition that has deteriorated and become hazardous. (This shall be stored in isolation and destroyed at the earliest convenience).

**<u>Main idea/objective for slide:</u>**
**Explain what compatibility mixing rules Notes are and how they are applied, using the 'Mixing Rules'.**

<u>What the instructor should cover (in addition to slide content)</u>
Conventional ammunition should be stored in accordance with these mixing rules. This table is in the IATG, specifically at IATG 01:50. Note that this applies to 'fixed' ammunition storage sites, for example a base ammunition depot, or similar.

Compatibility Group 'B' items are those like detonators. Compatibility Group 'S' items are things like SAA Ball ammunition.

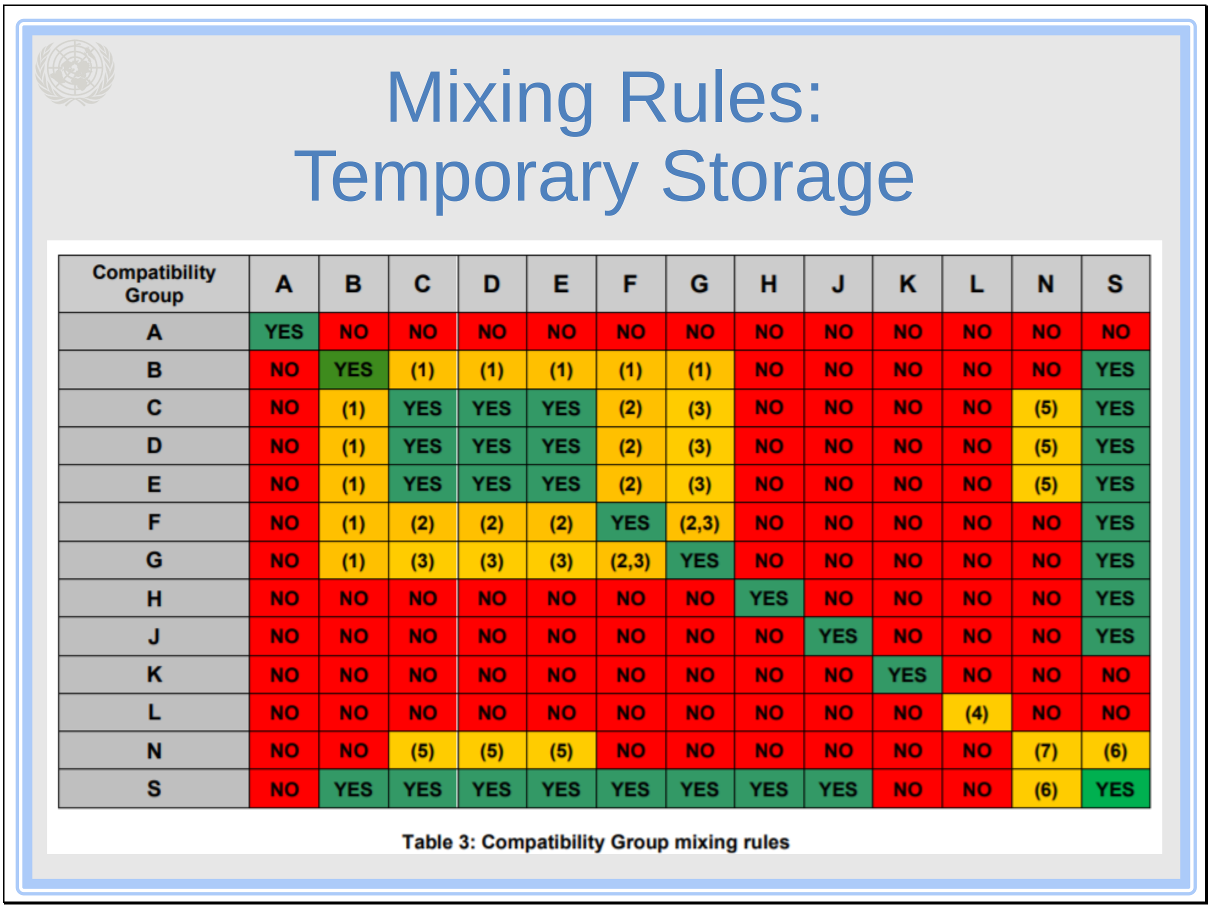
Compatibility Group 'H' items are incendiary items, for example mortar smoke bombs containing white phosphorous.

<u>participant activity</u>

- Ask questions to the class to ensure understanding.

References/further reading
http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Slide 32



# Mixing Rules: Temporary Storage

| Compatibility Group | A | B | C | D | E | F | G | H | J | K | L | N | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | YES | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| B | NO | YES | (1) | (1) | (1) | (1) | (1) | NO | NO | NO | NO | NO | YES |
| C | NO | (1) | YES | YES | YES | (2) | (3) | NO | NO | NO | NO | (5) | YES |
| D | NO | (1) | YES | YES | YES | (2) | (3) | NO | NO | NO | NO | (5) | YES |
| E | NO | (1) | YES | YES | YES | (2) | (3) | NO | NO | NO | NO | (5) | YES |
| F | NO | (1) | (2) | (2) | (2) | YES | (2,3) | NO | NO | NO | NO | NO | YES |
| G | NO | (1) | (3) | (3) | (3) | (2,3) | YES | NO | NO | NO | NO | NO | YES |
| H | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO | NO | YES |
| J | NO | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO | YES |
| K | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO |
| L | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | (4) | NO | NO |
| N | NO | NO | (5) | (5) | (5) | NO | NO | NO | NO | NO | NO | (7) | (6) |
| S | NO | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | (6) | YES |

Table 3: Compatibility Group mixing rules

**<u>Main idea/objective for slide:</u>**
**Explain what compatibility mixing rules are and how they are applied, using the 'Mixing Rules Table for Field Storage'.**

<u>What the instructor should cover (in addition to slide content)</u>
Temporary storage presents its own challenges.

A larger safety area will also often be necessary, to ensure explosive safety for neighbouring civilian populations. There will also be security issues to be addressed as the ground area is necessarily larger than that used for permanent ammunition storage facilities.

This table is different from the 'standard' mixing rules.

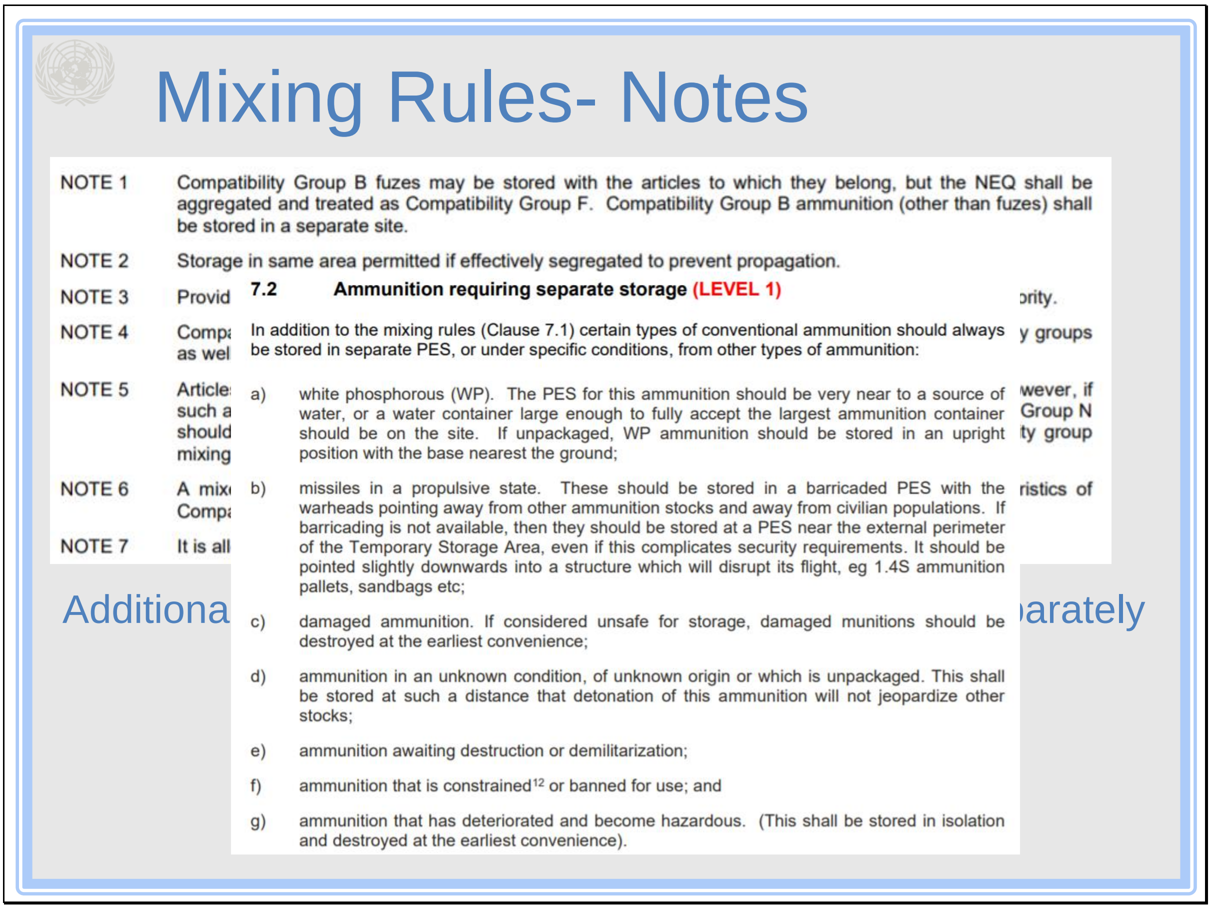
The principle is the same.  It is however important to use the correct table, depending on the situation.

participant activity

- Ask questions to the class to ensure understanding.

References/further reading

IATG 04.10 Temporary Storage



# Mixing Rules- Notes

NOTE 1 Compatibility Group B fuzes may be stored with the articles to which they belong, but the NEQ shall be aggregated and treated as Compatibility Group F. Compatibility Group B ammunition (other than fuzes) shall be stored in a separate site.

NOTE 2 Storage in same area permitted if effectively segregated to prevent propagation.

NOTE 3 Provid … ority.

NOTE 4 Compa … y groups as wel

NOTE 5 Article … wever, if such a … Group N should … ty group mixing

NOTE 6 A mix … ristics of Compa

NOTE 7 It is all

Additiona … arately

**7.2 Ammunition requiring separate storage (LEVEL 1)**

In addition to the mixing rules (Clause 7.1) certain types of conventional ammunition should always be stored in separate PES, or under specific conditions, from other types of ammunition:

a) white phosphorous (WP). The PES for this ammunition should be very near to a source of water, or a water container large enough to fully accept the largest ammunition container should be on the site. If unpackaged, WP ammunition should be stored in an upright position with the base nearest the ground;

b) missiles in a propulsive state. These should be stored in a barricaded PES with the warheads pointing away from other ammunition stocks and away from civilian populations. If barricading is not available, then they should be stored at a PES near the external perimeter of the Temporary Storage Area, even if this complicates security requirements. It should be pointed slightly downwards into a structure which will disrupt its flight, eg 1.4S ammunition pallets, sandbags etc;

c) damaged ammunition. If considered unsafe for storage, damaged munitions should be destroyed at the earliest convenience;

d) ammunition in an unknown condition, of unknown origin or which is unpackaged. This shall be stored at such a distance that detonation of this ammunition will not jeopardize other stocks;

e) ammunition awaiting destruction or demilitarization;

f) ammunition that is constrained[12] or banned for use; and

g) ammunition that has deteriorated and become hazardous. (This shall be stored in isolation and destroyed at the earliest convenience).

**Main idea/objective for slide:**

**Explain what compatibility mixing rules Notes are and how they are applied, using the 'Mixing Rules'.**

What the instructor should cover (in addition to slide content)

Conventional ammunition should be stored in accordance with these mixing rules. This table is in the IATG, specifically at IATG 04.10. Note that this applies to 'temporary' ammunition storage sites, for example a UN Mission operating base, or similar.

Compatibility Group 'B' items are those like detonators. Compatibility Group 'S' items are things like SAA Ball ammunition.

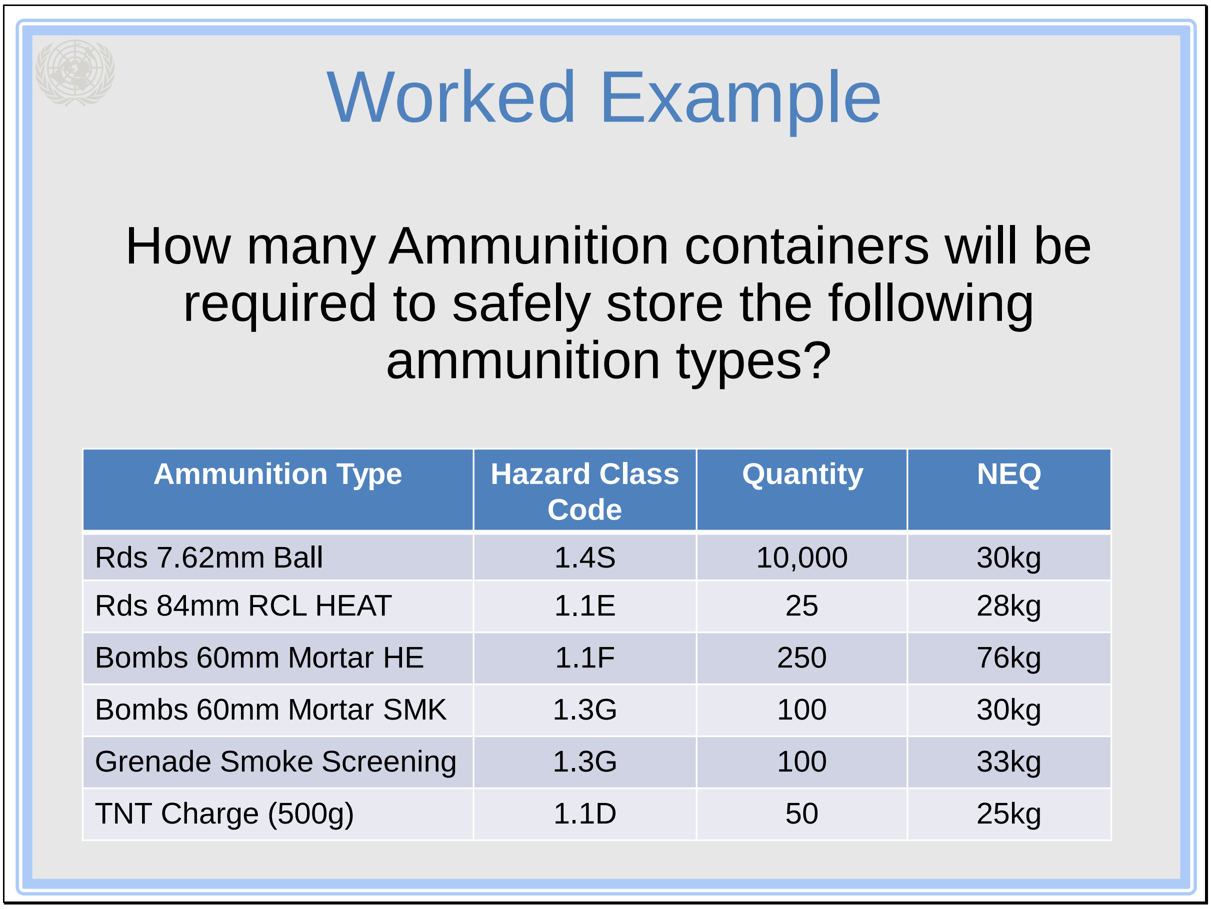
Compatibility Group 'H' items are incendiary items, for example mortar smoke bombs containing white phosphorous.

participant activity

- Ask questions to the class to ensure understanding.

References/further reading
http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf

Slide 34



# Worked Example

How many Ammunition containers will be required to safely store the following ammunition types?

| Ammunition Type | Hazard Class Code | Quantity | NEQ |
|---|---|---|---|
| Rds 7.62mm Ball | 1.4S | 10,000 | 30kg |
| Rds 84mm RCL HEAT | 1.1E | 25 | 28kg |
| Bombs 60mm Mortar HE | 1.1F | 250 | 76kg |
| Bombs 60mm Mortar SMK | 1.3G | 100 | 30kg |
| Grenade Smoke Screening | 1.3G | 100 | 33kg |
| TNT Charge (500g) | 1.1D | 50 | 25kg |

**Main idea/objective for slide:**
**Provide a range of examples, highlighting how the mixing rules work.**

What the instructor should cover (in addition to slide content)
Complete a worked-out example on applying mixing rules for a storage container.
Work through this example and ask questions to the participants regularly.

participant activity

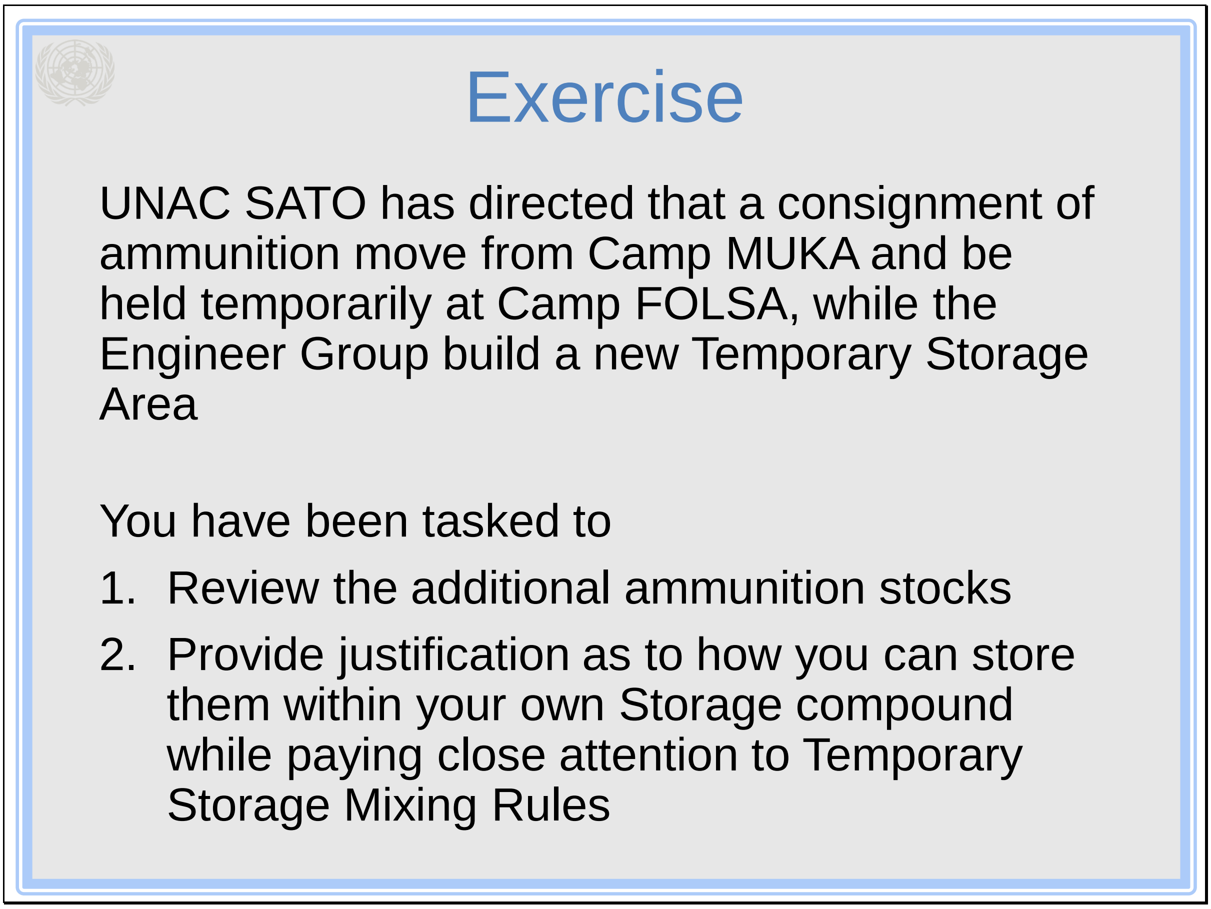
- Ask questions to the class to ensure understanding.

Slide 35

participant
Exercise

**Phase 2. Development (**Time allocation - 70 min**)**

Stage 3 (Time allocation 20 mins) – participant Exercise



## Exercise

UNAC SATO has directed that a consignment of ammunition move from Camp MUKA and be held temporarily at Camp FOLSA, while the Engineer Group build a new Temporary Storage Area

You have been tasked to

1. Review the additional ammunition stocks
2. Provide justification as to how you can store them within your own Storage compound while paying close attention to Temporary Storage Mixing Rules

**<u>Main idea/objective for slide:</u>**
**participant exercise using the CARANA scenario to identify the various Hazard Classification Codes and Fire Divisions for a range of ammunition natures deployed on a UN mission.**

<u>What the instructor should cover (in addition to slide content)</u>

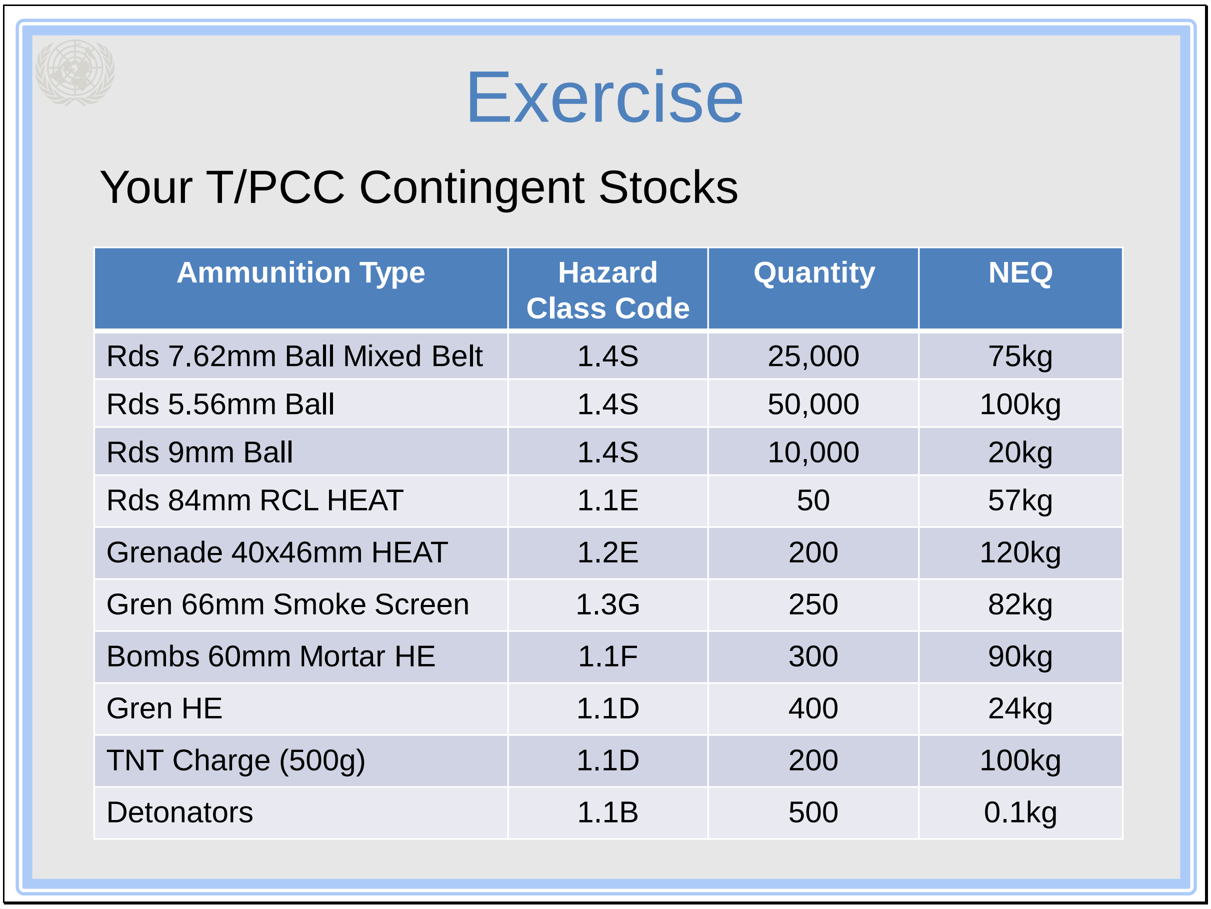
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions

<u>participant activity</u>

- participants must identify the compatibility groups and use the Mixing Rules Table for Field Storage for both ammunition natures that are currently being stored in their own camp and integrate the additional ammunition stores arriving from Camp MUKA

- participants must provide a rationale as to how they decided on the mixing of these ammunition natures and explain how many ammunition containers they will require to hold the complete stock.

Slide 37



# Exercise

Your T/PCC Contingent Stocks

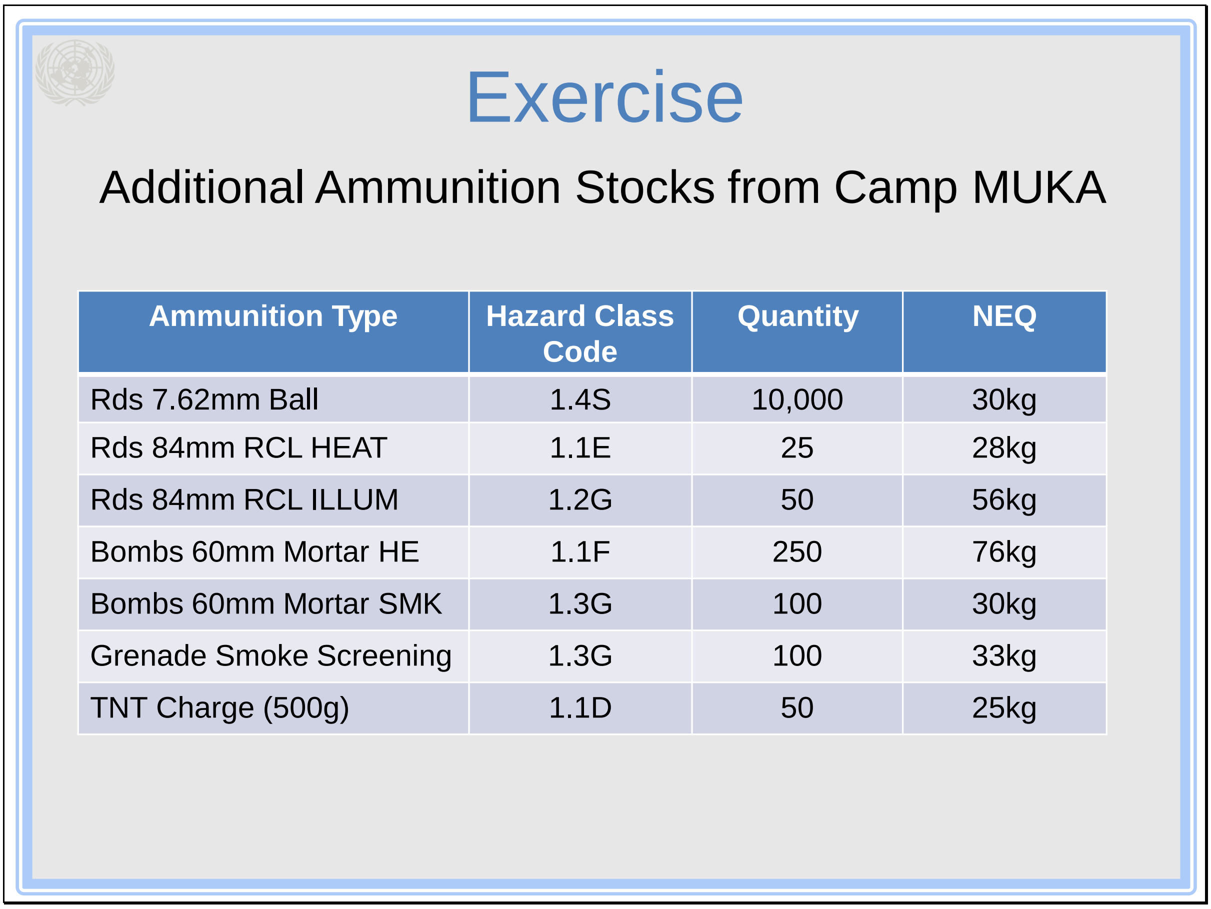
| Ammunition Type | Hazard Class Code | Quantity | NEQ |
|---|---|---|---|
| Rds 7.62mm Ball Mixed Belt | 1.4S | 25,000 | 75kg |
| Rds 5.56mm Ball | 1.4S | 50,000 | 100kg |
| Rds 9mm Ball | 1.4S | 10,000 | 20kg |
| Rds 84mm RCL HEAT | 1.1E | 50 | 57kg |
| Grenade 40x46mm HEAT | 1.2E | 200 | 120kg |
| Gren 66mm Smoke Screen | 1.3G | 250 | 82kg |
| Bombs 60mm Mortar HE | 1.1F | 300 | 90kg |
| Gren HE | 1.1D | 400 | 24kg |
| TNT Charge (500g) | 1.1D | 200 | 100kg |
| Detonators | 1.1B | 500 | 0.1kg |

**Main idea/objective for slide:**
**participant exercise using the CARANA scenario to identify the various Hazard Class Codes and Fire Divisions for a range of ammunition natures deployed on a UN mission.**

What the instructor should cover (in addition to slide content)
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions

participant activity
- participants must identify the compatibility groups and use the Mixing Rules Table for Field Storage for both ammunition natures that are currently being stored in their own camp and integrate the additional ammunition stores arriving from Camp MUKA

- participants must provide a rationale as to how they decided on the mixing of these ammunition natures and explain how many ammunition containers they will require to hold the complete stock.



# Exercise

## Additional Ammunition Stocks from Camp MUKA

| Ammunition Type | Hazard Class Code | Quantity | NEQ |
|---|---|---|---|
| Rds 7.62mm Ball | 1.4S | 10,000 | 30kg |
| Rds 84mm RCL HEAT | 1.1E | 25 | 28kg |
| Rds 84mm RCL ILLUM | 1.2G | 50 | 56kg |
| Bombs 60mm Mortar HE | 1.1F | 250 | 76kg |
| Bombs 60mm Mortar SMK | 1.3G | 100 | 30kg |
| Grenade Smoke Screening | 1.3G | 100 | 33kg |
| TNT Charge (500g) | 1.1D | 50 | 25kg |

**Main idea/objective for slide:**
**participant exercise using the CARANA scenario to identify the various Hazard Class Codes and Fire Divisions for a range of ammunition natures deployed on a UN mission.**

What the instructor should cover (in addition to slide content)

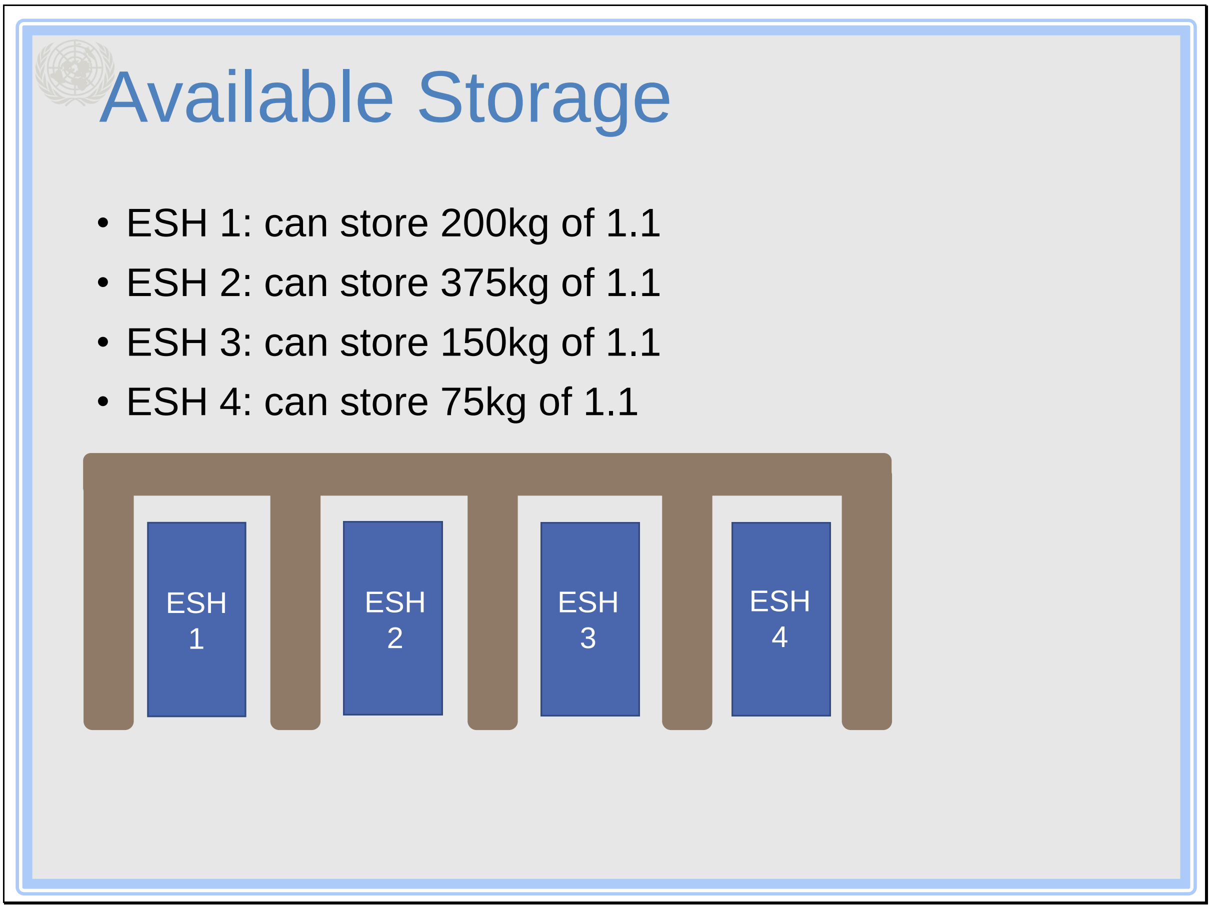
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions
- The instructor can add more exercises if required by improvising new lists of ammunition.

participant activity

- participants must identify the compatibility groups and use the Mixing Rules Table for Field Storage for both ammunition natures that are currently being stored in their own camp and integrate the additional ammunition stores arriving from Camp MUKA

- participants must provide a rationale as to how they decided on the mixing of these ammunition natures and explain how many ammunition containers they will require to hold the complete stock.

Slide 39



# Available Storage

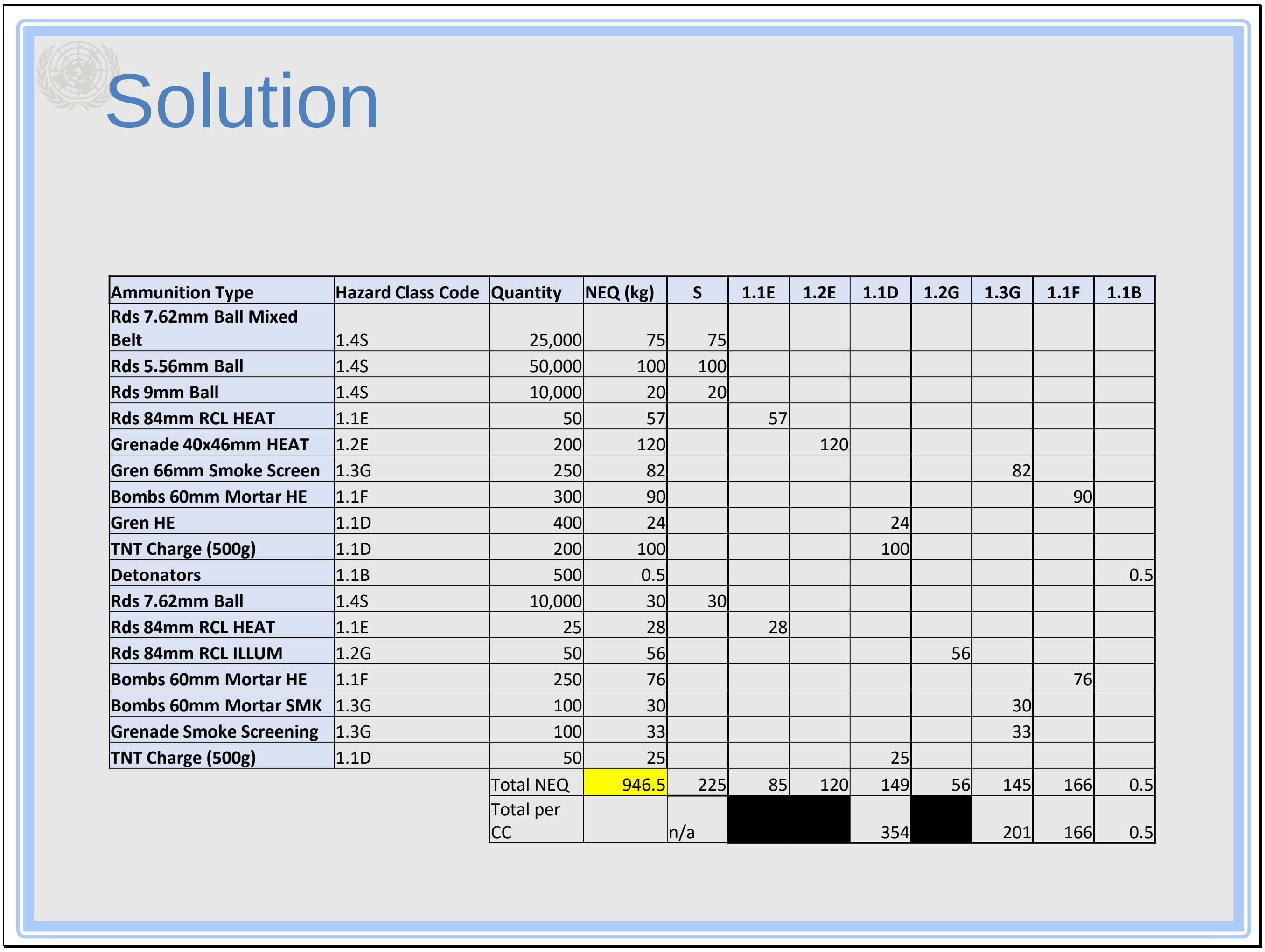
- ESH 1: can store 200kg of 1.1
- ESH 2: can store 375kg of 1.1
- ESH 3: can store 150kg of 1.1
- ESH 4: can store 75kg of 1.1

ESH 1

ESH 2

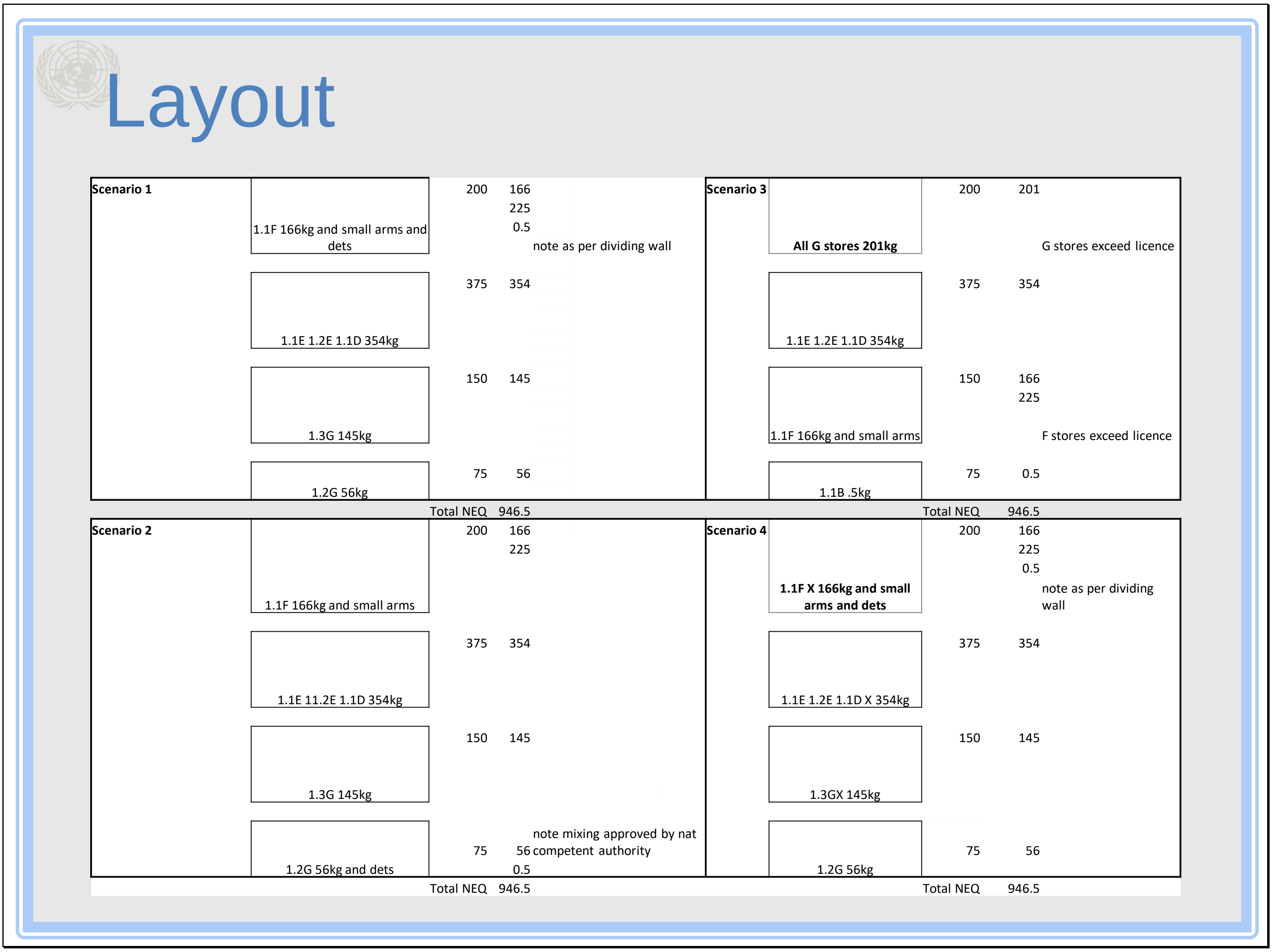
ESH 3

ESH 4



# Solution

| Ammunition Type | Hazard Class Code | Quantity | NEQ (kg) | S | 1.1E | 1.2E | 1.1D | 1.2G | 1.3G | 1.1F | 1.1B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Rds 7.62mm Ball Mixed Belt | 1.4S | 25,000 | 75 | 75 | | | | | | | |
| Rds 5.56mm Ball | 1.4S | 50,000 | 100 | 100 | | | | | | | |
| Rds 9mm Ball | 1.4S | 10,000 | 20 | 20 | | | | | | | |
| Rds 84mm RCL HEAT | 1.1E | 50 | 57 | | 57 | | | | | | |
| Grenade 40x46mm HEAT | 1.2E | 200 | 120 | | | 120 | | | | | |
| Gren 66mm Smoke Screen | 1.3G | 250 | 82 | | | | | | 82 | | |
| Bombs 60mm Mortar HE | 1.1F | 300 | 90 | | | | | | | 90 | |
| Gren HE | 1.1D | 400 | 24 | | | | 24 | | | | |
| TNT Charge (500g) | 1.1D | 200 | 100 | | | | 100 | | | | |
| Detonators | 1.1B | 500 | 0.5 | | | | | | | | 0.5 |
| Rds 7.62mm Ball | 1.4S | 10,000 | 30 | 30 | | | | | | | |
| Rds 84mm RCL HEAT | 1.1E | 25 | 28 | | 28 | | | | | | |
| Rds 84mm RCL ILLUM | 1.2G | 50 | 56 | | | | | 56 | | | |
| Bombs 60mm Mortar HE | 1.1F | 250 | 76 | | | | | | | 76 | |
| Bombs 60mm Mortar SMK | 1.3G | 100 | 30 | | | | | | 30 | | |
| Grenade Smoke Screening | 1.3G | 100 | 33 | | | | | | 33 | | |
| TNT Charge (500g) | 1.1D | 50 | 25 | | | | 25 | | | | |
| | | Total NEQ | 946.5 | 225 | 85 | 120 | 149 | 56 | 145 | 166 | 0.5 |
| | | Total per CC | | n/a | | | 354 | | 201 | 166 | 0.5 |



# Layout

**Scenario 1**

| | | | |
|---|---|---|---|
| 1.1F 166kg and small arms and dets | 200 | 166<br>225<br>0.5 | note as per dividing wall |
| 1.1E 1.2E 1.1D 354kg | 375 | 354 | |
| 1.3G 145kg | 150 | 145 | |
| 1.2G 56kg | 75 | 56 | |
| | Total NEQ | 946.5 | |

**Scenario 3**

| | | | |
|---|---|---|---|
| **All G stores 201kg** | 200 | 201 | G stores exceed licence |
| 1.1E 1.2E 1.1D 354kg | 375 | 354 | |
| 1.1F 166kg and small arms | 150 | 166<br>225 | F stores exceed licence |
| 1.1B .5kg | 75 | 0.5 | |
| | Total NEQ | 946.5 | |

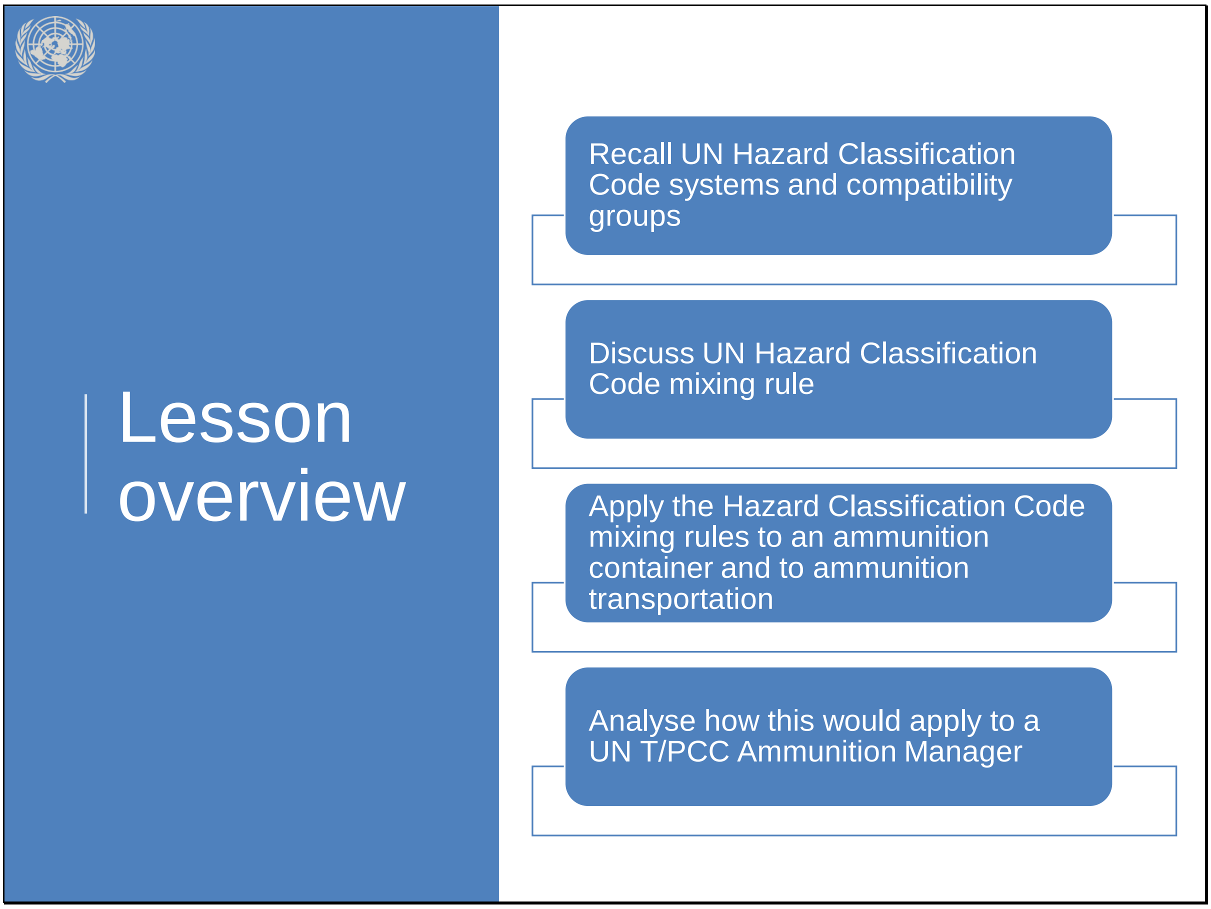
**Scenario 2**

| | | | |
|---|---|---|---|
| 1.1F 166kg and small arms | 200 | 166<br>225 | |
| 1.1E 11.2E 1.1D 354kg | 375 | 354 | |
| 1.3G 145kg | 150 | 145 | |
| 1.2G 56kg and dets | 75 | 56<br>0.5 | note mixing approved by nat competent authority |
| | Total NEQ | 946.5 | |

**Scenario 4**

| | | | |
|---|---|---|---|
| **1.1F X 166kg and small arms and dets** | 200 | 166<br>225<br>0.5 | note as per dividing wall |
| 1.1E 1.2E 1.1D X 354kg | 375 | 354 | |
| 1.3GX 145kg | 150 | 145 | |
| 1.2G 56kg | 75 | 56 | |
| | Total NEQ | 946.5 | |

Slide 42



Lesson overview

- Recall UN Hazard Classification Code systems and compatibility groups
- Discuss UN Hazard Classification Code mixing rule
- Apply the Hazard Classification Code mixing rules to an ammunition container and to ammunition transportation
- Analyse how this would apply to a UN T/PCC Ammunition Manager

## Summary

This training session aimed to equip participants with the knowledge and skills necessary to understand and recognize Hazard Classification Codes associated with explosive materials. Key learning points included:

- Review and remember the UN Hazard Classification Code systems and compatibility groups relevant to explosive materials.
- Engage in discussions about the mixing rules associated with UN Hazard Classification Codes to ensure safe storage, transportation, and packaging of explosive materials.
- Practice applying Hazard Classification Code mixing rules to correctly store, transport, and package explosive and ammunition natures, ensuring compliance with safety standards.
- Analyze and understand the application of Hazard Classification Code mixing rules in the role of a UN T/PCC Ammunition Manager, emphasizing the importance of adherence to safety protocols.

Slide 43

Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Understanding Ammunition Management

**Main idea/objective for slide:**

Look ahead to the next lesson of the course:

Understanding Ammunition Management

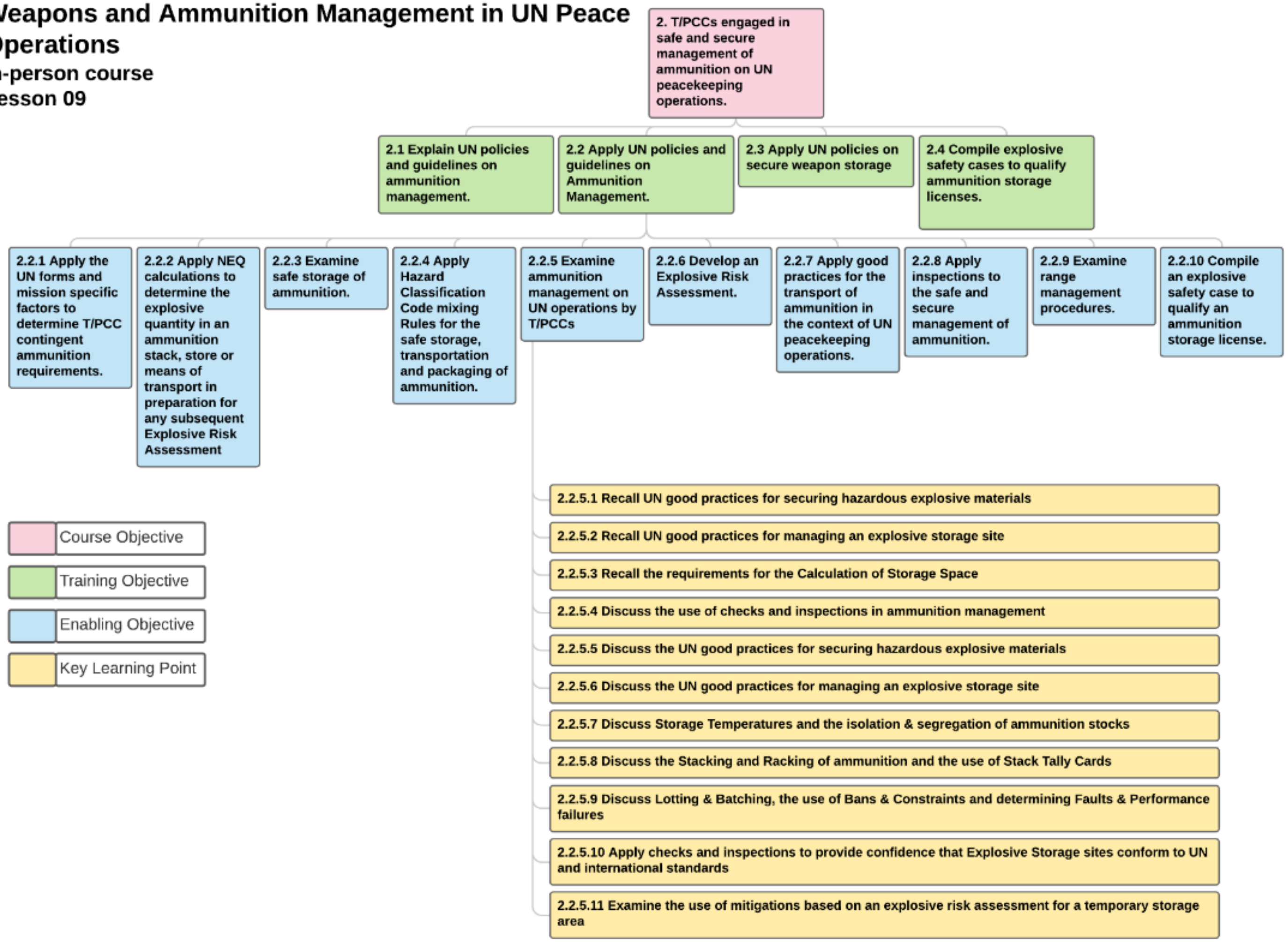
# Lesson
# 2.5

## Lesson 2.5: Understanding Ammunition Management

**Weapons and Ammunition Management in UN Peace Operations**

**In-person course**

**Lesson 09**



2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.

- 2.1 Explain UN policies and guidelines on ammunition management.
- 2.2 Apply UN policies and guidelines on Ammunition Management.
  - 2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.
  - 2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment
  - 2.2.3 Examine safe storage of ammunition.
  - 2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.
  - 2.2.5 Examine ammunition management on UN operations by T/PCCs
    - 2.2.5.1 Recall UN good practices for securing hazardous explosive materials
    - 2.2.5.2 Recall UN good practices for managing an explosive storage site
    - 2.2.5.3 Recall the requirements for the Calculation of Storage Space
    - 2.2.5.4 Discuss the use of checks and inspections in ammunition management
    - 2.2.5.5 Discuss the UN good practices for securing hazardous explosive materials
    - 2.2.5.6 Discuss the UN good practices for managing an explosive storage site
    - 2.2.5.7 Discuss Storage Temperatures and the isolation & segregation of ammunition stocks
    - 2.2.5.8 Discuss the Stacking and Racking of ammunition and the use of Stack Tally Cards
    - 2.2.5.9 Discuss Lotting & Batching, the use of Bans & Constraints and determining Faults & Performance failures
    - 2.2.5.10 Apply checks and inspections to provide confidence that Explosive Storage sites conform to UN and international standards
    - 2.2.5.11 Examine the use of mitigations based on an explosive risk assessment for a temporary storage area
  - 2.2.6 Develop an Explosive Risk Assessment.
  - 2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.
  - 2.2.8 Apply inspections to the safe and secure management of ammunition.
  - 2.2.9 Examine range management procedures.
  - 2.2.10 Compile an explosive safety case to qualify an ammunition storage license.
- 2.3 Apply UN policies on secure weapon storage
- 2.4 Compile explosive safety cases to qualify ammunition storage licenses.

| | |
|---|---|
| 🟪 | Course Objective |
| 🟩 | Training Objective |
| 🟦 | Enabling Objective |
| 🟨 | Key Learning Point |

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L09. Understanding Ammunition Management |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 180 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.5 Examine ammunition management on UN operations by T/PCCs | 2.2.5.1 Recall UN good practices for securing hazardous explosive materials<br>2.2.5.2 Recall UN good practices for managing an explosive storage site<br>2.2.5.3 Recall the requirements for the Calculation of Storage Space<br>2.2.5.4 Discuss the use of checks and inspections in ammunition management<br>2.2.5.5 Discuss the UN good practices for securing hazardous explosive materials<br>2.2.5.6 Discuss the UN good practices for managing an explosive storage site<br>2.2.5.7 Discuss Storage Temperatures and the isolation & segregation of ammunition stocks<br>2.2.5.8 Discuss the Stacking and Racking of ammunition and the use of Stack Tally Cards<br>2.2.5.9 Discuss Lotting & Batching, the use of Bans & Constraints and determining Faults & Performance failures<br>2.2.5.10 Apply checks and inspections to provide confidence that Explosive Storage sites conform to UN and international standards<br>2.2.5.11 Examine the use of mitigations based on an explosive risk assessment for a temporary storage area |

| | |
|---|---|
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Examine ammunition management on UN operations by T/PCCs |
| **Assessment Criteria:** | There is no final assessment for this exercise, however, Instructors will use informal class discussion, questioning of participants and review the work by the participants to enable a positive feedback loop to be established to enhance the effectiveness of the learning. |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | 1:6 in syndicates. Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom |
| **Instructional tools & materials** | Calculators, projector and screen, flipchart, whiteboard<br>10-15 Images needed of an explosive storage area, barricades, fencing and Containers/buildings required for participant exercise |
| **Participant Resources:** | Full size printouts of some slides where required – see slide notes for details. E.g. Explosive Storehouse Inspection matrix template |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: Health and safety checklist for classrooms (hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

# SECTION 2: LESSON PLAN

## Executive summary:

During this lesson participants will examine further ammunition management on UN operations by T/PCCs. They will recall UN good practices for securing explosive materials, the management of an explosive storage site, and the requirements for the Calculation of Storage Space. They will discuss the use of checks and inspections in ammunition management, along with the UN good practices for securing hazardous explosive materials and for managing an explosive storage site. They will look in detail at Storage Temperatures and the isolation & segregation of ammunition stocks, the Stacking and Racking of ammunition and the use of Stack Tally Cards and determining Faults & Performance failures. They will apply these checks and inspections to provide confidence that Explosive Storage sites conform to UN and international standards and finally they will examine the use of mitigations based on an explosive risk assessment for a temporary storage area.

## Setup:

Phase 1, Phase 2 (stages 1 & 2) and Phase 3 will be delivered to the class as a single collective.

Phase 3 (stage 3) will be conducted in small groups (6-8 participants) each with a dedicated instructor.

## Conduct:

### Phase 1. Introduction (Time allocation - 20 min)

- Introduce the objectives of the lesson.
- The instructor is to hold a questions and answer session with the participants to discuss the range of good practices for security and associated explosives storage.
- Instructors should note these good points on a flipchart and post them to the wall for future reference.

### Phase 2. Development

Stage 1 (Time allocation 50 mins) – Managing ammunition stocks

- Provide the rationale and benefit of using lotting and batching markings and explain how they are used to identify ammunition and explosives.
- Using images and working in their groups, have the participants identify the relevant lots and batches of a range of munition natures.
- Introduce and explain the several types of ammunition stockpiles, their usefulness and where they may be used.
- Provide the participants with the definition of a stack and introduce them to the use of stack tally cards.

- Discuss with the class the requirement to accurately account for ammunition and explosives and highlight its benefits. Using a whiteboard ask the participants to list the possible negative effects of implementing poor or no accounting activities.
- Introduce and explain the Unit of Space concept and provide an example floor plan or model that demonstrates this concept.

Stage 2 (Time allocation 50 mins) – Inspections, Faults and Restrictions of ammunition

- Introduce the participants to the necessary inspection requirements for an ammunition store.
- Discuss the several types of internal and external inspections highlighting key areas to focus attention and the hazards to look out for.
- Show participants an example Explosive Storehouse Inspection matrix and demonstrate to the participants how to complete this.
- Describe and explain the following definitions giving examples in each case: ammunition accident; blind; misfire; fault; incident; and performance failure.
- Highlight the need to report and document each of these events accurately and how to complete the reporting procedure.
- Provide the definitions of a Ban and a Constraint in terms of ammunition management.
- Discuss the differences between a Ban and a Constraint and outline the actions to be carried out when these terms have been applied to ammunition.

Stage 3 (Time allocation 50 mins) – Participant exercise

- Using a series of images of a Temporary Storage Area and its stockpiles, ask the syndicate groups to conduct visual inspections of the images and complete the ESH Inspection Checklist (as provided as a handout during the lesson at Slide 28) for each Stockpile or storehouse.
- Participants must identify the hazards and make recommendations to mitigate the risks of these hazards.
- Instructors are to move around the class and help participants where required.
- When complete, work through the answers with the class and ask questions.

**Phase 3. Consolidation (Time allocation - 10 min)**

- Review Enabling objective and Key Learning points (see Section 1), drawing out any common themes
- Look ahead to the next lesson of the course:
    - Explosive Risk Assessment

Slide 1

Weapons and Ammunition Management in UN Peace Operations

# Understanding Ammunition Management

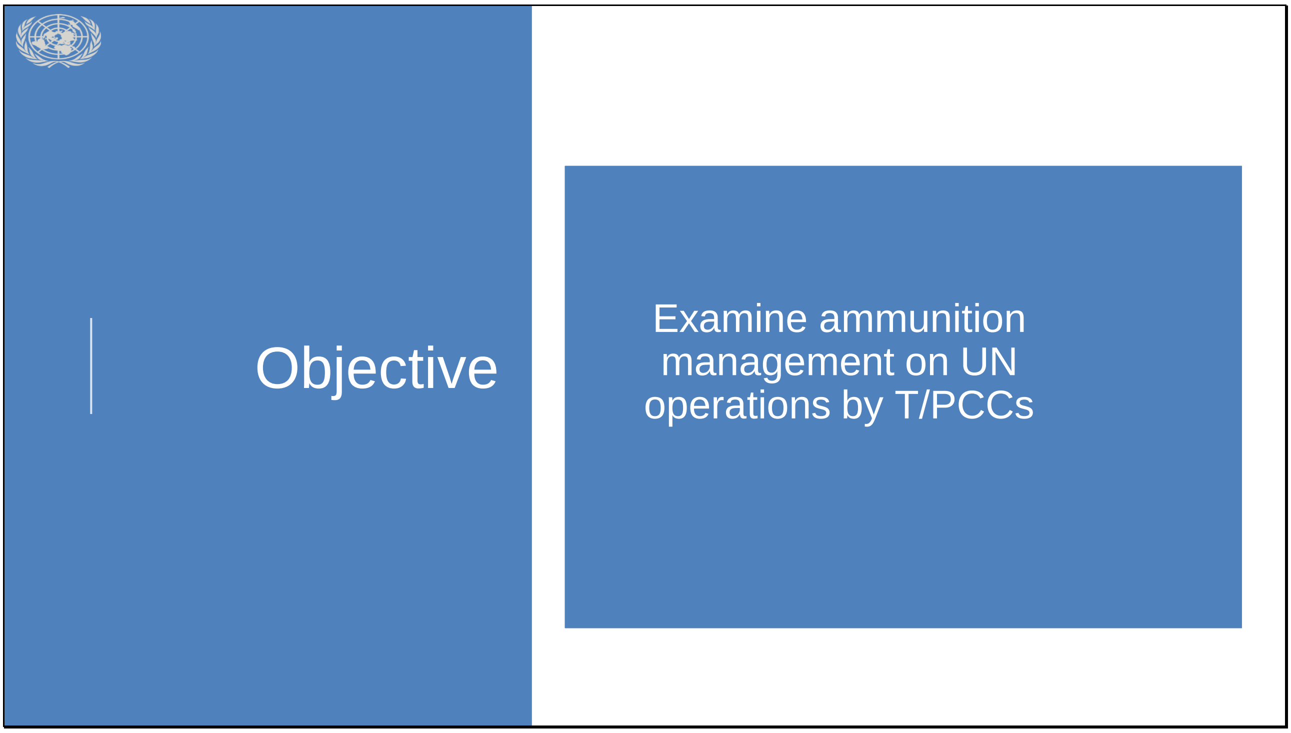
**Key Reference Documents for this lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

- http://data.unsaferguard.org/iatg/en/IATG-03.20-Lotting-batching-IATG-V.3.pdf
- http://data.unsaferguard.org/iatg/en/IATG-03.10-Inventory-management-IATG-V.3.pdf
- http://data.unsaferguard.org/iatg/en/IATG-06.70-Inspection-explosives-facilities-IATG-V.3.pdf
- http://data.unsaferguard.org/iatg/en/IATG-12.10-Multi-national-operations-IATG-V.3.pdf
- http://data.unsaferguard.org/iatg/en/IATG-01.60-Ammunition-faults-performance-failures-IATG-V.3.pdf
- http://data.unsaferguard.org/iatg/en/IATG-01.70-Bans-constraints-IATG-V.3.pdf

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2



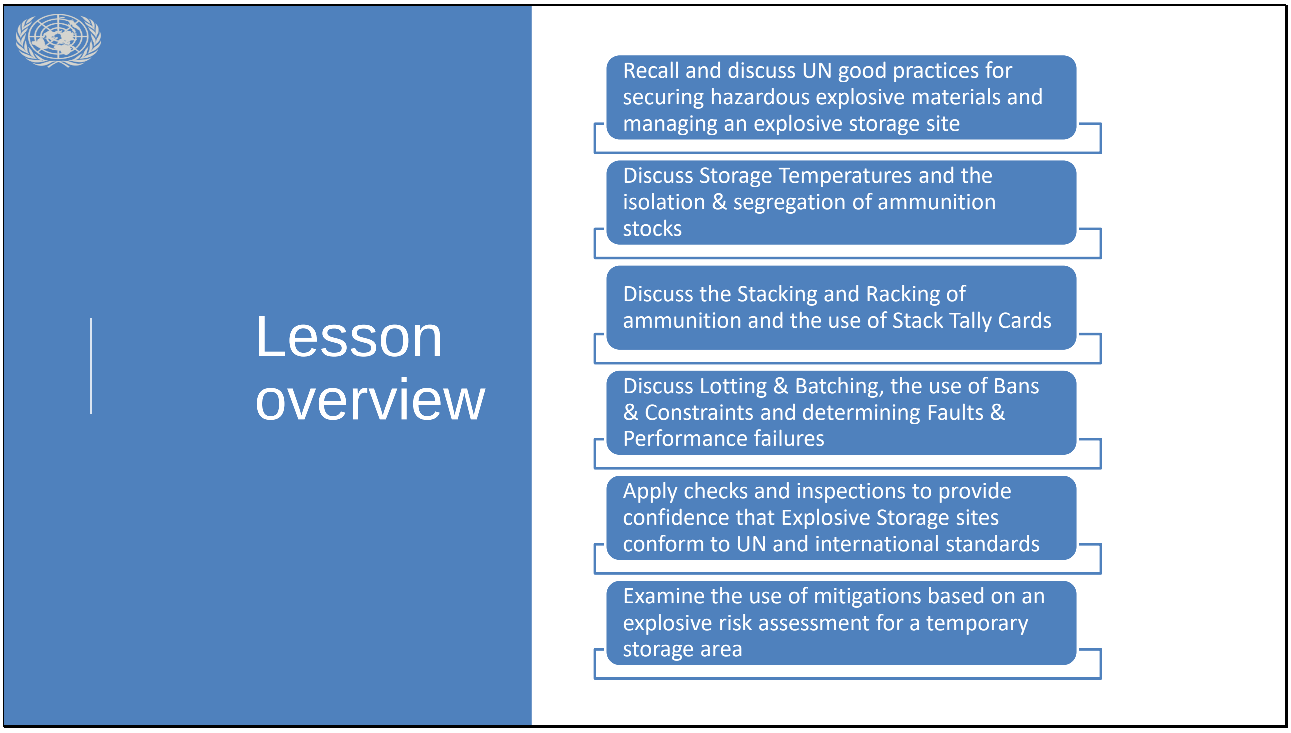
Objective

Examine ammunition management on UN operations by T/PCCs

**<u>Main idea/objective for slide:</u>**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.5 Examine ammunition management on UN operations by T/PCCs .)

<u>What the instructor should cover (in addition to slide content)</u>
By the end of this training session the participant will examine ammunition management on UN operations by T/PCCs

Slide 3



Lesson overview

- Recall and discuss UN good practices for securing hazardous explosive materials and managing an explosive storage site
- Discuss Storage Temperatures and the isolation & segregation of ammunition stocks
- Discuss the Stacking and Racking of ammunition and the use of Stack Tally Cards
- Discuss Lotting & Batching, the use of Bans & Constraints and determining Faults & Performance failures
- Apply checks and inspections to provide confidence that Explosive Storage sites conform to UN and international standards
- Examine the use of mitigations based on an explosive risk assessment for a temporary storage area

**Main idea/objective for slide:**
**Introduce the Key Learning Points**

What the instructor should cover (in addition to slide content)
Emphasise 'recall' – this is revisiting/revising content covered in the workbook

Key Learning Points
2.2.5.1 Recall UN good practices for securing hazardous explosive materials
2.2.5.2 Recall UN good practices for managing an explosive storage site
2.2.5.3 Recall the requirements for the Calculation of Storage Space
2.2.5.4 Discuss the use of checks and inspections in ammunition management
2.2.5.5 Discuss the UN good practices for securing hazardous explosive materials
2.2.5.6 Discuss the UN good practices for managing an explosive storage site
2.2.5.7 Discuss Storage Temperatures and the isolation & segregation of ammunition stocks
2.2.5.8 Discuss the Stacking and Racking of ammunition and the use of Stack Tally Cards
2.2.5.9 Discuss Lotting & Batching, the use of Bans & Constraints and determining Faults & Performance failures

2.2.5.10 Apply checks and inspections to provide confidence that Explosive Storage sites conform to UN and international standards
2.2.5.11 Examine the use of mitigations based on an explosive risk assessment for a temporary storage area

Slide 4

Good Practices for Security and Storage of Ammunition

**Phase 1. Introduction (**Time allocation - 20 min**)**

Slide 5

What do you think are good Ammunition Management practices?

**Phase 1. Introduction (**Time allocation - 20 min**)**

**<u>Main idea/objective for slide:</u>**
**Hold a question and answer session with the participants to discuss the range of good practices for security and associated explosives storage.**
**Discuss the what and why.**
**Include bad practice if time is available.**

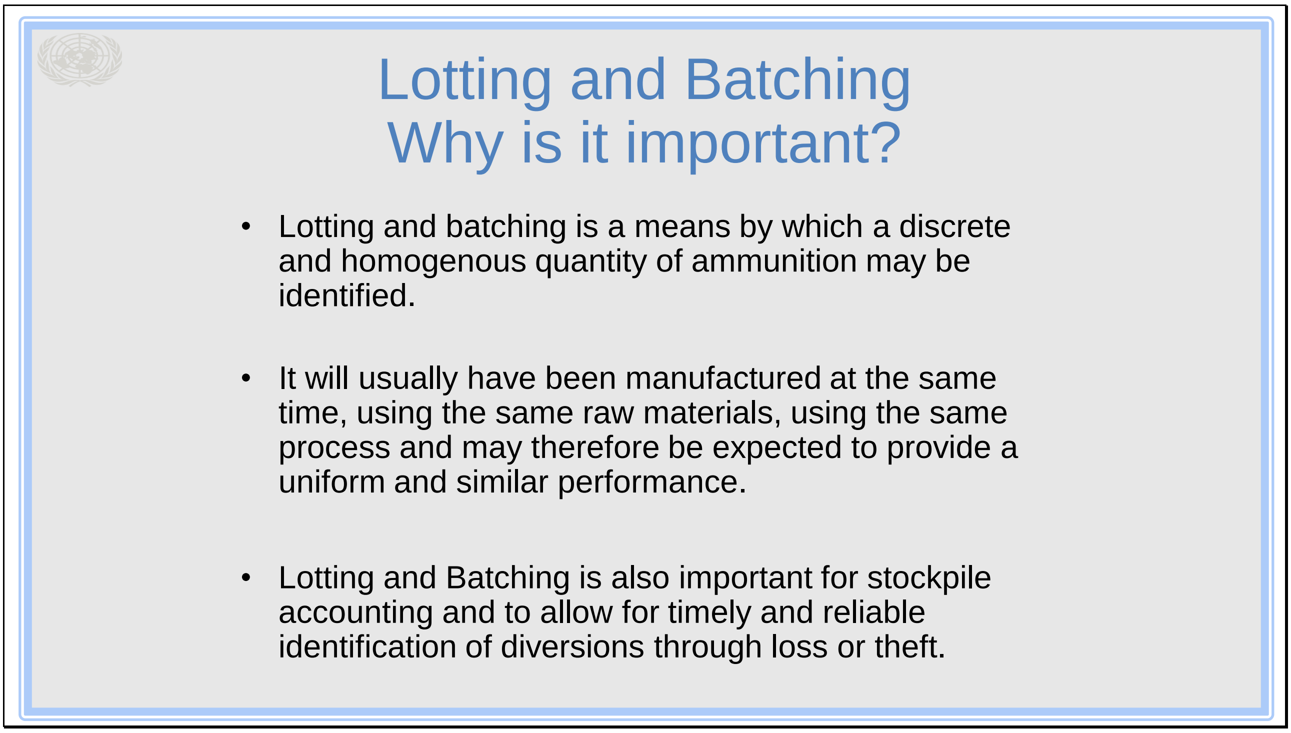
<u>What the instructor should cover (in addition to slide content)</u>
- Instructors should note these good points on a flipchart and post them to the wall for future reference.

Slide 6

Managing
Ammunition
Stocks

**Phase 2. Development (**Time allocation - 150 min**)**

Stage 1 (Time allocation 50 mins) – Managing Ammunition Stocks



## Lotting and Batching
## Why is it important?

- Lotting and batching is a means by which a discrete and homogenous quantity of ammunition may be identified.
- It will usually have been manufactured at the same time, using the same raw materials, using the same process and may therefore be expected to provide a uniform and similar performance.
- Lotting and Batching is also important for stockpile accounting and to allow for timely and reliable identification of diversions through loss or theft.

**Main idea/objective for slide:**
**Provide the rationale and benefit of using lotting and batching markings and explain how they are used to identify ammunition and explosives.**

**What the instructor should cover (in addition to slide content)**
Ask the participants what they believe to be the difference between Lotting and Batching and why it is important to know?

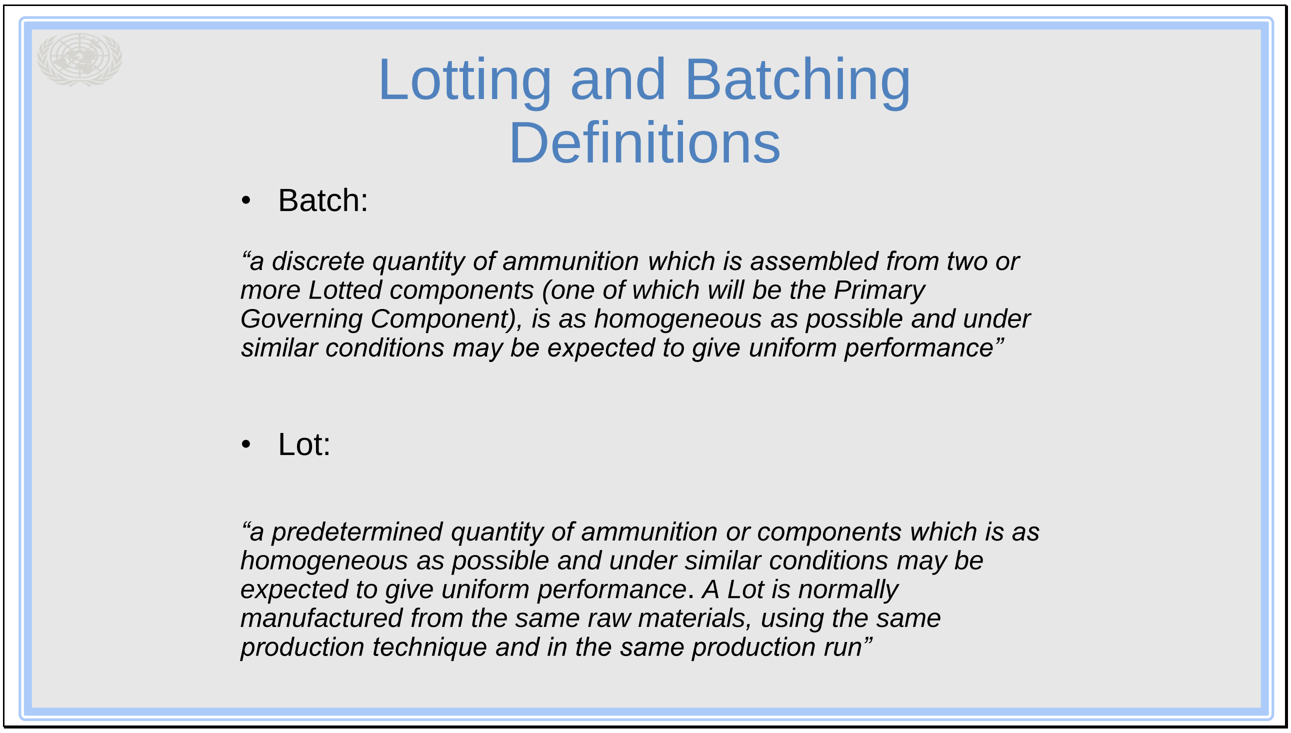
References/further reading
**IATG 03.20 – Lotting and Batching.** http://data.unsaferguard.org/iatg/en/IATG-03.20-Lotting-batching-IATG-V.3.pdf

- Ammunition and explosives may deteriorate more rapidly or become damaged unless they are correctly stored, handled and transported, with the resultant effect that they may fail to function as designed and may become dangerous in storage, handling, transport and use. It is therefore important that the location of specific items of ammunition and explosives can be rapidly identified in order that the appropriate remedial action can be taken to ensure safety during these activities. A system of Lotting and Batching is an important component of this safety mechanism.
- Lotting and batching is a means by which a discrete and homogenous quantity of ammunition may be identified. It will usually have been

manufactured at the same time, using the same raw materials, using the same process and may therefore be expected to provide a uniform and similar performance. Whether it is appropriate to use Lotting or Batching for an item of ammunition will normally depend upon the complexity of the ammunition (ie the number of different components) and will require technical judgment.

- Lotting and Batching is also important for stockpile accounting and to allow for timely and reliable identification of diversions through loss or theft.

Slide 8



## Lotting and Batching Definitions

- Batch:

*"a discrete quantity of ammunition which is assembled from two or more Lotted components (one of which will be the Primary Governing Component), is as homogeneous as possible and under similar conditions may be expected to give uniform performance"*

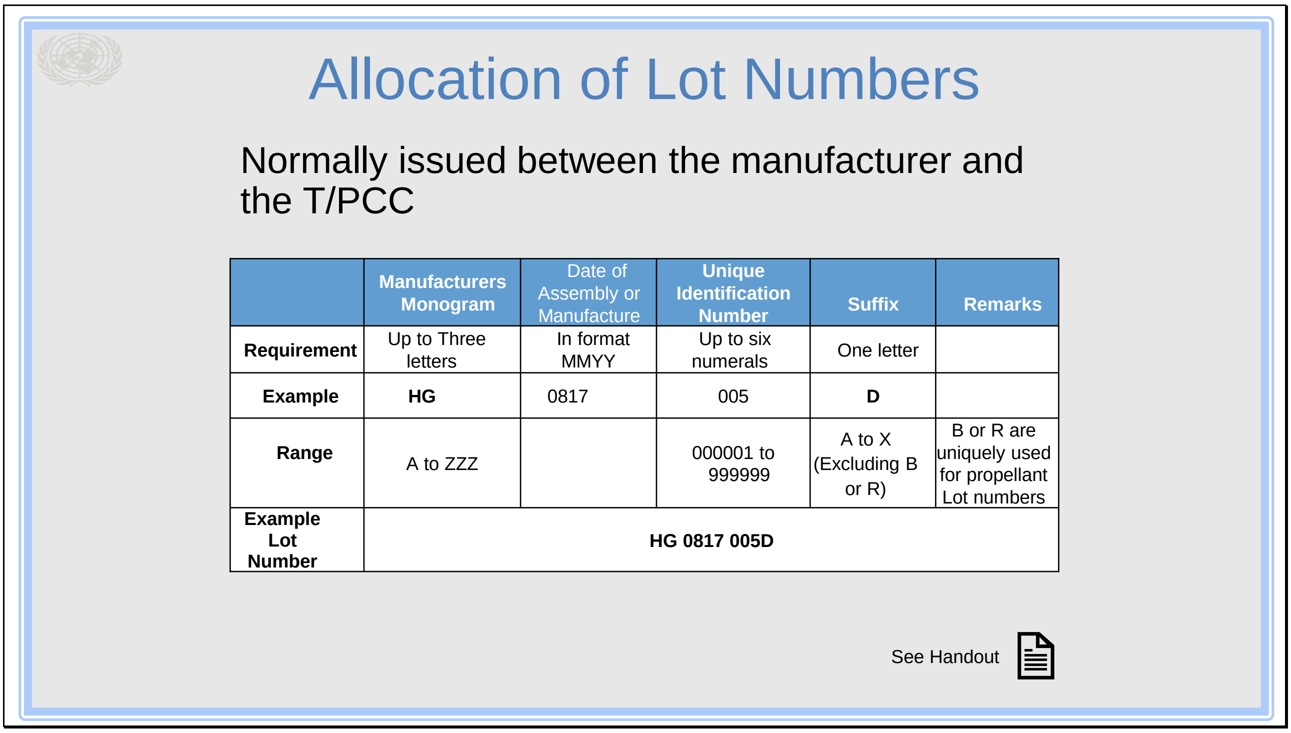
- Lot:

*"a predetermined quantity of ammunition or components which is as homogeneous as possible and under similar conditions may be expected to give uniform performance. A Lot is normally manufactured from the same raw materials, using the same production technique and in the same production run"*

**Main idea/objective for slide:**
**Define Batch and Lot**

References/further reading
**IATG 03.20 – Lotting and Batching**

Slide 9



# Allocation of Lot Numbers

Normally issued between the manufacturer and the T/PCC

| | Manufacturers Monogram | Date of Assembly or Manufacture | Unique Identification Number | Suffix | Remarks |
|---|---|---|---|---|---|
| **Requirement** | Up to Three letters | In format MMYY | Up to six numerals | One letter | |
| **Example** | **HG** | 0817 | 005 | **D** | |
| **Range** | A to ZZZ | | 000001 to 999999 | A to X (Excluding B or R) | B or R are uniquely used for propellant Lot numbers |
| **Example Lot Number** | **HG 0817 005D** | | | | |

See Handout

**Main idea/objective for slide:**

**Explain allocation of Lot numbers, with example**

What the instructor should cover (in addition to slide content)

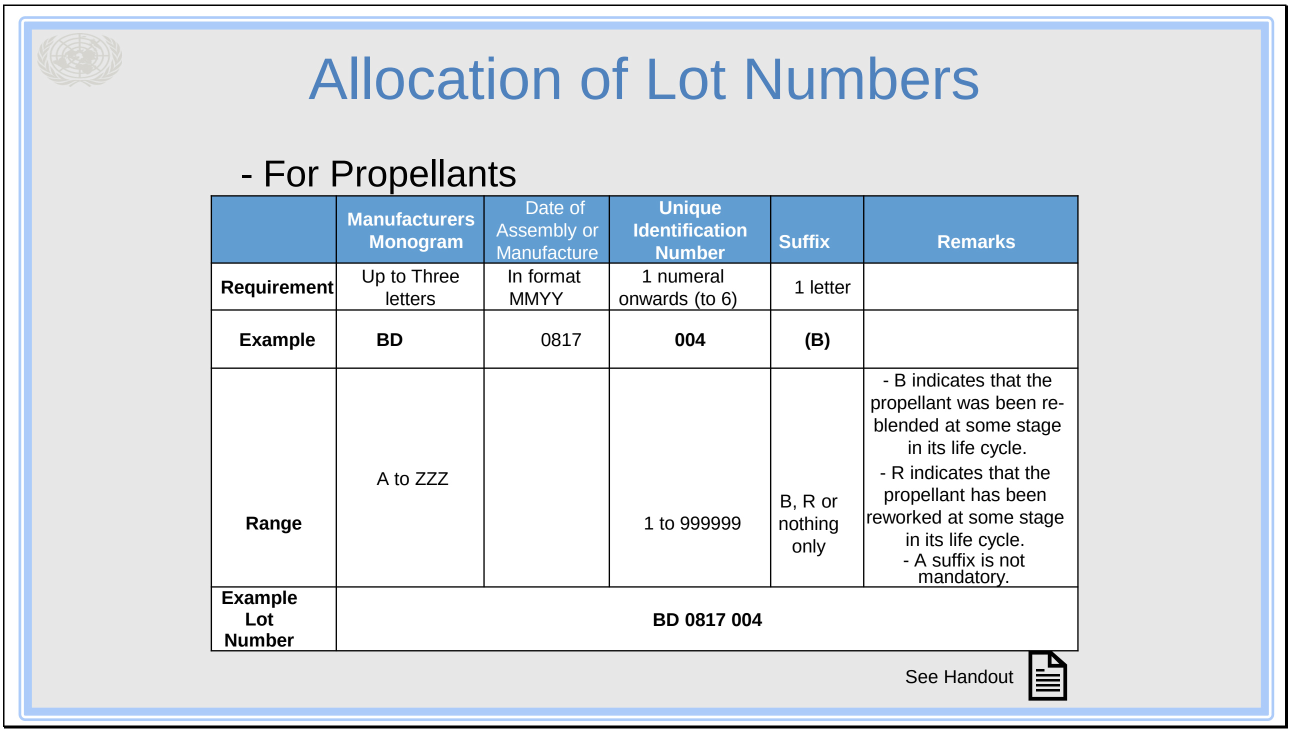
Write the following on the white board and ask the participants explain the parts: AB 0320 36421C

Include table in a hand-out for participants

References/further reading

**IATG 03.20 – Lotting and Batching**

Slide 10



## Allocation of Lot Numbers

- For Propellants

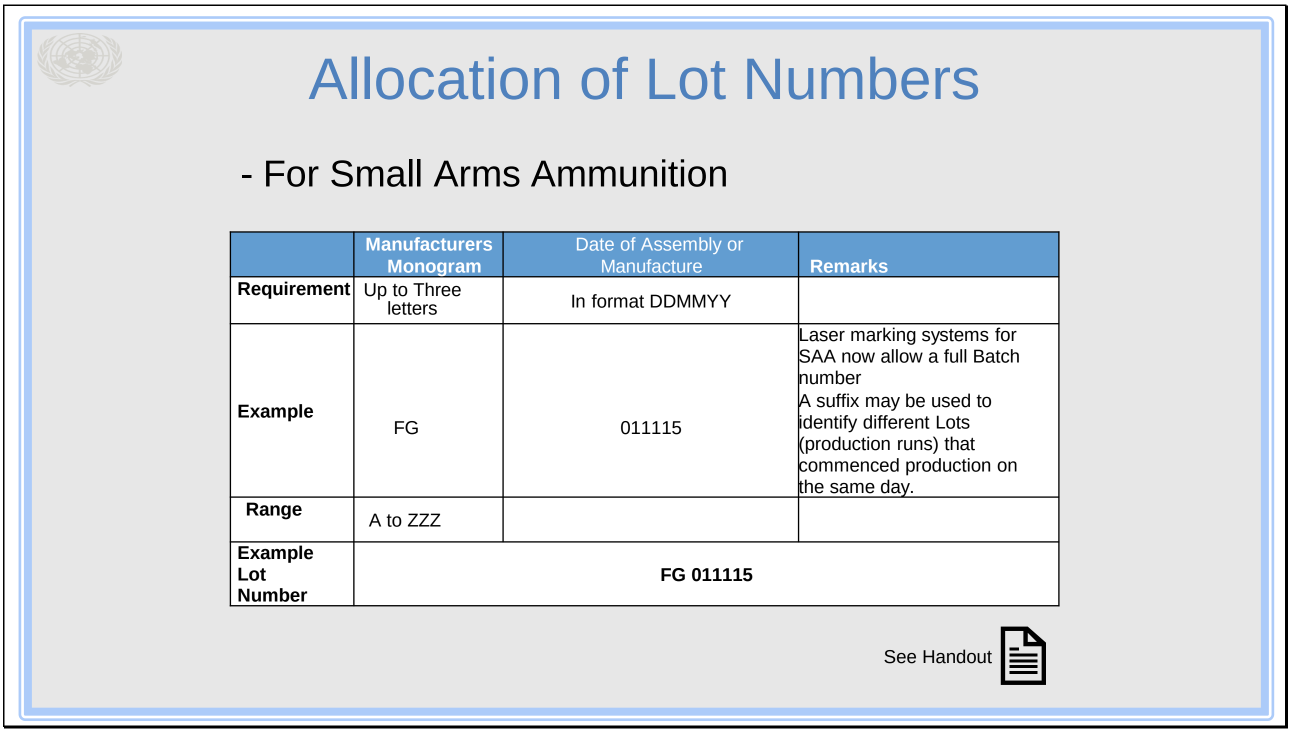
| | Manufacturers Monogram | Date of Assembly or Manufacture | Unique Identification Number | Suffix | Remarks |
|---|---|---|---|---|---|
| **Requirement** | Up to Three letters | In format MMYY | 1 numeral onwards (to 6) | 1 letter | |
| **Example** | **BD** | 0817 | **004** | **(B)** | |
| **Range** | A to ZZZ | | 1 to 999999 | B, R or nothing only | - B indicates that the propellant was been re-blended at some stage in its life cycle.<br>- R indicates that the propellant has been reworked at some stage in its life cycle.<br>- A suffix is not mandatory. |
| **Example Lot Number** | **BD 0817 004** | | | | |

See Handout

**Main idea/objective for slide:**
**Explain allocation of Lot numbers for Propellants, with example**

What the instructor should cover (in addition to slide content)
Write the following on the white board and ask the participants explain the parts: FZ 1111 56785 B
Include table in a hand-out for participants

References/further reading
**IATG 03.20 – Lotting and Batching**



# Allocation of Lot Numbers

- For Small Arms Ammunition

| | Manufacturers Monogram | Date of Assembly or Manufacture | Remarks |
|---|---|---|---|
| **Requirement** | Up to Three letters | In format DDMMYY | |
| **Example** | FG | 011115 | Laser marking systems for SAA now allow a full Batch number<br>A suffix may be used to identify different Lots (production runs) that commenced production on the same day. |
| **Range** | A to ZZZ | | |
| **Example Lot Number** | **FG 011115** | | |

See Handout

**<u>Main idea/objective for slide:</u>**
**Explain allocation of Lot numbers for Small Arms Ammunition, with example**

<u>What the instructor should cover (in addition to slide content)</u>
Write the following on the white board and ask the participants explain the parts: TFI 290898
Include table in a hand-out for participants

<u>References/further reading</u>
**IATG 03.20 – Lotting and Batching**

## Find the Lot and Batch numbers

**Main idea/objective for slide:**

**Using images and working in their groups, have the participants identify the relevant lots and batches of a range of munition natures.**

What the instructor should cover (in addition to slide content)

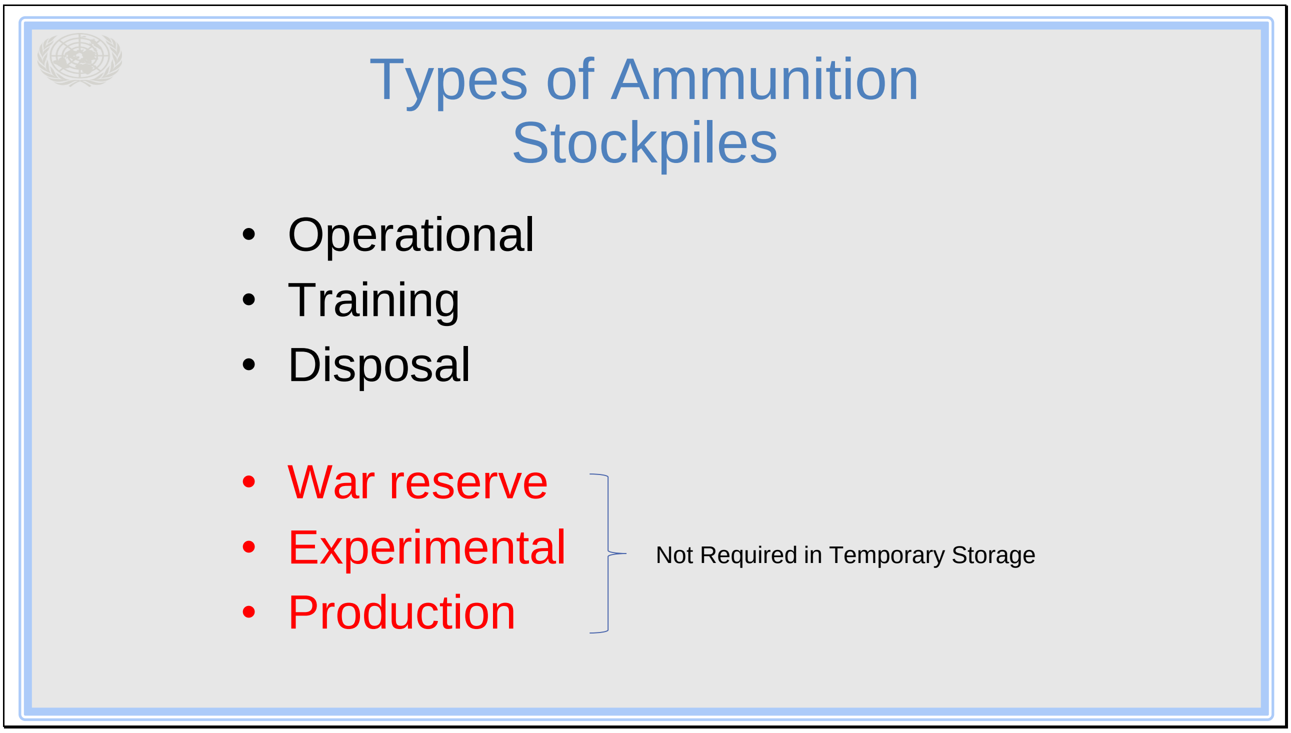
Using each image, ask the participants to identify the Lot numbers and explain the detail in each lot number

References/further reading

**IATG 03.20 – Lotting and Batching**

Slide 13

# Find the Lot and Batch numbers



## Types of Ammunition Stockpiles

- Operational
- Training
- Disposal

- War reserve
- Experimental
- Production

Not Required in Temporary Storage

**Main idea/objective for slide:**

- **Introduce and explain the several types of ammunition stockpiles, their usefulness and where they may be used.**

What the instructor should cover (in addition to slide content)

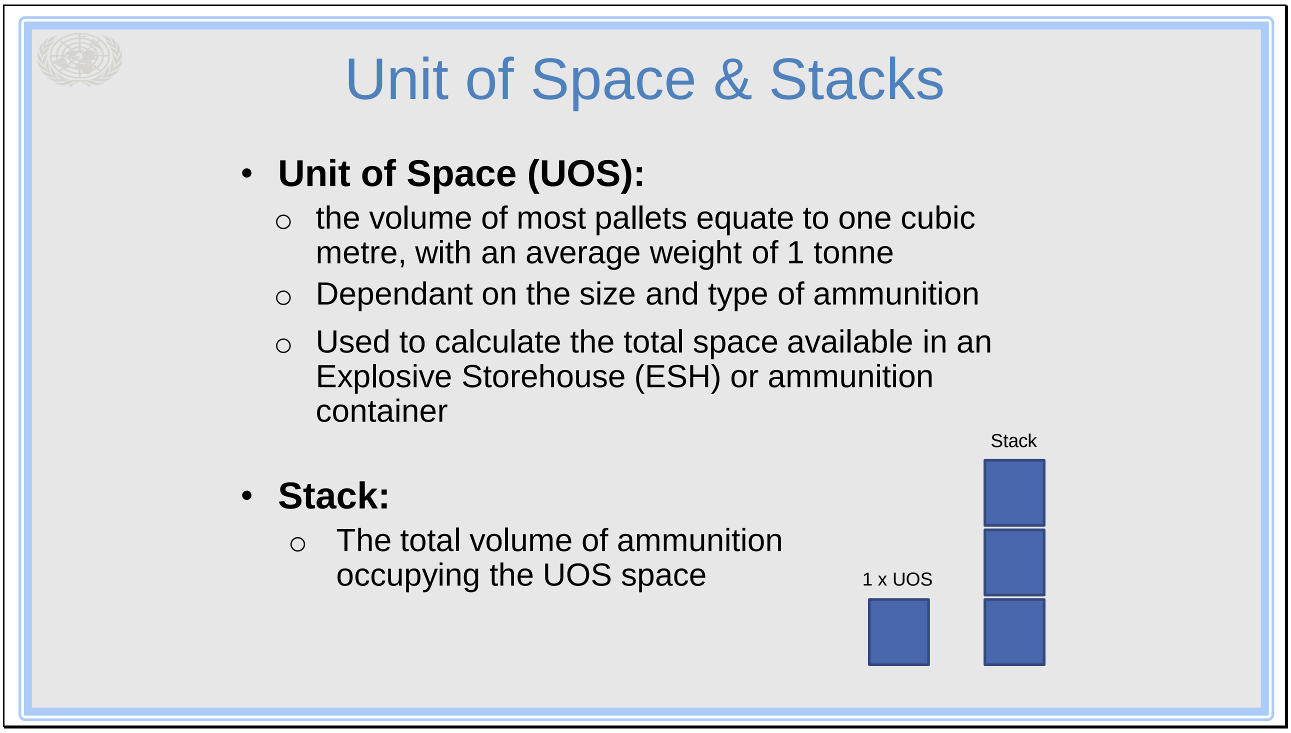
**IATG 03.10 – Inventory Management.** http://data.unsaferguard.org/iatg/en/IATG-03.10-Inventory-management-IATG-V.3.pdf

- Operational ammunition and explosives:
  - The ammunition and explosives necessary to support the routine operations of military, police and other security agencies over an agreed period of time.
- Training ammunition and explosives:
  - The ammunition and explosives necessary to support the routine training of military, police and other security agencies. This will usually be an agreed percentage of the war reserve holdings. 15% would not be unreasonable, dependent on the training activities and frequency.
- Ammunition and explosives awaiting disposal:
  - The ammunition and explosives that have been identified as unserviceable, unstable or surplus to requirements.

**Not used in Temporary Storage, but explain to participants to provide context:**

- War reserve ammunition and explosives:
    - The ammunition and explosives necessary to support the operations of military, police and other security agencies during external conflict or general war over an agreed period of time. 30 days at intensive expenditure rates is often used as the time period.
- Experimental ammunition and explosives:
    - This type of ammunition is usually only held by those nations with a research, development and production capability. These holdings will be minimal, but must be included for intellectual accuracy.
- Production ammunition:
    - This type of ammunition is usually only held by those nations with a production capability. The ammunition and explosives that have been produced and are awaiting sale under the control of the manufacturer. These may be available to the military during general war but would not form part of the war reserve as their availability cannot be guaranteed.

Slide 15



## Unit of Space & Stacks

- **Unit of Space (UOS):**
    - the volume of most pallets equate to one cubic metre, with an average weight of 1 tonne
    - Dependant on the size and type of ammunition
    - Used to calculate the total space available in an Explosive Storehouse (ESH) or ammunition container
- **Stack:**
    - The total volume of ammunition occupying the UOS space

**Main idea/objective for slide:**

- **Provide the participants with the definition of a stack and 'Unit Of Space'**

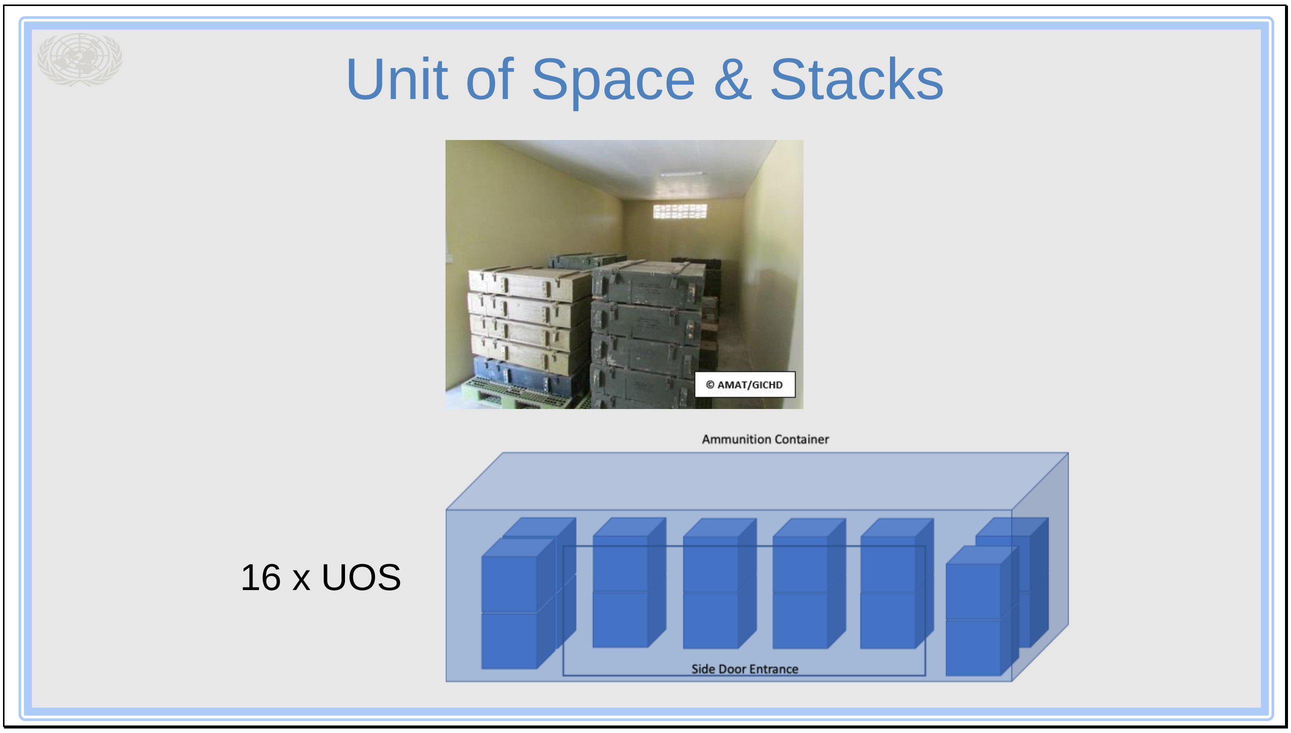
What the instructor should cover (in addition to slide content)

- It is generally assumed for planning purposes that the volume of most pallets or unit load containers equate to one cubic metre, with an average weight of 1 tonne.
- This approach simplifies ammunition storage planning, as the number of UOS within an explosive storehouse may be easily calculated by a simple volume measurement.
- A small amount of space can be deducted to allow for:
    - the maximum safe stacking height for the ammunition
    - aisles wide enough for the type of mechanical handling equipment being used [not likely to be used in Ammunition Containers]
    - a 500mm air gap from the front wall of the ESH to ammunition stacks; and [may be less in Ammunition Containers]
    - a 500mm air gap between the exterior walls of the ESH and the ammunition stacks. [may be less in Ammunition Containers]

References/further reading

**IATG 03.10 – Inventory Management**

Slide 16



## Unit of Space & Stacks

© AMAT/GICHD

Ammunition Container

16 x UOS

Side Door Entrance

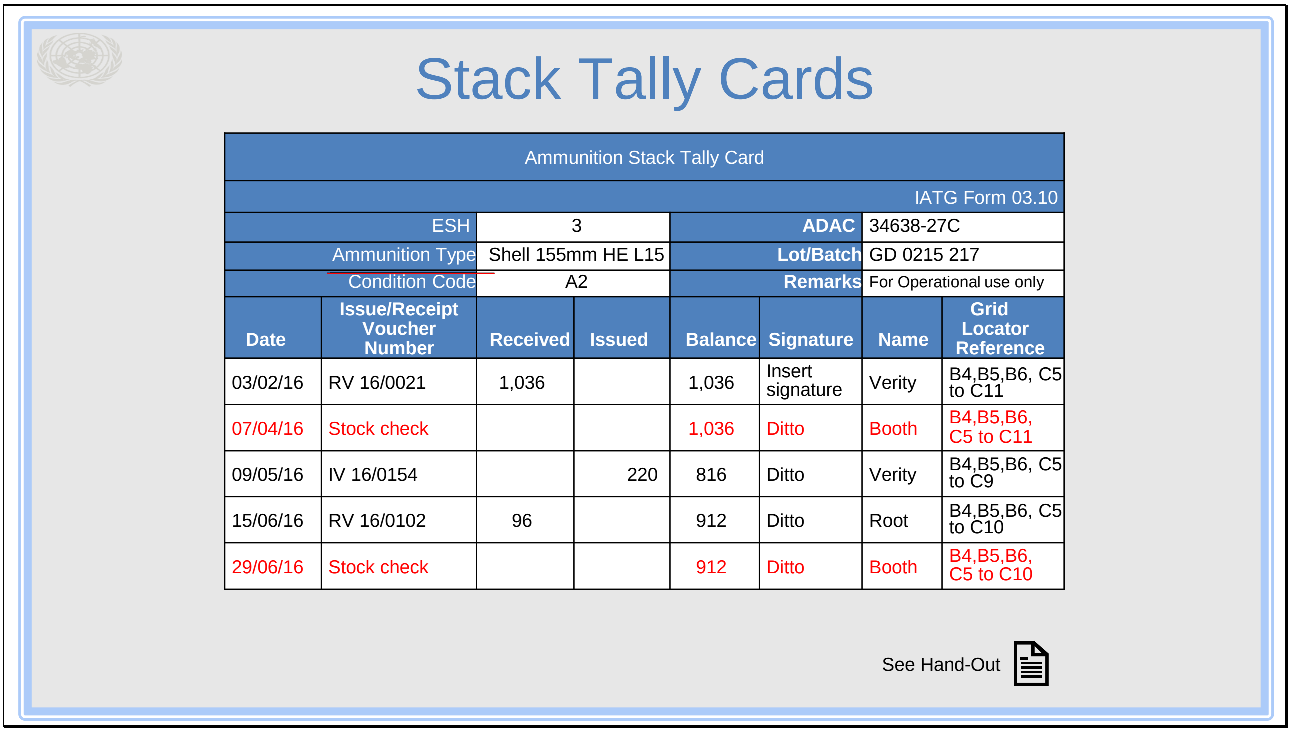
**<u>Main idea/objective for slide:</u>**

- **Introduce and explain the Unit of Space concept and provide an example floor plan or model that demonstrates this concept.**

<u>What the instructor should cover (in addition to slide content)</u>

<u>References/further reading</u>

**IATG 03.10 – Inventory Management**



# Stack Tally Cards

Ammunition Stack Tally Card

IATG Form 03.10

| | | | |
|---|---|---|---|
| ESH | 3 | **ADAC** | 34638-27C |
| Ammunition Type | Shell 155mm HE L15 | **Lot/Batch** | GD 0215 217 |
| Condition Code | A2 | **Remarks** | For Operational use only |

| Date | Issue/Receipt Voucher Number | Received | Issued | Balance | Signature | Name | Grid Locator Reference |
|---|---|---|---|---|---|---|---|
| 03/02/16 | RV 16/0021 | 1,036 | | 1,036 | Insert signature | Verity | B4,B5,B6, C5 to C11 |
| 07/04/16 | Stock check | | | 1,036 | Ditto | Booth | B4,B5,B6, C5 to C11 |
| 09/05/16 | IV 16/0154 | | 220 | 816 | Ditto | Verity | B4,B5,B6, C5 to C9 |
| 15/06/16 | RV 16/0102 | 96 | | 912 | Ditto | Root | B4,B5,B6, C5 to C10 |
| 29/06/16 | Stock check | | | 912 | Ditto | Booth | B4,B5,B6, C5 to C10 |

See Hand-Out

**<u>Main idea/objective for slide:</u>**

- **Introduce participants to the use of stack tally cards.**

What the instructor should cover (in addition to slide content)

Give a hand out of a Stack tally Card to participants, **IATG 03.10 – Inventory Management, Page 12**

- The use of stack tally cards is an effective measure that supports accurate ammunition accounting, assists in stock taking and deters theft.
- Each stack of ammunition should have a tally card(s) attached to it that records the following information for that particular stack.
- Stack tally cards should be placed in plastic envelopes or suitable substitutes to prevent deterioration of the forms and to protect them from moisture.
- When the form is completed, or the last lot or batch of that particular ammunition has been issued, then the stack tally card should be kept for at least two years by the ammunition depot's stock taking department.
- This allows future reconciliation of ammunition accounts should a discrepancy occur in the future during stock taking or audit.

**A stack tally card should record the following information:**

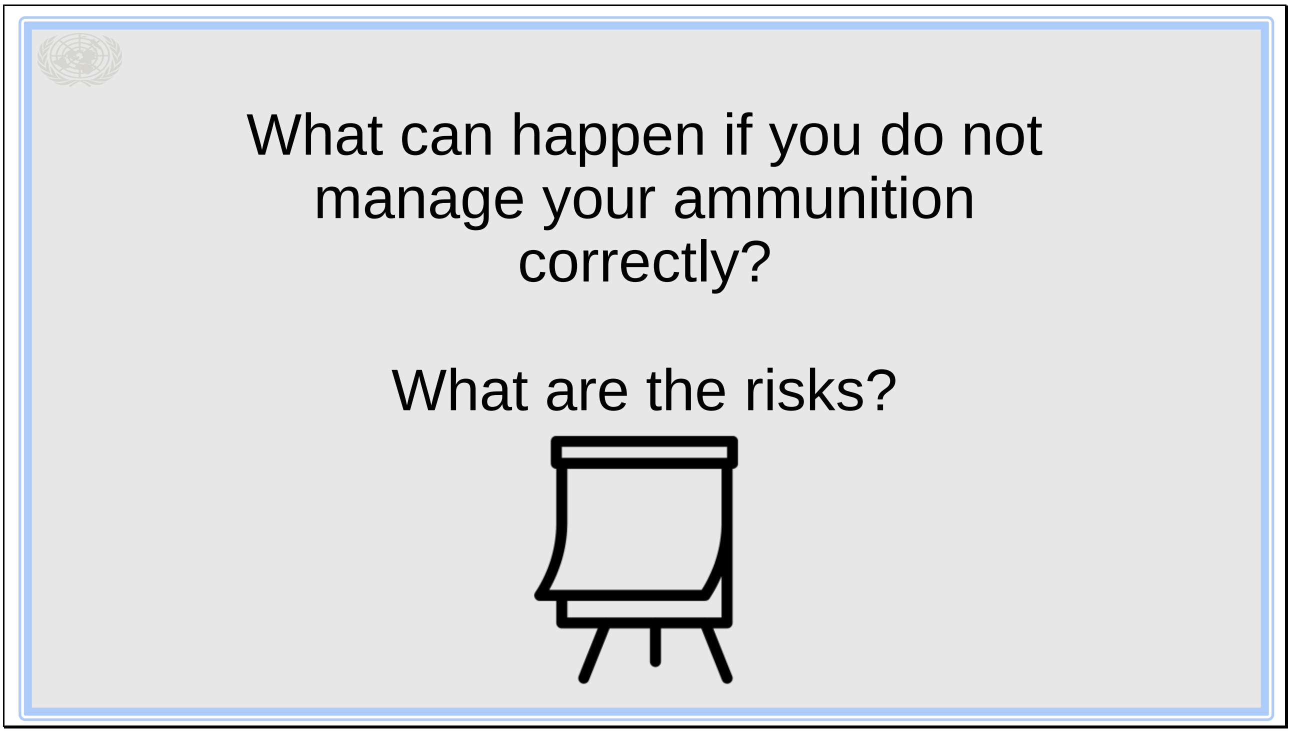
- Grid locator reference to identify where in the building or area it is
- The Explosive Storehouse (ESH) number or other site identification number

- Full description of ammunition
- Ammunition Descriptive Asset Codes (ADAC) number or similar asset code system
- Lot and/or batch number, (a separate card should be used for each lot and/or batch number)
- Ammunition condition code, eg 'serviceable', 'constrained'
- A record of transactions for that stack by quantity, lot/batch number and date
- The issue or receipt voucher reference for each transaction.

References/further reading

**IATG 03.10 – Inventory Management, Page 12**

Slide 18



What can happen if you do not manage your ammunition correctly?

What are the risks?

**Main idea/objective for slide:**
Discuss with the class the requirement to accurately account for ammunition and explosives and highlight its benefits.

What the instructor should cover (in addition to slide content)
Using a whiteboard ask the participants to list the:

- possible negative effects of implementing poor or no accounting activities
- The benefits of good ammunition management practices

References/further reading
**IATG 03.10 – Inventory Management**

- Ammunition is an expensive commodity which could be regarded as an 'insurance' policy for the nation. It is hoped that it will never be needed, but long production lead times and national security commitments mean that it must be procured in advance in order that it is available on demand. This all comes at a cost which means that the inventory management systems should not only be capable of accounting for ammunition in great detail to support explosive safety but should also be designed to ensure that best 'value for money' is obtained from the ammunition.

- Ammunition and explosives may deteriorate more rapidly or become damaged unless they are correctly stored, handled and transported, with the resultant effect that they may fail to function as designed and may become dangerous in storage, handling, transport and use. An accurate assessment of a munition’s life is of paramount importance in terms of safety, performance and cost.
- Effective inventory management is an important component in a national authority's ‘Duty of Care’ to ensure that only ammunition that is serviceable and safe to use is issued to security agencies for both training and operational use. There is also a ‘Duty of Care’ to protect the civilian population in the local areas around explosive storage areas with appropriate quantity distances based on accurate net explosives weight of stocks.
- The ability to rapidly detect inadvertent inaccuracy in accounting, loss of, theft from or diversion from the national stockpile is also a key control measure of effective stockpile management. Ineffective stock accounting systems significantly increase the risk of proliferation.

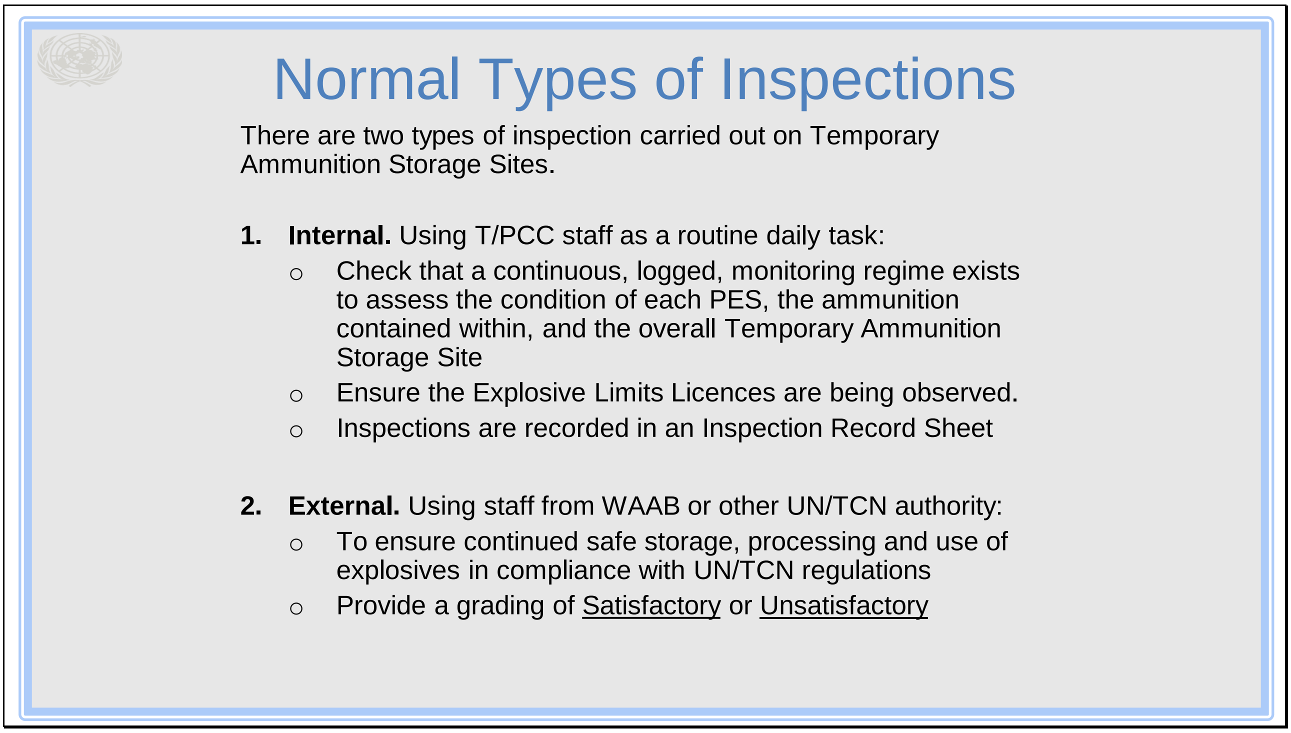
Slide 19

Inspections,
Faults and
Restrictions of
Ammunition

**Phase 2. Development (**Time allocation - 150 min**)**

Stage 2 (Time allocation 50 mins) – Inspections, Faults and Restrictions of Ammunition

Slide 20



## Normal Types of Inspections

There are two types of inspection carried out on Temporary Ammunition Storage Sites.

1. **Internal.** Using T/PCC staff as a routine daily task:
   - Check that a continuous, logged, monitoring regime exists to assess the condition of each PES, the ammunition contained within, and the overall Temporary Ammunition Storage Site
   - Ensure the Explosive Limits Licences are being observed.
   - Inspections are recorded in an Inspection Record Sheet

2. **External.** Using staff from WAAB or other UN/TCN authority:
   - To ensure continued safe storage, processing and use of explosives in compliance with UN/TCN regulations
   - Provide a grading of Satisfactory or Unsatisfactory

**Main idea/objective for slide:**
**Discuss with the class the requirement to accurately account for ammunition and explosives and highlight its benefits.**

What the instructor should cover (in addition to slide content)
Emphasise the importance, seriousness and necessity for inspections.

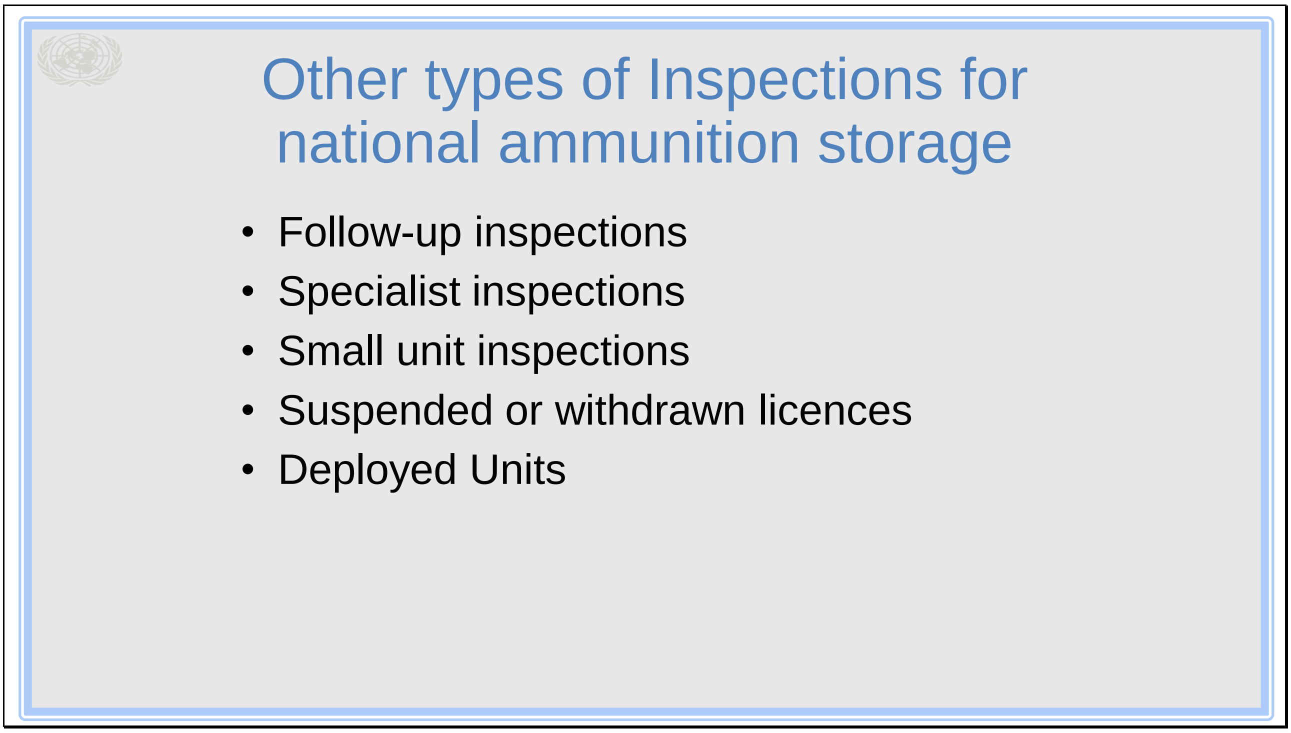
References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**
- Since ammunition contains high energy material and is designed to be as lethal as possible, it is highly desired that it is safe, reliable and effective during operation, transportation and handling.
- Therefore, inspections and evaluations shall be carried out to ensure that ammunition policy/guidelines are adhered to by units.
- Evaluation and recommendations shall be done to improve the standard of ammunition management in units
- The SATO shall carry out the following types of inspection in the units:
  - Annual Routine Inspection as per a circulated program;
  - The SATO or another ATO shall accompany the COE team to the Operational Readiness Inspection for each unit;
  - An inspection carried out on units upon arrival and repatriation;

  - Any other inspection as appeared/requested by the concerned unit;
  - The SATO shall have the authority to conduct impromptu inspections at any time.
  - The SATO may be unable to attend all inspections for all T/PCCs. Each unit shall be inspected at a minimum of once a year.
- An internal inspection shall be carried out by the T/PCC person in charge of ammunition storage (or a nominated and qualified representative), normally from the military/police unit occupying the camp, to ensure that:
  - There is a continuous recording/logging and monitoring regime to ascertain the condition of each PES, the stockpile contained within and the overall ammunition storage area;
  - There is a PES log book with temperature and humidity records;
  - The firefighting equipment is working, and drills are conducted;
  - The security alarm is working.
- The results of the inspection shall be recorded on an inspection record sheet. A copy of these inspection records shall be sent to the SATO.
- IATG 06.70 will be adhered to during inspection for consultation. A standard Inspection Criteria/Evaluation Template is attached to this manual at Annex C
- The SATO or his/her appropriate representative is authorized to carry out inspection of ammunition and evaluation of units as per this manual.
  - Details regarding the competency and responsibility of SATO are given at Annex D.
- After the inspection is carried out, the SATO shall furnish an inspection and evaluation report on the ammunition storage conditions of the concerned unit.
  - The reports shall be shared with all members of the WAAB and approved during the next WAAB meeting.
  - The chair of the WAAB shall be informed without delay when the minimum standards cannot be met.
  - Copies of the approved report shall be disseminated to all concerned for appropriate action

### IATG 06.70 – Inspection of explosives facilities

- As per slide

Slide 21



## Other types of Inspections for national ammunition storage

- Follow-up inspections
- Specialist inspections
- Small unit inspections
- Suspended or withdrawn licences
- Deployed Units

**Main idea/objective for slide:**

- **Discuss the several types of internal and external inspections highlighting key areas to focus attention and the hazards to look out for.**

What the instructor should cover (in addition to slide content)

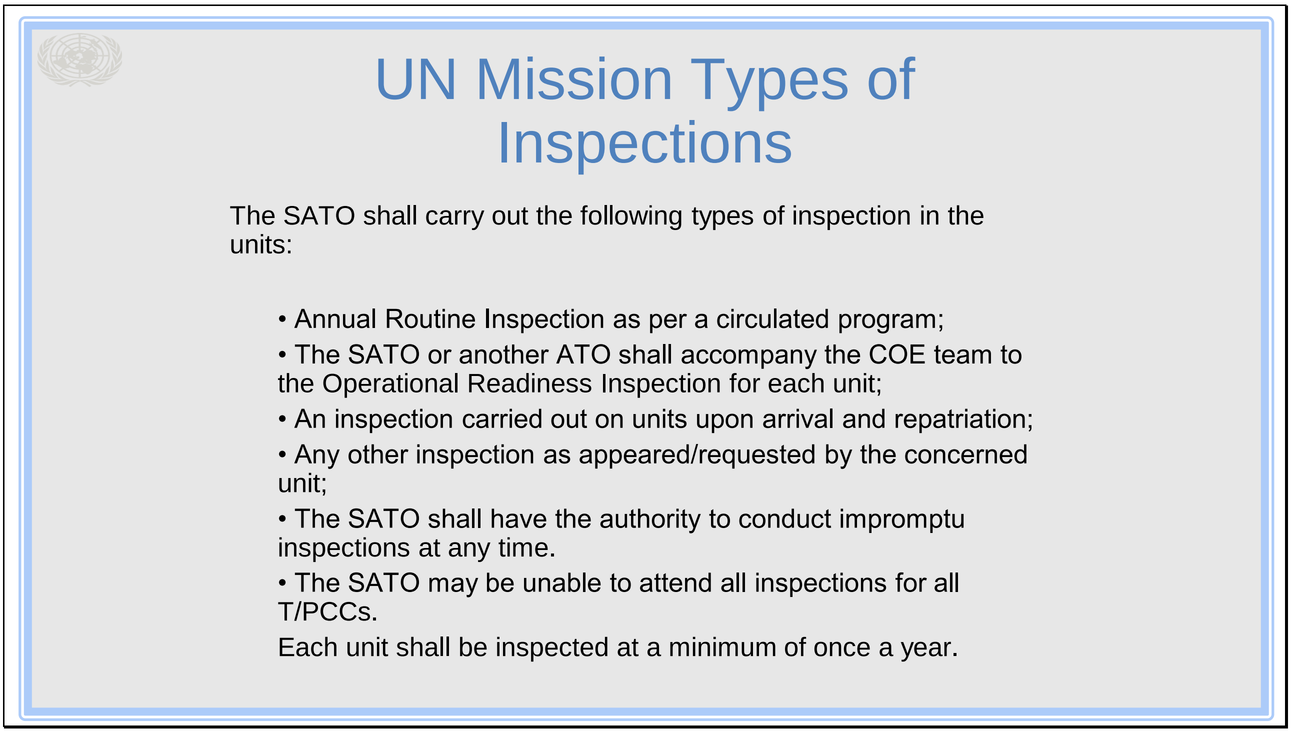
Explain how these additional inspection may occur from time to time and the conditions that may cause them to arise.

References/further reading

**United Nations Manual of Ammunition Management, 2020 1st Ed**

**IATG 06.70 – Inspection of explosives facilities**

Slide 22



## UN Mission Types of Inspections

The SATO shall carry out the following types of inspection in the units:

- Annual Routine Inspection as per a circulated program;
- The SATO or another ATO shall accompany the COE team to the Operational Readiness Inspection for each unit;
- An inspection carried out on units upon arrival and repatriation;
- Any other inspection as appeared/requested by the concerned unit;
- The SATO shall have the authority to conduct impromptu inspections at any time.
- The SATO may be unable to attend all inspections for all T/PCCs.

Each unit shall be inspected at a minimum of once a year.

**Main idea/objective for slide:**
**Discuss with the class the requirement to accurately account for ammunition and explosives and highlight its benefits.**

What the instructor should cover (in addition to slide content)
Emphasise the importance, seriousness and necessity for inspections.

References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**

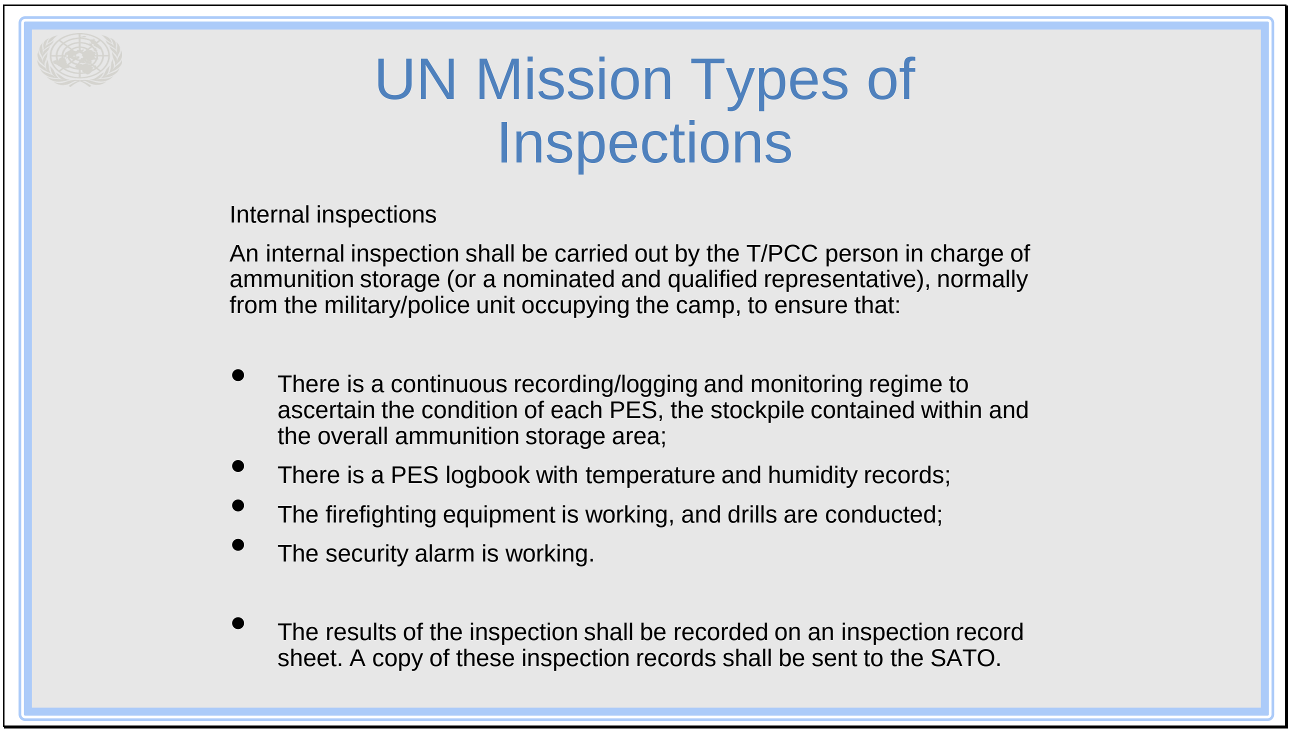
- Since ammunition contains high energy material and is designed to be as lethal as possible, it is highly desired that it is safe, reliable and effective during operation, transportation and handling.
- Therefore, inspections and evaluations shall be carried out to ensure that ammunition policy/guidelines are adhered to by units.
- Evaluation and recommendations shall be done to improve the standard of ammunition management in units
- The SATO shall carry out the following types of inspection in the units:
    - Annual Routine Inspection as per a circulated program;
    - The SATO or another ATO shall accompany the COE team to the Operational Readiness Inspection for each unit;
    - An inspection carried out on units upon arrival and repatriation;

  - Any other inspection as appeared/requested by the concerned unit;
  - The SATO shall have the authority to conduct impromptu inspections at any time.
  - The SATO may be unable to attend all inspections for all T/PCCs. Each unit shall be inspected at a minimum of once a year.
- An internal inspection shall be carried out by the T/PCC person in charge of ammunition storage (or a nominated and qualified representative), normally from the military/police unit occupying the camp, to ensure that:
  - There is a continuous recording/logging and monitoring regime to ascertain the condition of each PES, the stockpile contained within and the overall ammunition storage area;
  - There is a PES log book with temperature and humidity records;
  - The firefighting equipment is working, and drills are conducted;
  - The security alarm is working.
- The results of the inspection shall be recorded on an inspection record sheet. A copy of these inspection records shall be sent to the SATO.
- IATG 06.70 will be adhered to during inspection for consultation. A standard Inspection Criteria/Evaluation Template is attached to this manual at Annex C
- The SATO or his/her appropriate representative is authorized to carry out inspection of ammunition and evaluation of units as per this manual.
  - Details regarding the competency and responsibility of SATO are given at Annex D.
- After the inspection is carried out, the SATO shall furnish an inspection and evaluation report on the ammunition storage conditions of the concerned unit.
  - The reports shall be shared with all members of the WAAB and approved during the next WAAB meeting.
  - The chair of the WAAB shall be informed without delay when the minimum standards cannot be met.
  - Copies of the approved report shall be disseminated to all concerned for appropriate action

**IATG 06.70 – Inspection of explosives facilities**

- As per slide

Slide 23



## UN Mission Types of Inspections

Internal inspections

An internal inspection shall be carried out by the T/PCC person in charge of ammunition storage (or a nominated and qualified representative), normally from the military/police unit occupying the camp, to ensure that:

- There is a continuous recording/logging and monitoring regime to ascertain the condition of each PES, the stockpile contained within and the overall ammunition storage area;
- There is a PES logbook with temperature and humidity records;
- The firefighting equipment is working, and drills are conducted;
- The security alarm is working.

- The results of the inspection shall be recorded on an inspection record sheet. A copy of these inspection records shall be sent to the SATO.

**Main idea/objective for slide:**
**Discuss with the class the requirement to accurately account for ammunition and explosives and highlight its benefits.**

What the instructor should cover (in addition to slide content)
Emphasise the importance, seriousness and necessity for inspections.

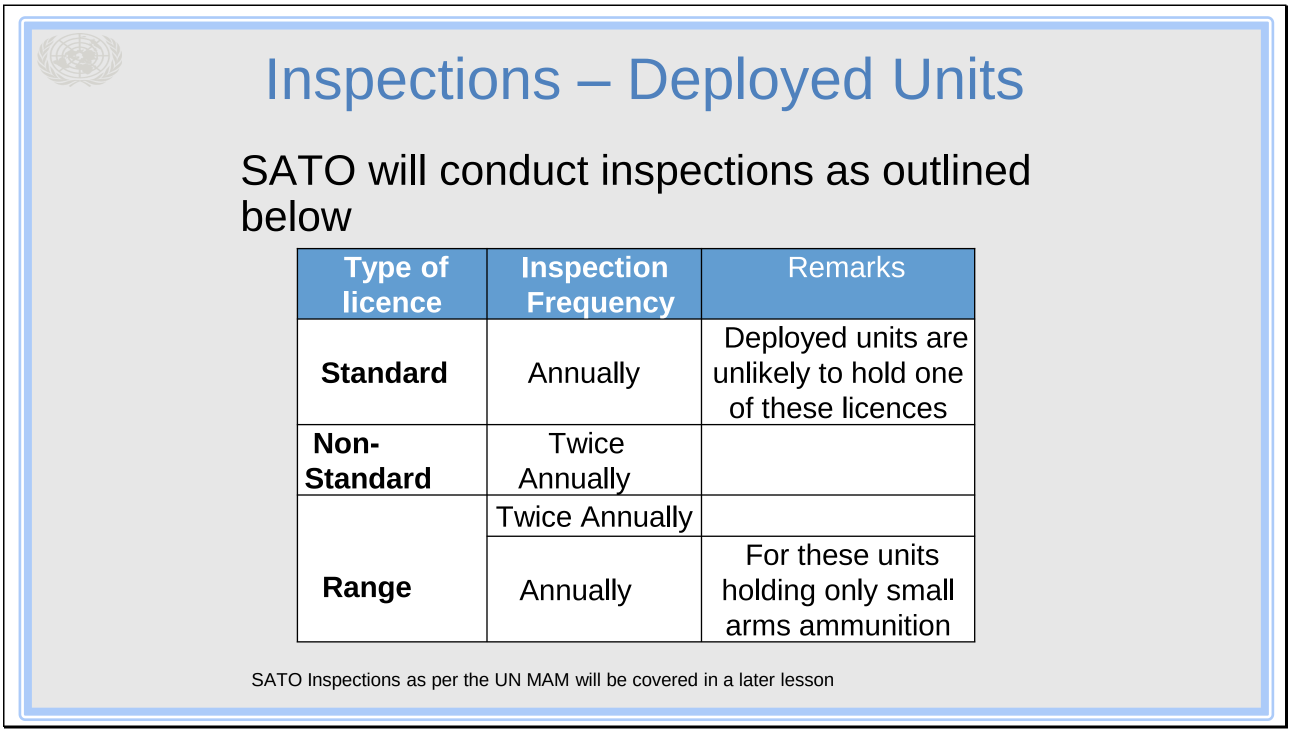
References/further reading
**United Nations Manual of Ammunition Management, 2020 1st Ed**

- Since ammunition contains high energy material and is designed to be as lethal as possible, it is highly desired that it is safe, reliable and effective during operation, transportation and handling.
- Therefore, inspections and evaluations shall be carried out to ensure that ammunition policy/guidelines are adhered to by units.
- Evaluation and recommendations shall be done to improve the standard of ammunition management in units
- The SATO shall carry out the following types of inspection in the units:
  - Annual Routine Inspection as per a circulated program;
  - The SATO or another ATO shall accompany the COE team to the Operational Readiness Inspection for each unit;
  - An inspection carried out on units upon arrival and repatriation;

  - Any other inspection as appeared/requested by the concerned unit;
  - The SATO shall have the authority to conduct impromptu inspections at any time.
  - The SATO may be unable to attend all inspections for all T/PCCs. Each unit shall be inspected at a minimum of once a year.
- An internal inspection shall be carried out by the T/PCC person in charge of ammunition storage (or a nominated and qualified representative), normally from the military/police unit occupying the camp, to ensure that:
  - There is a continuous recording/logging and monitoring regime to ascertain the condition of each PES, the stockpile contained within and the overall ammunition storage area;
  - There is a PES log book with temperature and humidity records;
  - The firefighting equipment is working, and drills are conducted;
  - The security alarm is working.
- The results of the inspection shall be recorded on an inspection record sheet. A copy of these inspection records shall be sent to the SATO.
- IATG 06.70 will be adhered to during inspection for consultation. A standard Inspection Criteria/Evaluation Template is attached to this manual at Annex C
- The SATO or his/her appropriate representative is authorized to carry out inspection of ammunition and evaluation of units as per this manual.
  - Details regarding the competency and responsibility of SATO are given at Annex D.
- After the inspection is carried out, the SATO shall furnish an inspection and evaluation report on the ammunition storage conditions of the concerned unit.
  - The reports shall be shared with all members of the WAAB and approved during the next WAAB meeting.
  - The chair of the WAAB shall be informed without delay when the minimum standards cannot be met.
  - Copies of the approved report shall be disseminated to all concerned for appropriate action

**IATG 06.70 – Inspection of explosives facilities**

- As per slide



## Inspections – Deployed Units

SATO will conduct inspections as outlined below

| Type of licence | Inspection Frequency | Remarks |
|---|---|---|
| **Standard** | Annually | Deployed units are unlikely to hold one of these licences |
| **Non-Standard** | Twice Annually | |
| **Range** | Twice Annually | |
| | Annually | For these units holding only small arms ammunition |

SATO Inspections as per the UN MAM will be covered in a later lesson

**<u>Main idea/objective for slide:</u>**

- **Discuss the several types of internal and external inspections highlighting key areas to focus attention and the hazards to look out for.**

<u>What the instructor should cover (in addition to slide content)</u>

Check the participants understanding of Standard and Non-Standard Licences – Clarify if needed

<u>References/further reading</u>

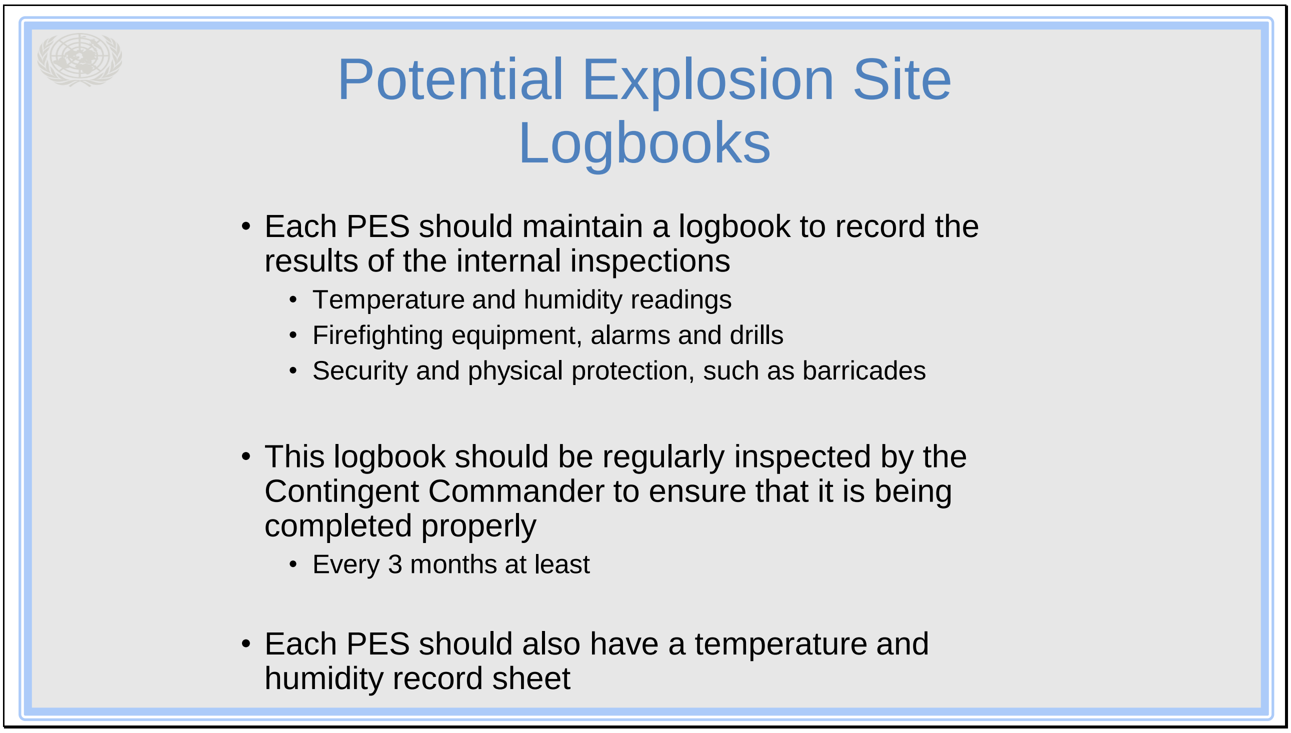
**United Nations Manual of Ammunition Management, 2020 1st Ed**

**IATG 12.10 – Ammunition on multi-national operations**

- The efficiency of the unit in relation to its ammunition responsibilities should, on completion of each periodic inspection, be graded in terms of **Satisfactory** or **Unsatisfactory**.
- The grading shall be based on the standard found at the time of the inspection and give an accurate picture of the efficiency of the unit.
- Small infringements may be corrected as the inspection proceeds but a general comment observing this is to be recorded in the report.
- Subsequent corrective action may be taken as necessary to correct faults and bring the unit up to an acceptable standard.

- Accurate reporting is essential to give the chain of command a clear and unambiguous view of ammunition and explosives safety across their area.
- This grading shall be recorded on IATG Form 12.10A (see Annex D) (or national equivalent) by the Inspector.
- When assessing the grading of a unit's efficiency, the Inspector should base his or her judgement on the points listed in IATG 06.70 *Inspection of explosives facilities*, Annex E**.**
- An unsatisfactory grading should only be given if:
  - there is more than one violation of a major point which is considered to compromise explosive safety;
  - there are four or more minor points violated and no corrective action has been taken during the inspection; or
  - Recommendations to resolve a major point or two minor points specified in a previous inspection report have not been carried out.
- The Inspector shall also recommend if more specialist inspections are warranted, (e.g. electrical, lightning protection, infrastructure stability etc).
- A recommended report format for deployed unit ammunition inspections is at Annex D for information

Slide 25



## Potential Explosion Site Logbooks

- Each PES should maintain a logbook to record the results of the internal inspections
  - Temperature and humidity readings
  - Firefighting equipment, alarms and drills
  - Security and physical protection, such as barricades
- This logbook should be regularly inspected by the Contingent Commander to ensure that it is being completed properly
  - Every 3 months at least
- Each PES should also have a temperature and humidity record sheet

**Main idea/objective for slide:**

- **Discuss the necessity for Logbooks at each Potential Explosion Site and the merits of maintaining these logs to a high standard.**

What the instructor should cover (in addition to slide content)

References/further reading:

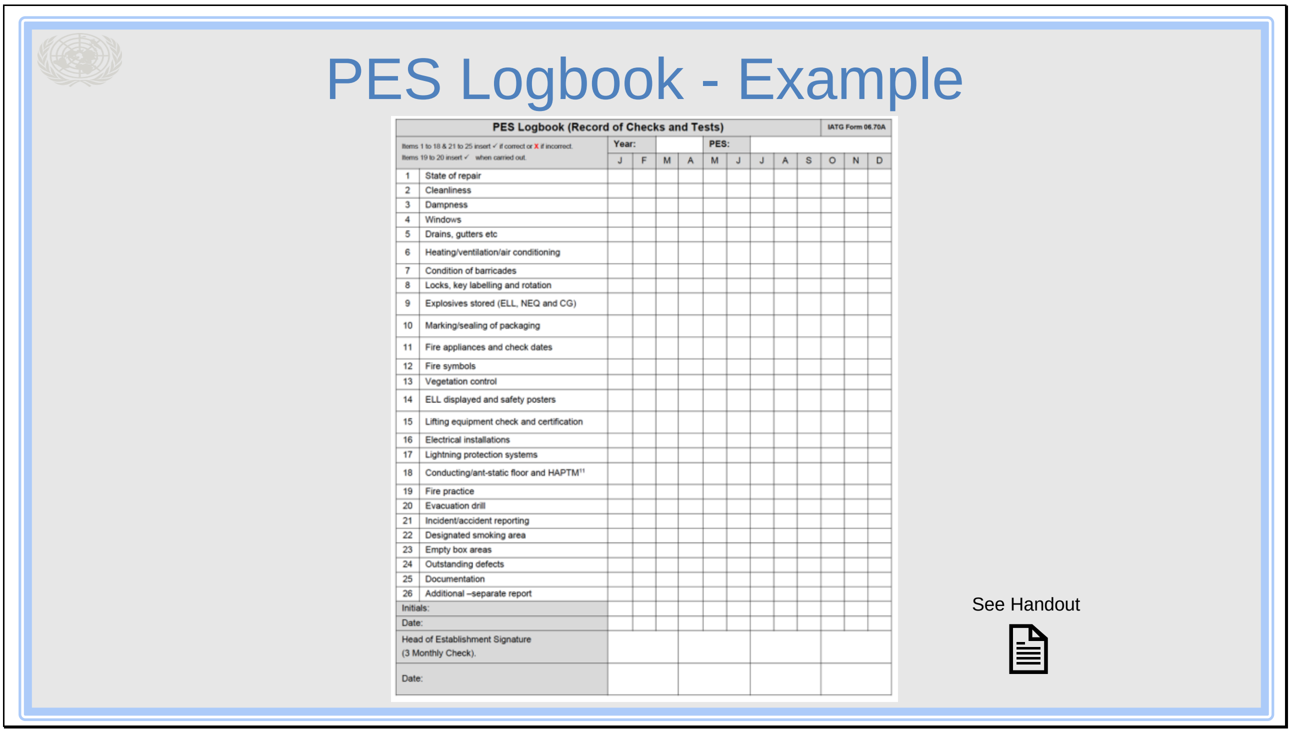
**IATG 06.70 – Inspection of explosives facilities**

- Immediate firefighting appliances (IFFA), including fire beaters, pre-positioned engines and motor driven pumps, hose reels and hydrants, should be inspected by the head of the establishment at intervals specified by the head of the establishment or in the case of equipment, by the manufacturer's recommendations. IFFA inspections shall be recorded.
- Fire alarm systems shall be maintained in accordance with IATG 02.50 *Fire safety* and the manufacturer's recommendations. Electrical fire alarm systems should be tested weekly and the test recorded. All alarm points should be tested during any three-month period.
- Details shall be recorded on the reverse of the inspection record sheet for the PES concerned whenever fire or escape drills are practised. Completion of any actions required by the post drill recommendations is

also to be recorded. Drills for the whole storage site are to be recorded on the site inspection record sheet.

- Security alarms should be inspected and tested regularly. Where specific guidance is not available, the alarms should be tested for serviceability at weekly intervals such that all alarm activation points are tested within a three-month period.
- Where fitted, public address systems should be tested in accordance with IATG 05.40 *Safety standards for electrical installations*. If no specific guidance is available, a weekly test broadcast should be made.
- To complement the logbook, each PES should also have a temperature and humidity record sheet.

Slide 26



# PES Logbook - Example

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PES Logbook (Record of Checks and Tests)** | | | | | | | | | | | | | IATG Form 06.70A |
| Items 1 to 18 & 21 to 25 insert ✓ if correct or X if incorrect.<br>Items 19 to 20 insert ✓ when carried out. | | **Year:** | | | | **PES:** | | | | | | | |
| | | J | F | M | A | M | J | J | A | S | O | N | D |
| 1 | State of repair | | | | | | | | | | | | |
| 2 | Cleanliness | | | | | | | | | | | | |
| 3 | Dampness | | | | | | | | | | | | |
| 4 | Windows | | | | | | | | | | | | |
| 5 | Drains, gutters etc | | | | | | | | | | | | |
| 6 | Heating/ventilation/air conditioning | | | | | | | | | | | | |
| 7 | Condition of barricades | | | | | | | | | | | | |
| 8 | Locks, key labelling and rotation | | | | | | | | | | | | |
| 9 | Explosives stored (ELL, NEQ and CG) | | | | | | | | | | | | |
| 10 | Marking/sealing of packaging | | | | | | | | | | | | |
| 11 | Fire appliances and check dates | | | | | | | | | | | | |
| 12 | Fire symbols | | | | | | | | | | | | |
| 13 | Vegetation control | | | | | | | | | | | | |
| 14 | ELL displayed and safety posters | | | | | | | | | | | | |
| 15 | Lifting equipment check and certification | | | | | | | | | | | | |
| 16 | Electrical installations | | | | | | | | | | | | |
| 17 | Lightning protection systems | | | | | | | | | | | | |
| 18 | Conducting/ant-static floor and HAPTM[11] | | | | | | | | | | | | |
| 19 | Fire practice | | | | | | | | | | | | |
| 20 | Evacuation drill | | | | | | | | | | | | |
| 21 | Incident/accident reporting | | | | | | | | | | | | |
| 22 | Designated smoking area | | | | | | | | | | | | |
| 23 | Empty box areas | | | | | | | | | | | | |
| 24 | Outstanding defects | | | | | | | | | | | | |
| 25 | Documentation | | | | | | | | | | | | |
| 26 | Additional –separate report | | | | | | | | | | | | |
| Initials: | | | | | | | | | | | | | |
| Date: | | | | | | | | | | | | | |
| Head of Establishment Signature<br>(3 Monthly Check). | | | | | | | | | | | | | |
| Date: | | | | | | | | | | | | | |

See Handout

**Main idea/objective for slide:**

- **Share an example of a Potential Explosion Site logbook.**

What the instructor should cover (in addition to slide content)

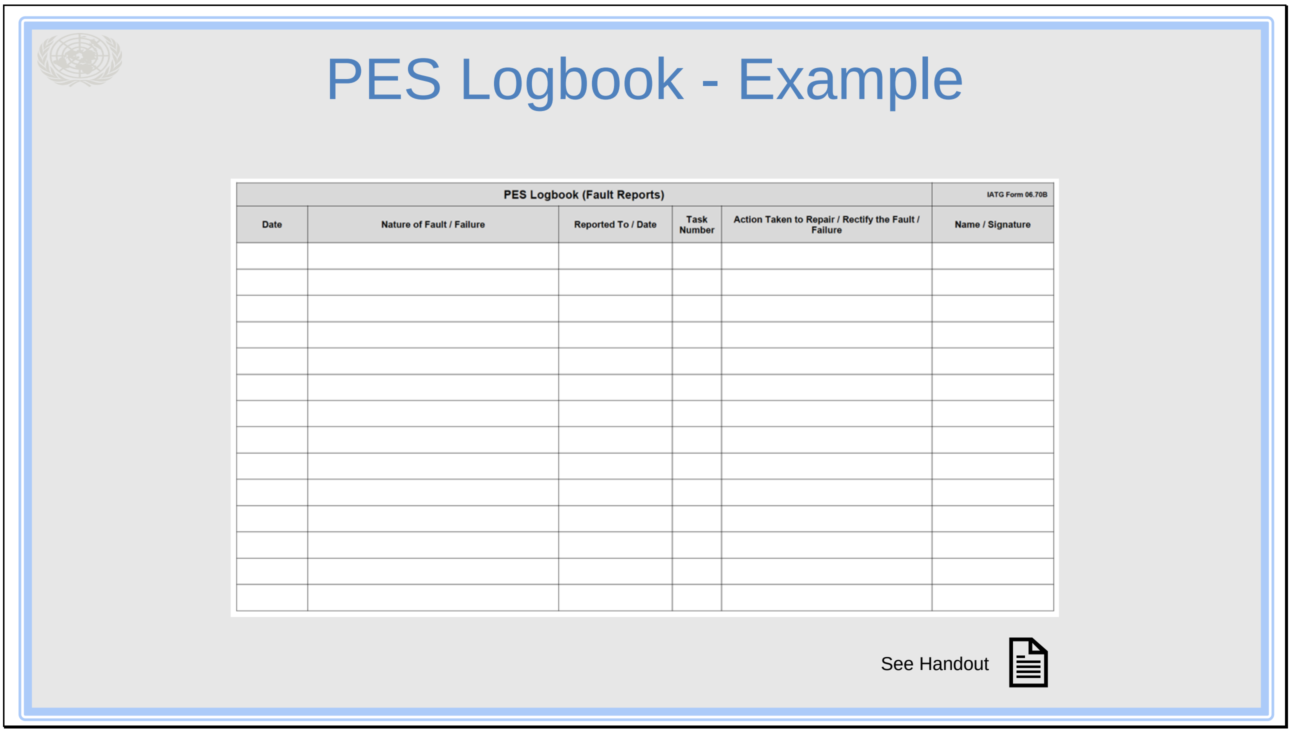
Provide the PES Logbook as a Handout and explain each page and how it is completed (Record of Checks and Tests)

References/further reading:

**IATG 06.70 – Inspection of explosives facilities - Annex C**

- The following check list of inspection points and records of checks and tests may be used to maintain records

Slide 27



## PES Logbook - Example

| PES Logbook (Fault Reports) | | | | | IATG Form 06.70B |
|---|---|---|---|---|---|
| Date | Nature of Fault / Failure | Reported To / Date | Task Number | Action Taken to Repair / Rectify the Fault / Failure | Name / Signature |
| | | | | | |
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See Handout

**Main idea/objective for slide:**

- **Share an example of a Potential Explosion Site logbook.**

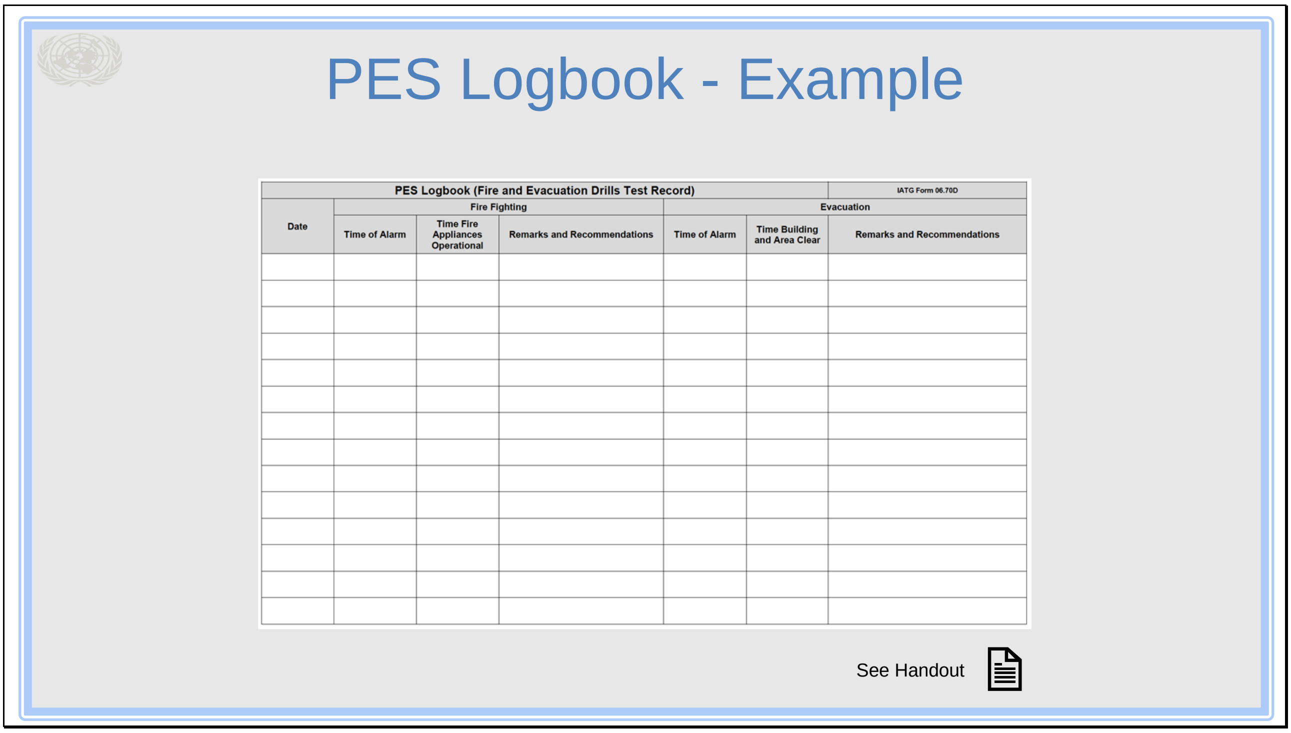
What the instructor should cover (in addition to slide content)

Provide the PES Logbook as a Handout and explain each page and how it is completed (Fault Reports)

References/further reading:

**IATG 06.70 – Inspection of explosives facilities - Annex C**

Slide 28



## PES Logbook - Example

| PES Logbook (Fire and Evacuation Drills Test Record) | | | | | | IATG Form 06.70D |
|---|---|---|---|---|---|---|
| Date | Fire Fighting | | | Evacuation | | |
| | Time of Alarm | Time Fire Appliances Operational | Remarks and Recommendations | Time of Alarm | Time Building and Area Clear | Remarks and Recommendations |
| | | | | | | |
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See Handout

**<u>Main idea/objective for slide:</u>**

- **Share an example of a Potential Explosion Site logbook.**

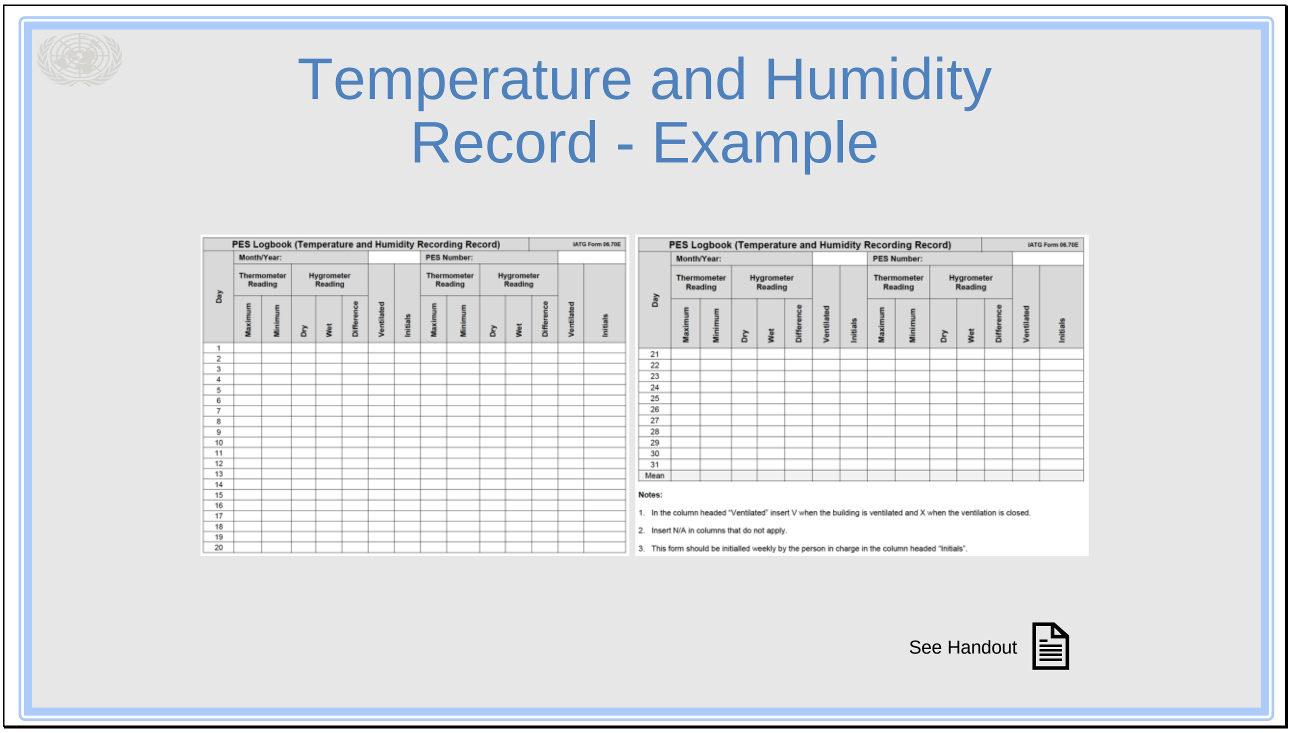
<u>What the instructor should cover (in addition to slide content)</u>

Provide the PES Logbook as a Handout and explain each page and how it is completed (Fire Evacuation and Drills)

<u>References/further reading:</u>

**IATG 06.70 – Inspection of explosives facilities - Annex C**

Slide 29



# Temperature and Humidity Record - Example

**PES Logbook (Temperature and Humidity Recording Record)** IATG Form 06.70E

**Month/Year:** **PES Number:**

| Day | Thermometer Reading | | Hygrometer Reading | | | Ventilated | Initials | Thermometer Reading | | Hygrometer Reading | | | Ventilated | Initials |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Dry | Wet | Difference | | | Maximum | Minimum | Dry | Wet | Difference | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |

**PES Logbook (Temperature and Humidity Recording Record)** IATG Form 06.70E

**Month/Year:** **PES Number:**

| Day | Thermometer Reading | | Hygrometer Reading | | | Ventilated | Initials | Thermometer Reading | | Hygrometer Reading | | | Ventilated | Initials |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Dry | Wet | Difference | | | Maximum | Minimum | Dry | Wet | Difference | | |
| 21 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | | |
| Mean | | | | | | | | | | | | | | |

**Notes:**

1. In the column headed "Ventilated" insert V when the building is ventilated and X when the ventilation is closed.
2. Insert N/A in columns that do not apply.
3. This form should be initialled weekly by the person in charge in the column headed "Initials".

See Handout

<u>**Main idea/objective for slide:**</u>

- **Share an example of a Temperature and Humidity Record.**

<u>What the instructor should cover (in addition to slide content)</u>

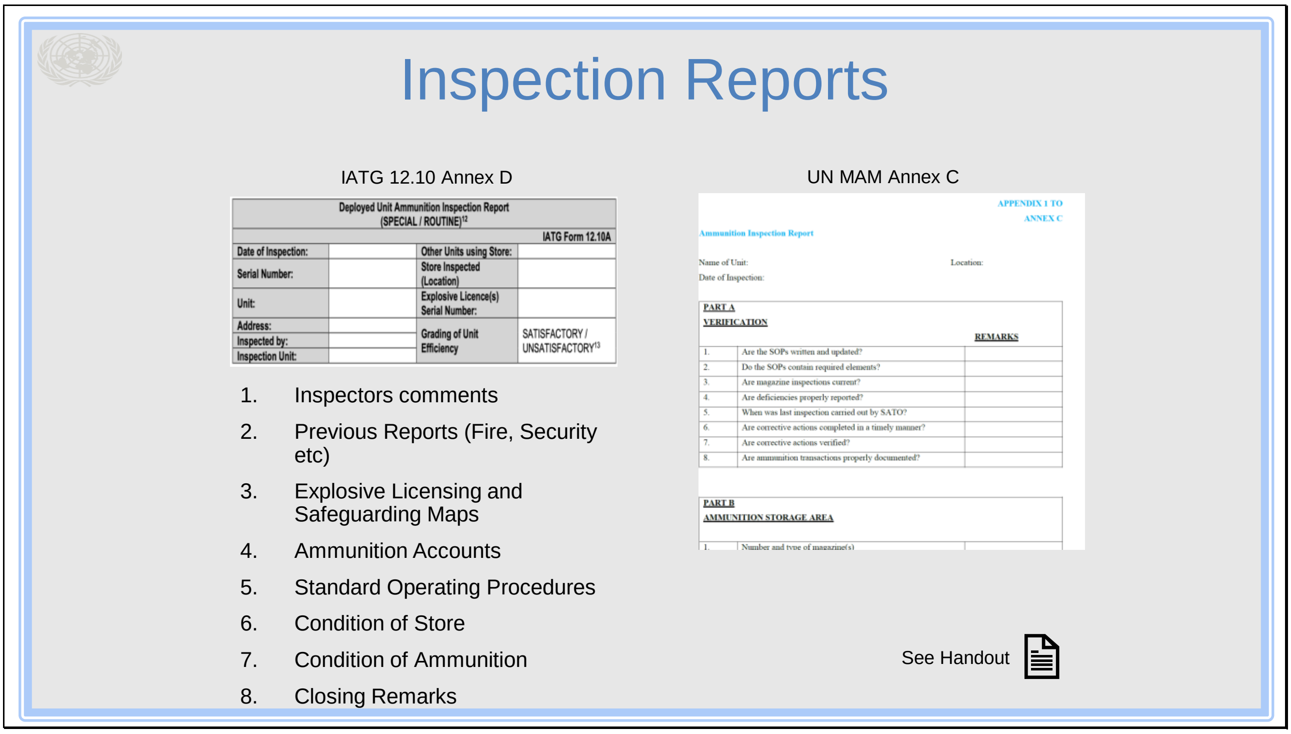
Provide the PES Logbook as a Handout and explain each page and how it is completed (Temperature and Humidity Records)

<u>References/further reading:</u>

**IATG 06.70 – Inspection of explosives facilities - Annex D**

- As per slide

Slide 30



# Inspection Reports

IATG 12.10 Annex D

| | | | |
|---|---|---|---|
| **Deployed Unit Ammunition Inspection Report (SPECIAL / ROUTINE)[12]** | | | |
| | | | **IATG Form 12.10A** |
| **Date of Inspection:** | | **Other Units using Store:** | |
| **Serial Number:** | | **Store Inspected (Location)** | |
| **Unit:** | | **Explosive Licence(s) Serial Number:** | |
| **Address:** | | **Grading of Unit Efficiency** | SATISFACTORY / UNSATISFACTORY[13] |
| **Inspected by:** | | | |
| **Inspection Unit:** | | | |

1. Inspectors comments
2. Previous Reports (Fire, Security etc)
3. Explosive Licensing and Safeguarding Maps
4. Ammunition Accounts
5. Standard Operating Procedures
6. Condition of Store
7. Condition of Ammunition
8. Closing Remarks

UN MAM Annex C

APPENDIX 1 TO
ANNEX C

Ammunition Inspection Report

Name of Unit: Location:
Date of Inspection:

| | | |
|---|---|---|
| **PART A**<br>**VERIFICATION** | | **REMARKS** |
| 1. | Are the SOPs written and updated? | |
| 2. | Do the SOPs contain required elements? | |
| 3. | Are magazine inspections current? | |
| 4. | Are deficiencies properly reported? | |
| 5. | When was last inspection carried out by SATO? | |
| 6. | Are corrective actions completed in a timely manner? | |
| 7. | Are corrective actions verified? | |
| 8. | Are ammunition transactions properly documented? | |

| | | |
|---|---|---|
| **PART B**<br>**AMMUNITION STORAGE AREA** | | |
| 1. | Number and type of magazine(s) | |

See Handout 🗎

**Main idea/objective for slide:**

- **Share an example of an Inspection Report**

What the instructor should cover (in addition to slide content)

Provide a handout of an example Inspection Report, IATG 12.10 – Ammunition on multi-national operations. Annex D

Provide a handout of example Inspection Report, UNMAM Annex & Annex C appendix 1

Explain similar but different layouts and content.

References/further reading:

**United Nations Manual of Ammunition Management, 2020 1st Ed**

- Since ammunition contains high energy material and is designed to be as lethal as possible, it is highly desired that it is safe, reliable and effective during operation, transportation and handling.
- Therefore, inspections and evaluations shall be carried out to ensure that ammunition policy/guidelines are adhered to by units.
- Evaluation and recommendations shall be done to improve the standard of ammunition management in units
- The SATO shall carry out the following types of inspection in the units:
    - Annual Routine Inspection as per a circulated program;
    - The SATO or another ATO shall accompany the COE team to the Operational Readiness Inspection for each unit;
    - An inspection carried out on units upon arrival and repatriation;
    - Any other inspection as appeared/requested by the concerned unit;

  - The SATO shall have the authority to conduct impromptu inspections at any time.
  - The SATO may be unable to attend all inspections for all T/PCCs. Each unit shall be inspected at a minimum of once a year.
- An internal inspection shall be carried out by the T/PCC person in charge of ammunition storage (or a nominated and qualified representative), normally from the military/police unit occupying the camp, to ensure that:
  - There is a continuous recording/logging and monitoring regime to ascertain the condition of each PES, the stockpile contained within and the overall ammunition storage area;
  - There is a PES log book with temperature and humidity records;
  - The firefighting equipment is working, and drills are conducted;
  - The security alarm is working.
- The results of the inspection shall be recorded on an inspection record sheet. A copy of these inspection records shall be sent to the SATO.
- IATG 06.70 will be adhered to during inspection for consultation. A standard Inspection Criteria/Evaluation Template is attached to this manual at Annex C
- The SATO or his/her appropriate representative is authorized to carry out inspection of ammunition and evaluation of units as per this manual.
  - Details regarding the competency and responsibility of SATO are given at Annex D.
- After the inspection is carried out, the SATO shall furnish an inspection and evaluation report on the ammunition storage conditions of the concerned unit.
  - The reports shall be shared with all members of the WAAB and approved during the next WAAB meeting.
  - The chair of the WAAB shall be informed without delay when the minimum standards cannot be met.
  - Copies of the approved report shall be disseminated to all concerned for appropriate action

**IATG 12.10 – Ammunition on multi-national operations. Annex D.** http://data.unsaferguard.org/iatg/en/IATG-12.10-Multi-national-operations-IATG-V.3.pdf

- The efficiency of the unit in relation to its ammunition responsibilities should, on completion of each periodic inspection, be graded in terms of **Satisfactory** or **Unsatisfactory**.
- The grading shall be based on the standard found at the time of the inspection and give an accurate picture of the efficiency of the unit.
- Small infringements may be corrected as the inspection proceeds but a general comment observing this is to be recorded in the report.
- Subsequent corrective action may be taken as necessary to correct faults and bring the unit up to an acceptable standard.
- Accurate reporting is essential to give the chain of command a clear and unambiguous view of ammunition and explosives safety across their area.

- This grading shall be recorded on IATG Form 12.10A (see Annex D) (or national equivalent) by the Inspector.
- When assessing the grading of a unit's efficiency, the Inspector should base his or her judgement on the points listed in IATG 06.70 *Inspection of explosives facilities*, Annex E**.**
- An unsatisfactory grading should only be given if:
    - there is more than one violation of a major point which is considered to compromise explosive safety;
    - there are four or more minor points violated and no corrective action has been taken during the inspection; or
    - Recommendations to resolve a major point or two minor points specified in a previous inspection report have not been carried out.
- The Inspector shall also recommend if more specialist inspections are warranted, (e.g. electrical, lightning protection, infrastructure stability etc).
- A recommended report format for deployed unit ammunition inspections is at Annex D for information

Slide 31

Explosive Storehouse
Inspection Checklist:

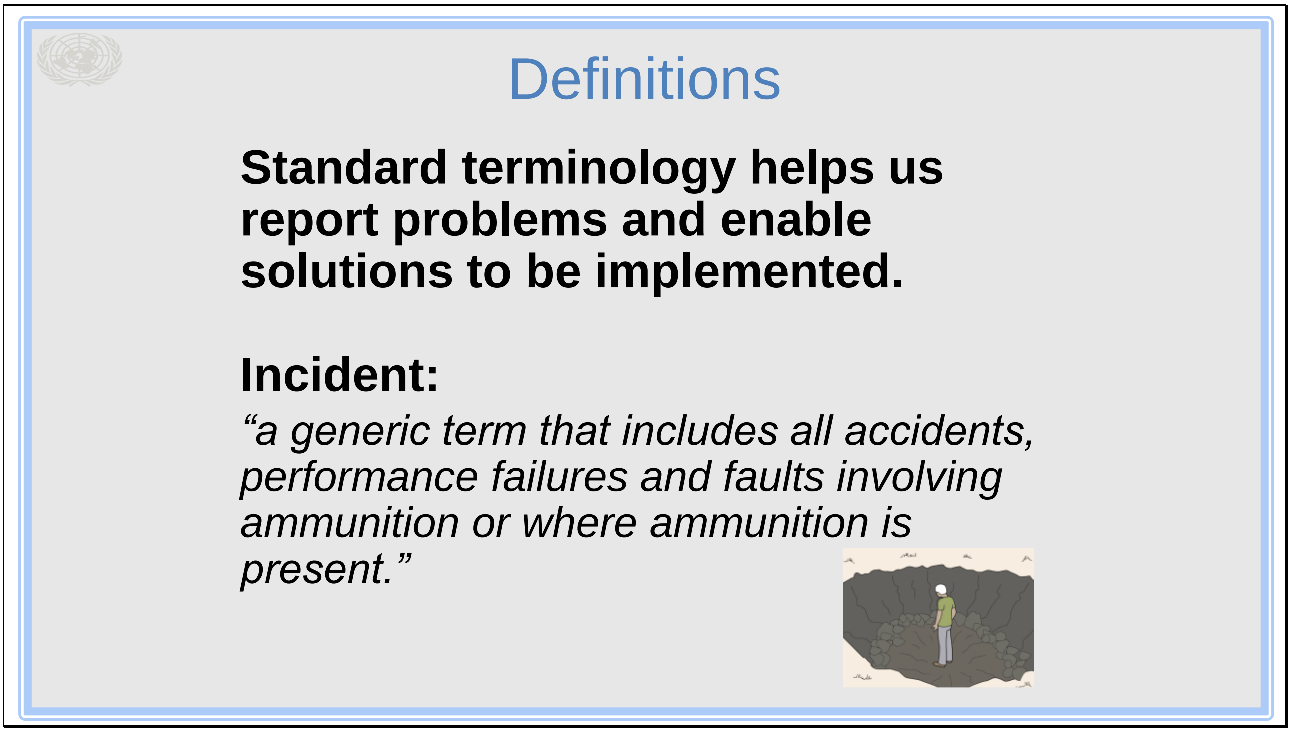
IATG 06.70 Annex F

**<u>Main idea/objective for slide:</u>**
**Show participants an example Explosive Storehouse Inspection Checklist and give a brief overview to the participants how to complete this**

<u>What the instructor should cover (in addition to slide content)</u>
Provide a handout of a sample ESH Inspection Checklist and walk the participants through the various headings.
Print IATG 06.70 Annex C. & UNMAM Annex C, 1 copy per student

<u>References/further reading:</u>
**IATG 06.70 – Inspection of explosives facilities - Annex F.** http://data.unsaferguard.org/iatg/en/IATG-06.70-Inspection-explosives-facilities-IATG-V.3.pdf

Slide 32



## Definitions

**Standard terminology helps us report problems and enable solutions to be implemented.**

**Incident:**

*“a generic term that includes all accidents, performance failures and faults involving ammunition or where ammunition is present.”*

**Main idea/objective for slide:**

- **Describe and explain the following definitions giving examples in each case: ammunition accident; blind; misfire; fault; incident; and performance failure.**

What the instructor should cover (in addition to slide content)

Ask the participants to define an incident before showing this slide

References/further reading:

**IATG 01.60 – Ammunition faults and performance failures**

Slide 33

## Definitions

**Ammunition Accident:**

*"…any incident involving ammunition or explosives that results in, or has potential to result in, death or injury to a person(s) and/or damage to equipment and/or property, military or civilian."*

**<u>Main idea/objective for slide:</u>**

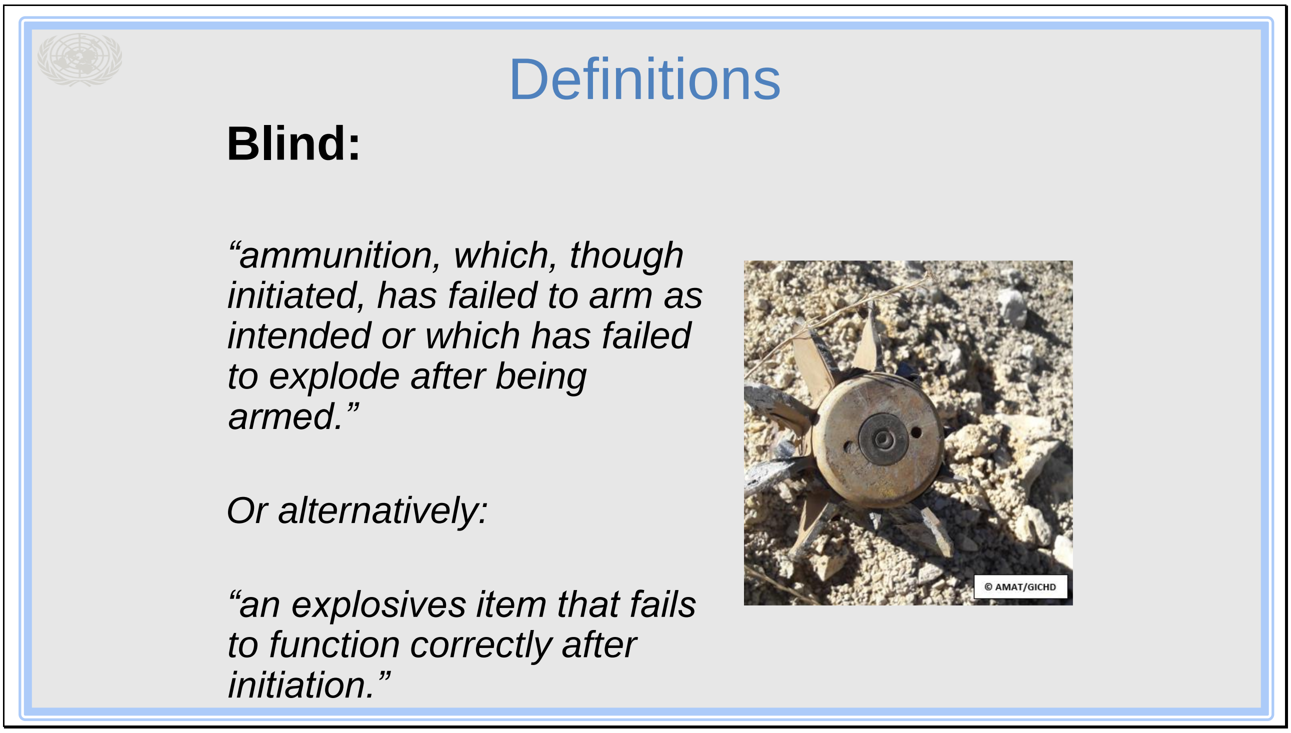
- **Describe and explain the following definitions giving examples in each case: ammunition accident; blind; misfire; fault; incident; and performance failure.**

<u>What the instructor should cover (in addition to slide content)</u>

Ask the participants to define an Ammunition Accident before showing this slide

<u>References/further reading:</u>

**IATG 01.60 – Ammunition faults and performance failures.** http://data.unsaferguard.org/iatg/en/IATG-01.60-Ammunition-faults-performance-failures-IATG-V.3.pdf



## Definitions

**Blind:**

*"ammunition, which, though initiated, has failed to arm as intended or which has failed to explode after being armed."*

*Or alternatively:*

*"an explosives item that fails to function correctly after initiation."*

© AMAT/GICHD

**Main idea/objective for slide:**

- **Describe and explain the following definitions giving examples in each case: ammunition accident; blind; misfire; fault; incident; and performance failure.**

What the instructor should cover (in addition to slide content)
Ask the participants to define a blind before showing this slide

Primer has been struck, mortar has launched and impacted ground but has not functioned as designed.

References/further reading:
**IATG 01.60 – Ammunition faults and performance failures**

Slide 35

## Definitions

**Fault:**

*“any error in the make-up and/or marking and/or deterioration in the physical state of the ammunition, explosives, ammunition packages or ammunition containers.”*

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**Main idea/objective for slide:**

- **Describe and explain the following definitions giving examples in each case: ammunition accident; blind; misfire; fault; incident; and performance failure.**

What the instructor should cover (in addition to slide content)

Ask the participants to define a fault before showing this slide

Rust has appeared on the body of the projectile.

References/further reading:

**IATG 01.60 – Ammunition faults and performance failures**

Slide 36

## Definitions

**Misfire:**

*“ammunition which, when initiated, fails to fire or launch as intended”*

**Main idea/objective for slide:**

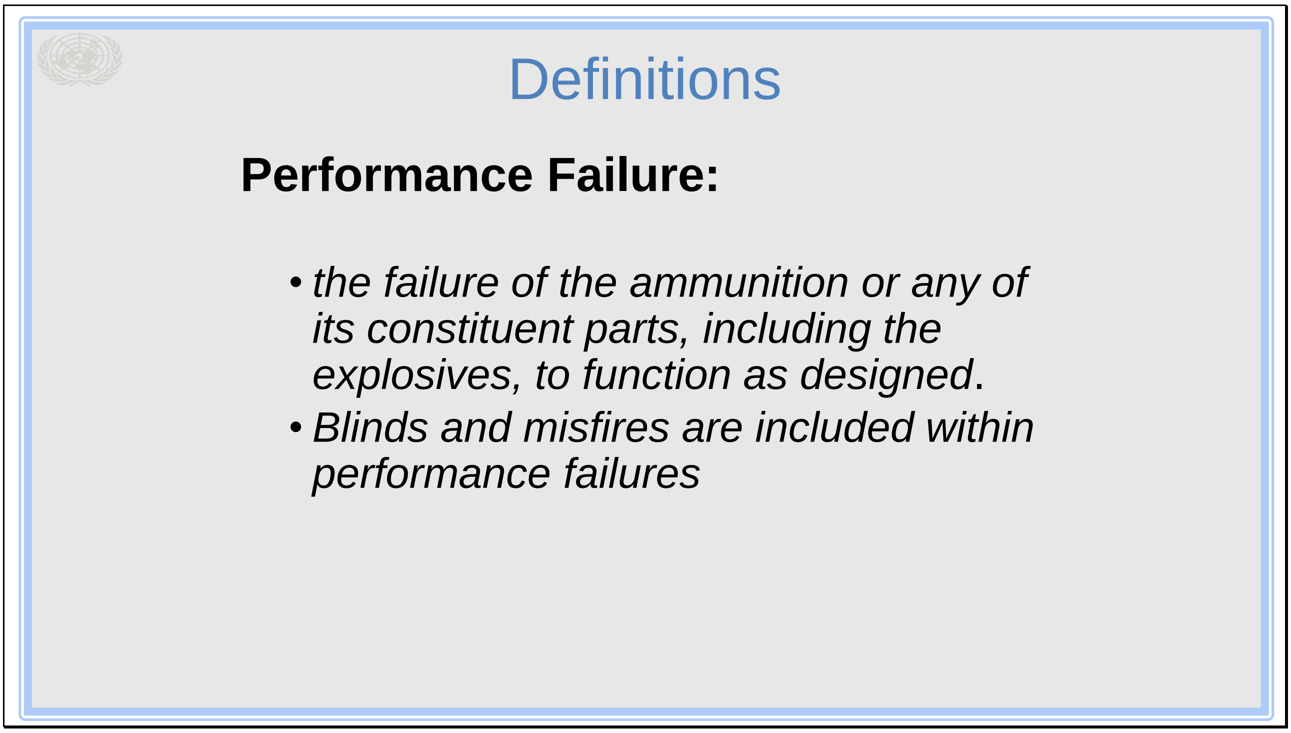
- **Describe and explain the following definitions giving examples in each case: ammunition accident; blind; misfire; fault; incident; and performance failure.**

What the instructor should cover (in addition to slide content)

Ask the participants to define a misfire before showing this slide

References/further reading:

**IATG 01.60 – Ammunition faults and performance failures**



## Definitions

**Performance Failure:**

- *the failure of the ammunition or any of its constituent parts, including the explosives, to function as designed*.
- *Blinds and misfires are included within performance failures*

**Main idea/objective for slide:**

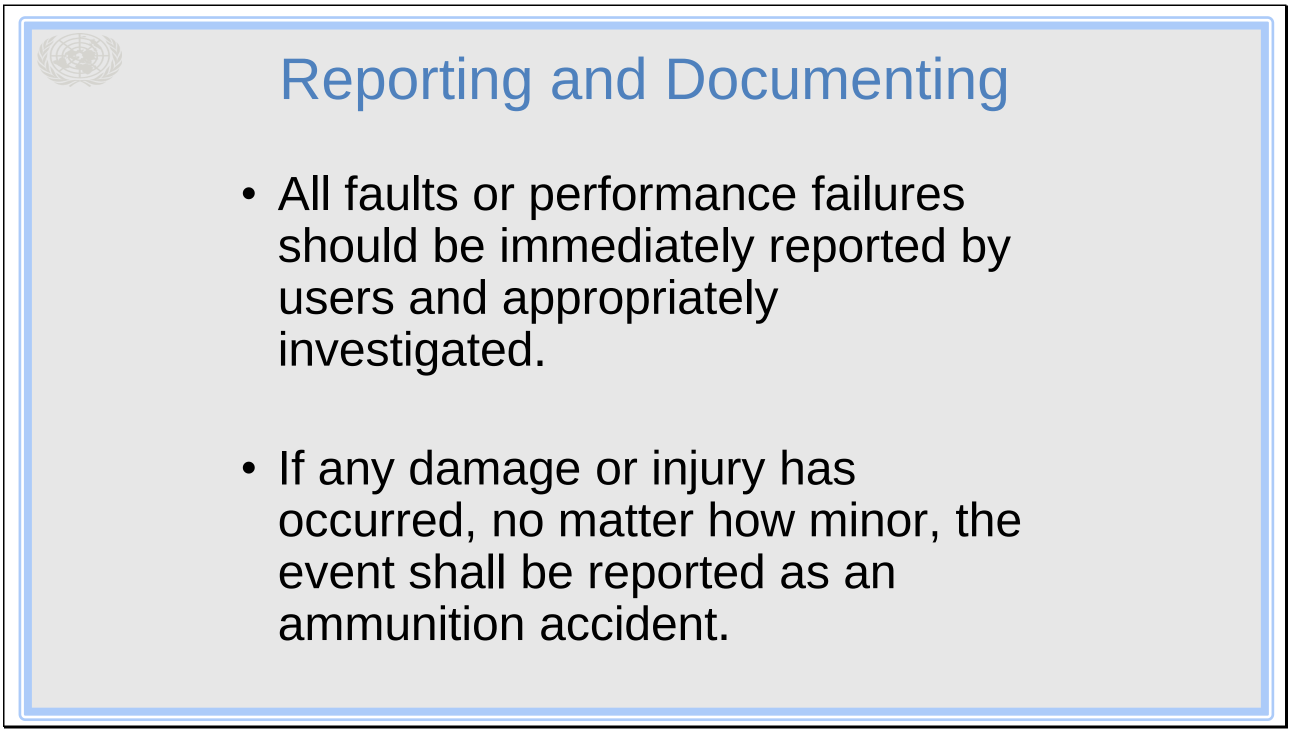
- **Describe and explain the following definitions giving examples in each case: ammunition accident; blind; misfire; fault; incident; and performance failure.**

What the instructor should cover (in addition to slide content)

Ask the participants to define a performance failure before showing this slide

References/further reading:

**IATG 01.60 – Ammunition faults and performance failures**



## Reporting and Documenting

- All faults or performance failures should be immediately reported by users and appropriately investigated.
- If any damage or injury has occurred, no matter how minor, the event shall be reported as an ammunition accident.

**Main idea/objective for slide:**

- **Highlight the need to report and document each of these events accurately and how to complete the reporting procedure.**

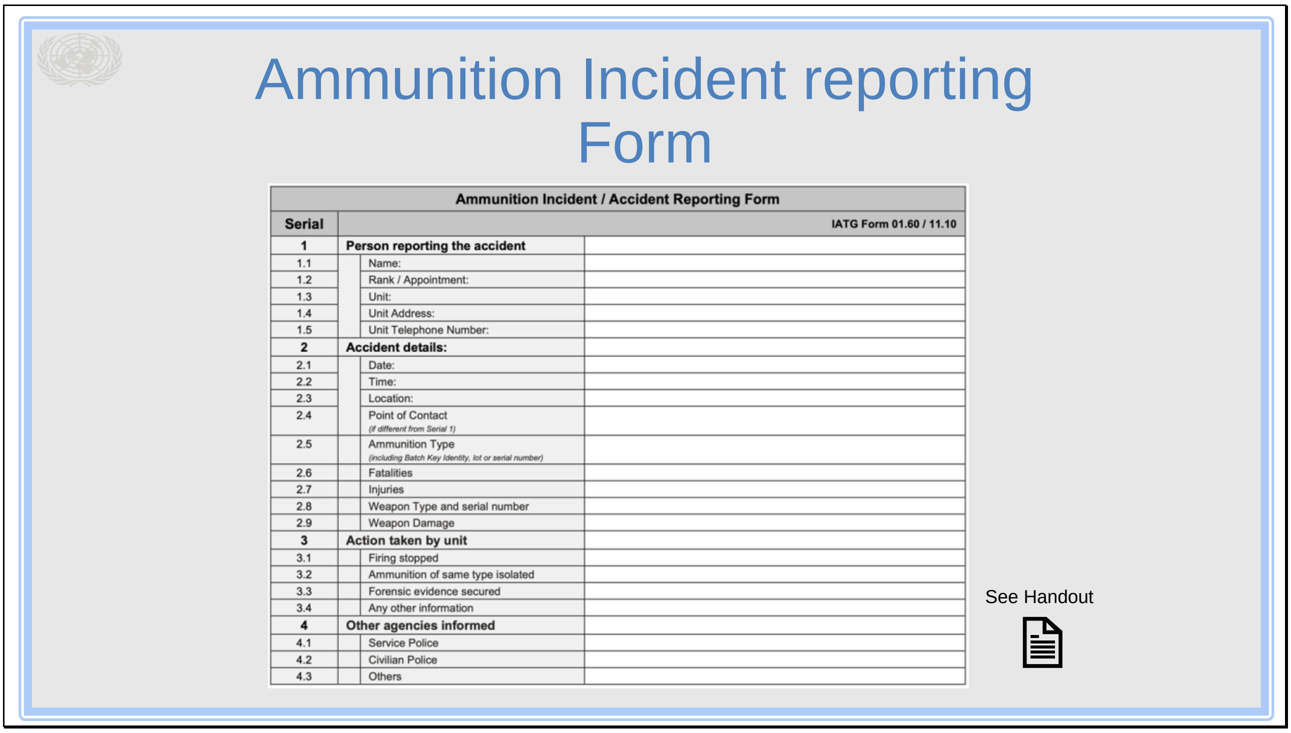
What the instructor should cover (in addition to slide content)
Ask the participants why it is essential to report and document faults or failures. What might happen if we do not?

References/further reading:
**IATG 01.60 – Ammunition faults and performance failures**

- As a fundamental preventative measure to support safe conventional ammunition stockpile management, any faults or performance failures should be immediately reported by users and appropriately investigated in order that the appropriate action can be taken to prevent reoccurrences. Such actions may include:
    - the revision of operating systems and procedures;
    - the imposition of a ban on the use, storage, handling, transport or disposal of the ammunition type involved;
    - after investigation, the imposition of constraints on the use, storage, handling, transport or disposal of the ammunition type involved;
    - rectification of the fault by repair; or
    - withdrawal of the ammunition from service use.

- This will require that an appropriate investigating authority is nominated, staffed and resourced. Therefore, ammunition stockpile management organisations should nominate an appropriate investigating authority and ensure that it is provided with the technically qualified staff and resources that are necessary to provide an effective and efficient capability in this area.
- It should be a mandatory requirement for users or stock-holding units to report any ammunition faults or performance failures to the investigating authority. All incidents of this type should be reported, and users or stock-holding units shall not make the decision that incidents are minor or not worth reporting.
- If any damage or injury has occurred, no matter how minor, the event shall be reported as an ammunition accident in line with the requirements of IATG 11.10 *Ammunition accidents, reporting and investigation.*

Slide 39



## Ammunition Incident reporting Form

**Ammunition Incident / Accident Reporting Form**

| Serial | IATG Form 01.60 / 11.10 | |
|---|---|---|
| **1** | **Person reporting the accident** | |
| 1.1 | Name: | |
| 1.2 | Rank / Appointment: | |
| 1.3 | Unit: | |
| 1.4 | Unit Address: | |
| 1.5 | Unit Telephone Number: | |
| **2** | **Accident details:** | |
| 2.1 | Date: | |
| 2.2 | Time: | |
| 2.3 | Location: | |
| 2.4 | Point of Contact *(if different from Serial 1)* | |
| 2.5 | Ammunition Type *(including Batch Key Identity, lot or serial number)* | |
| 2.6 | Fatalities | |
| 2.7 | Injuries | |
| 2.8 | Weapon Type and serial number | |
| 2.9 | Weapon Damage | |
| **3** | **Action taken by unit** | |
| 3.1 | Firing stopped | |
| 3.2 | Ammunition of same type isolated | |
| 3.3 | Forensic evidence secured | |
| 3.4 | Any other information | |
| **4** | **Other agencies informed** | |
| 4.1 | Service Police | |
| 4.2 | Civilian Police | |
| 4.3 | Others | |

See Handout

**Main idea/objective for slide:**

- **Highlight the need to report and document each of these events accurately and how to complete the reporting procedure.**

What the instructor should cover (in addition to slide content)

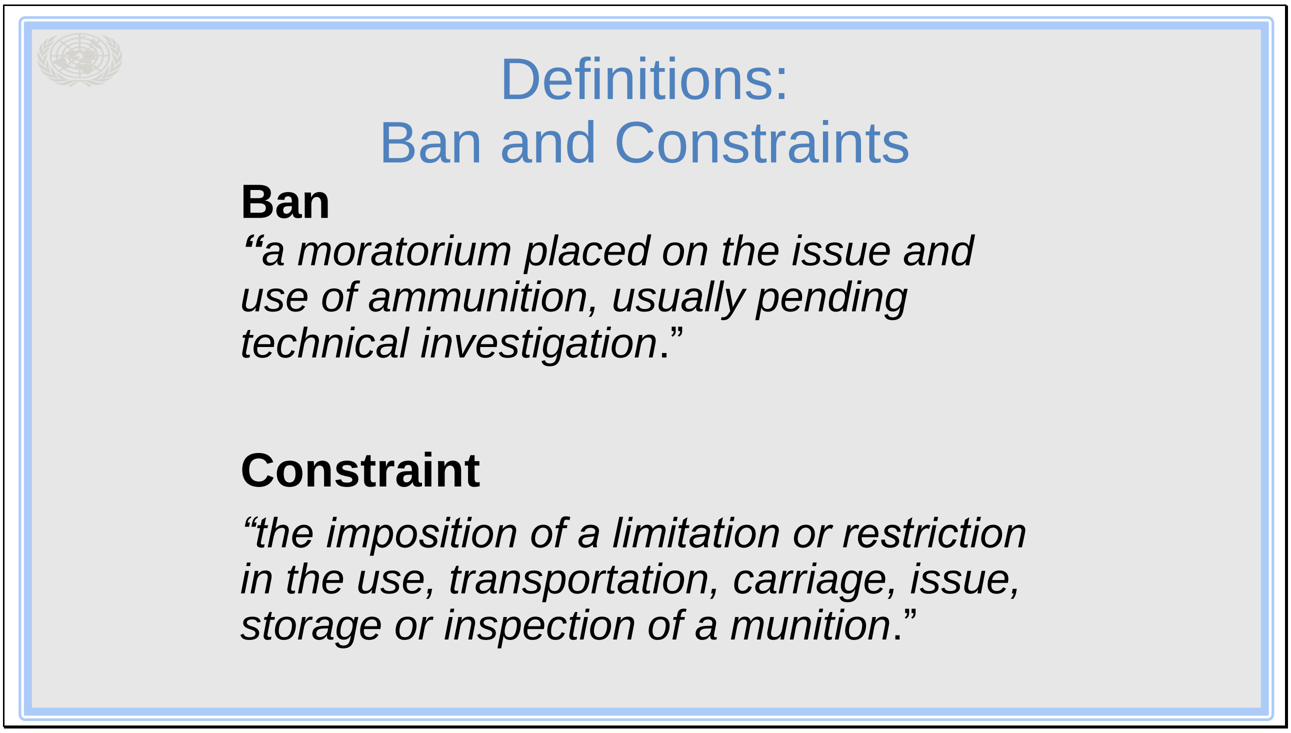
Discuss each heading of the Incident Form with the participants and ensure they understand the need for this information

Provide a handout of this Form to the participants

References/further reading:

**IATG 01.60 – Ammunition faults and performance failures, Annex C**

- The organisation responsible for the stockpile management of conventional ammunition should ensure that a system of reporting and investigating ammunition fault and performance failures is developed, promulgated to all users and is then effectively used.
- Users should be instructed to immediately report the following information on an ammunition fault or performance failure to the appropriate investigating authority



## Definitions:
## Ban and Constraints

**Ban**

*“a moratorium placed on the issue and use of ammunition, usually pending technical investigation.”*

**Constraint**

*“the imposition of a limitation or restriction in the use, transportation, carriage, issue, storage or inspection of a munition.”*

**Main idea/objective for slide:**

- **Provide the definitions of a Ban and a Constraint in terms of ammunition management.**

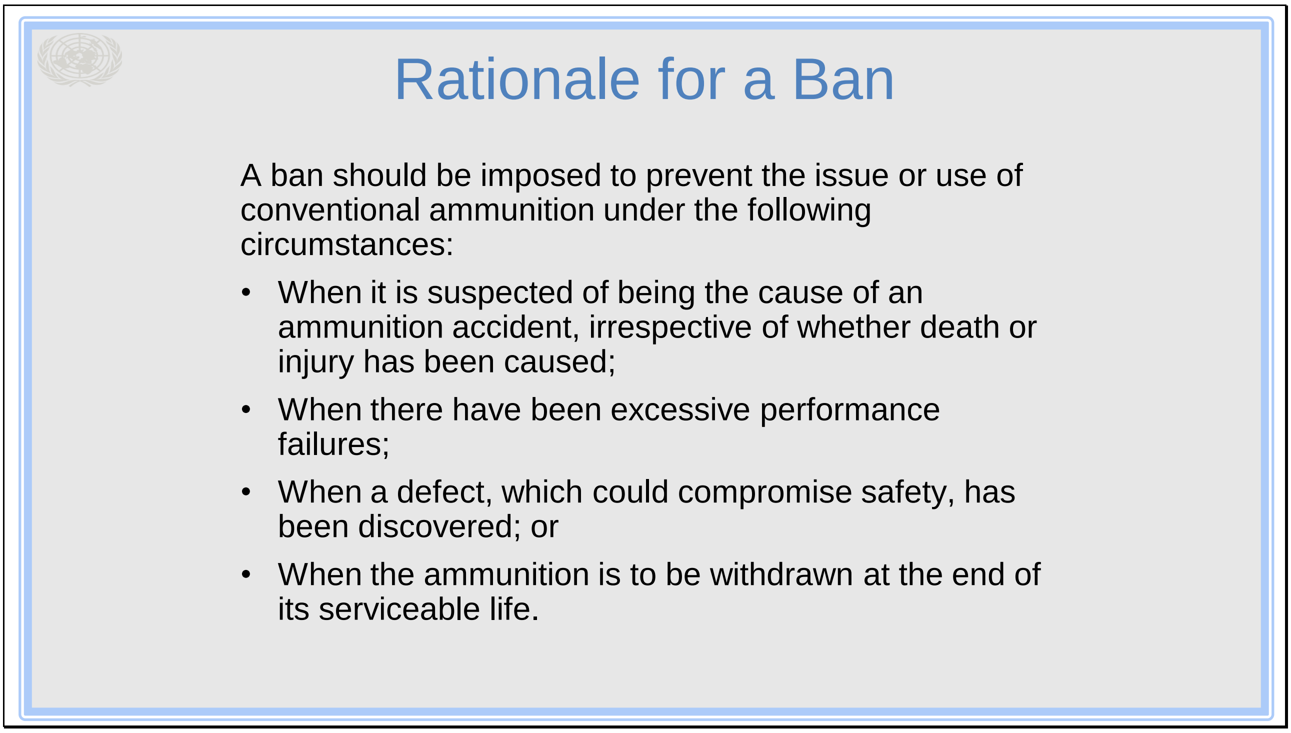
What the instructor should cover (in addition to slide content)

Ask the participants to explain the difference between a Ban and a Constraint before showing this slide

References/further reading:

**IATG 01.70 – Bans and Constraints.** http://data.unsaferguard.org/iatg/en/IATG-01.70-Bans-constraints-IATG-V.3.pdf

- The aim of a formal system of bans and constraints, instigated by a conventional ammunition stockpile management organisation, should be to ensure:
    - the safety of personnel during the use, storage, handling, transportation or disposal of conventional ammunition;
    - the optimum use of the conventional ammunition stockpile, which is an expensive national asset; and
- the controlled issue and use of specific or generic conventional ammunition during times of shortages.



## Rationale for a Ban

A ban should be imposed to prevent the issue or use of conventional ammunition under the following circumstances:

- When it is suspected of being the cause of an ammunition accident, irrespective of whether death or injury has been caused;
- When there have been excessive performance failures;
- When a defect, which could compromise safety, has been discovered; or
- When the ammunition is to be withdrawn at the end of its serviceable life.

**Main idea/objective for slide:**

**Discuss the differences between a Ban and a Constraint and outline the actions to be carried out when these terms have been applied to ammunition.**

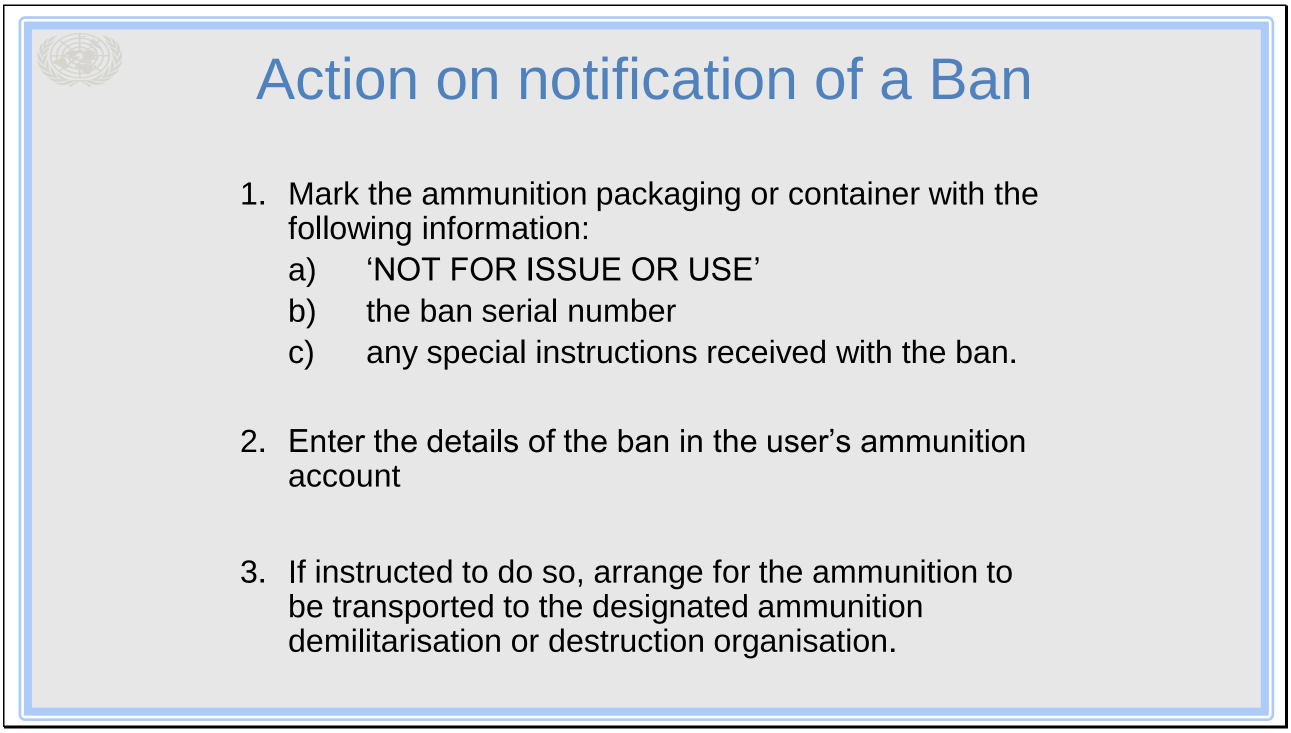
What the instructor should cover (in addition to slide content)

Explain why it is necessary to apply a Ban in these cases.

References/further reading:

- **IATG 01.70 – Bans and Constraints**

Slide 42



## Action on notification of a Ban

1. Mark the ammunition packaging or container with the following information:
   a) ‘NOT FOR ISSUE OR USE’
   b) the ban serial number
   c) any special instructions received with the ban.

2. Enter the details of the ban in the user’s ammunition account

3. If instructed to do so, arrange for the ammunition to be transported to the designated ammunition demilitarisation or destruction organisation.

**Main idea/objective for slide:**

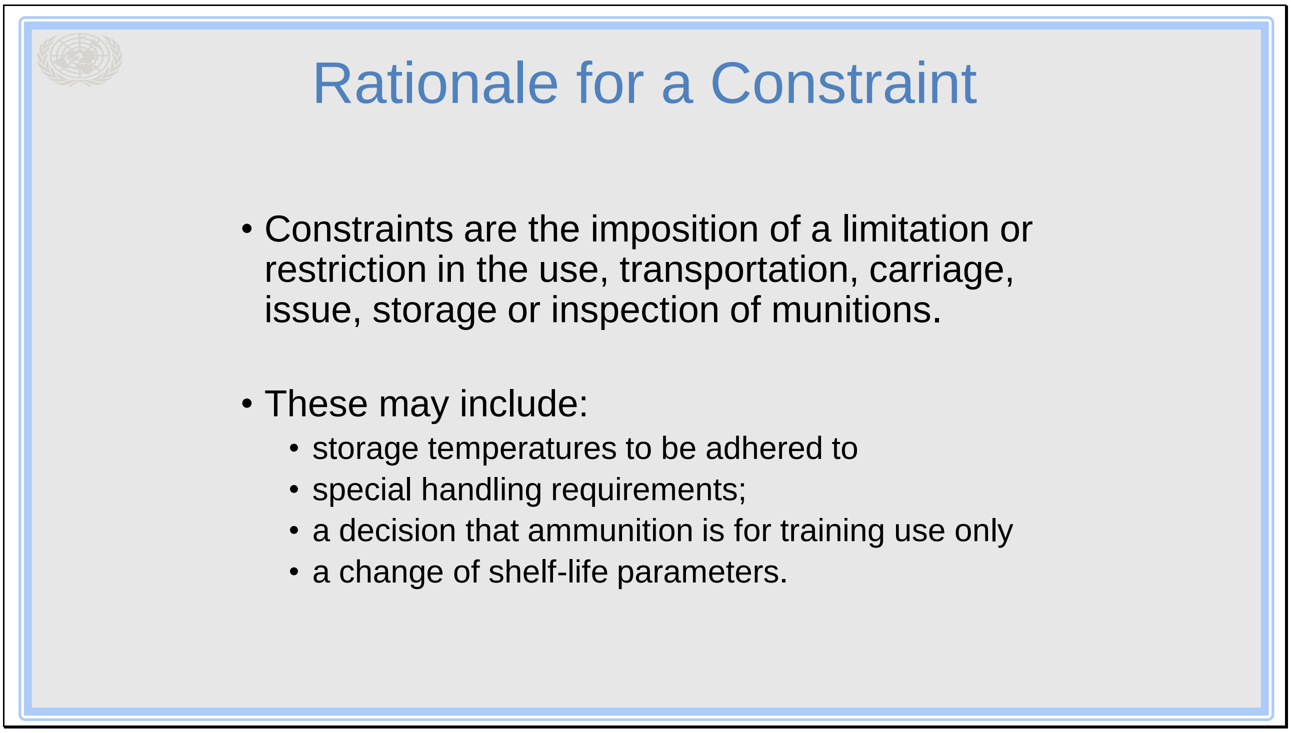
**Discuss the differences between a Ban and a Constraint and outline the actions to be carried out when these terms have been applied to ammunition.**

What the instructor should cover (in addition to slide content)

Write the steps for notifying a Ban on ammuntion onto  a white board

References/further reading:

**IATG 01.70 – Bans and Constraints**



## Rationale for a Constraint

- Constraints are the imposition of a limitation or restriction in the use, transportation, carriage, issue, storage or inspection of munitions.
- These may include:
  - storage temperatures to be adhered to
  - special handling requirements;
  - a decision that ammunition is for training use only
  - a change of shelf-life parameters.

<u>**Main idea/objective for slide:**</u>
**Discuss the differences between a Ban and a Constraint and outline the actions to be carried out when these terms have been applied to ammunition.**

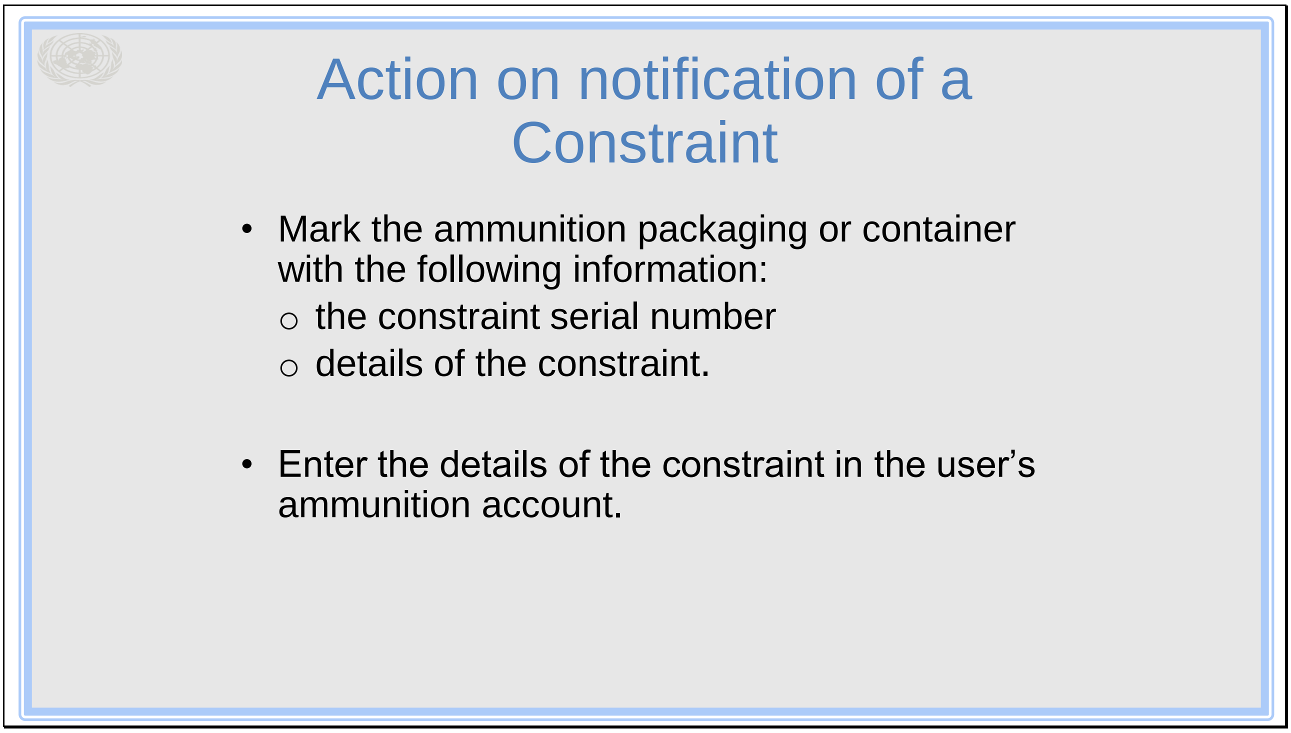
<u>What the instructor should cover (in addition to slide content)</u>
Explain why it is necessary to apply a Constraint in these cases.

<u>References/further reading:</u>
**IATG 01.70 – Bans and Constraints**

- Constraints (which may be at generic type, lot, batch and/or serial number level) are the imposition of a limitation or restriction in the use, transportation, carriage, issue, storage or inspection of munitions.
- Constraints should be used as a tool for the ammunition management system.
- They normally remain in force for the life of ammunition, while a ban can be a short-term measure.
- Details of the constraints shall be printed on the ammunition issue vouchers, and a note shall be made on the ammunition account sheet of any constraints.
- Constraints on the use, storage, handling, transportation or disposal of ammunition may include:

- storage temperatures to be adhered to;
- special handling requirements;
- a decision that ammunition is for training use only; and
- a change of shelf life parameters.

Slide 44



## Action on notification of a Constraint

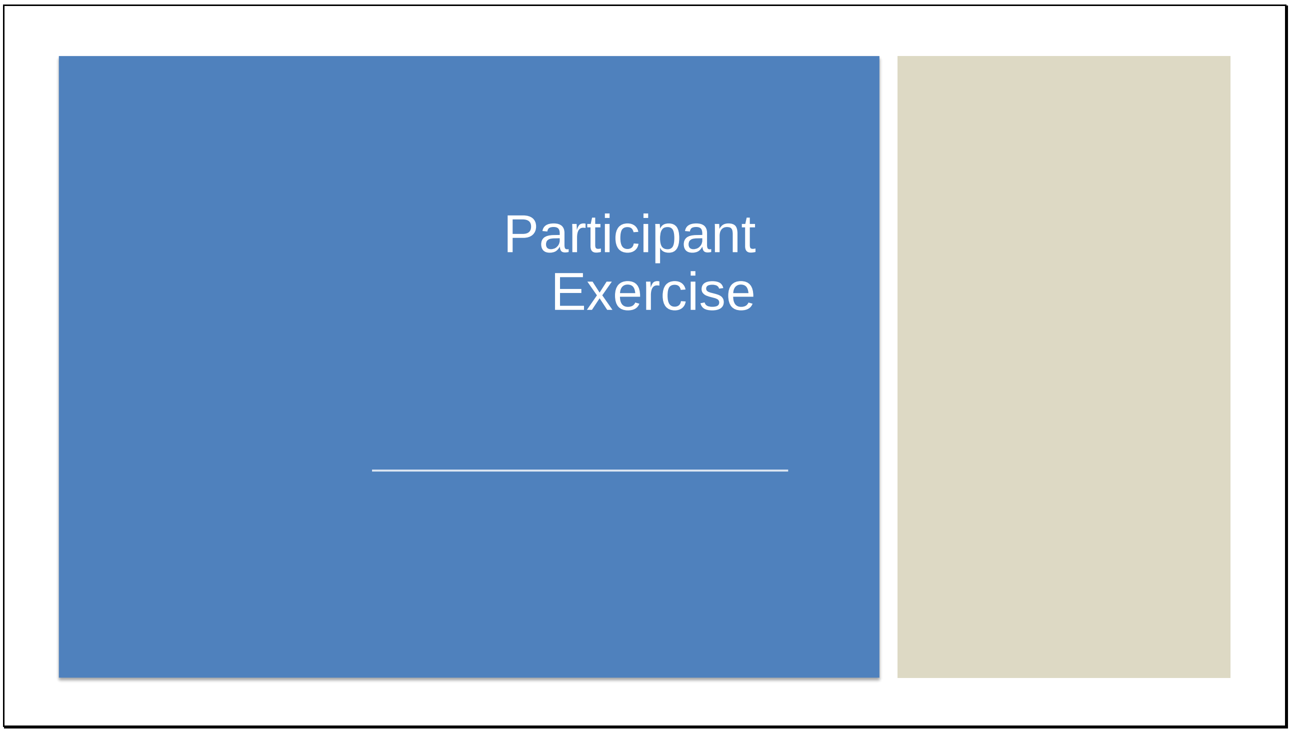
- Mark the ammunition packaging or container with the following information:
  - the constraint serial number
  - details of the constraint.
- Enter the details of the constraint in the user's ammunition account.

**<u>Main idea/objective for slide:</u>**
**Discuss the differences between a Ban and a Constraint and outline the actions to be carried out when these terms have been applied to ammunition.**

<u>What the instructor should cover (in addition to slide content)</u>
Write the steps for notifying a Constraint on ammuntion onto  a white board

<u>References/further reading:</u>
**IATG 01.70 – Bans and Constraints**

Slide 45

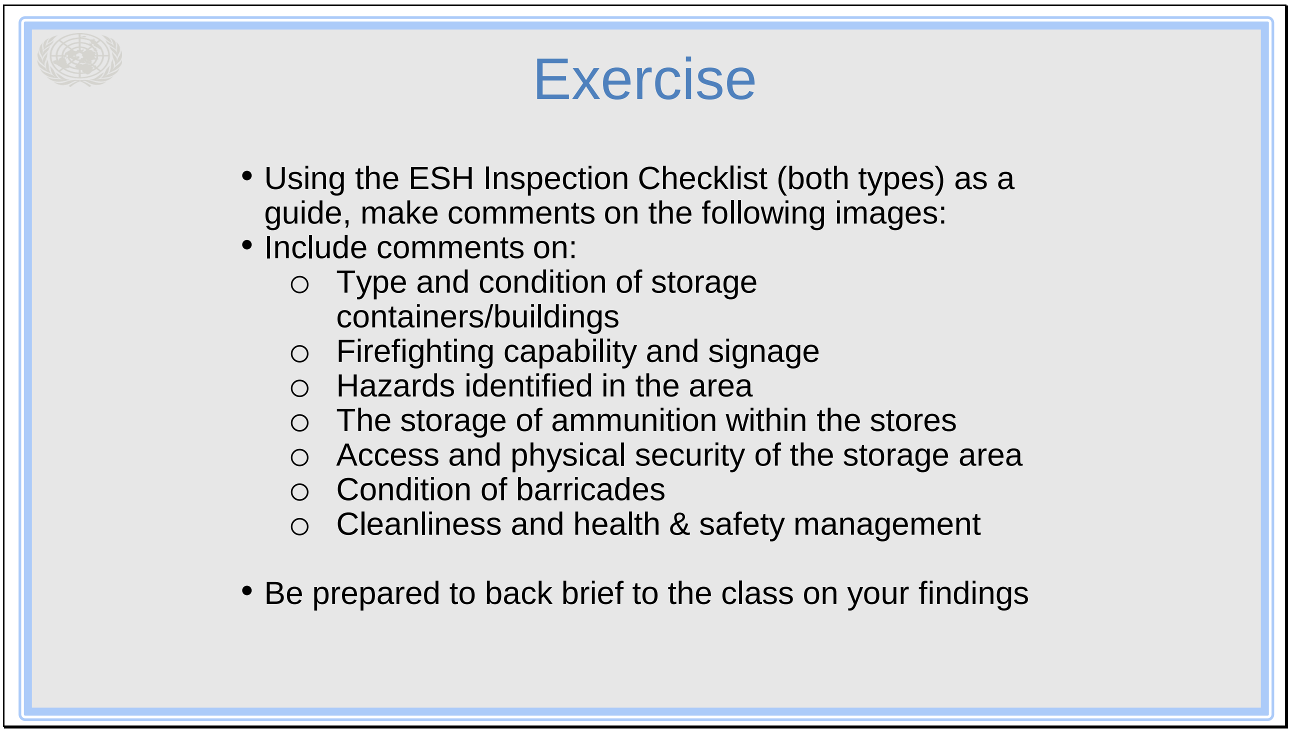


Participant Exercise

**Phase 2. Development (**Time allocation - 150 min**)**

Stage 3 (Time allocation 50 mins) – participant Exercise

Slide 46



## Exercise

- Using the ESH Inspection Checklist (both types) as a guide, make comments on the following images:
- Include comments on:
    - Type and condition of storage containers/buildings
    - Firefighting capability and signage
    - Hazards identified in the area
    - The storage of ammunition within the stores
    - Access and physical security of the storage area
    - Condition of barricades
    - Cleanliness and health & safety management

- Be prepared to back brief to the class on your findings

**Main idea/objective for slide:**
**participant Exercise to identify hazards, recommend mitigations and complete ESH Inspection Matrix**

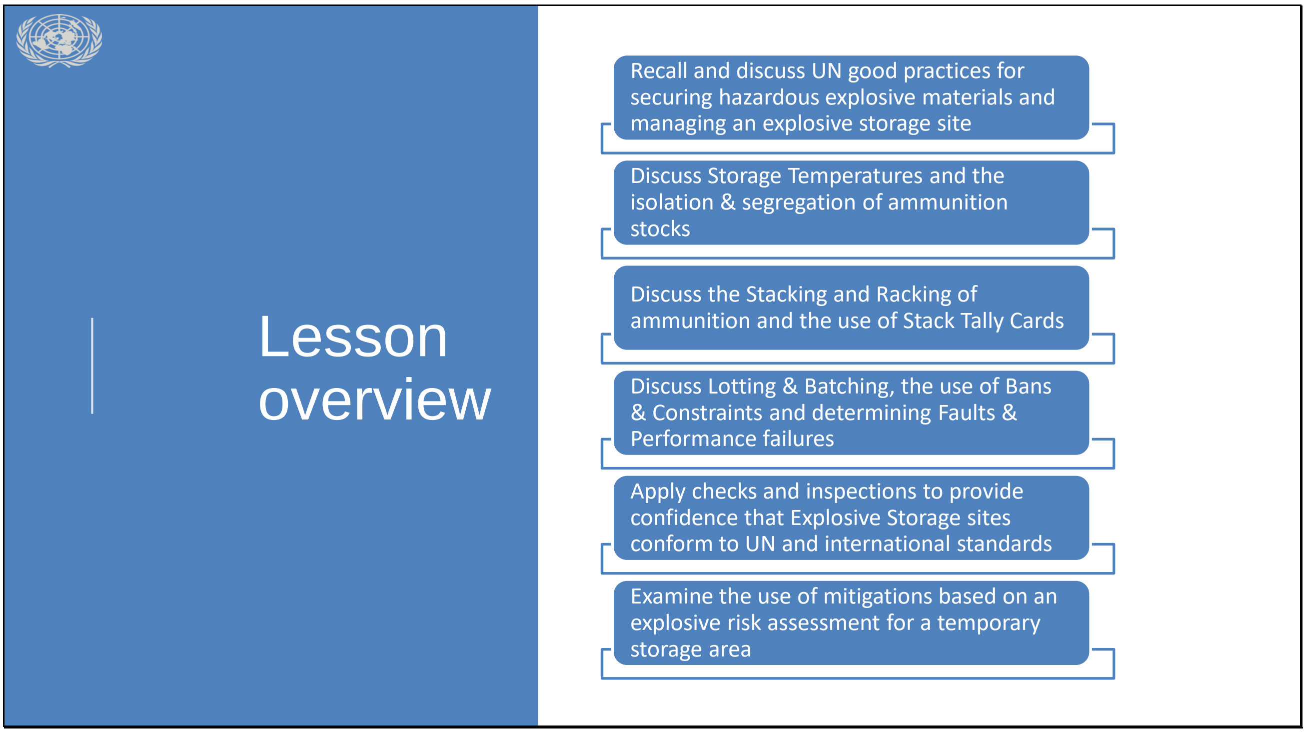
participant Activity

- Using a series of images of a Temporary Storage Area and its stockpiles, ask the syndicate groups to conduct visual inspections of the images and complete the ESH Inspection Checklist (as provided as a handout during the lesson at Slide 28) for each Stockpile or storehouse.
- participants must identify the hazards and make recommendations to mitigate the risks of these hazards.

What the instructor should cover (in addition to slide content)

- Instructors are to move around the class and help participants where required. participants may work in groups .
- When complete, work through the answers with the class and ask questions.

Slide 47



## Lesson overview

- Recall and discuss UN good practices for securing hazardous explosive materials and managing an explosive storage site
- Discuss Storage Temperatures and the isolation & segregation of ammunition stocks
- Discuss the Stacking and Racking of ammunition and the use of Stack Tally Cards
- Discuss Lotting & Batching, the use of Bans & Constraints and determining Faults & Performance failures
- Apply checks and inspections to provide confidence that Explosive Storage sites conform to UN and international standards
- Examine the use of mitigations based on an explosive risk assessment for a temporary storage area

## Summary

This lesson delved deeper into ammunition management on UN operations by T/PCCs, covering various aspects to ensure compliance with UN and international standards. Key learning points included:

- Review and discuss best practices for securing explosive materials and managing storage sites according to UN standards.
- Explore considerations regarding storage temperatures and the importance of isolating and segregating ammunition stocks to prevent accidents.
- Engage in discussions about proper stacking and racking techniques for ammunition and the use of stack tally cards for inventory management.
- Explore practices related to lotting and batching of ammunition, imposing bans and constraints, and identifying faults and performance failures for corrective action.
- Practice conducting checks and inspections to verify that explosive storage sites adhere to UN and international standards, ensuring safety and compliance.
- Analyze and understand the process of implementing mitigations based on an explosive risk assessment for temporary storage areas, emphasizing risk management and safety protocols.

Slide 48

Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Explosive Risk Assessment

**Main idea/objective for slide:**

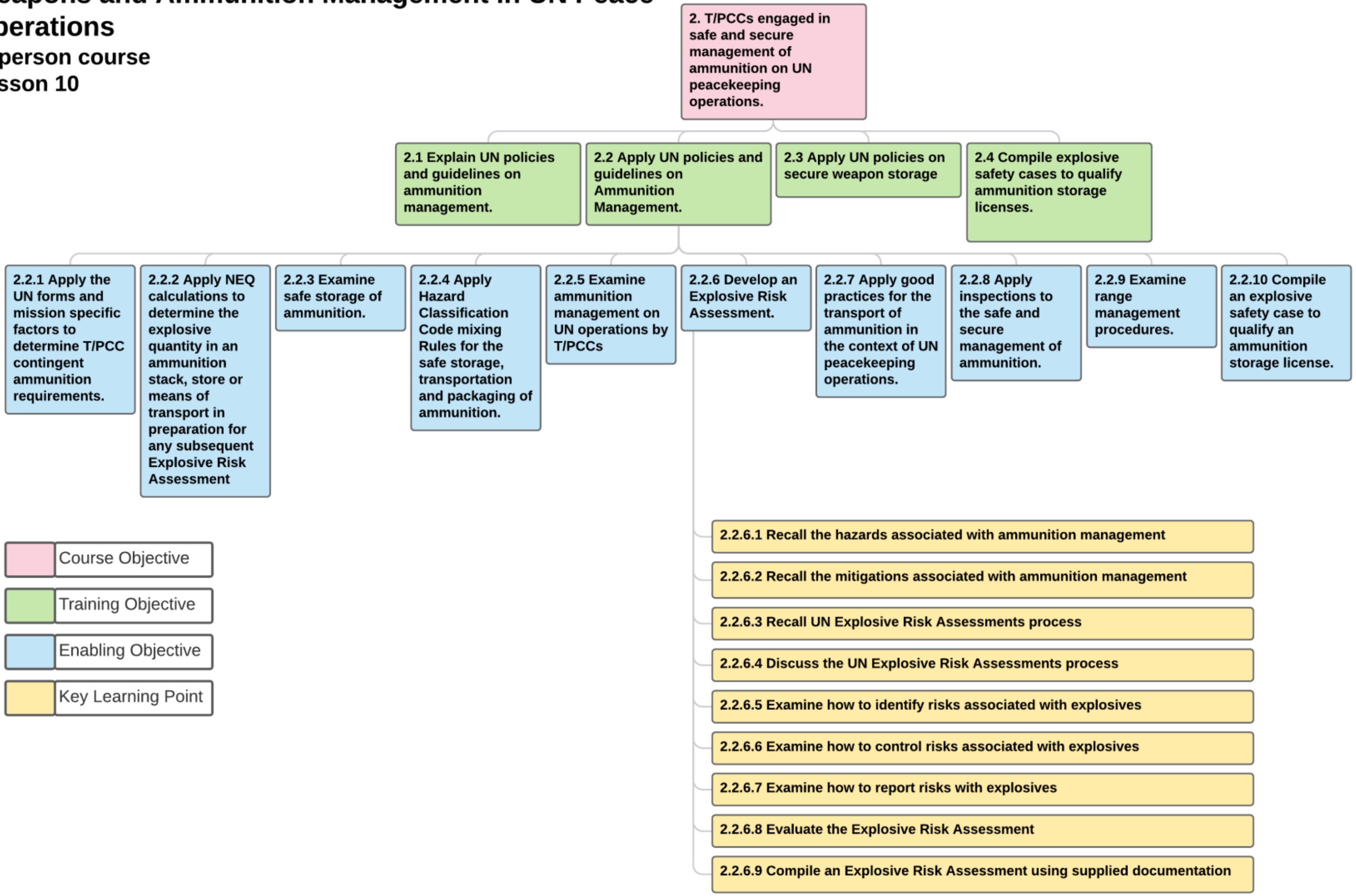
Look ahead to the next lesson of the course:

Explosive Risk Assessment

# Lesson 2.6

## Lesson 2.6: Explosive Risk Assessment

**Weapons and Ammunition Management in UN Peace Operations**
**In-person course**
**Lesson 10**



2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.

2.1 Explain UN policies and guidelines on ammunition management.

2.2 Apply UN policies and guidelines on Ammunition Management.

2.3 Apply UN policies on secure weapon storage

2.4 Compile explosive safety cases to qualify ammunition storage licenses.

2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.

2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment

2.2.3 Examine safe storage of ammunition.

2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.

2.2.5 Examine ammunition management on UN operations by T/PCCs

2.2.6 Develop an Explosive Risk Assessment.

2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.

2.2.8 Apply inspections to the safe and secure management of ammunition.

2.2.9 Examine range management procedures.

2.2.10 Compile an explosive safety case to qualify an ammunition storage license.

2.2.6.1 Recall the hazards associated with ammunition management

2.2.6.2 Recall the mitigations associated with ammunition management

2.2.6.3 Recall UN Explosive Risk Assessments process

2.2.6.4 Discuss the UN Explosive Risk Assessments process

2.2.6.5 Examine how to identify risks associated with explosives

2.2.6.6 Examine how to control risks associated with explosives

2.2.6.7 Examine how to report risks with explosives

2.2.6.8 Evaluate the Explosive Risk Assessment

2.2.6.9 Compile an Explosive Risk Assessment using supplied documentation

🟥 Course Objective
🟩 Training Objective
🟦 Enabling Objective
🟨 Key Learning Point

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L10. Explosive Risk Assessment |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 180 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.6 Develop an Explosive Risk Assessment. | 2.2.6.1 Recall the hazards associated with ammunition management<br>2.2.6.2 Recall the mitigations associated with ammunition management<br>2.2.6.3 Recall UN Explosive Risk Assessments process<br>2.2.6.4 Discuss the UN Explosive Risk Assessments process<br>2.2.6.5 Examine how to identify risks associated with explosives<br>2.2.6.6 Examine how to control risks associated with explosives<br>2.2.6.7 Examine how to report risks with explosives<br>2.2.6.8 Evaluate the Explosive Risk Assessment<br>2.2.6.9 Compile an Explosive Risk Assessment using supplied documentation |
| **Performance Statement:** | *By the end of the lessons the participants will…*<br>Compile an Explosive Risk Assessment. |
| **Assessment Criteria:** | There is no final assessment for this exercise, however, Instructors will use informal class discussion, questioning of participants and review the work by the participants to enable a positive feedback loop to be established to enhance the effectiveness of the learning. |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | 1:6 in syndicates. Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom |
| **Instructional tools & materials** | Example of an Explosive Risk Assessment, A qualitative risk assessment and a quantitative risk assessment. |
| **Participant Resources:** | • Participant handout (word doc 'WAMUNPOC L10 Risk Assessment Exercise')<br>• UN CARANA scenario narrative<br>• Full size printouts of some slides where required – see slide notes for details. E.g. Explosive Risk Assessment template for qualitative and quantitative risk assessments |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: Health and safety checklist for classrooms (hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

# SECTION 2: LESSON PLAN

## Executive summary:

By the end of this training session participants will have developed their ability to compile a risk assessment associated with explosive storage. They will apply various methods of determining, controlling and reporting risks associated with explosives. They will utilise the associated risk management documentation to implement effective explosive safety management to compile an Explosive Risk Assessment.

## Setup:

Phase 1, Phase 2 (stages 1&2) and Phase 3 will be delivered to the class as a single collective.

Phase 3 (stage 3) will be conducted in small groups (6-8 participants) each with a dedicated instructor.

## Conduct:

### Phase 1. Introduction (Time allocation - 10 min)

- Introduce the objectives of the lesson.
- Discuss the concept of explosive safety and emphasise the need to manage any event that can lead to a serious consequence.
- Explore with the participants what types of serious events may occur with stored ammunition and explosives. Also ask the participants to give examples of events that could lead to a serious situation. Write these on a flipchart and post it on the wall.

### Phase 2. Development

Stage 1 (Time allocation 40 mins) – The Risk Management Process

- Discuss the definition of Risk and tolerable risk (ALARP), placing emphasis on the management of ammunition and explosive storage.
- Introduce the risk management process, to include hazard identification, the likelihood of the event occurring and the consequence of such an event happening. Write these definitions on a flipchart and post it onto the wall.
- Explore with the participants the possible types of mitigation controls that can be employed in an explosive storage context and use this to explain residual risk.

Stage 2 (Time allocation 40 mins) – Explosive Risk Assessments

- Introduce the participants to the Explosive Risk Assessment and walk them through a complete worked example – discussing each phase and asking questions of the participants to check understanding.

- Discuss the difference between qualitative and quantitative explosive risk assessment.
- Provide an example of a qualitative explosive risk assessment to the participants and walk them through each section to explain how it is produced.
- Provide an example of a quantitative explosive risk assessment to the participants and walk him through each section to explain how it is produced.

Stage 3 (Time allocation 80 mins) – Participant exercise

- Participant exercise to identify the various hazards to an ammunition Temporary Storage area, using the CARANA scenario.
- Each participant should receive a copy of the handout (word doc 'Lesson 10 - Explosive Risk Assessment practical exercise')
- The participants must produce a qualitative explosive risk assessment which includes all mitigating controls and demonstrates the awareness of residual risk to ALARP levels.
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions.

**Phase 3. Consolidation (Time allocation - 10 min)**

- Review Enabling objective and Key Learning Points (see Section 1), drawing out any common themes.
- Look ahead to the next lesson of the course:
  - Transporting Ammunition on UN Operations

Slide 1

# Weapons and Ammunition Management in UN Peace Operations

## Explosive Risk Assessment

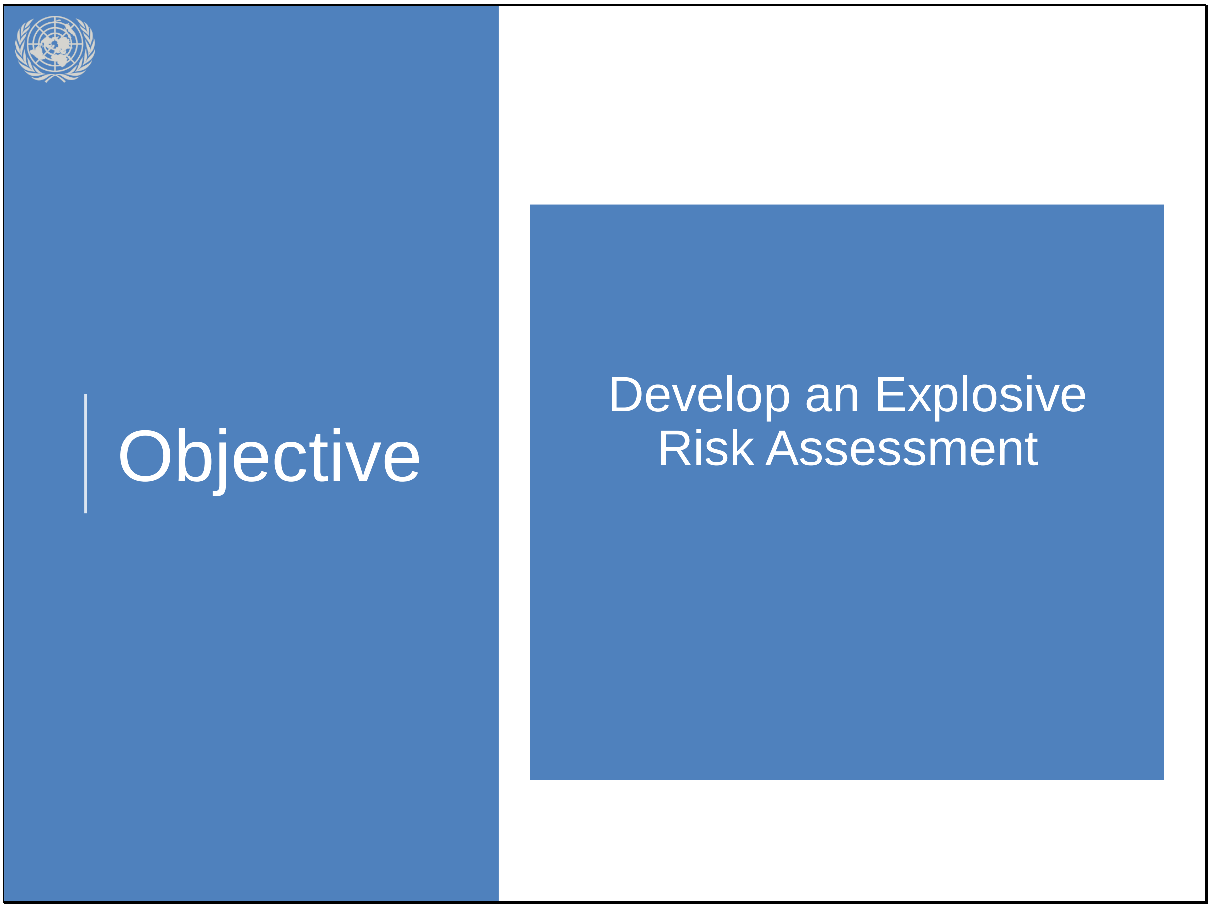
**Key Reference Documents for this lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

- http://data.unsaferguard.org/iatg/en/IATG-02.10-Introduction-risk-management-IATG-V.3.pdf

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2



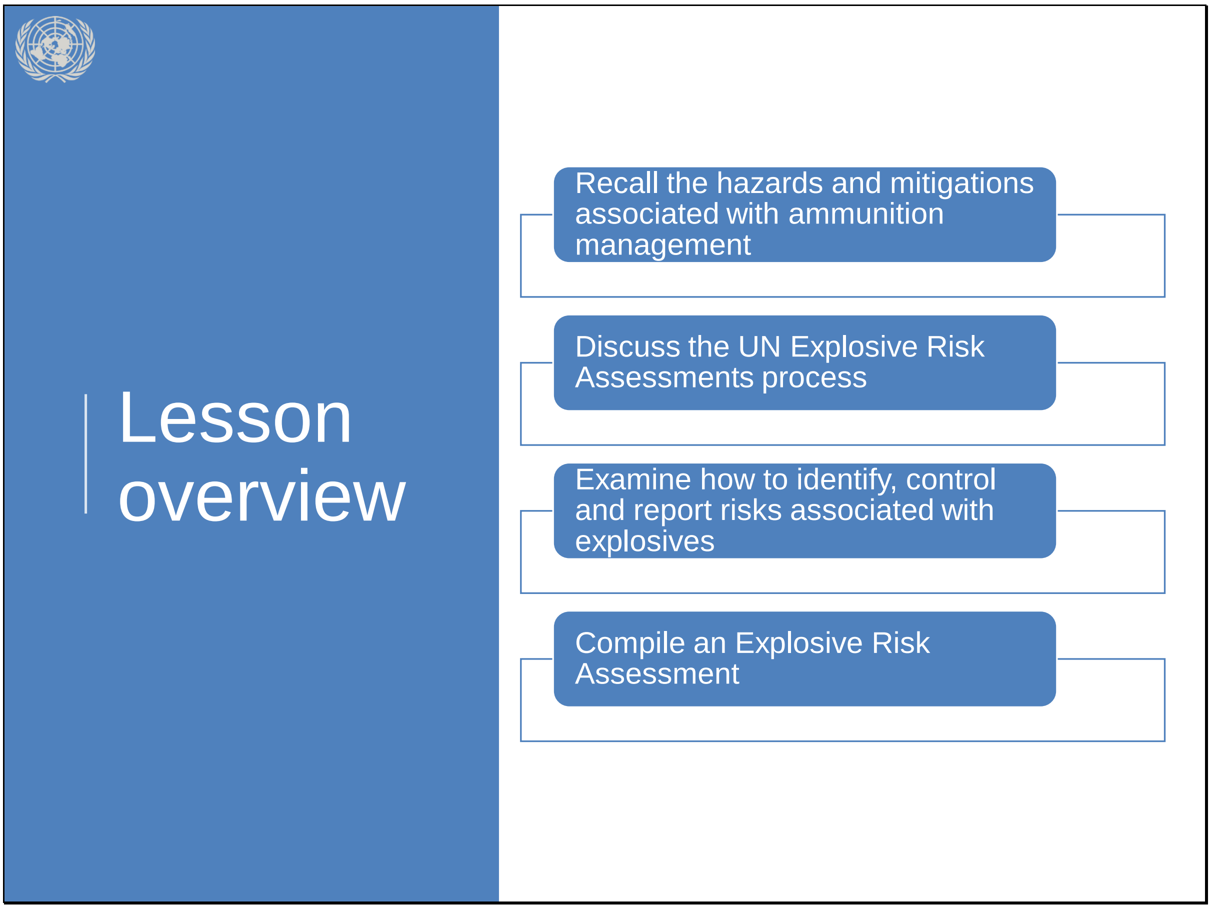
Objective

Develop an Explosive Risk Assessment

**<u>Main idea/objective for slide:</u>**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.6 Develop an Explosive Risk Assessment.)

<u>What the instructor should cover (in addition to slide content)</u>
By the end of this training session the participant will compile an Explosive Risk Assessment.

Slide 3



Lesson overview

- Recall the hazards and mitigations associated with ammunition management
- Discuss the UN Explosive Risk Assessments process
- Examine how to identify, control and report risks associated with explosives
- Compile an Explosive Risk Assessment

**Main idea/objective for slide:**
**Introduce the Key Learning Points**

What the instructor should cover (in addition to slide content)
Emphasise ‘recall’ – this is revisiting/revising content covered in the workbook

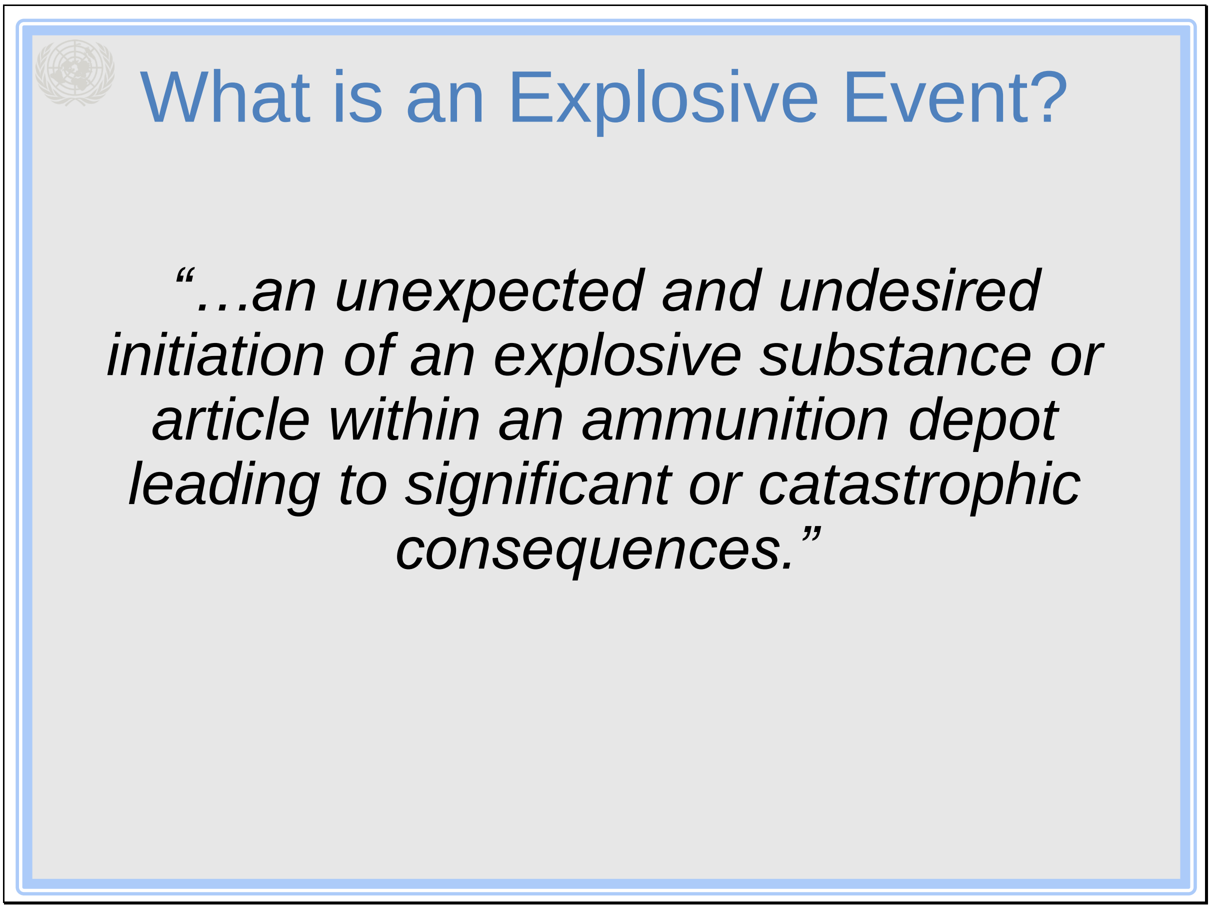
Key Learning Points
2.2.6.1 Recall the hazards associated with ammunition management
2.2.6.2 Recall the mitigations associated with ammunition management
2.2.6.3 Recall UN Explosive Risk Assessments process
2.2.6.4 Discuss the UN Explosive Risk Assessments process
2.2.6.5 Examine how to identify risks associated with explosives
2.2.6.6 Examine how to control risks associated with explosives
2.2.6.7 Examine how to report risks with explosives
2.2.6.8 Evaluate the Explosive Risk Assessment
2.2.6.9 Compile an Explosive Risk Assessment using supplied documentation

Slide 4

Why we need Explosive Safety

**Phase 1. Introduction (**Time allocation - 10 min**)**

Slide 5



## What is an Explosive Event?

*"…an unexpected and undesired initiation of an explosive substance or article within an ammunition depot leading to significant or catastrophic consequences."*

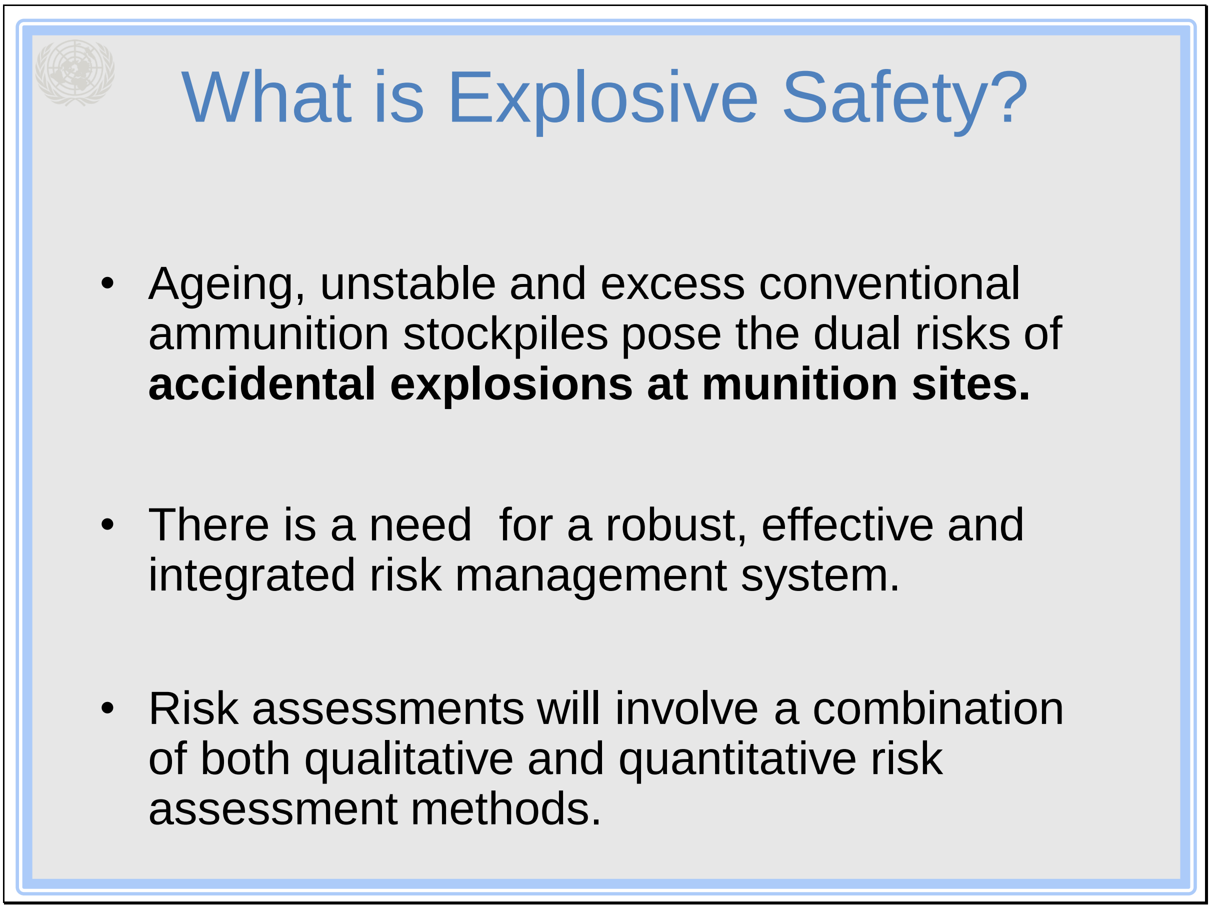
**<u>Main idea/objective for slide:</u>**

- **Discuss the concept of explosive safety and emphasise the need to manage any event that can lead to a serious consequence.**

<u>References/further reading</u>

**IATG 2.10 – Introduction to Risk Management Principles and Processes.** http://data.unsaferguard.org/iatg/en/IATG-02.10-Introduction-risk-management-IATG-V.3.pdf

Slide 6



## What is Explosive Safety?

- Ageing, unstable and excess conventional ammunition stockpiles pose the dual risks of **accidental explosions at munition sites.**
- There is a need for a robust, effective and integrated risk management system.
- Risk assessments will involve a combination of both qualitative and quantitative risk assessment methods.

**Main idea/objective for slide:**

- **Discuss the concept of explosive safety and emphasise the need to manage any event that can lead to a serious consequence.**

References/further reading

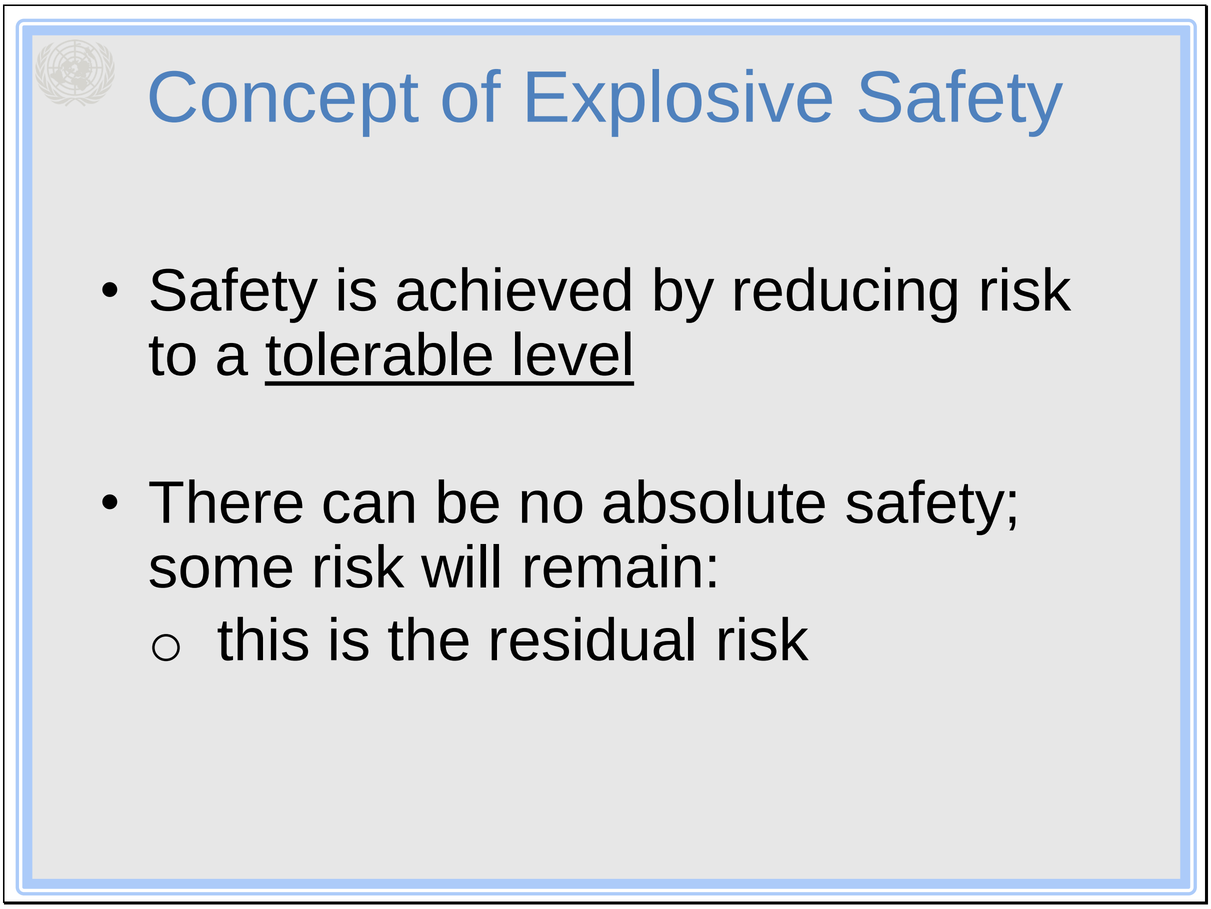
**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- A critical element of conventional ammunition stockpile management planning and operations should be the implementation of a robust, effective and integrated risk management system, preferably in accordance with the ISO guidance.
- This system should examine organisational, management, administrative and operational processes and procedures.
- The physical phenomena of blast, fragmentation and thermal radiation resulting from explosions are well understood, as are the mechanisms that cause fatalities, injury and damage as a result of these effects.
- As a result of this understanding a range of techniques and models have been developed by which these effects can be estimated; these

techniques and models form a key element of the overall risk management process.

- The term ‘estimated’ is important because the range of variables involved means that exact damage effects are unlikely to be accurately predicted; appropriate safety margins are therefore engineered into preventative measures.

Slide 7



## Concept of Explosive Safety

- Safety is achieved by reducing risk to a tolerable level
- There can be no absolute safety; some risk will remain:
  - this is the residual risk

**Main idea/objective for slide:**

- **Discuss the concept of explosive safety and emphasise the need to manage any event that can lead to a serious consequence.**

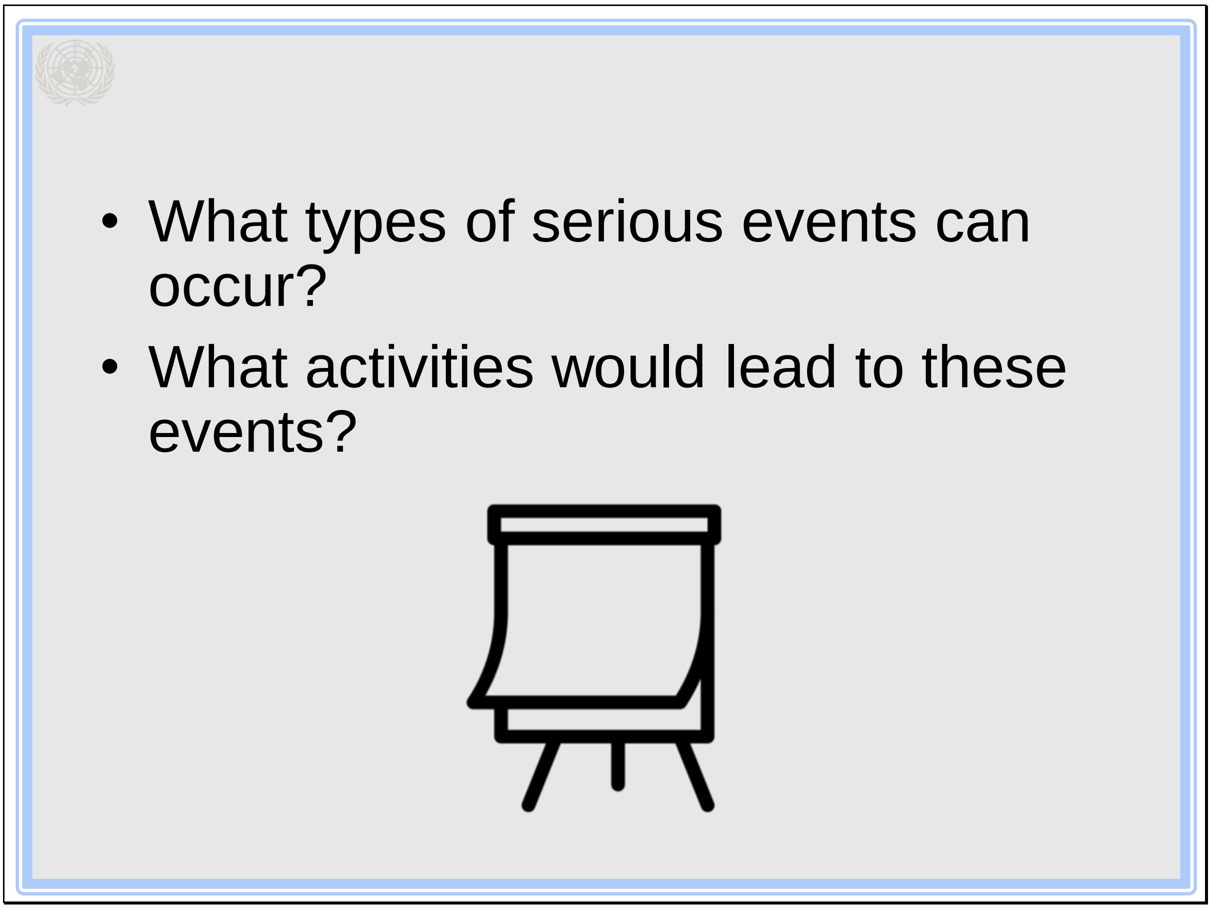
References/further reading

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- In the context of conventional ammunition stockpile management the enabling processes of storage, handling, destruction etc. can never be absolutely safe; they can only be relatively safe.
- This is an inevitable fact of life, which does not mean that all efforts to ensure safety are not being made.
- It just means that it cannot be proved, with 100% confidence, that absolute safety is being achieved.
- The risk management systems recommended in IATG, and used within the IATG software, aim to be as close to that 100% ideal confidence level as is realistically possible, whilst allowing stockpile management organisations to

determine what is the tolerable risk that they are prepared to accept in their particular environments.

Slide 8



- What types of serious events can occur?
- What activities would lead to these events?

**<u>Main idea/objective for slide:</u>**
**Explore with the participants what types of serious events may occur with stored ammunition and explosives.**

<u>participant Activity</u>
- Ask the participants to give examples.

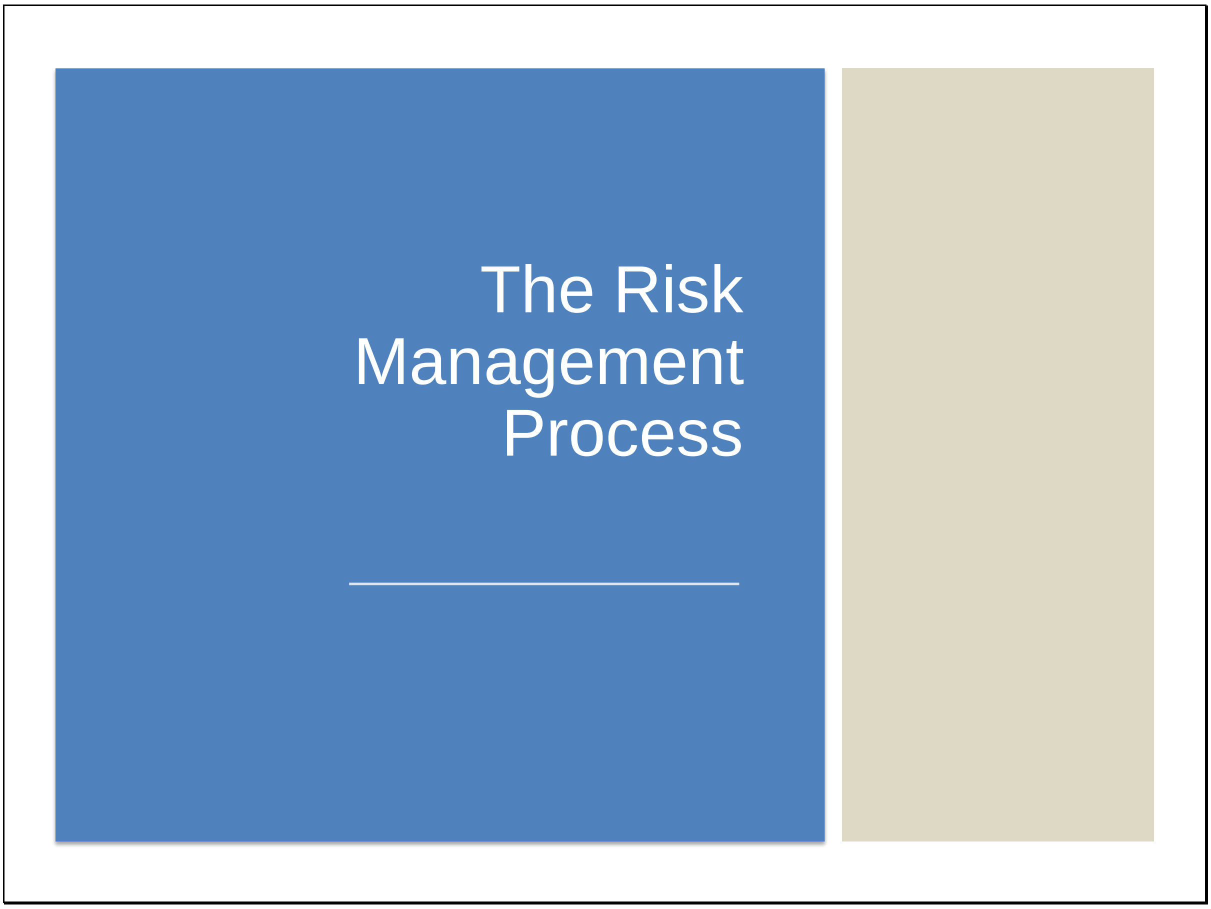
<u>What the instructor should cover (in addition to slide content)</u>
- Write examples on a flipchart and post it on the wall.

<u>References/further reading</u>
**IATG 2.10 – Introduction to Risk Management Principles and Processes**
- The target of conventional ammunition stock holding organisations should be the safe, effective and efficient stockpile management of conventional ammunition, explosives, propellants and pyrotechnics.
- There are potential hazards in this process:

  - inadequate storage conditions for conventional ammunition may result in undesired explosive events during storage;
  - ineffective physical inspection and chemical analysis of ammunition as part of a technical surveillance system may result in undesired explosive events during storage due to deteriorated ammunition;
  - inappropriate handling and processing of conventional ammunition has the potential to cause death or injury to workers or observers.

- Additional to these hazards there are a range of potential causes of an undesirable explosive event:
  - accidental fire in a vehicle, magazine or explosive storehouse;
  - human error due to accident, fatigue or inappropriate handling;
  - environmental (e.g. lightning strike);
  - intruder initiated (e.g. sabotage); or
  - enemy action (in periods of conflict) (e.g. improvised explosive device, direct or indirect fire).

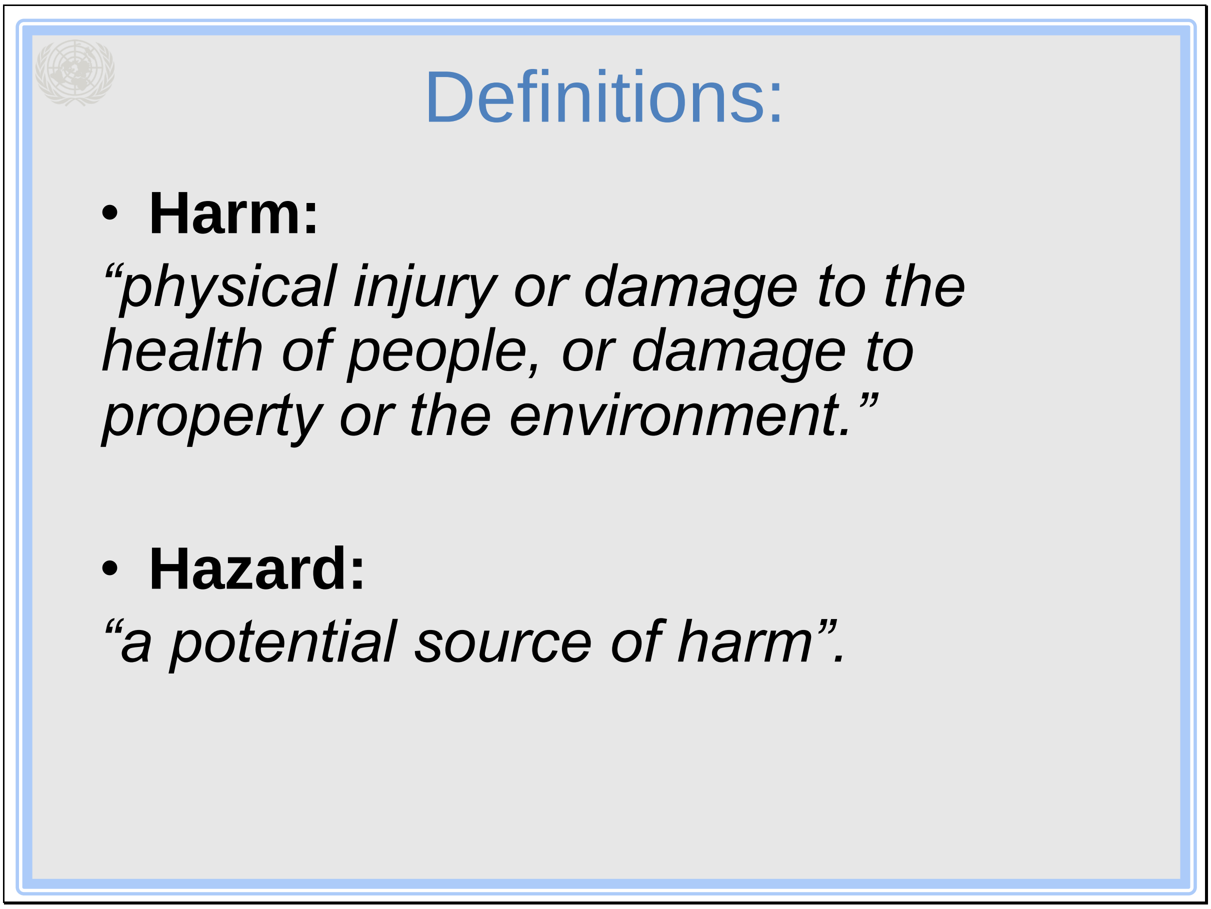
Slide 9



The Risk
Management
Process

**Phase 2. Development (**Time allocation - 160 min**)**

Stage 1 (Time allocation 40 mins) – The Risk Management Process



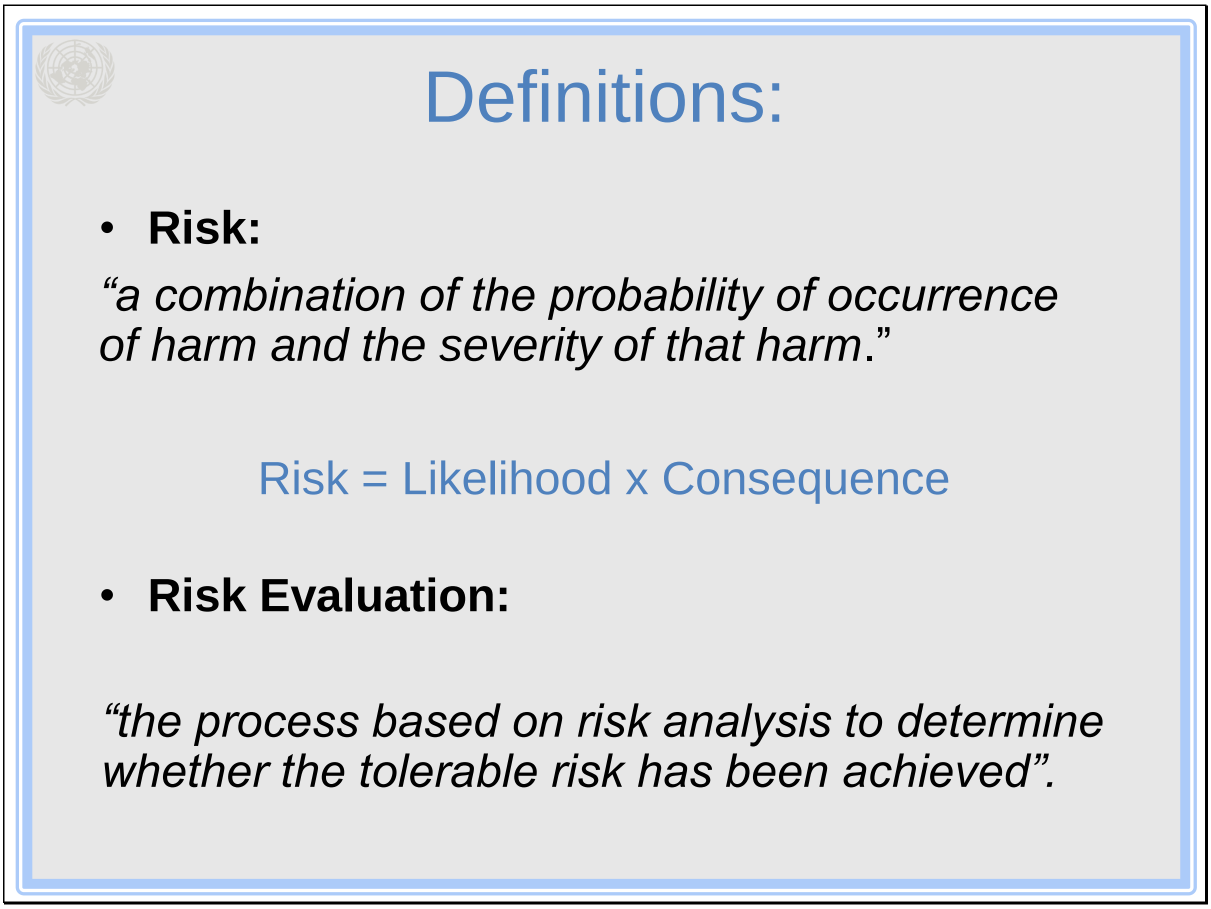
## Definitions:

- **Harm:**
*“physical injury or damage to the health of people, or damage to property or the environment.”*

- **Hazard:**
*“a potential source of harm”.*

**Main idea/objective for slide:**
**Discuss the definition of Harm and Hazard, placing emphasis on the management of ammunition and explosive storage**

References/further reading
**IATG 1.20 – Introduction to Risk Management Principles and Processes.** http://data.unsaferguard.org/iatg/en/IATG-02.10-Introduction-risk-management-IATG-V.3.pdf



# Definitions:

- **Risk:**

*“a combination of the probability of occurrence of harm and the severity of that harm.”*

Risk = Likelihood x Consequence

- **Risk Evaluation:**

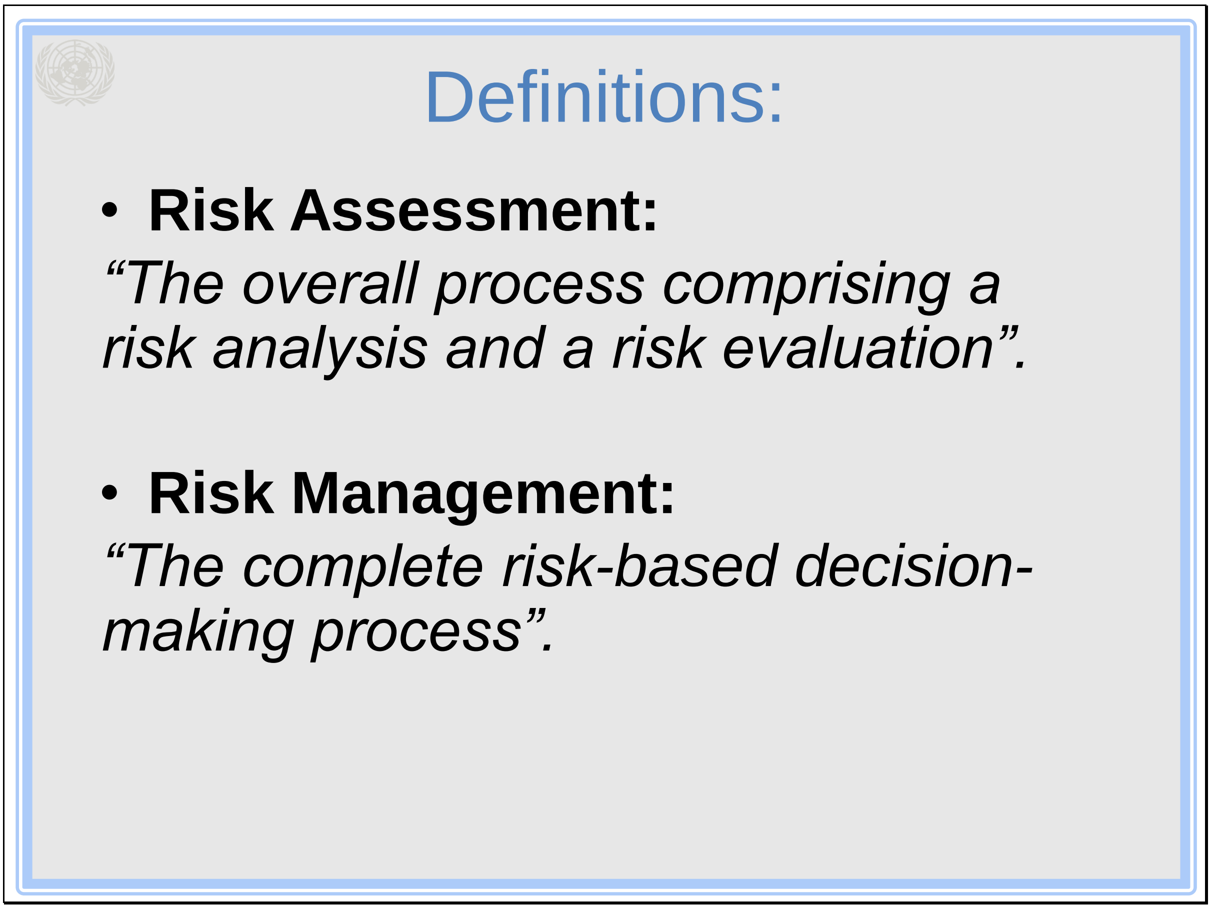
*“the process based on risk analysis to determine whether the tolerable risk has been achieved”.*

**Main idea/objective for slide:**

**Discuss the definition of Risk and Risk Evaluation, placing emphasis on the management of ammunition and explosive storage**

References/further reading

**IATG 2.10 – Introduction to Risk Management Principles and Processes**



# Definitions:

- **Risk Assessment:**

*“The overall process comprising a risk analysis and a risk evaluation”.*

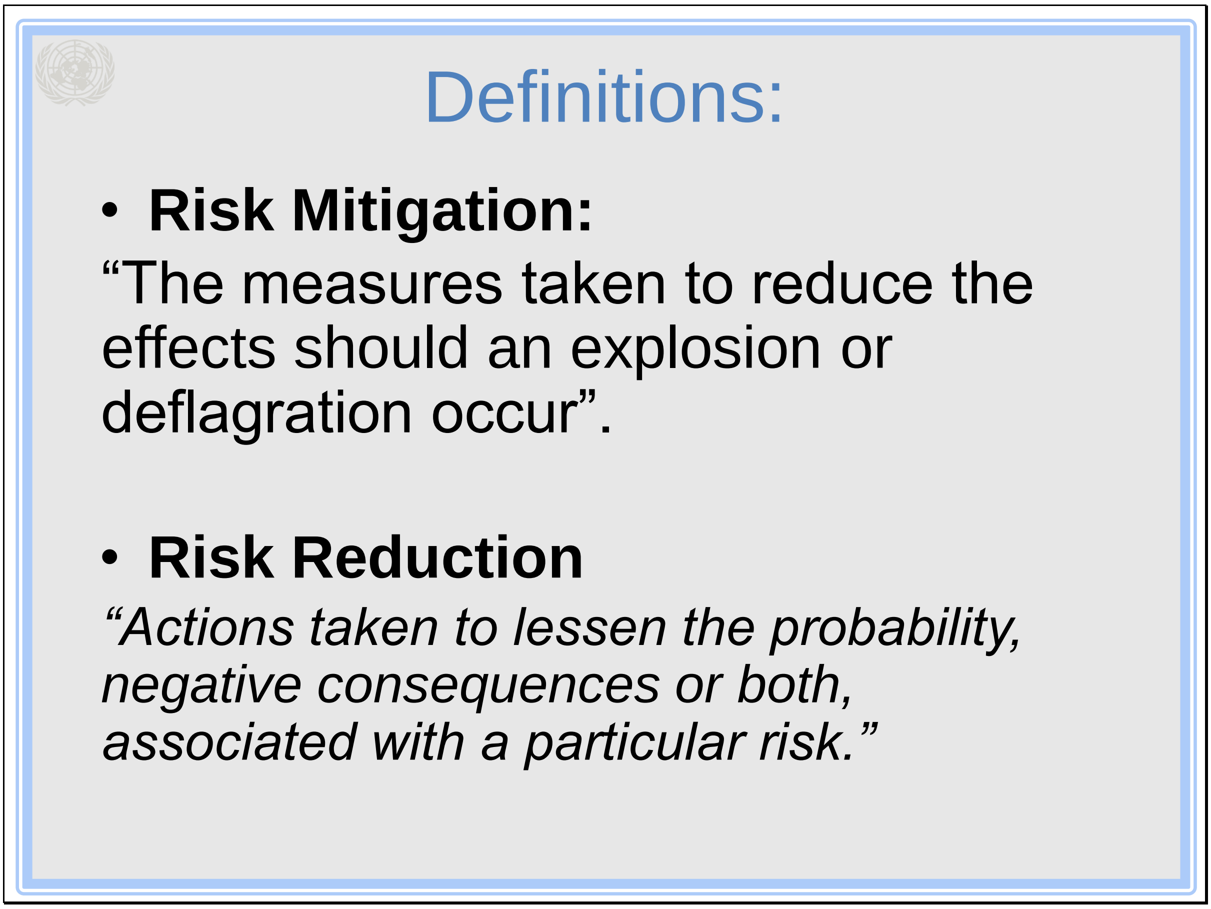
- **Risk Management:**

*“The complete risk-based decision-making process”.*

**Main idea/objective for slide:**
**Discuss the definition of Risk Assessment and Risk Management, placing emphasis on the management of ammunition and explosive storage**

References/further reading
**IATG 2.10 – Introduction to Risk Management Principles and Processes**

Slide 13



## Definitions:

- **Risk Mitigation:**

“The measures taken to reduce the effects should an explosion or deflagration occur”.

- **Risk Reduction**

*“Actions taken to lessen the probability, negative consequences or both, associated with a particular risk.”*

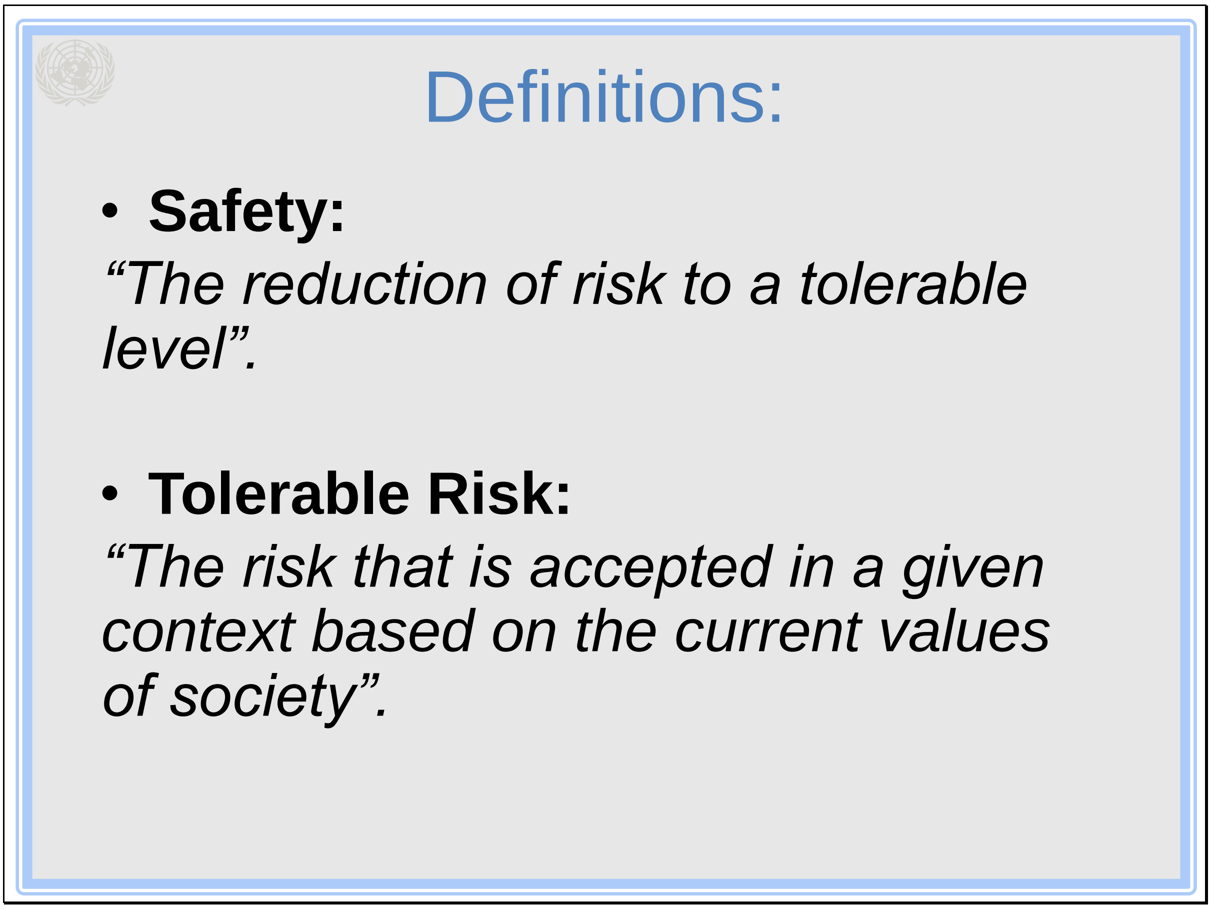
**Main idea/objective for slide:**

**Discuss the definition of Risk Mitigation and Risk Reduction, placing emphasis on the management of ammunition and explosive storage**

References/further reading

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

Slide 14



## Definitions:

- **Safety:**

*“The reduction of risk to a tolerable level”.*

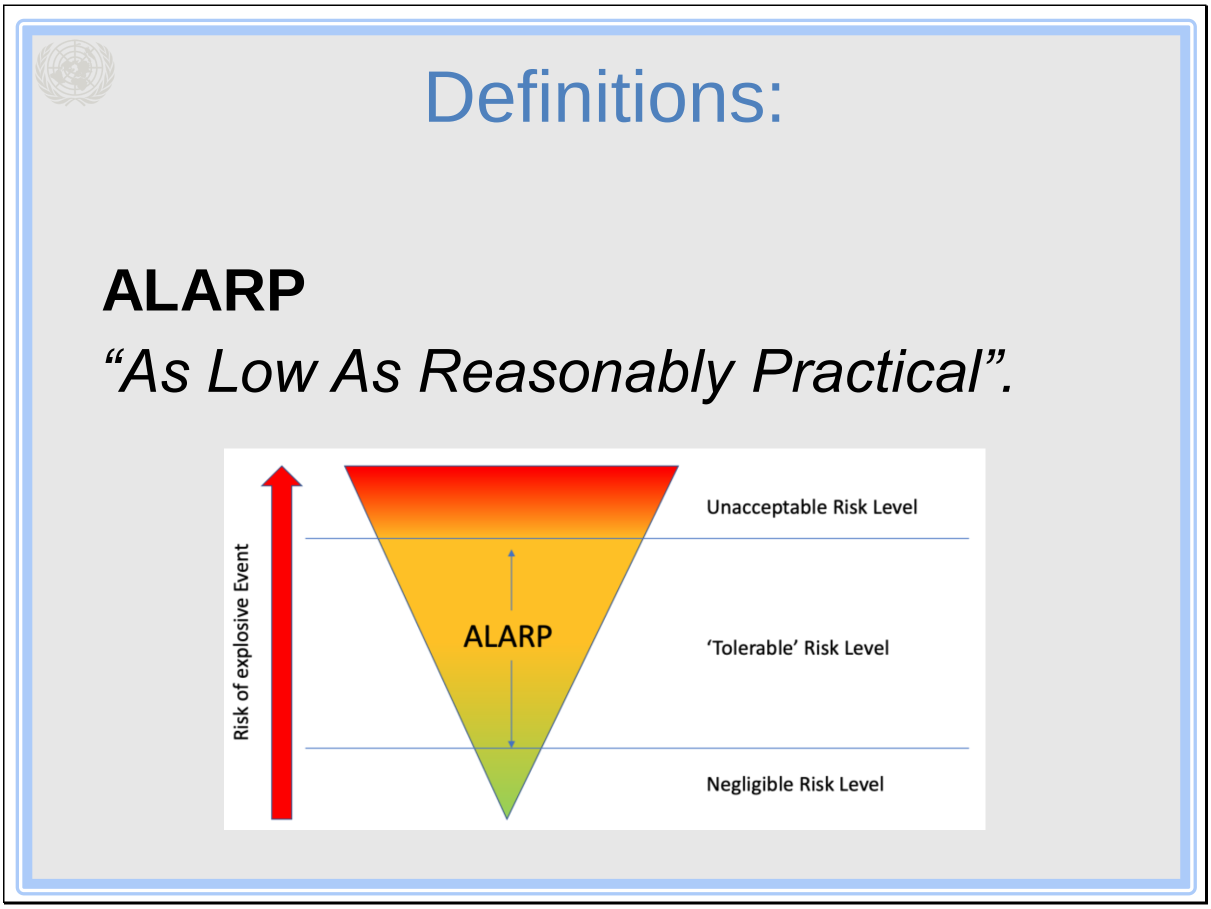
- **Tolerable Risk:**

*“The risk that is accepted in a given context based on the current values of society”.*

**Main idea/objective for slide:**
**Discuss the definition of Safety and Tolerable Risk, placing emphasis on the management of ammunition and explosive storage**

References/further reading
**IATG 2.20 – Introduction to Risk Management Principles and Processes**

Slide 15



## Definitions:

**ALARP**

*“As Low As Reasonably Practical”.*

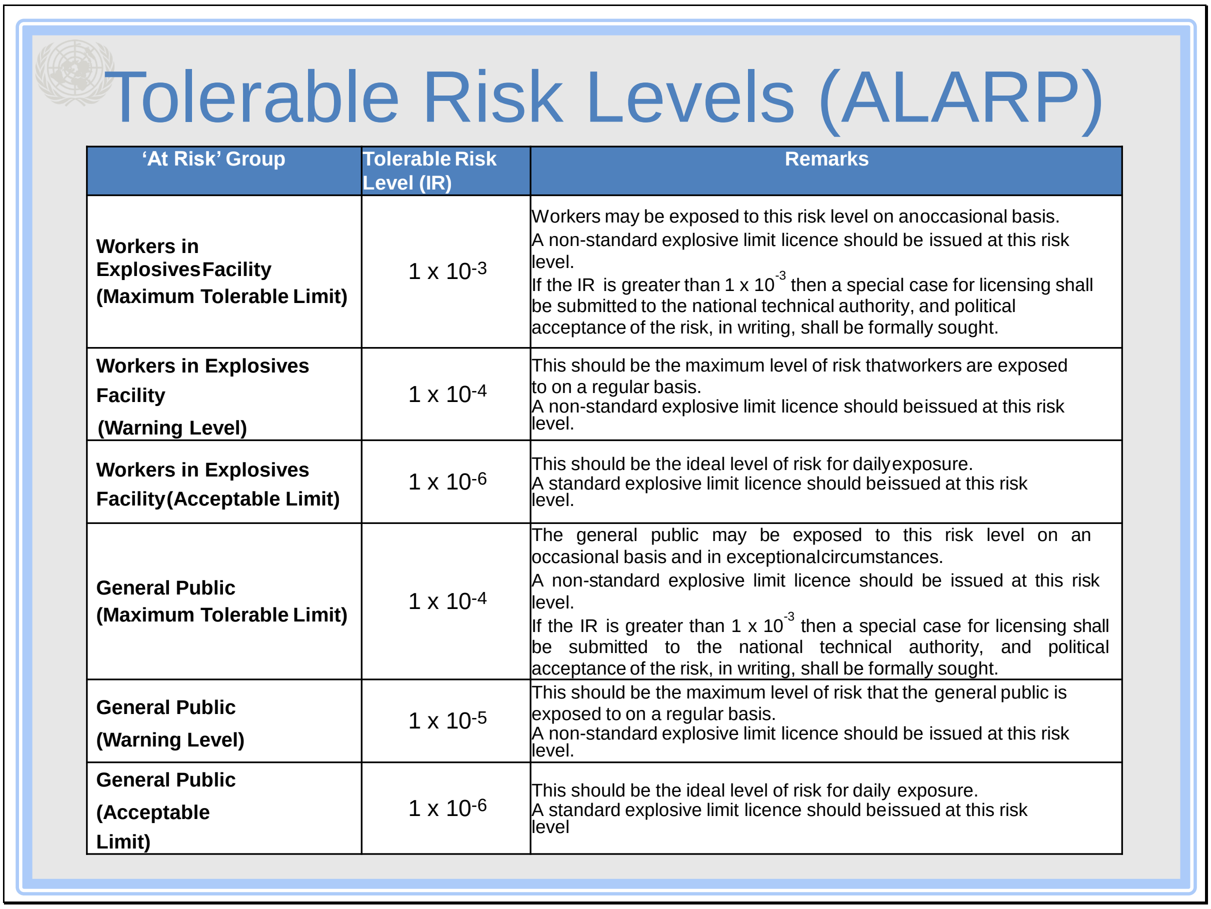
**Main idea/objective for slide:**

**Discuss the definition of Tolerable Risk (ALARP), placing emphasis on the management of ammunition and explosive storage**

References/further reading

**IATG 2.20 – Introduction to Risk Management Principles and Processes**

Slide 16



# Tolerable Risk Levels (ALARP)

| 'At Risk' Group | Tolerable Risk Level (IR) | Remarks |
|---|---|---|
| **Workers in Explosives Facility (Maximum Tolerable Limit)** | 1 x $10^{-3}$ | Workers may be exposed to this risk level on an occasional basis.<br>A non-standard explosive limit licence should be issued at this risk level.<br>If the IR is greater than 1 x $10^{-3}$ then a special case for licensing shall be submitted to the national technical authority, and political acceptance of the risk, in writing, shall be formally sought. |
| **Workers in Explosives Facility (Warning Level)** | 1 x $10^{-4}$ | This should be the maximum level of risk that workers are exposed to on a regular basis.<br>A non-standard explosive limit licence should be issued at this risk level. |
| **Workers in Explosives Facility (Acceptable Limit)** | 1 x $10^{-6}$ | This should be the ideal level of risk for daily exposure.<br>A standard explosive limit licence should be issued at this risk level. |
| **General Public (Maximum Tolerable Limit)** | 1 x $10^{-4}$ | The general public may be exposed to this risk level on an occasional basis and in exceptional circumstances.<br>A non-standard explosive limit licence should be issued at this risk level.<br>If the IR is greater than 1 x $10^{-3}$ then a special case for licensing shall be submitted to the national technical authority, and political acceptance of the risk, in writing, shall be formally sought. |
| **General Public (Warning Level)** | 1 x $10^{-5}$ | This should be the maximum level of risk that the general public is exposed to on a regular basis.<br>A non-standard explosive limit licence should be issued at this risk level. |
| **General Public (Acceptable Limit)** | 1 x $10^{-6}$ | This should be the ideal level of risk for daily exposure.<br>A standard explosive limit licence should be issued at this risk level |

**Main idea/objective for slide:**

- **Discuss Tolerable risk levels**

What the instructor should cover (in addition to slide content)

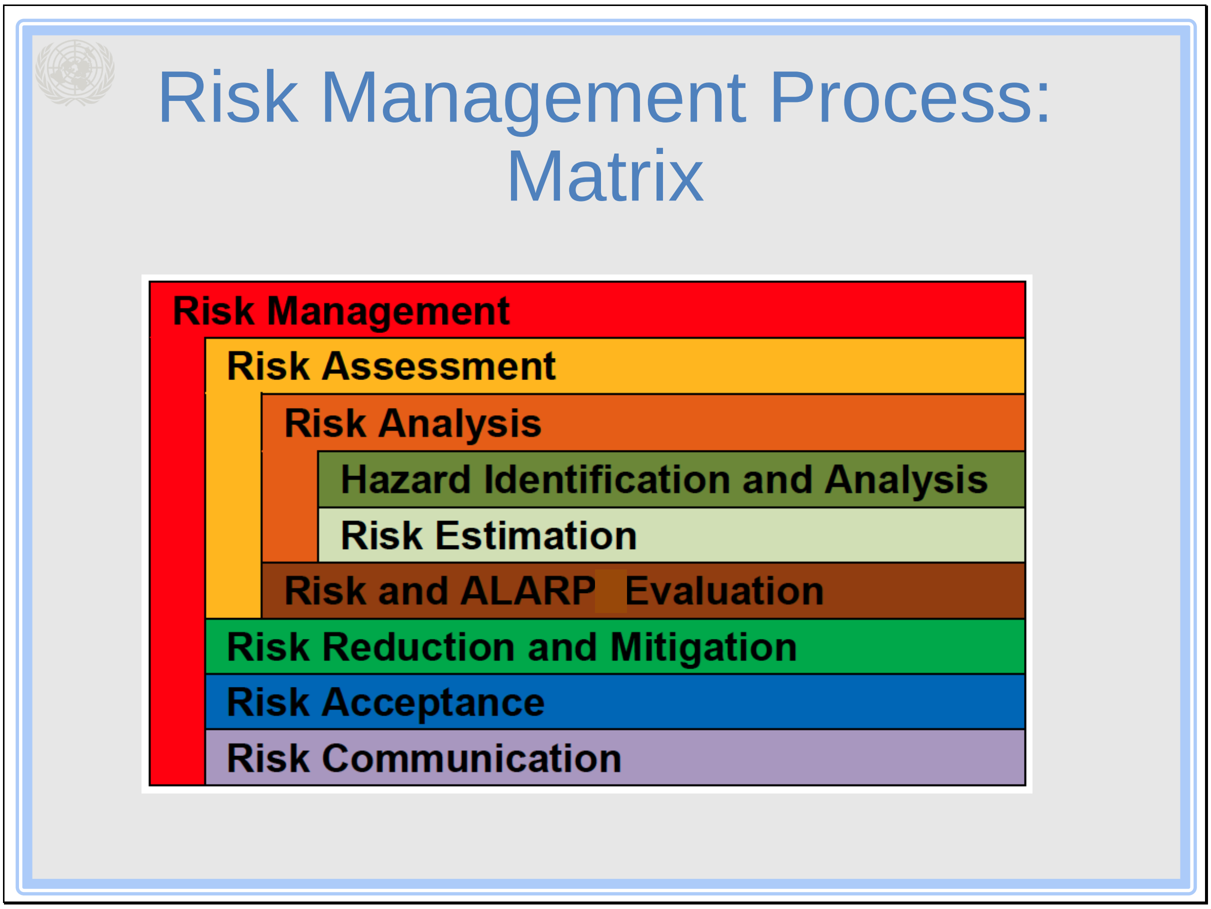
Provide this table as a Handout

References/further reading]

**IATG 2.10 – Introduction to Risk Management Principles and Processes, Page 6**

- Tolerable risk is determined by the search for absolute safety contrasted against factors such as:
  - the inherent explosive safety hazards of storing, handling and processing ammunition
  - available resources
  - the conventions of the society where the ammunition is being stored
  - the financial costs.

- It follows that there is therefore a need to continually review the tolerable risk that underpins the concept behind stockpile management operations in a particular environment.
- The level of tolerable risk shall be determined by the appropriate national authority, but it should not be less than the tolerable risk accepted, for example, in manufacturing or industrial processes



## Risk Management Process: Matrix

- Risk Management
  - Risk Assessment
    - Risk Analysis
      - Hazard Identification and Analysis
      - Risk Estimation
    - Risk and ALARP Evaluation
  - Risk Reduction and Mitigation
  - Risk Acceptance
  - Risk Communication

**<u>Main idea/objective for slide:</u>**

- **Introduce the risk management process, to include hazard identification, the likelihood of the event occurring and the consequence of such an event happening.**

<u>What the instructor should cover (in addition to slide content)</u>
Write these definitions on a flipchart and post it onto the wall.

- Risk management – is the overall process of identifying, analysing, mitigating and communicating risk to ensure the safety of people and property from unwanted explosive events
- Risk Assessment - Is a process that is made up of three separate processes: Hazard identification, risk analysis, and risk and ALARP evaluation
- Risk Reduction and Mitigation – Is a process that identifies and implements controls and measures to reduce the risk to a tolerable level.

- Risk Acceptance – Is the formal acceptance of National Authorities of the residual risk from an explosive area, following the effective implementation of mitigating factors to initial risks involved.
- Risk Communication – Is the process of communication the necessary information, processes and procedures to be followed by all personnel to ensure that the risk remains ALARA at all times.
- Risk Analysis - A process that is used to understand the nature, sources, and causes of the risks that you have identified and to estimate the level of risk
- Risk and ALARP Evaluation - Is a process that is used to compare risk analysis results with risk criteria in order to determine whether or not a specified level of risk is acceptable or tolerable
- Hazard Identification and Analysis - Is a process that is used to find, recognize, and describe the risks that could affect the safety of people and property from an explosive event

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- Risk management is sometimes a misunderstood term, within which there are common misconceptions in terms of the relationship between, for example, risk assessment and risk analysis.
- The matrix identifies the relationship between the different components of risk management that shall be used

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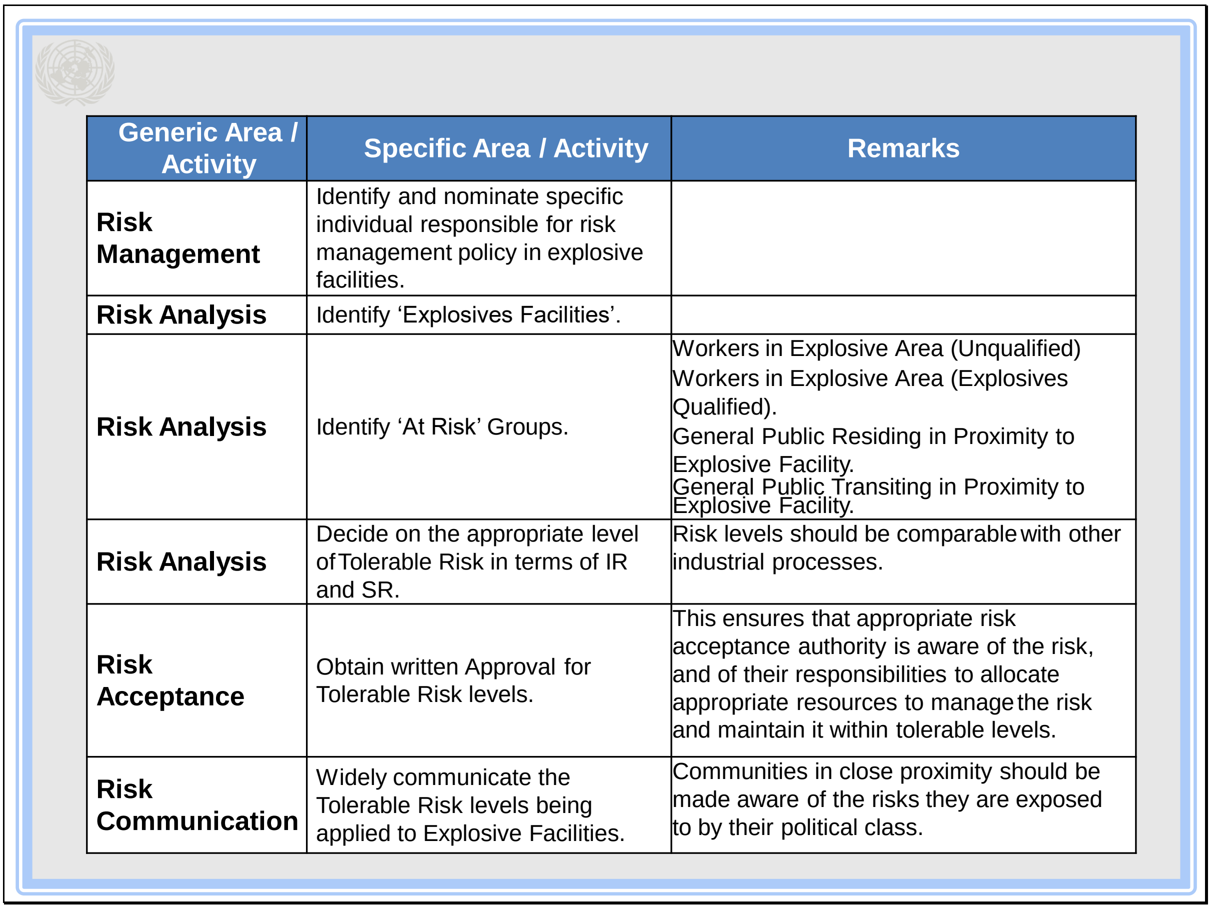


| Generic Area / Activity | Specific Area / Activity | Remarks |
|---|---|---|
| **Risk Management** | Identify and nominate specific individual responsible for risk management policy in explosive facilities. | |
| **Risk Analysis** | Identify 'Explosives Facilities'. | |
| **Risk Analysis** | Identify 'At Risk' Groups. | Workers in Explosive Area (Unqualified)<br>Workers in Explosive Area (Explosives Qualified).<br>General Public Residing in Proximity to Explosive Facility.<br>General Public Transiting in Proximity to Explosive Facility. |
| **Risk Analysis** | Decide on the appropriate level of Tolerable Risk in terms of IR and SR. | Risk levels should be comparable with other industrial processes. |
| **Risk Acceptance** | Obtain written Approval for Tolerable Risk levels. | This ensures that appropriate risk acceptance authority is aware of the risk, and of their responsibilities to allocate appropriate resources to manage the risk and maintain it within tolerable levels. |
| **Risk Communication** | Widely communicate the Tolerable Risk levels being applied to Explosive Facilities. | Communities in close proximity should be made aware of the risks they are exposed to by their political class. |

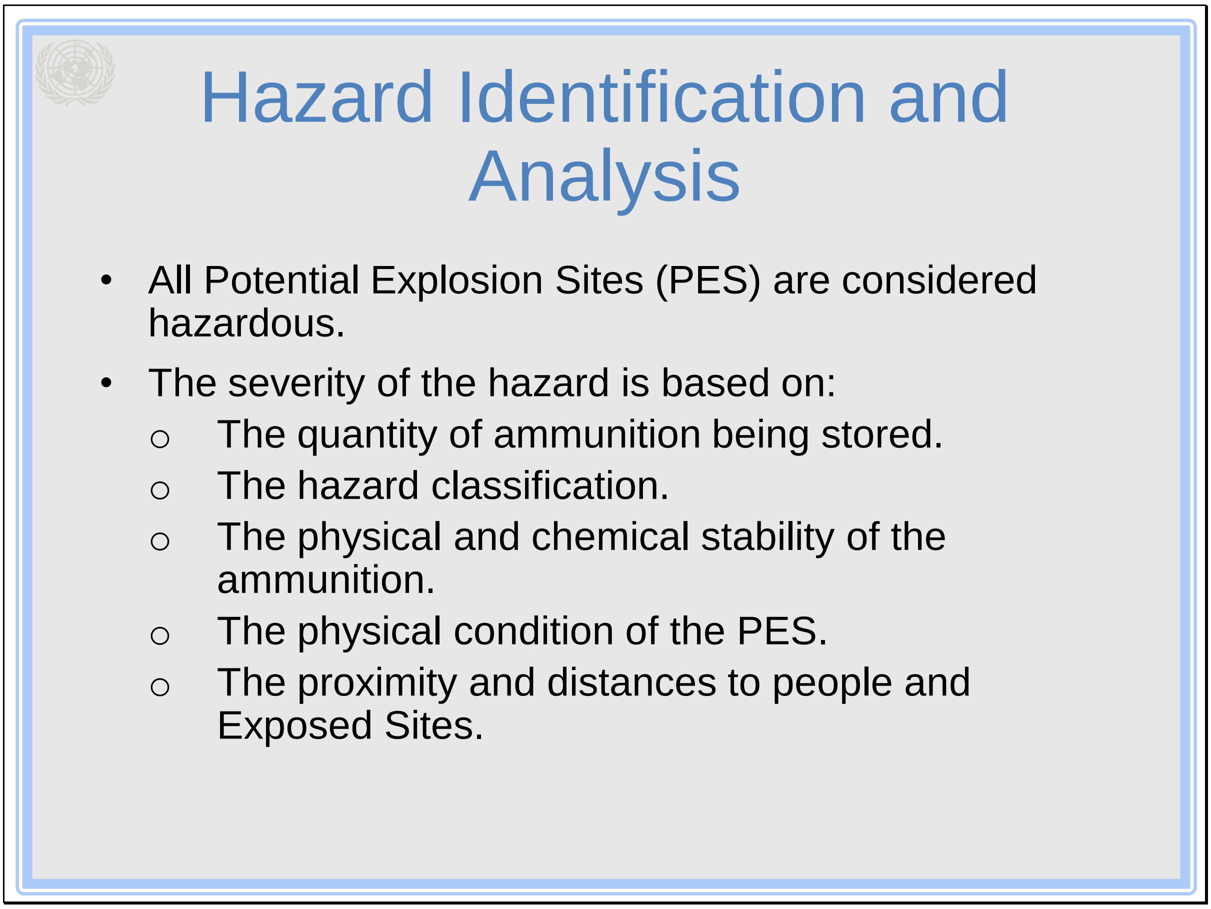
**Main idea/objective for slide:**

- **Explore how the activities within a Risk Management Process are used in a typical explosive storage environment**

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- Risk management is sometimes a misunderstood term, within which there are common misconceptions in terms of the relationship between, for example, risk assessment and risk analysis.
- The matrix identifies the relationship between the different components of risk management that shall be used



## Hazard Identification and Analysis

- All Potential Explosion Sites (PES) are considered hazardous.
- The severity of the hazard is based on:
  - The quantity of ammunition being stored.
  - The hazard classification.
  - The physical and chemical stability of the ammunition.
  - The physical condition of the PES.
  - The proximity and distances to people and Exposed Sites.

**Main idea/objective for slide:**

- **Outline what Hazard Analysis involves and what constitutes a hazard in an explosive area.**

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- Hazard identification and analysis is a reasonably simple process for the risk management process that supports conventional ammunition storage.
- As hazards are defined as a potential source of harm, then the hazard from, for example, individual explosive storehouses (ESH) will depend on the quantity, hazard classification,22 physical condition and chemical stability of the ammunition contained within that ESH.
- If the inter-magazine distances (IMD) are not in accordance with the recommendations contained in IATG 02.20, *Quantity and separation distances,* then further risk analysis will be required.
- Normally each ESH is considered to be an individual Potential Explosion Site (PES).

- Yet, if there is a risk of practically instantaneous propagation (PIP) due to inadequate IMD between the ESH, then they may have to be treated as one PES, and the explosive quantity aggregated.

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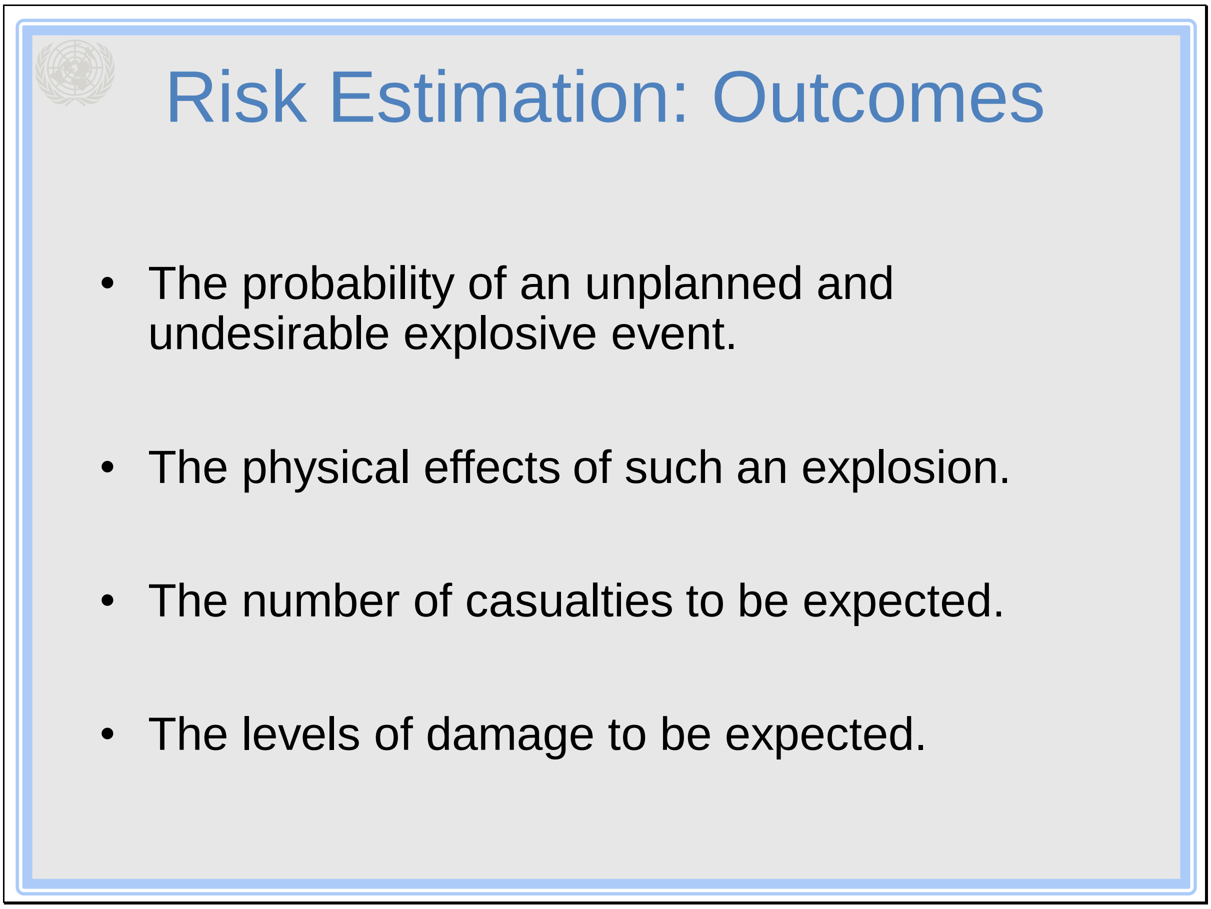


# Risk Estimation: Outcomes

- The probability of an unplanned and undesirable explosive event.
- The physical effects of such an explosion.
- The number of casualties to be expected.
- The levels of damage to be expected.

**Main idea/objective for slide:**

- **Discuss the need to estimate the risk and determine the likely outcomes from an unwanted explosive event.**

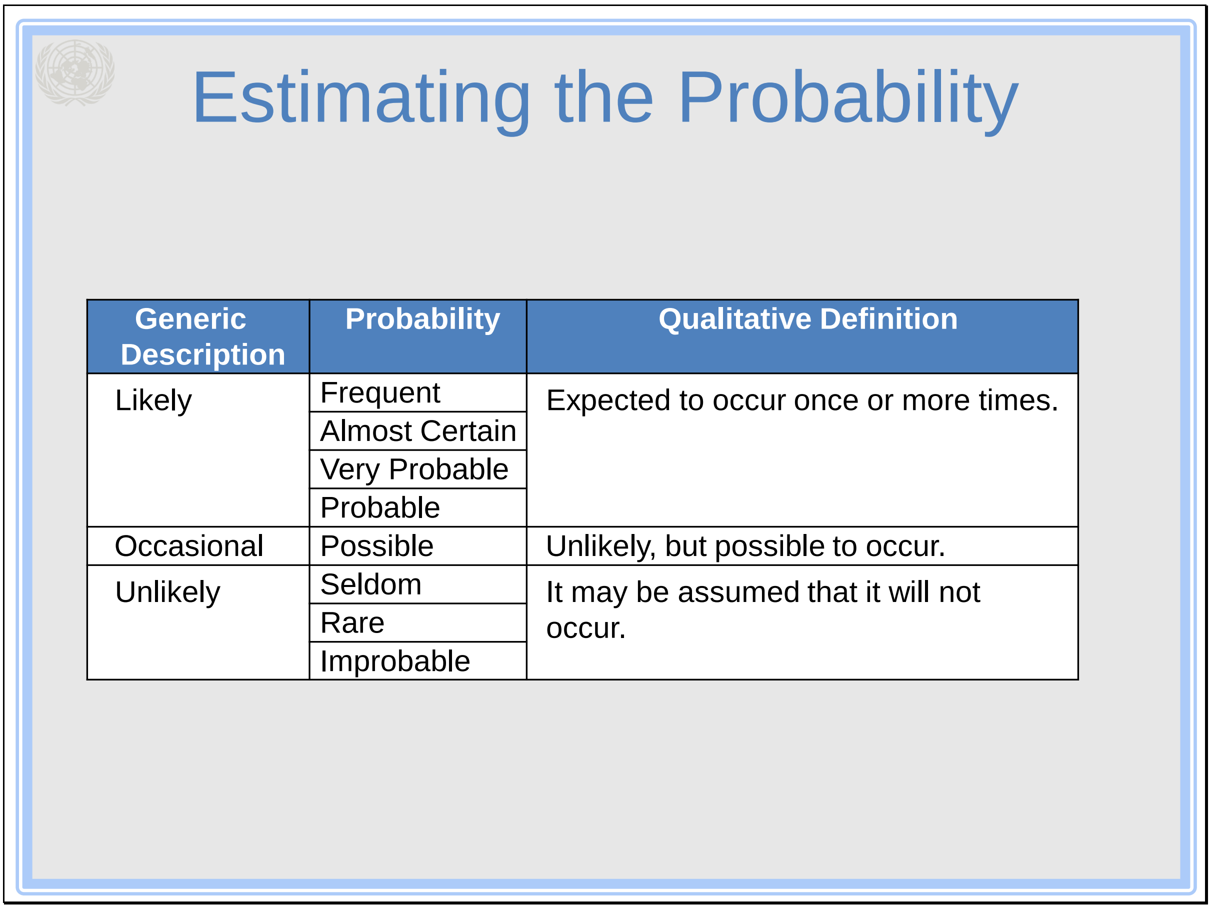
References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- In many cases, it will be difficult to establish the probability of an unplanned and undesirable explosive event at a particular explosive storage area.
- Yet data is available on the number of such events annually and a stockpile management organization should be aware of previous similar events in their region; this will assist the organization in assessing frequency, and hence probability.
- This is known as the 'historical' approach and an example model is at Clause 8.2.1.1. A more qualitative approach is at Clause 8.2.1.2.
- Alternative methods for establishing frequency, and hence the probability of explosive events, during the risk estimation process include analytical

techniques such as attempts to define and quantify all of the potential scenarios in which an explosive event can occur.

- Logic or fault tree approaches are often used depending upon the complexity of and number of proposed scenarios leading to an event.
- It can be a complex and sophisticated process, and further guidance is available in the informative references at Annex B.



# Estimating the Probability

| Generic Description | Probability | Qualitative Definition |
|---|---|---|
| Likely | Frequent<br>Almost Certain<br>Very Probable<br>Probable | Expected to occur once or more times. |
| Occasional | Possible | Unlikely, but possible to occur. |
| Unlikely | Seldom<br>Rare<br>Improbable | It may be assumed that it will not occur. |

**<u>Main idea/objective for slide:</u>**

- **Highlight how important is it to estimate and quantify the probability of such as an unwanted explosive event occurring.**

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- A qualitative means of estimating probability

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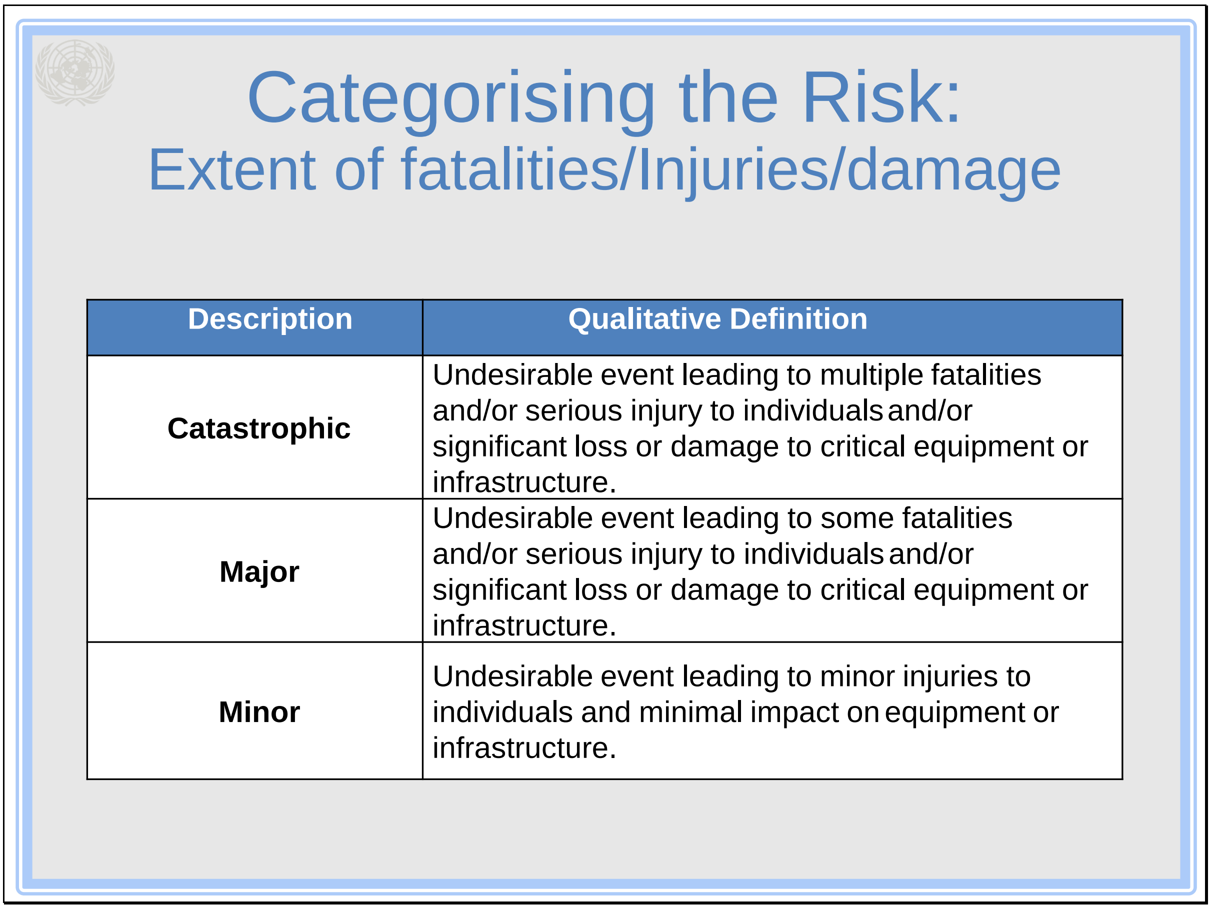

## Categorising the Risk:
### Extent of fatalities/Injuries/damage

| Description | Qualitative Definition |
|---|---|
| **Catastrophic** | Undesirable event leading to multiple fatalities and/or serious injury to individuals and/or significant loss or damage to critical equipment or infrastructure. |
| **Major** | Undesirable event leading to some fatalities and/or serious injury to individuals and/or significant loss or damage to critical equipment or infrastructure. |
| **Minor** | Undesirable event leading to minor injuries to individuals and minimal impact on equipment or infrastructure. |

**Main idea/objective for slide:**

- **Discuss how to categorise the risk, once the hazards and the probabilitys have been determined**

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- The physical effects of an undesirable explosive event within an ammunition depot can be estimated by using the appropriate equation contained within IATG 01.80 *Formulae for ammunition management* (Clause 6.2).
- This can be used to determine the blast over-pressure and impulse at the distance from a potential explosion site to an exposed site from a known explosive mass.
- Threshold blast over-pressures for effects on humans have been established by experimentation, (34,5kPa for onset of hearing damage, 207kPa for lung damage and 690kPa for fatality),27 and therefore if the population density

is known within the appropriate ranges an estimate of the total number of fatalities and casualties can then be derived.
- Alternatively, the *ESTC Outdoor Model* may be used. (Both in Clause 11.2 to IATG 01.80 *Formulae for ammunition management*).
- Similarly, the effects of blast on buildings within and outside the perimeter of the ammunition depot can be estimated. (Clause 10 of IATG 01.80 *Formulae for ammunition management)*.

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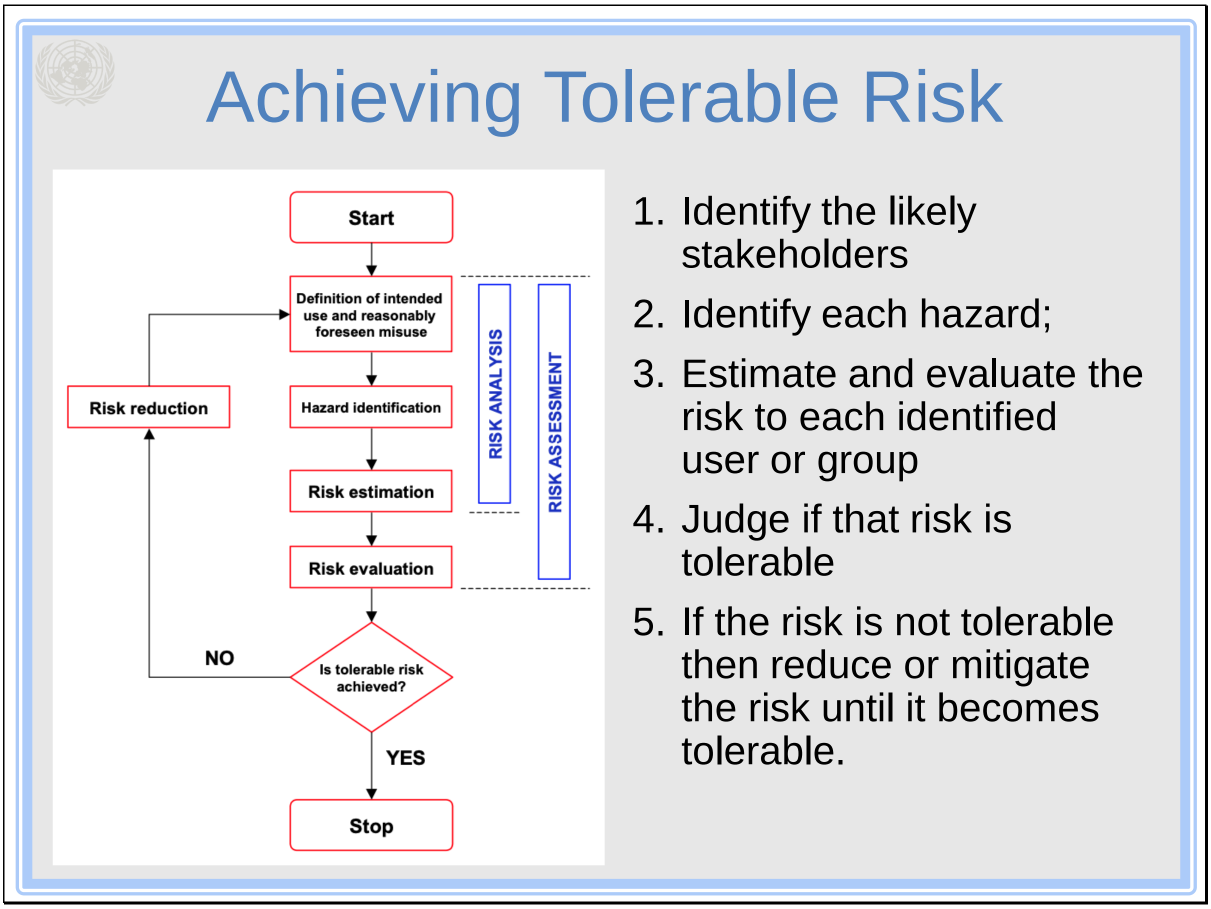

## Achieving Tolerable Risk

1. Identify the likely stakeholders
2. Identify each hazard;
3. Estimate and evaluate the risk to each identified user or group
4. Judge if that risk is tolerable
5. If the risk is not tolerable then reduce or mitigate the risk until it becomes tolerable.

**<u>Main idea/objective for slide:</u>**

- **Introduce the Flow Diagram for determine what is the "Tolerable Risk', or the amount of risk that will be accepted by a National Authority.**

<u>What the instructor should cover (in addition to slide content)</u>
Provide a handout of this flow chart to participants

<u>References/further reading:</u>
**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- Tolerable risk is achieved by the iterative process of risk assessment (risk analysis and risk evaluation) and risk reduction
- Effective risk assessment has a range of benefits that include:
  - it helps in ranking the importance of individual risk contributions to the overall risk;
  - it helps to identify risks that are easily reduced or eliminated;

- it helps to clarify what is known and what is not known about the potential risk;
- it can provide an objective basis for decisions on controlling risks, especially those applying to the local civilian communities near ammunition storage areas;
- it can provide important quantitative information as input to decisions for allocating resources to conventional ammunition stockpile management;
- it makes it possible to rank risk reduction or remediation alternatives in terms of risk to workers, the environment, and the public; and
- it can provide a process for consensus-building and a forum for the participation of stakeholders in the development of the risk assessment process and the identification of tolerable risk. This process will hopefully lead to greater acceptance of that risk.

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What types of Risk Mitigation controls can we use?

**Main idea/objective for slide:**

- **Explore and discuss the numerous type of risk mitigation and control measures that can be used to reduce the risk in an explosive storage area.**

What the instructor should cover (in addition to slide content)
Ask questions of the participants and write their answers on a white board. Look to group their responses were possible.

References/further reading:
**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- In order to reduce the estimated risk from an unplanned or undesirable explosive event at an ammunition storage area, one or a combination of the following actions should be taken:
    - closure of the ammunition depot and the transfer of stocks to an ammunition depot with spare capacity, mitigation;

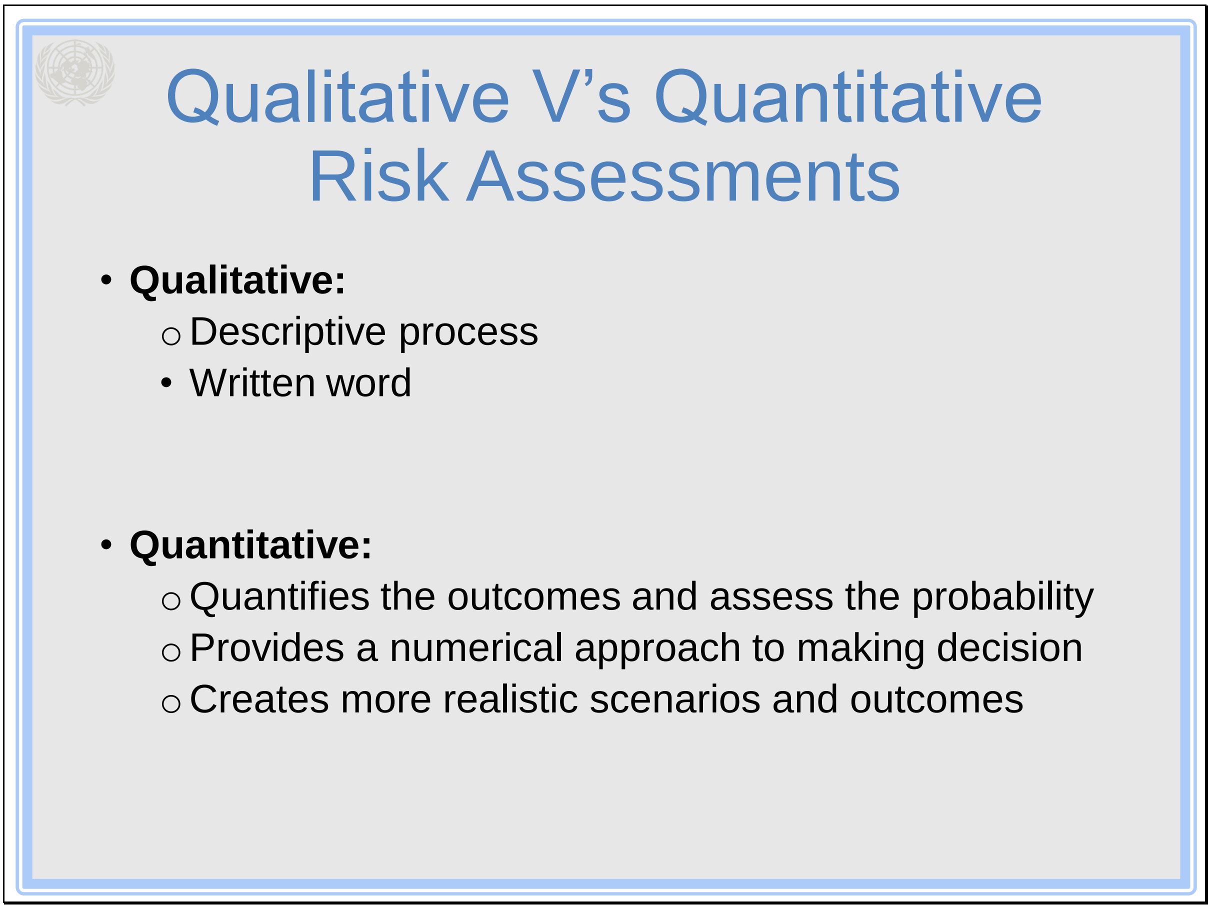
- a reduction of ammunition stock levels within the explosive storage area until appropriate predicted blast over-pressure levels are reached at the exposed site, mitigation
- the probable impact of the estimated risk to the local community is formally accepted at the appropriate political level, acceptance.
- an increase in the separation distance between the potential explosion site and the exposed site until tolerable blast over-pressure levels are reached at the exposed site, mitigation
- improvements in the physical infrastructure of ammunition storage to achieve tolerable estimated blast over-pressure levels at the exposed site, mitigation
- instigation of effective ammunition surveillance and proof systems to identify ammunition and propellant that has deteriorated

Slide 25

Explosive Risk Assessments

**Phase 2. Development (**Time allocation - 160 min**)**

Stage 2 (Time allocation 40 mins) – Explosive Risk Assessments



## Qualitative V's Quantitative Risk Assessments

- **Qualitative:**
  - Descriptive process
  - Written word

- **Quantitative:**
  - Quantifies the outcomes and assess the probability
  - Provides a numerical approach to making decision
  - Creates more realistic scenarios and outcomes

**Main idea/objective for slide:**

- **Discuss the difference between qualitative and quantitative explosive risk assessment.**

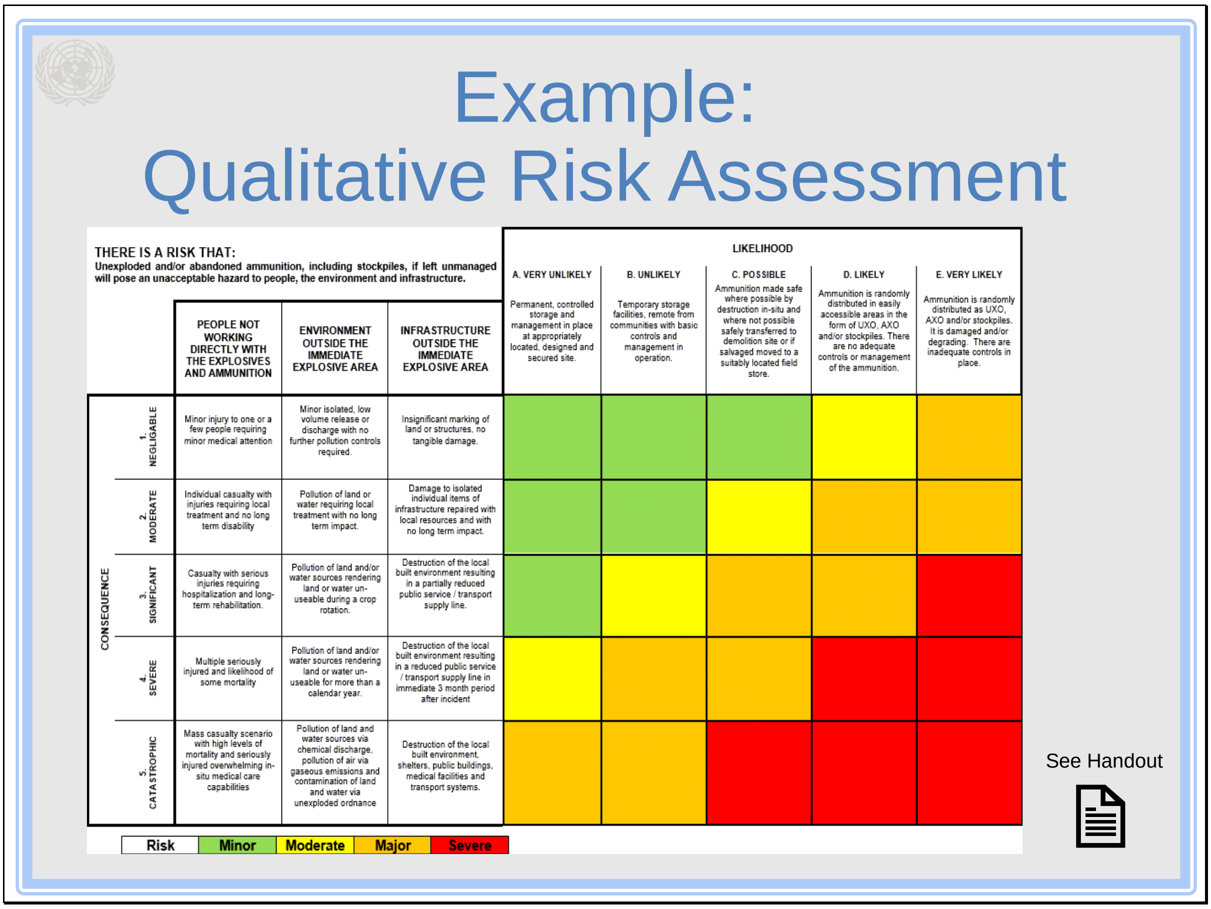
References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- Qualitative risk assessments are descriptive, rather than using measurable or calculable data, and they are by far the most widely used approach to risk analysis in many circumstances.
- Probability data is not required and only estimated potential loss is used.
- A qualitative risk assessment can be a helpful first step, when a State decides to implement risk assessment procedures, but they should not be used as a replacement for the scientifically accepted and proven techniques which are available to allow for a more quantitative risk assessment.

- They may be used though for specific processes that support ammunition management where little quantitative data is available, such as technical procedures for ammunition processing tasks

- Quantitative Risk Assessment (QRA) is a powerful tool for the investigation and reduction of risk.
- It should be used to estimate the approximate probability of an accidental explosion during ammunition storage and then estimate the fatalities, injuries, damage and other losses from such an explosion (referred to as the consequences).
- This enables professional judgement to be applied as to whether or not the risk meets the ALARP principal.
- QRA provides an advantage over more subjective methods in that a more complete set of available information is used to quantify ‘risk’ as a parameter.
- This allows for consistency and repeatability from decision to decision, (for example when comparing the hazard presented by each explosive storehouse within an ammunition depot).



# Example:
# Qualitative Risk Assessment

**THERE IS A RISK THAT:**
**Unexploded and/or abandoned ammunition, including stockpiles, if left unmanaged will pose an unacceptable hazard to people, the environment and infrastructure.**

| | | PEOPLE NOT WORKING DIRECTLY WITH THE EXPLOSIVES AND AMMUNITION | ENVIRONMENT OUTSIDE THE IMMEDIATE EXPLOSIVE AREA | INFRASTRUCTURE OUTSIDE THE IMMEDIATE EXPLOSIVE AREA | LIKELIHOOD | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | A. VERY UNLIKELY<br>Permanent, controlled storage and management in place at appropriately located, designed and secured site. | B. UNLIKELY<br>Temporary storage facilities, remote from communities with basic controls and management in operation. | C. POSSIBLE<br>Ammunition made safe where possible by destruction in-situ and where not possible safely transferred to demolition site or if salvaged moved to a suitably located field store. | D. LIKELY<br>Ammunition is randomly distributed in easily accessible areas in the form of UXO, AXO and/or stockpiles. There are no adequate controls or management of the ammunition. | E. VERY LIKELY<br>Ammunition is randomly distributed as UXO, AXO and/or stockpiles. It is damaged and/or degrading. There are inadequate controls in place. |
| CONSEQUENCE | 1. NEGLIGABLE | Minor injury to one or a few people requiring minor medical attention | Minor isolated, low volume release or discharge with no further pollution controls required. | Insignificant marking of land or structures, no tangible damage. | 🟩 | 🟩 | 🟩 | 🟨 | 🟧 |
| | 2. MODERATE | Individual casualty with injuries requiring local treatment and no long term disability | Pollution of land or water requiring local treatment with no long term impact. | Damage to isolated individual items of infrastructure repaired with local resources and with no long term impact. | 🟩 | 🟩 | 🟨 | 🟧 | 🟧 |
| | 3. SIGNIFICANT | Casualty with serious injuries requiring hospitalization and long-term rehabilitation. | Pollution of land and/or water sources rendering land or water un-useable during a crop rotation. | Destruction of the local built environment resulting in a partially reduced public service / transport supply line. | 🟩 | 🟨 | 🟧 | 🟧 | 🟥 |
| | 4. SEVERE | Multiple seriously injured and likelihood of some mortality | Pollution of land and/or water sources rendering land or water un-useable for more than a calendar year. | Destruction of the local built environment resulting in a reduced public service / transport supply line in immediate 3 month period after incident | 🟨 | 🟧 | 🟧 | 🟥 | 🟥 |
| | 5. CATASTROPHIC | Mass casualty scenario with high levels of mortality and seriously injured overwhelming in-situ medical care capabilities | Pollution of land and water sources via chemical discharge, pollution of air via gaseous emissions and contamination of land and water via unexploded ordnance | Destruction of the local built environment, shelters, public buildings, medical facilities and transport systems. | 🟧 | 🟧 | 🟥 | 🟥 | 🟥 |

| Risk | Minor | Moderate | Major | Severe |
|---|---|---|---|---|
| | 🟩 | 🟨 | 🟧 | 🟥 |

See Handout

## Main idea/objective for slide:

- **Provide an example of a qualitative explosive risk assessment to the participants and walk them through each section to explain how it is produced.**

What the instructor should cover (in addition to slide content)
Provide a handout of this table to the participants, and work through examples.

References/further reading:
**IATG 2.10 – Introduction to Risk Management Principles and Processes, Page 13**

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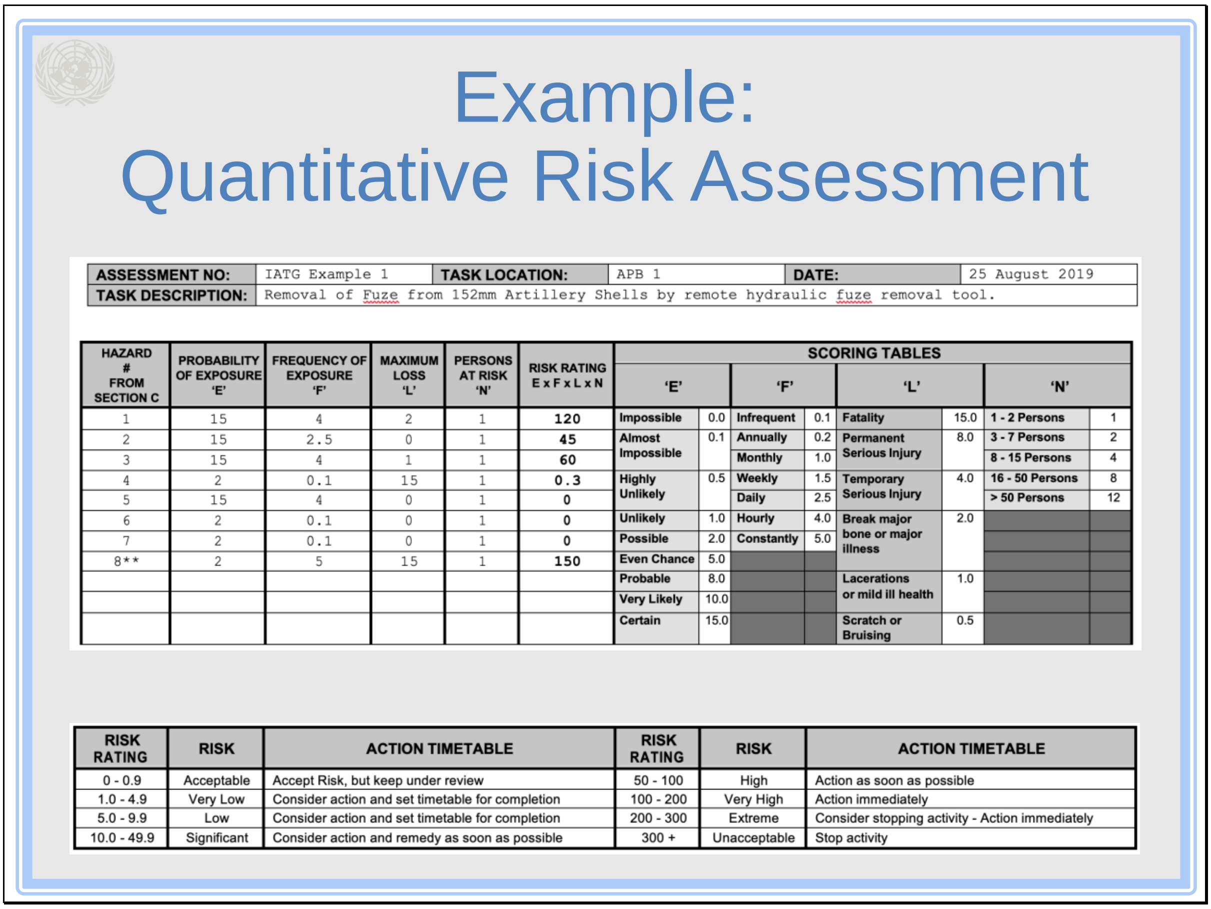


# Example:
# Quantitative Risk Assessment

| | | | | | |
|---|---|---|---|---|---|
| **ASSESSMENT NO:** | IATG Example 1 | **TASK LOCATION:** | APB 1 | **DATE:** | 25 August 2019 |
| **TASK DESCRIPTION:** | Removal of Fuze from 152mm Artillery Shells by remote hydraulic fuze removal tool. | | | | |

| HAZARD # FROM SECTION C | PROBABILITY OF EXPOSURE 'E' | FREQUENCY OF EXPOSURE 'F' | MAXIMUM LOSS 'L' | PERSONS AT RISK 'N' | RISK RATING E x F x L x N | SCORING TABLES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 'E' | | 'F' | | 'L' | | 'N' | |
| 1 | 15 | 4 | 2 | 1 | **120** | **Impossible** | 0.0 | **Infrequent** | 0.1 | **Fatality** | 15.0 | **1 - 2 Persons** | 1 |
| 2 | 15 | 2.5 | 0 | 1 | **45** | **Almost Impossible** | 0.1 | **Annually** | 0.2 | **Permanent Serious Injury** | 8.0 | **3 - 7 Persons** | 2 |
| 3 | 15 | 4 | 1 | 1 | **60** | | | **Monthly** | 1.0 | | | **8 - 15 Persons** | 4 |
| 4 | 2 | 0.1 | 15 | 1 | **0.3** | **Highly Unlikely** | 0.5 | **Weekly** | 1.5 | **Temporary Serious Injury** | 4.0 | **16 - 50 Persons** | 8 |
| 5 | 15 | 4 | 0 | 1 | **0** | | | **Daily** | 2.5 | | | **> 50 Persons** | 12 |
| 6 | 2 | 0.1 | 0 | 1 | **0** | **Unlikely** | 1.0 | **Hourly** | 4.0 | **Break major bone or major illness** | 2.0 | | |
| 7 | 2 | 0.1 | 0 | 1 | **0** | **Possible** | 2.0 | **Constantly** | 5.0 | | | | |
| 8** | 2 | 5 | 15 | 1 | **150** | **Even Chance** | 5.0 | | | | | | |
| | | | | | | **Probable** | 8.0 | | | **Lacerations or mild ill health** | 1.0 | | |
| | | | | | | **Very Likely** | 10.0 | | | | | | |
| | | | | | | **Certain** | 15.0 | | | **Scratch or Bruising** | 0.5 | | |

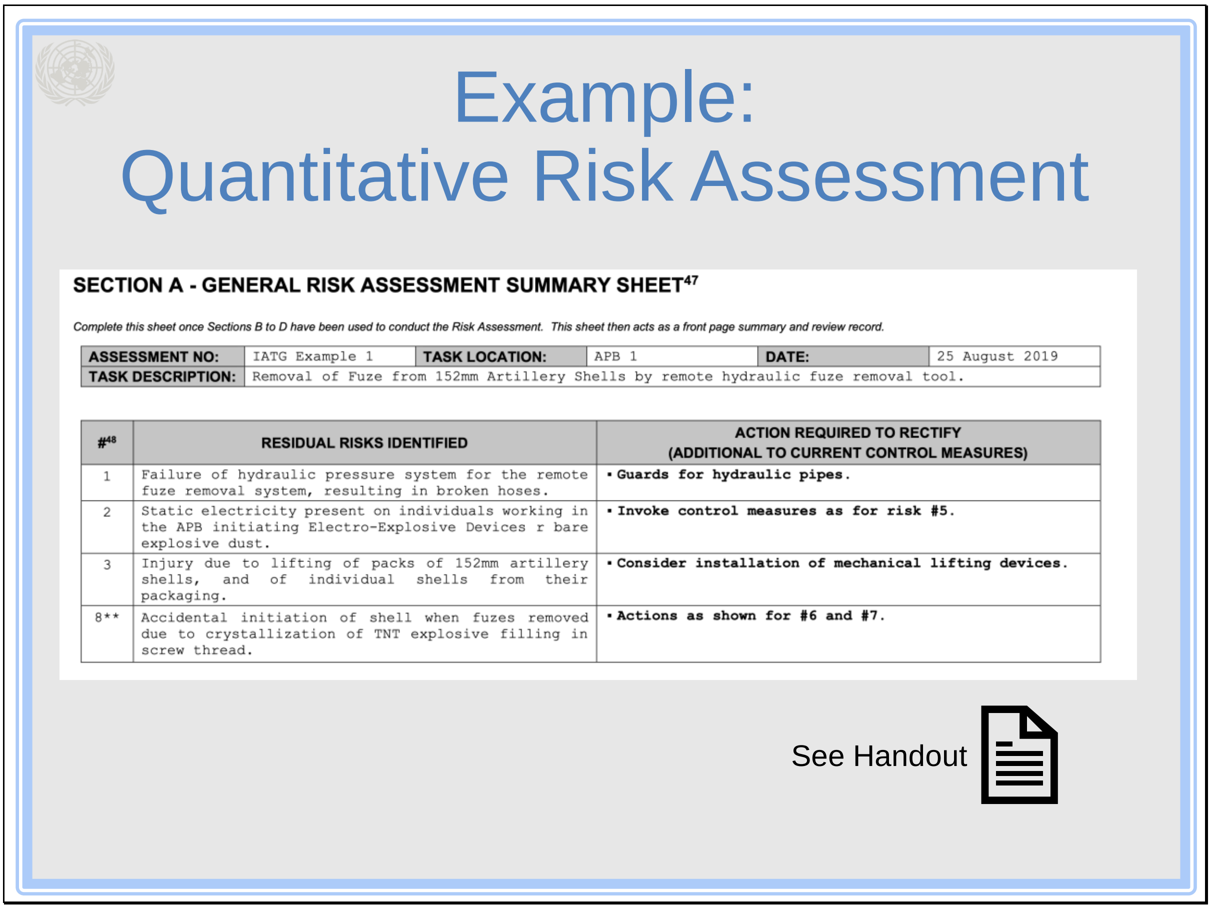
| RISK RATING | RISK | ACTION TIMETABLE | RISK RATING | RISK | ACTION TIMETABLE |
|---|---|---|---|---|---|
| 0 - 0.9 | Acceptable | Accept Risk, but keep under review | 50 - 100 | High | Action as soon as possible |
| 1.0 - 4.9 | Very Low | Consider action and set timetable for completion | 100 - 200 | Very High | Action immediately |
| 5.0 - 9.9 | Low | Consider action and set timetable for completion | 200 - 300 | Extreme | Consider stopping activity - Action immediately |
| 10.0 - 49.9 | Significant | Consider action and remedy as soon as possible | 300 + | Unacceptable | Stop activity |

**Main idea/objective for slide:**

- **Provide an example of a quantitative explosive risk assessment to the participants and walk them through each section to explain how it is produced.**

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes, Annex D**



# Example:
# Quantitative Risk Assessment

**SECTION A - GENERAL RISK ASSESSMENT SUMMARY SHEET**[47]

*Complete this sheet once Sections B to D have been used to conduct the Risk Assessment. This sheet then acts as a front page summary and review record.*

| | | | | | |
|---|---|---|---|---|---|
| **ASSESSMENT NO:** | IATG Example 1 | **TASK LOCATION:** | APB 1 | **DATE:** | 25 August 2019 |
| **TASK DESCRIPTION:** | Removal of Fuze from 152mm Artillery Shells by remote hydraulic fuze removal tool. | | | | |

| #[48] | RESIDUAL RISKS IDENTIFIED | ACTION REQUIRED TO RECTIFY (ADDITIONAL TO CURRENT CONTROL MEASURES) |
|---|---|---|
| 1 | Failure of hydraulic pressure system for the remote fuze removal system, resulting in broken hoses. | ▪ **Guards for hydraulic pipes.** |
| 2 | Static electricity present on individuals working in the APB initiating Electro-Explosive Devices r bare explosive dust. | ▪ **Invoke control measures as for risk #5.** |
| 3 | Injury due to lifting of packs of 152mm artillery shells, and of individual shells from their packaging. | ▪ **Consider installation of mechanical lifting devices.** |
| 8** | Accidental initiation of shell when fuzes removed due to crystallization of TNT explosive filling in screw thread. | ▪ **Actions as shown for #6 and #7.** |

See Handout

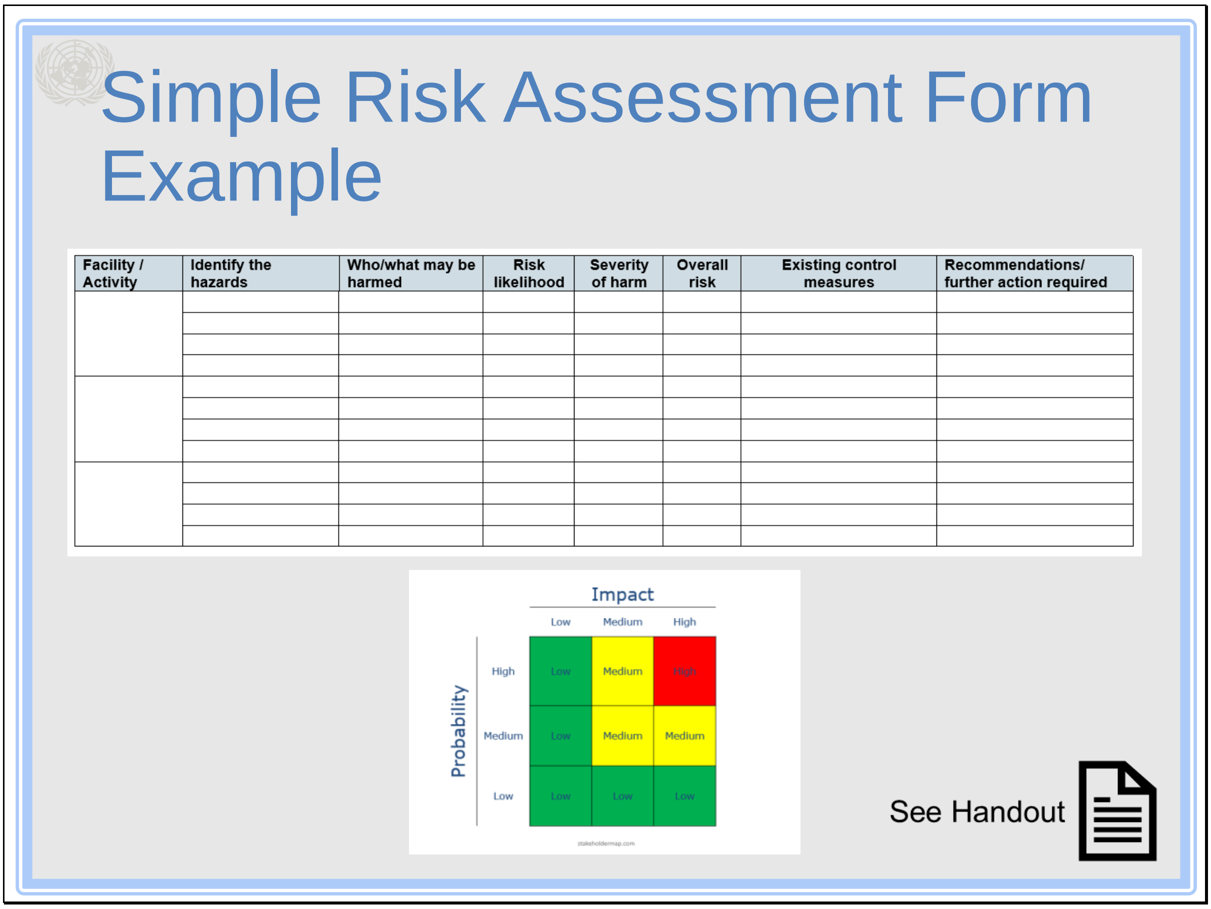
**<u>Main idea/objective for slide:</u>**

- **Provide an example of a quantitative explosive risk assessment to the participants and walk them through each section to explain how it is produced.**

<u>References/further reading:</u>

**IATG 2.10 – Introduction to Risk Management Principles and Processes, Annex D**

- Handout QRA to participants



# Simple Risk Assessment Form Example

| Facility / Activity | Identify the hazards | Who/what may be harmed | Risk likelihood | Severity of harm | Overall risk | Existing control measures | Recommendations/ further action required |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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Impact

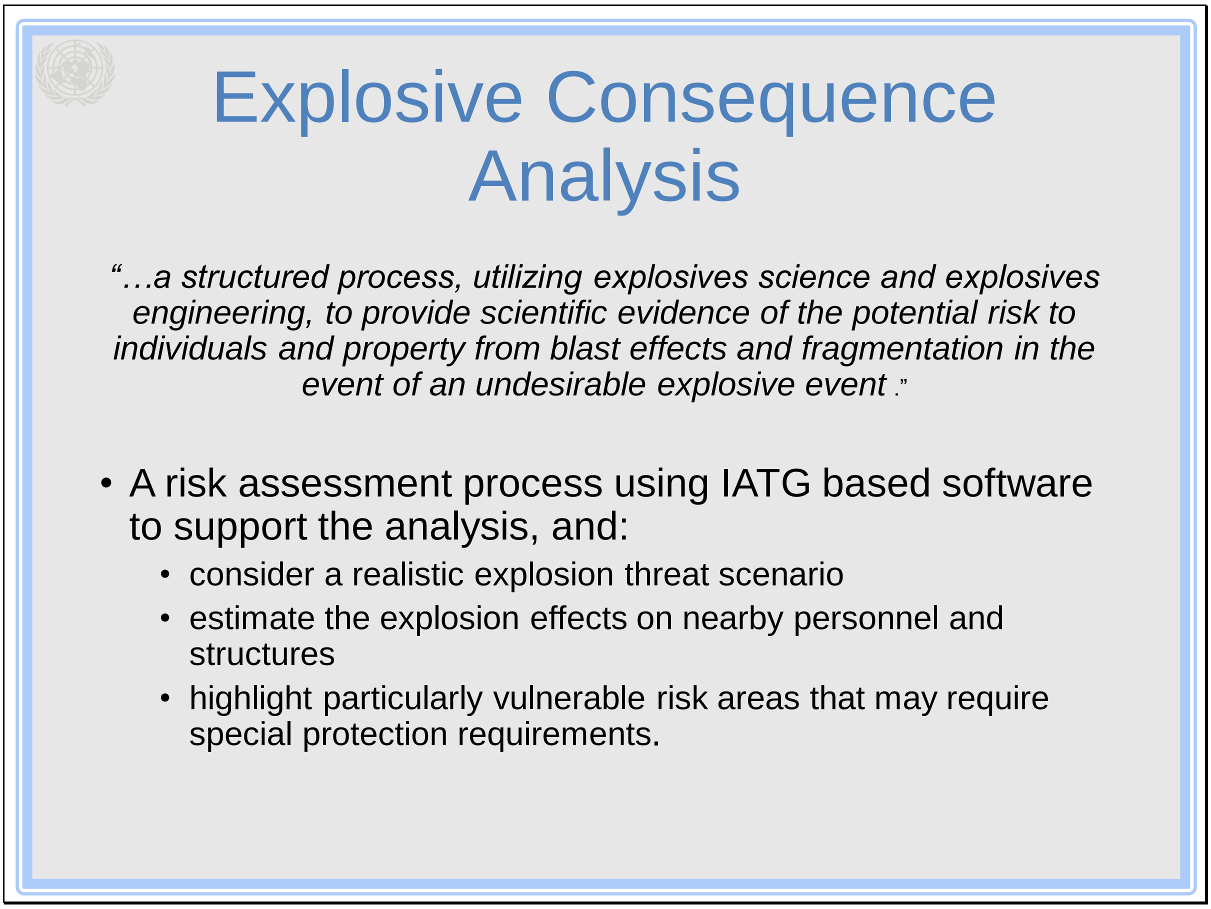
| Probability | Low | Medium | High |
|---|---|---|---|
| High | Low | Medium | High |
| Medium | Low | Medium | Medium |
| Low | Low | Low | Low |

stakeholdermap.com

See Handout

**Main idea/objective for slide:**
Provide an example of a simple quantitative explosive risk assessment to the participants and walk them through each section to explain how it is produced.
Explain the use to a risk assessment matrix

What the instructor should cover (in addition to slide content)
Show a 3x3 matrix and a 5x5 matrix.



## Explosive Consequence Analysis

*"…a structured process, utilizing explosives science and explosives engineering, to provide scientific evidence of the potential risk to individuals and property from blast effects and fragmentation in the event of an undesirable explosive event ."*

- A risk assessment process using IATG based software to support the analysis, and:
  - consider a realistic explosion threat scenario
  - estimate the explosion effects on nearby personnel and structures
  - highlight particularly vulnerable risk areas that may require special protection requirements.

**Main idea/objective for slide:**

- **Discuss Explosive Consequence Analysis**

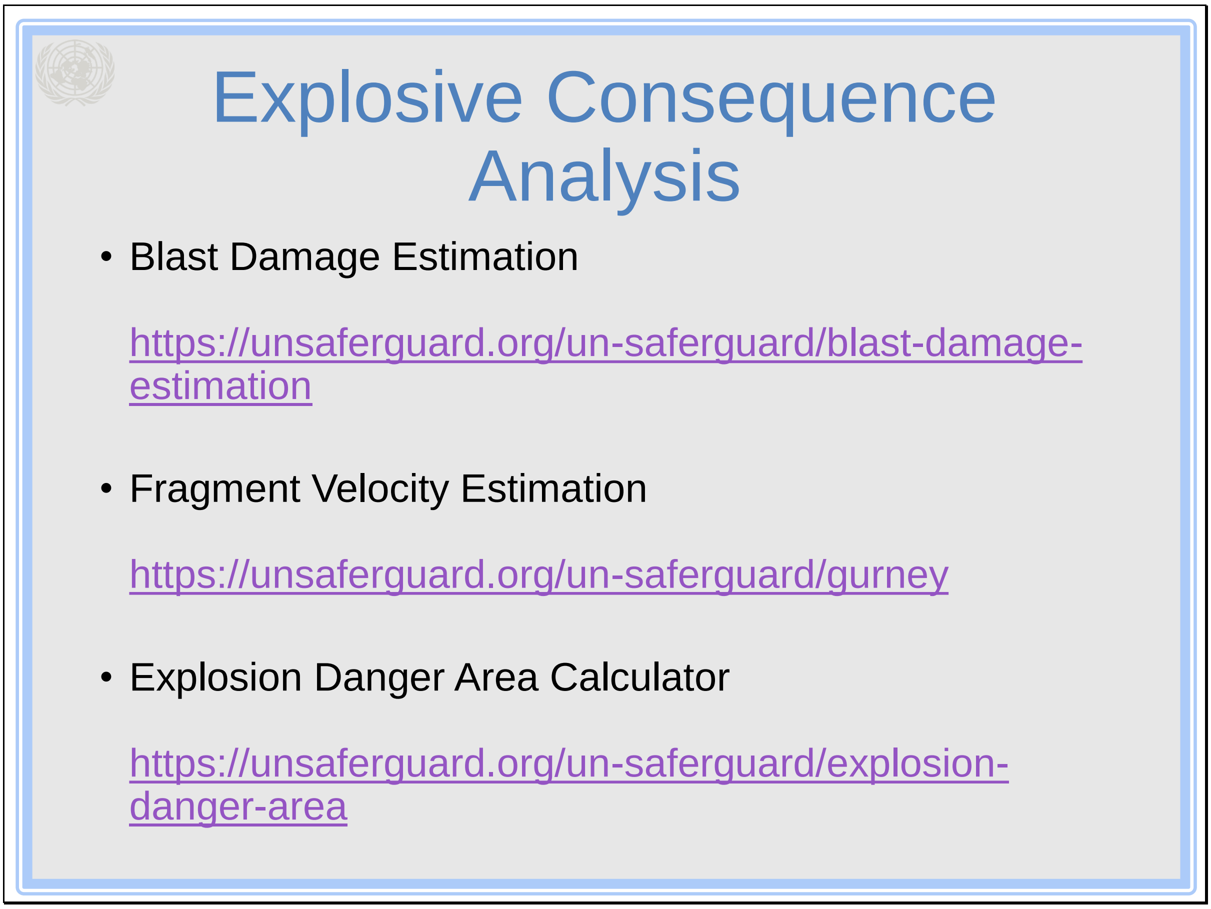
References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- The ECA can be a core component of the risk analysis process during the development of a Quantitative Risk Assessment.
- The initial component of an ECA should be compiled using the appropriate scientific formula(e) from IATG 01.80 *Formulae for ammunition management*.
- The objectives of an ECA should be to:
  - consider a realistic explosion threat scenario;
  - estimate the explosion effects on nearby personnel and structures; and
  - highlight particularly vulnerable risk areas that may require special protection requirements.

- An example of a simple ECA methodology that could be used is at Annex E.
- A fuller ECA should also consider the following additional external hazards and contributions to initiation frequency:
    - lightning strikes. Where lightning protection in accordance with IATG 05.40 *Safety standards for electrical installations* is not provided
    - flooding. Where the explosives facility is within a known flood plain
    - aircraft crash. Where the explosives facility is close to commercial air routes or if in an area of high use by light aircraft
    - nearby hazardous installations. Where the explosive facility is close to, or co-located with, for example, petroleum depots or ammunition disposal sites
    - malicious destruction. The threat from sabotage or terrorist attack
    - consequential initiation. Where the potential explosion sites (PES) are within inappropriate separation distances and an explosion in one causes the initiation of explosives in nearby PES.
- The IATG software includes an 'automated' ECA which just requires the input of basic readily available data.

Slide 32



## Explosive Consequence Analysis

- Blast Damage Estimation

  https://unsaferguard.org/un-saferguard/blast-damage-estimation

- Fragment Velocity Estimation

  https://unsaferguard.org/un-saferguard/gurney

- Explosion Danger Area Calculator

  https://unsaferguard.org/un-saferguard/explosion-danger-area

**Main idea/objective for slide:**

- **Discuss Explosive Consequence Analysis**

What the instructor should cover (in addition to slide content)

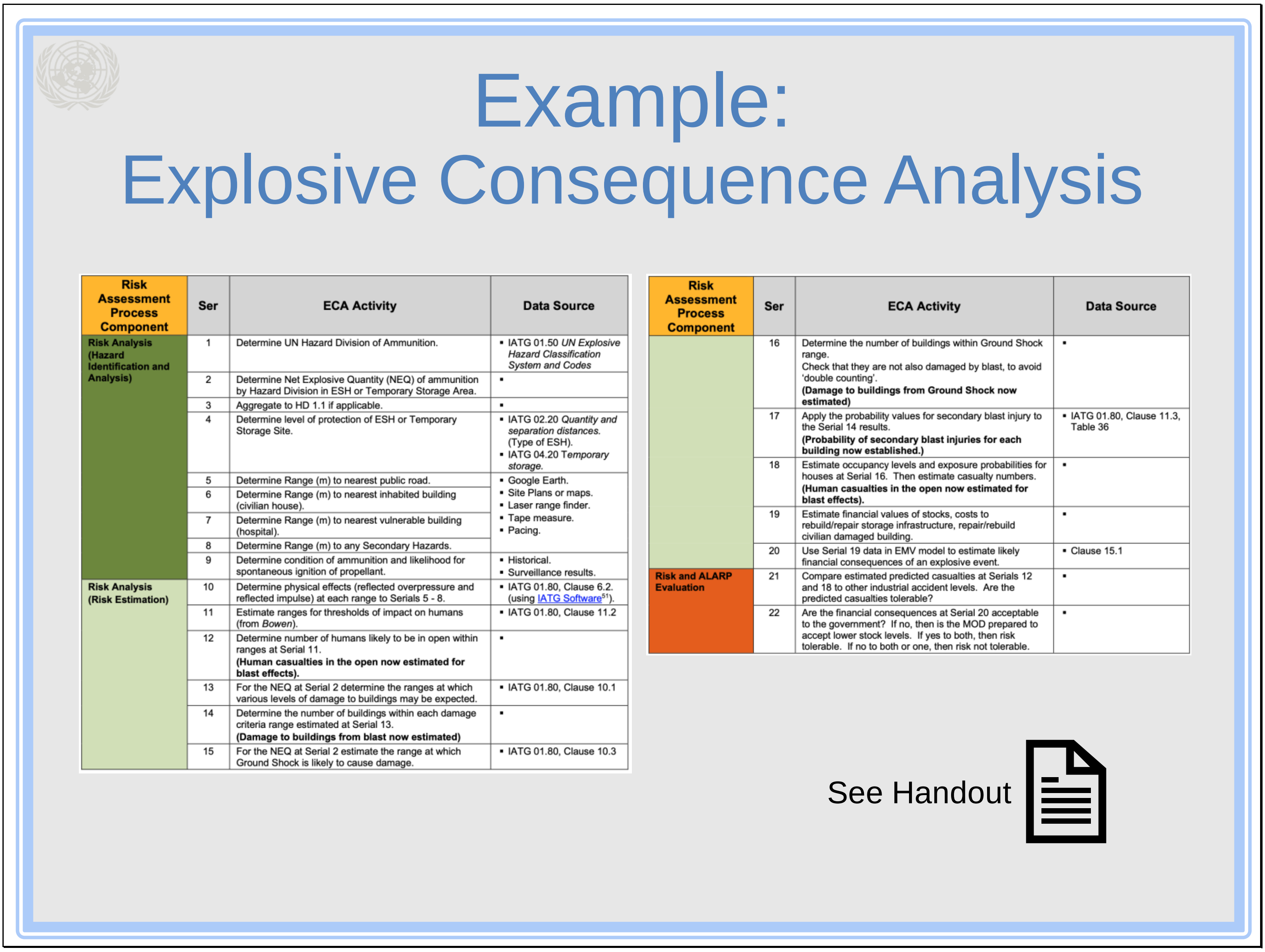
Where possible, the instructor can explore these links during the lesson (dependant on internet connectivity)
Otherwise, direct the participant to these links as an online source of support to determine blast radius and explosive danger area distances.

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- The IATG Implementation Support Tool provides an Explosion Consequence Analysis tool that calculates the blast overpressure element for the analysis. Other tools, such as the Gurney equations for Fragment Velocity and Explosion Danger Area Calculator might also be used to support the analysis..

Slide 33



# Example:
# Explosive Consequence Analysis

| Risk Assessment Process Component | Ser | ECA Activity | Data Source |
|---|---|---|---|
| **Risk Analysis (Hazard Identification and Analysis)** | 1 | Determine UN Hazard Division of Ammunition. | ▪ IATG 01.50 *UN Explosive Hazard Classification System and Codes* |
| | 2 | Determine Net Explosive Quantity (NEQ) of ammunition by Hazard Division in ESH or Temporary Storage Area. | ▪ |
| | 3 | Aggregate to HD 1.1 if applicable. | ▪ |
| | 4 | Determine level of protection of ESH or Temporary Storage Site. | ▪ IATG 02.20 *Quantity and separation distances.* (Type of ESH).<br>▪ IATG 04.20 T*emporary storage.* |
| | 5 | Determine Range (m) to nearest public road. | ▪ Google Earth.<br>▪ Site Plans or maps.<br>▪ Laser range finder.<br>▪ Tape measure.<br>▪ Pacing. |
| | 6 | Determine Range (m) to nearest inhabited building (civilian house). | |
| | 7 | Determine Range (m) to nearest vulnerable building (hospital). | |
| | 8 | Determine Range (m) to any Secondary Hazards. | |
| | 9 | Determine condition of ammunition and likelihood for spontaneous ignition of propellant. | ▪ Historical.<br>▪ Surveillance results. |
| **Risk Analysis (Risk Estimation)** | 10 | Determine physical effects (reflected overpressure and reflected impulse) at each range to Serials 5 - 8. | ▪ IATG 01.80, Clause 6.2. (using IATG Software[51]). |
| | 11 | Estimate ranges for thresholds of impact on humans (from *Bowen*). | ▪ IATG 01.80, Clause 11.2 |
| | 12 | Determine number of humans likely to be in open within ranges at Serial 11.<br>**(Human casualties in the open now estimated for blast effects).** | ▪ |
| | 13 | For the NEQ at Serial 2 determine the ranges at which various levels of damage to buildings may be expected. | ▪ IATG 01.80, Clause 10.1 |
| | 14 | Determine the number of buildings within each damage criteria range estimated at Serial 13.<br>**(Damage to buildings from blast now estimated)** | ▪ |
| | 15 | For the NEQ at Serial 2 estimate the range at which Ground Shock is likely to cause damage. | ▪ IATG 01.80, Clause 10.3 |
| | 16 | Determine the number of buildings within Ground Shock range.<br>Check that they are not also damaged by blast, to avoid 'double counting'.<br>**(Damage to buildings from Ground Shock now estimated)** | ▪ |
| | 17 | Apply the probability values for secondary blast injury to the Serial 14 results.<br>**(Probability of secondary blast injuries for each building now established.)** | ▪ IATG 01.80, Clause 11.3, Table 36 |
| | 18 | Estimate occupancy levels and exposure probabilities for houses at Serial 16. Then estimate casualty numbers.<br>**(Human casualties in the open now estimated for blast effects).** | ▪ |
| | 19 | Estimate financial values of stocks, costs to rebuild/repair storage infrastructure, repair/rebuild civilian damaged building. | ▪ |
| | 20 | Use Serial 19 data in EMV model to estimate likely financial consequences of an explosive event. | ▪ Clause 15.1 |
| **Risk and ALARP Evaluation** | 21 | Compare estimated predicted casualties at Serials 12 and 18 to other industrial accident levels. Are the predicted casualties tolerable? | ▪ |
| | 22 | Are the financial consequences at Serial 20 acceptable to the government? If no, then is the MOD prepared to accept lower stock levels. If yes to both, then risk tolerable. If no to both or one, then risk not tolerable. | ▪ |

See Handout

**Main idea/objective for slide:**

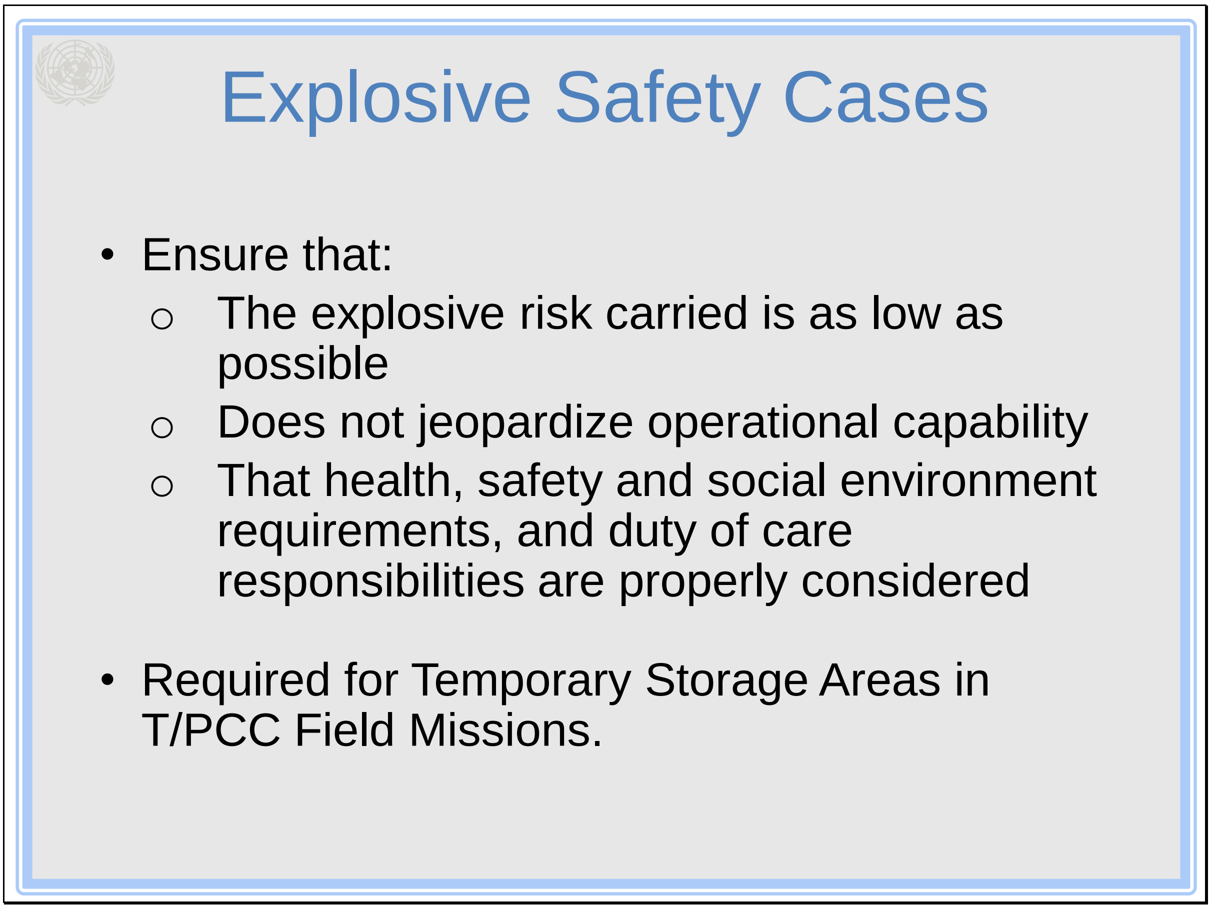
- **Discuss Explosive Consequence Analysis**

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes.** http://data.unsaferguard.org/iatg/en/IATG-02.10-Introduction-risk-management-IATG-V.3.pdf

- Page 30
- Handout ECA to participants

Slide 34



## Explosive Safety Cases

- Ensure that:
  - The explosive risk carried is as low as possible
  - Does not jeopardize operational capability
  - That health, safety and social environment requirements, and duty of care responsibilities are properly considered
- Required for Temporary Storage Areas in T/PCC Field Missions.

**Main idea/objective for slide:**

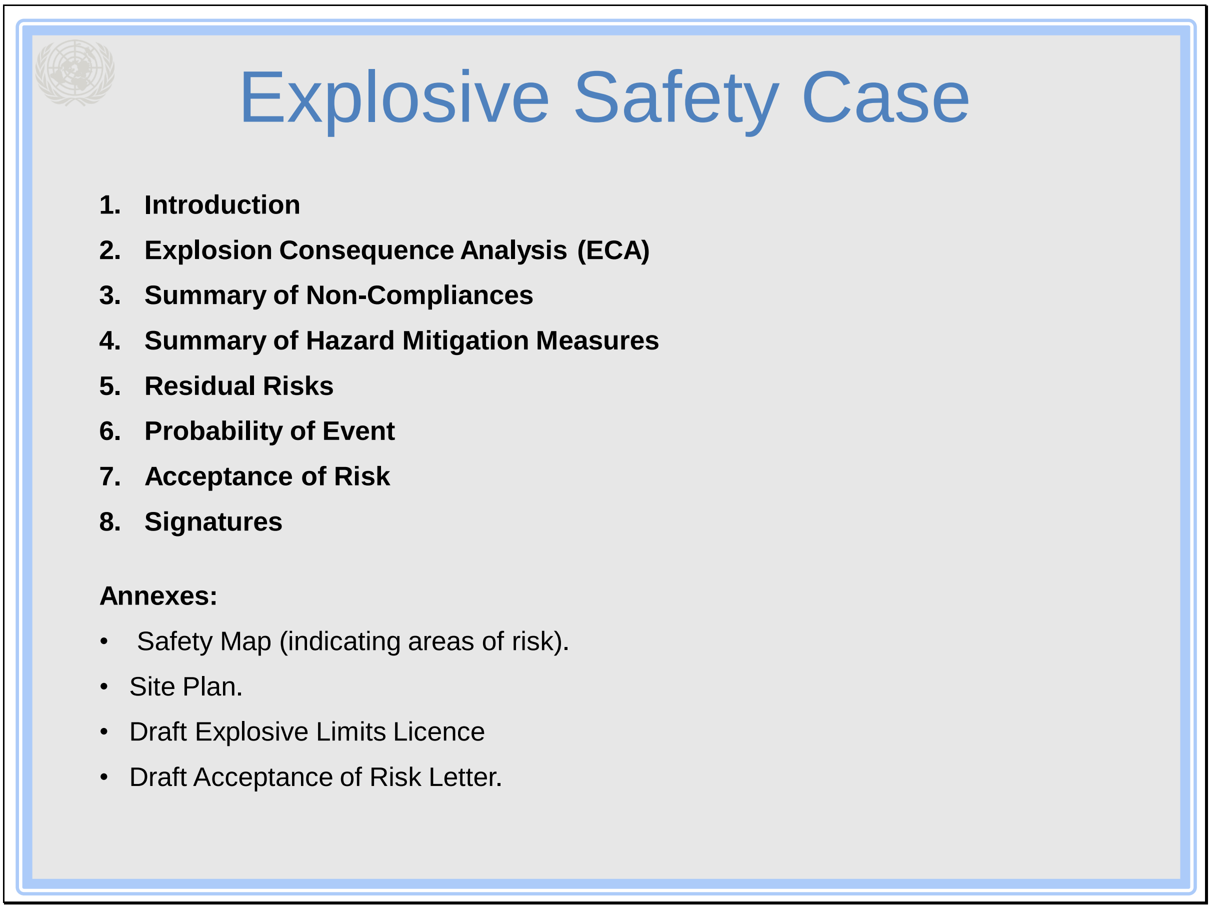
- **Discuss Explosive Safety Cases**

References/further reading:

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

- For the construction of temporary ammunition storage sites (see IATG 04.10) when full compliance with Outside Quantity Distances and Inside Quantity Distances is not possible, an Explosive Safety Case (ESC) shall be compiled.
- This is done to ensure that the explosive risk carried is as low as possible, does not jeopardize operational capability and that health and safety requirements, and duty of care responsibilities, are properly considered.
- There will be instances, particularly in post conflict environments, where a multitude of stakeholders are involved in ammunition stockpile management advisory or operational functions for humanitarian purposes.

- It is highly desirable that in such circumstances all stakeholders should use a common format for explosive safety cases, which integrates requirements from across the IATG. Such a format is at Annex G.
- Explosive Safety Cases shall only be accomplished by individuals whom are appropriately qualified and experienced in ammunition safety management



# Explosive Safety Case

1. **Introduction**
2. **Explosion Consequence Analysis (ECA)**
3. **Summary of Non-Compliances**
4. **Summary of Hazard Mitigation Measures**
5. **Residual Risks**
6. **Probability of Event**
7. **Acceptance of Risk**
8. **Signatures**

**Annexes:**

- Safety Map (indicating areas of risk).
- Site Plan.
- Draft Explosive Limits Licence
- Draft Acceptance of Risk Letter.

**<u>Main idea/objective for slide:</u>**

- **Discuss Explosive Safety Cases**

<u>References/further reading:</u>

**IATG 2.10 – Introduction to Risk Management Principles and Processes**

1. Include an explanation of the explosive storage area and summarize why full IATG compliance is not possible. This should include location, infrastructure type, total numbers of persons at the site or in the immediate area of the site.

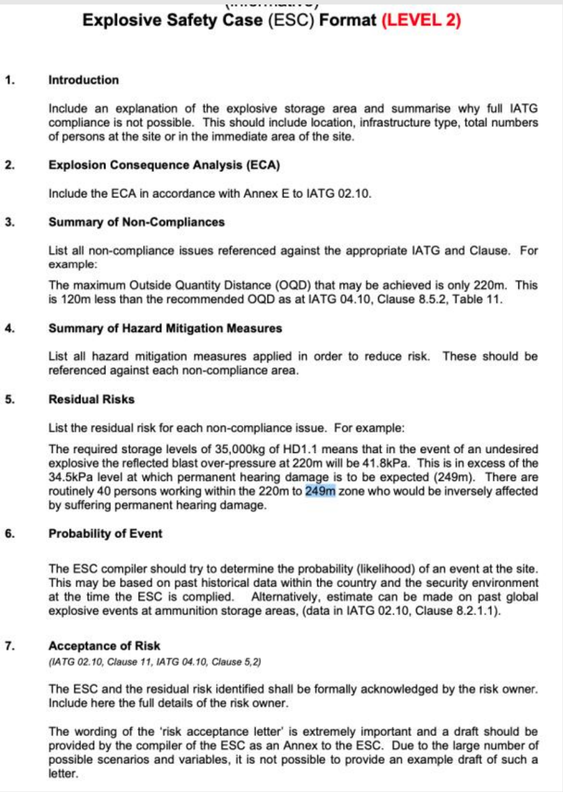
2. Include the ECA in accordance with Annex E to IATG 02.10.

3. List all non-compliance issues referenced against the appropriate IATG and Clause. For example: The maximum Outside Quantity Distance (OQD) that

may be achieved is only 220m. This is 120m less than the recommended OQD as at IATG 04.10, Clause 8.5.2, Table 11.

4. List all hazard mitigation measures applied in order to reduce risk. These should be referenced against each non-compliance area.
5. List the residual risk for each non-compliance issue. For example: The required storage levels of 35,000kg of HD1.1 means that in the event of an undesired explosive the reflected blast over-pressure at 220m will be 41.8kPa. This is in excess of the 34.5kPa level at which permanent hearing damage is to be expected (249m). There are routinely 40 persons working within the 220m to 249m zone who would be inversely affected by suffering permanent hearing damage.
6. The ESC compiler should try to determine the probability (likelihood) of an event at the site. This may be based on past historical data within the country and the security environment at the time the ESC is complied. Alternatively, estimate can be made on past global explosive events at ammunition storage areas, (data in IATG 02.10, Clause 8.2.1.1).
7. The ESC and the residual risk identified shall be formally acknowledged by the risk owner. Include here the full details of the risk owner. The wording of the 'risk acceptance letter' is extremely important and a draft should be provided by the compiler of the ESC as an Annex to the ESC. Due to the large number of possible scenarios and variables, it is not possible to provide an example draft of such a letter.

# Example:
# Explosive Safety Case



**Explosive Safety Case** (ESC) **Format (LEVEL 2)**

1. **Introduction**

   Include an explanation of the explosive storage area and summarise why full IATG compliance is not possible. This should include location, infrastructure type, total numbers of persons at the site or in the immediate area of the site.

2. **Explosion Consequence Analysis (ECA)**

   Include the ECA in accordance with Annex E to IATG 02.10.

3. **Summary of Non-Compliances**

   List all non-compliance issues referenced against the appropriate IATG and Clause. For example:

   The maximum Outside Quantity Distance (OQD) that may be achieved is only 220m. This is 120m less than the recommended OQD as at IATG 04.10, Clause 8.5.2, Table 11.

4. **Summary of Hazard Mitigation Measures**

   List all hazard mitigation measures applied in order to reduce risk. These should be referenced against each non-compliance area.

5. **Residual Risks**

   List the residual risk for each non-compliance issue. For example:

   The required storage levels of 35,000kg of HD1.1 means that in the event of an undesired explosive the reflected blast over-pressure at 220m will be 41.8kPa. This is in excess of the 34.5kPa level at which permanent hearing damage is to be expected (249m). There are routinely 40 persons working within the 220m to 249m zone who would be inversely affected by suffering permanent hearing damage.

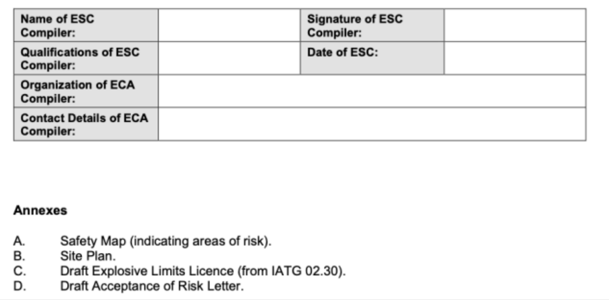
6. **Probability of Event**

   The ESC compiler should try to determine the probability (likelihood) of an event at the site. This may be based on past historical data within the country and the security environment at the time the ESC is complied. Alternatively, estimate can be made on past global explosive events at ammunition storage areas, (data in IATG 02.10, Clause 8.2.1.1).

7. **Acceptance of Risk**
   *(IATG 02.10, Clause 11, IATG 04.10, Clause 5,2)*

   The ESC and the residual risk identified shall be formally acknowledged by the risk owner. Include here the full details of the risk owner.

   The wording of the 'risk acceptance letter' is extremely important and a draft should be provided by the compiler of the ESC as an Annex to the ESC. Due to the large number of possible scenarios and variables, it is not possible to provide an example draft of such a letter.



| | | | |
|---|---|---|---|
| **Name of ESC Compiler:** | | **Signature of ESC Compiler:** | |
| **Qualifications of ESC Compiler:** | | **Date of ESC:** | |
| **Organization of ECA Compiler:** | | | |
| **Contact Details of ECA Compiler:** | | | |

**Annexes**

A. Safety Map (indicating areas of risk).
B. Site Plan.
C. Draft Explosive Limits Licence (from IATG 02.30).
D. Draft Acceptance of Risk Letter.

See Handout

__Main idea/objective for slide:__
- **Discuss Explosive Safety Cases**

__References/further reading:__
**IATG 2.10 – Introduction to Risk Management Principles and Processes** http://data.unsaferguard.org/iatg/en/IATG-02.10-Introduction-risk-management-IATG-V.3.pdf
- Annex G
- Handout ESC to participants

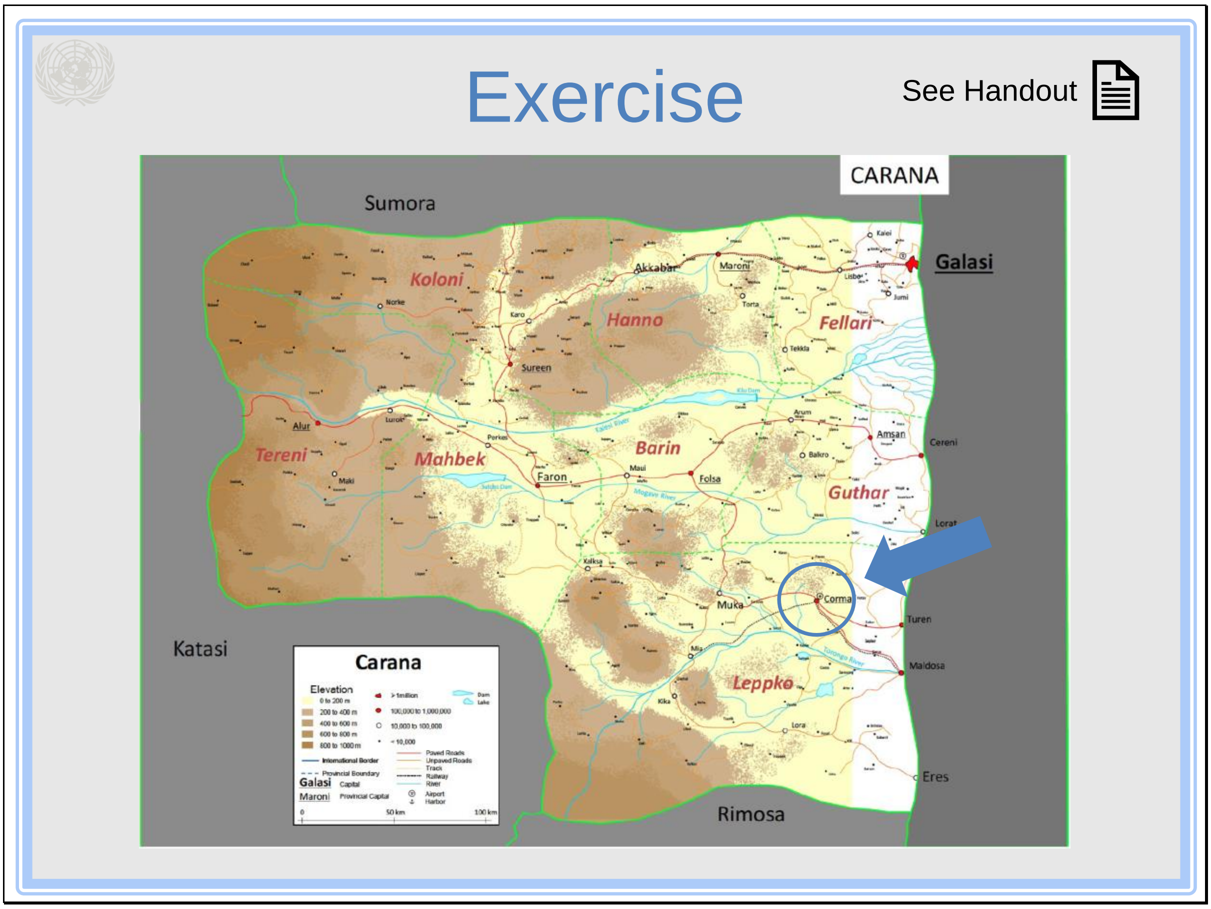
Slide 37

Participant Exercise

**Phase 2. Development (**Time allocation - 160 min**)**

Stage 3 (Time allocation 80 mins) – participant Exercise

Slide 38



# Exercise

See Handout

**Main idea/objective for slide:**

- **participant exercise to identify the various hazards to an ammunition Temporary Storage area.**

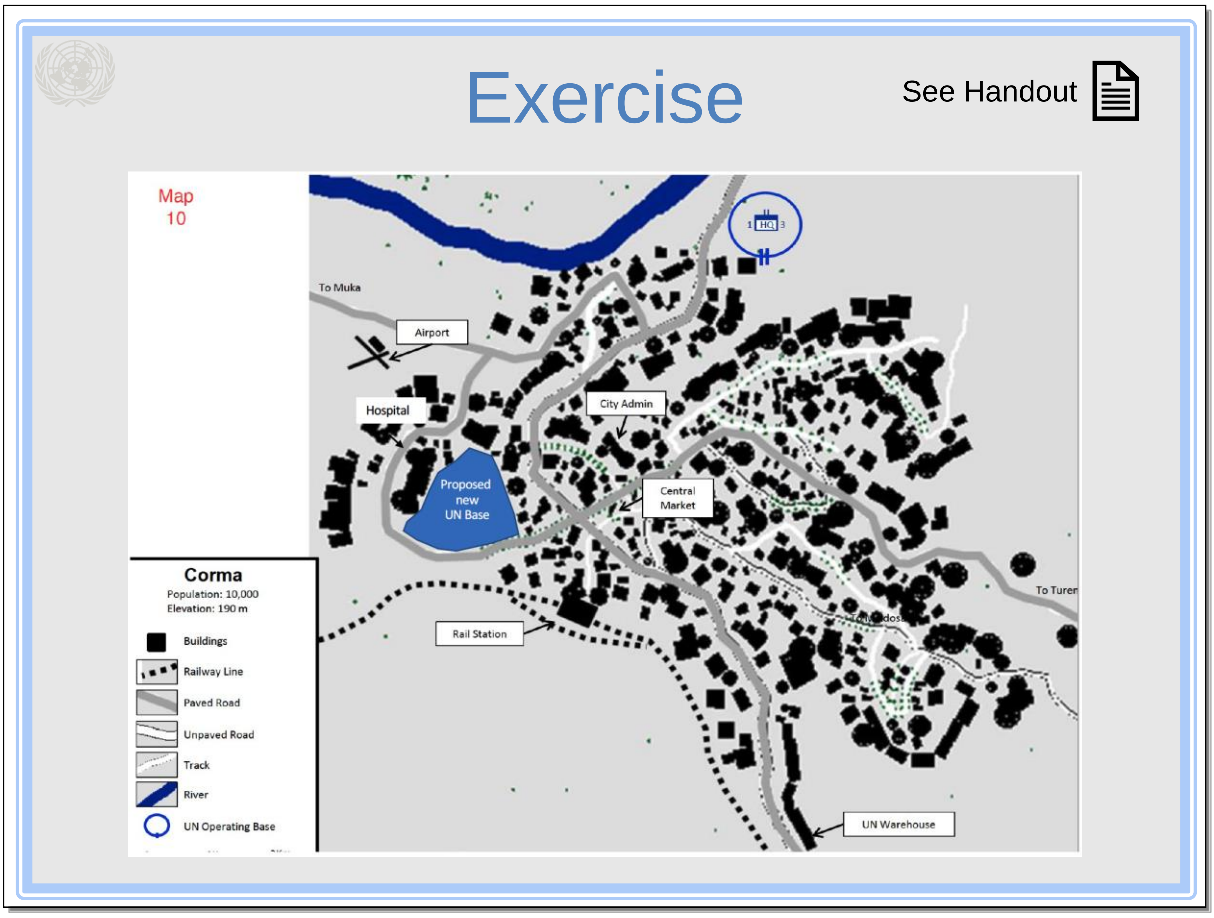
What the instructor should cover (in addition to slide content)

- Using the CARANA scenario, participants are required to identify the various hazards to an ammunition Field Storage area.
- Each participant should receive a copy of the handout (word doc 'WAMUNPOC L10 Risk Assessment Exercise')
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions.

Participant Activity

The participants must produce a qualitative explosive risk assessment which includes all mitigating controls and demonstrates the awareness of residual risk to ALARP levels.

Slide 39



Exercise

See Handout

**<u>Main idea/objective for slide:</u>**

- **participant exercise to identify the various hazards to an ammunition Temporary Storage area.**

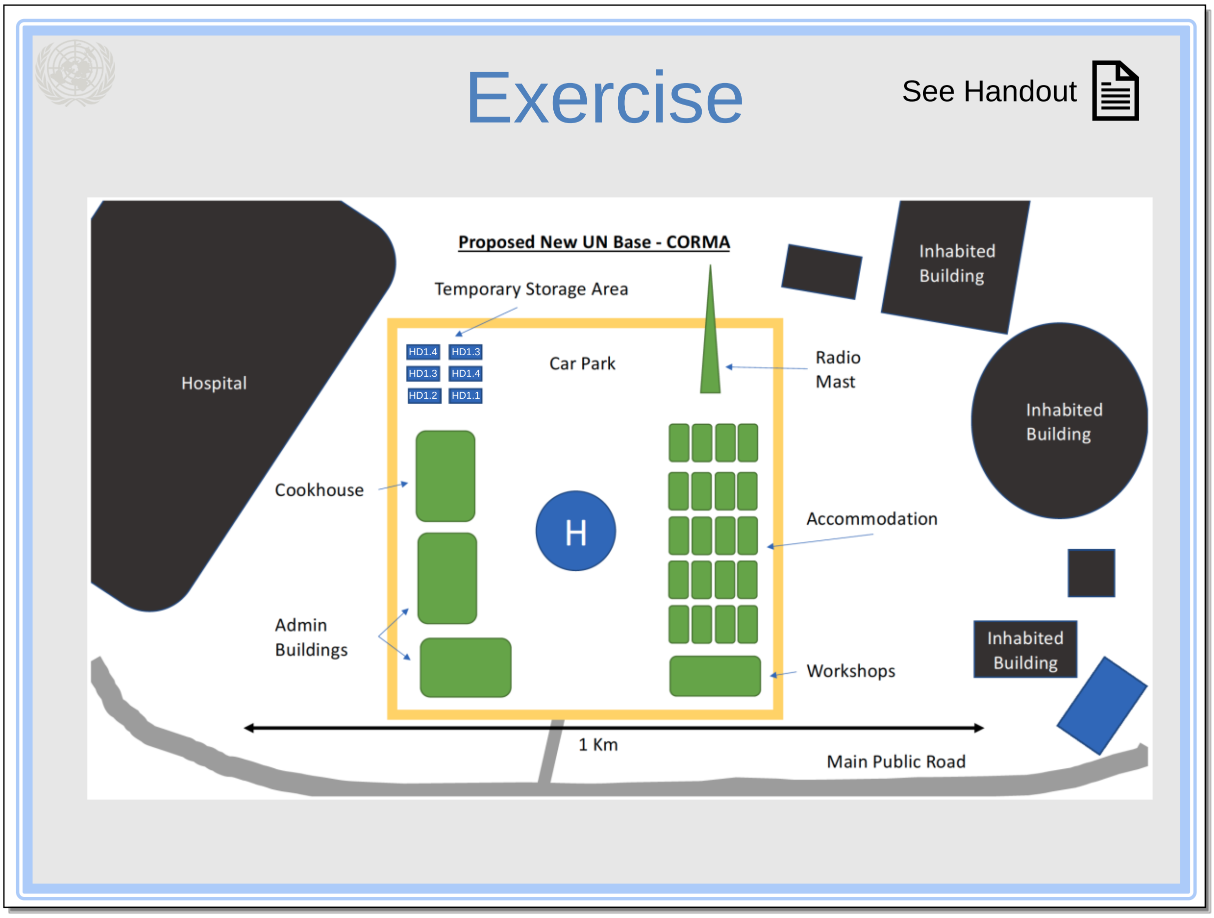
<u>What the instructor should cover (in addition to slide content)</u>

- Using the CARANA scenario, participants are required to identify the various hazards to an ammunition Field Storage area.
- Each participant should receive a copy of the handout (word doc ‘WAMUNPOC L10 Risk Assessment Exercise’)
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions.

<u>participant Activity</u>

The participants must produce a qualitative explosive risk assessment which includes all mitigating controls and demonstrates the awareness of residual risk to ALARP levels.

Slide 40



# Exercise

See Handout

**Main idea/objective for slide:**

- **participant exercise to identify the various hazards to an ammunition Temporary Storage area.**

What the instructor should cover (in addition to slide content)

- Using the CARANA scenario, participants are required to identify the various hazards to an ammunition Field Storage area.
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- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions.

participant Activity

The participants must produce a qualitative explosive risk assessment which includes all mitigating controls and demonstrates the awareness of residual risk to ALARP levels.

Slide 41

## Exercise

See Handout

| Ammunition Type | Hazard Class Code | Quantity | NEQ |
|---|---|---|---|
| Rds 7.62mm Ball Mixed Belt | 1.4S | 25,000 | 75kg |
| Rds 7.62mm Ball | 1.4S | 10,000 | 30kg |
| Rds 5.56mm Ball | 1.4S | 50,000 | 100kg |
| Rds 9mm Ball | 1.4S | 10,000 | 20kg |
| Rds 84mm RCL HEAT | 1.1E | 75 | 85kg |
| Rds 84mm RCL ILLUM | 1.2G | 50 | 56kg |
| CTGS 40x46mm HEAT | 1.2E | 200 | 120kg |
| Gren 66mm Smoke Screen | 1.3G | 250 | 82kg |
| Bombs 60mm Mortar HE | 1.1F | 550 | 166kg |
| Bombs 60mm Mortar SMK | 1.3G | 200 | 60kg |
| Gren HE | 1.1D | 400 | 24kg |
| TNT Charge (500g) | 1.1D | 200 | 100kg |
| Detonators | 1.1B | 500 | 0.1kg |

**Main idea/objective for slide:**

- **participant exercise to identify the various hazards to an ammunition Temporary Storage area.**

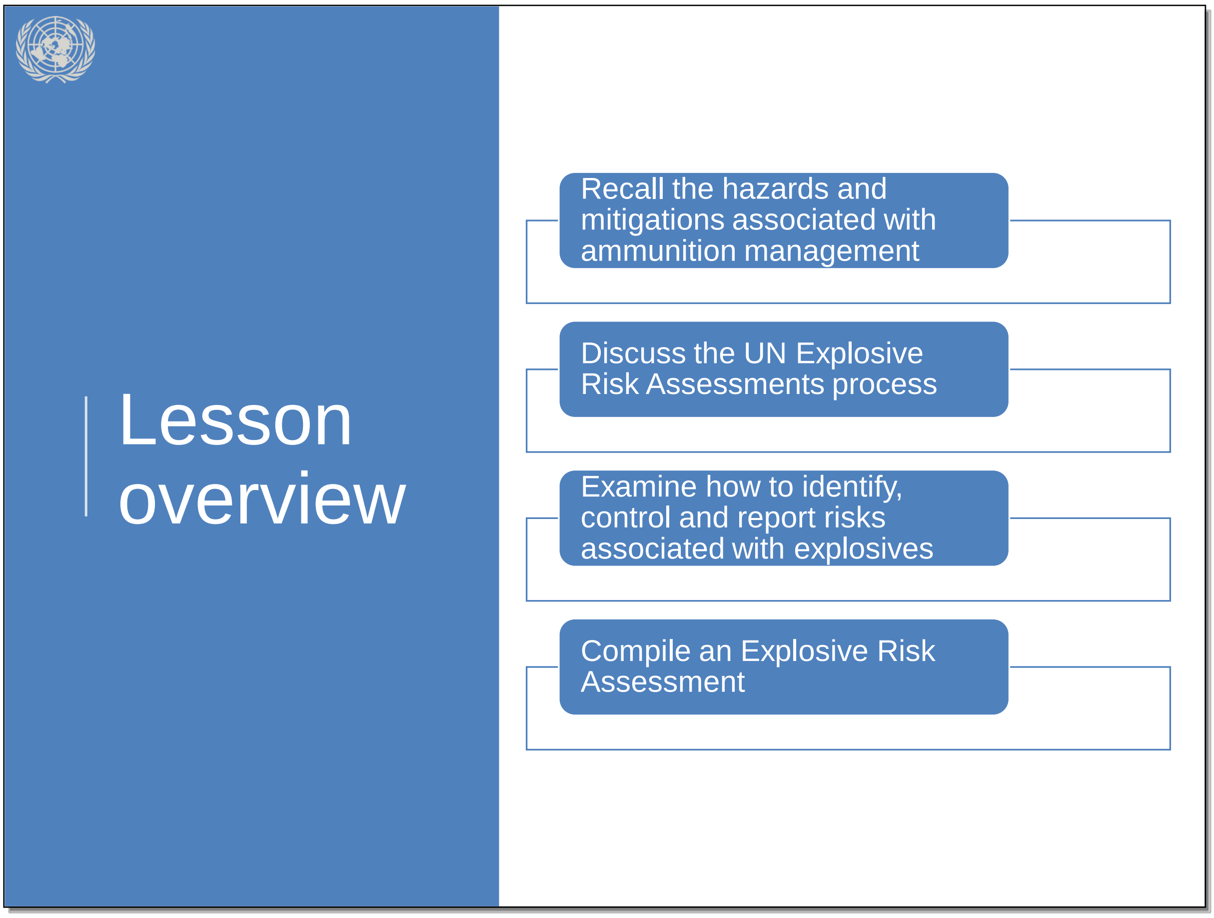
What the instructor should cover (in addition to slide content)

- Using the CARANA scenario, participants are required to identify the various hazards to an ammunition Field Storage area.
- Each participant should receive a copy of the handout (word doc 'WAMUNPOC L10 Risk Assessment Exercise')
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions.

participant Activity

The participants must produce a qualitative explosive risk assessment which includes all mitigating controls and demonstrates the awareness of residual risk to ALARP levels.

Slide 42



# Lesson overview

- Recall the hazards and mitigations associated with ammunition management
- Discuss the UN Explosive Risk Assessments process
- Examine how to identify, control and report risks associated with explosives
- Compile an Explosive Risk Assessment

## Summary

This training session focused on enhancing participants' ability to compile a risk assessment associated with explosive storage and implement effective explosive safety management. Key learning points included:

- Review and remember the various hazards and corresponding mitigations related to ammunition management to ensure safety protocols are understood.
- Engage in discussions about the process of conducting Explosive Risk Assessments as per UN guidelines, emphasizing the importance of thorough risk assessment procedures.
- Explore methods for identifying, controlling, and reporting risks associated with explosives, ensuring comprehensive risk management strategies are implemented.
- Practice compiling an Explosive Risk Assessment using the knowledge and skills acquired throughout the session, demonstrating proficiency in assessing and mitigating risks associated with explosive storage.

Slide 43

Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Transporting Ammunition on UN Operations

**Main idea/objective for slide:**
Look ahead to the next lesson of the course:
Transporting Ammunition on UN Operations

# Lesson 2.7

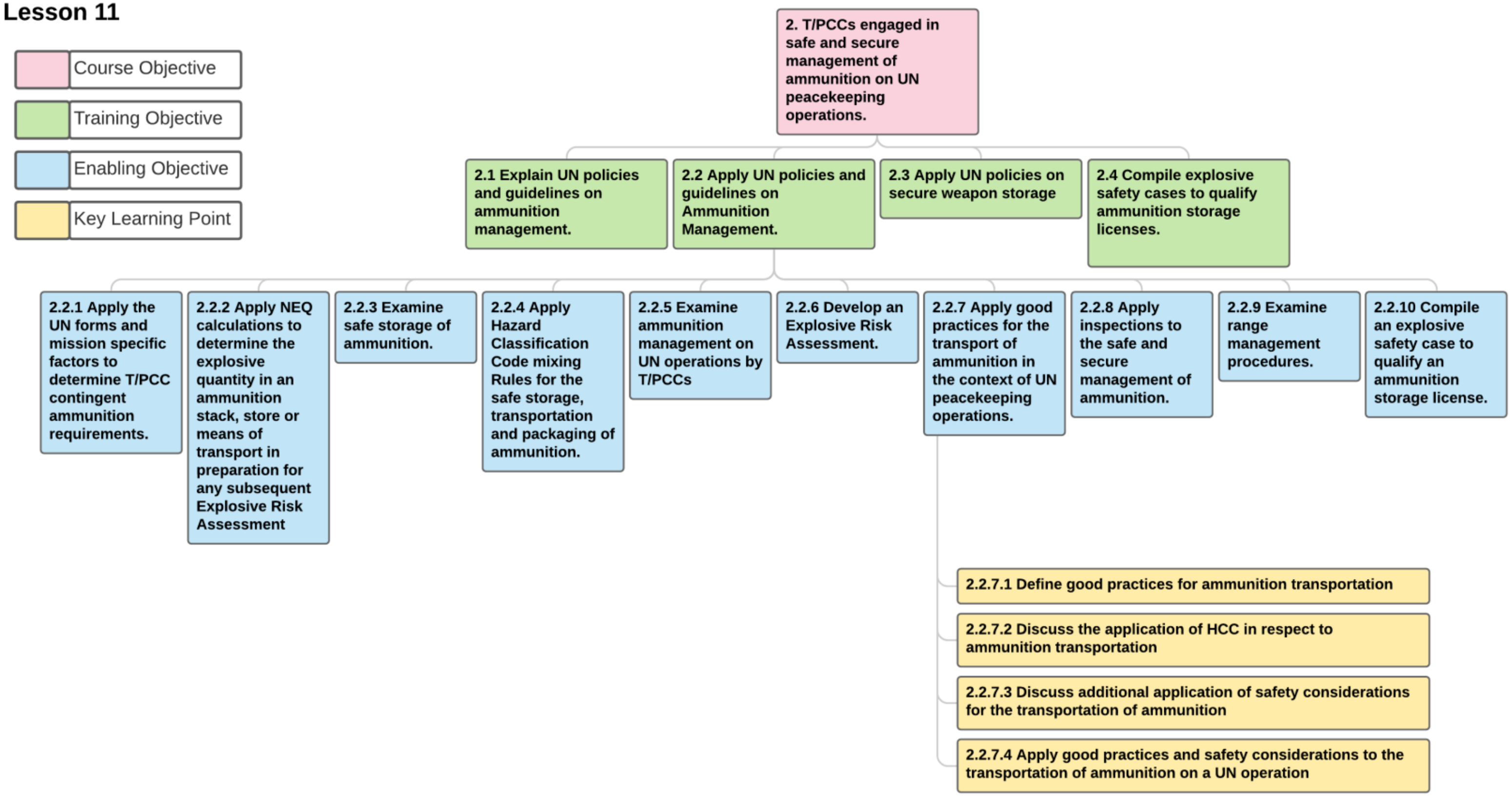
## Lesson 2.7: Transporting ammunition on UN operations

**Weapons and Ammunition Management in UN Peace Operations**

**In-person course**

**Lesson 11**

🟥 Course Objective
🟩 Training Objective
🟦 Enabling Objective
🟨 Key Learning Point



**2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.**

**2.1 Explain UN policies and guidelines on ammunition management.**

**2.2 Apply UN policies and guidelines on Ammunition Management.**

**2.3 Apply UN policies on secure weapon storage**

**2.4 Compile explosive safety cases to qualify ammunition storage licenses.**

**2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.**

**2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment**

**2.2.3 Examine safe storage of ammunition.**

**2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.**

**2.2.5 Examine ammunition management on UN operations by T/PCCs**

**2.2.6 Develop an Explosive Risk Assessment.**

**2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.**

**2.2.8 Apply inspections to the safe and secure management of ammunition.**

**2.2.9 Examine range management procedures.**

**2.2.10 Compile an explosive safety case to qualify an ammunition storage license.**

**2.2.7.1 Define good practices for ammunition transportation**

**2.2.7.2 Discuss the application of HCC in respect to ammunition transportation**

**2.2.7.3 Discuss additional application of safety considerations for the transportation of ammunition**

**2.2.7.4 Apply good practices and safety considerations to the transportation of ammunition on a UN operation**

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L11. Transporting ammunition on UN operations |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 45 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations. | 2.2.7.1 Define good practices for ammunition transportation<br>2.2.7.2 Discuss the application of HCC in respect to ammunition transportation<br>2.2.7.3 Discuss additional application of safety considerations for the transportation of ammunition<br>2.2.7.4 Apply good practices and safety considerations to the transportation of ammunition on a UN operation |
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Apply good practices for the transport of ammunition in the context of UN peacekeeping operations. |
| **Assessment Criteria:** | There is no final assessment for this exercise, however, Instructors will use informal class discussion, questioning of participants and review the work by the participants to enable a positive feedback loop to be established to enhance the effectiveness of the learning. |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom, projector and screen, flipchart, whiteboard |
| **Instructional tools & materials** | • UN HCC Compatibility Mixing rules matrix<br>• Worked-out example of a basic risk assessment that manages explosive risk during transport of ammunition |
| **Participant Resources:** | • UN CARANA scenario narrative<br>• Explosive Risk Assessment template<br>• Full size printouts of some slides where required – see slide notes for details. |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: Health and safety checklist for classrooms (hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

## SECTION 2: LESSON PLAN

### Executive summary:

During this lesson participants will investigate the application of good practices for the transport of ammunition in the context of UN peacekeeping operations. They will define good practices for ammunition transportation, discuss the application of HCC in respect to ammunition transportation and the application of safety considerations for the transportation of ammunition.

### Setup:

Phase 1, Phase 2 (stages 1 & 2) and Phase 3 will be delivered to the class as a single collective.

Phase 3 (stage 3) will be conducted in small groups (6-8 participants) each with a dedicated instructor.

### Conduct:

**Phase 1. Introduction (Time allocation - 5 min)**

- Introduce the objectives of the lesson.
- Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.

**Phase 2. Development**

Stage 1 (Time allocation 10 mins) – Ensuring safety in ammunition transport

- In groups, have the participants discuss the various risks (hazards and likelihoods) associated with the transport of ammunition and explosives in a UN mission area.
- The instructor should question the groups and their findings to develop the depth of understanding of the explosive risks.
- Instructors to write these hazards and risks onto the flipchart and post onto the wall.

Stage 2 (Time allocation 10 mins) – Hazard Classification Codes and transporting ammunition

- Revise the UN HCC system, including compatibility groups and its mixing rules.
- Instructors ask questions to the class to reinforce this learning.
- Discuss with the participants the various activities and checks that should be undertaken by the transport driver and the ammunition technician on the vehicle prior to loading.

- Highlight the safety precautions that should be put in place for each vehicle which is to carry ammunition.
- Discuss the safety precautions to be considered during the convoy, along the route and during the loading and unloading of ammunition onto/from the vehicle.
- Describe the layout of a security plan and explosive safety case for transportation of AE

Stage 3 (Time allocation 15 mins) – Participant exercise

- In groups, the participants are to undertake a Risk Assessment for the transport of this ammunition from one UN camp to another, based on the UN CARANA scenario. See slides for exercise detail and instructions.
- Instructors are to work closely with the groups to help them identify hazards, develop mitigating factors and ultimately produce a suitable explosive risk assessment for this operation.
- When the groups have completed their groupwork, work through the answers with the class and ask questions.

**Phase 3. Consolidation (Time allocation - 5 min)**

- Review Enabling Objective and Key Learning Points (see Section 1), drawing out any common themes.
- Look ahead to the next lesson of the course:
    - Ammunition Inspection

## Diagrams / Notes:

Slide 1

Weapons and Ammunition Management in UN Peace Operations

Transporting ammunition on UN operations

**Key Reference Documents for this lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2

Objective

Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.

<u>**Main idea/objective for slide:**</u>

**Phase 1. Introduction - Introduce the objectives of the lesson.**

(Enabling Objective: 2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.)

<u>What the instructor should cover (in addition to slide content)</u>

By the end of this training session the participant will apply good practices for the transport of ammunition in the context of UN peacekeeping operations.

Slide 3

Lesson overview

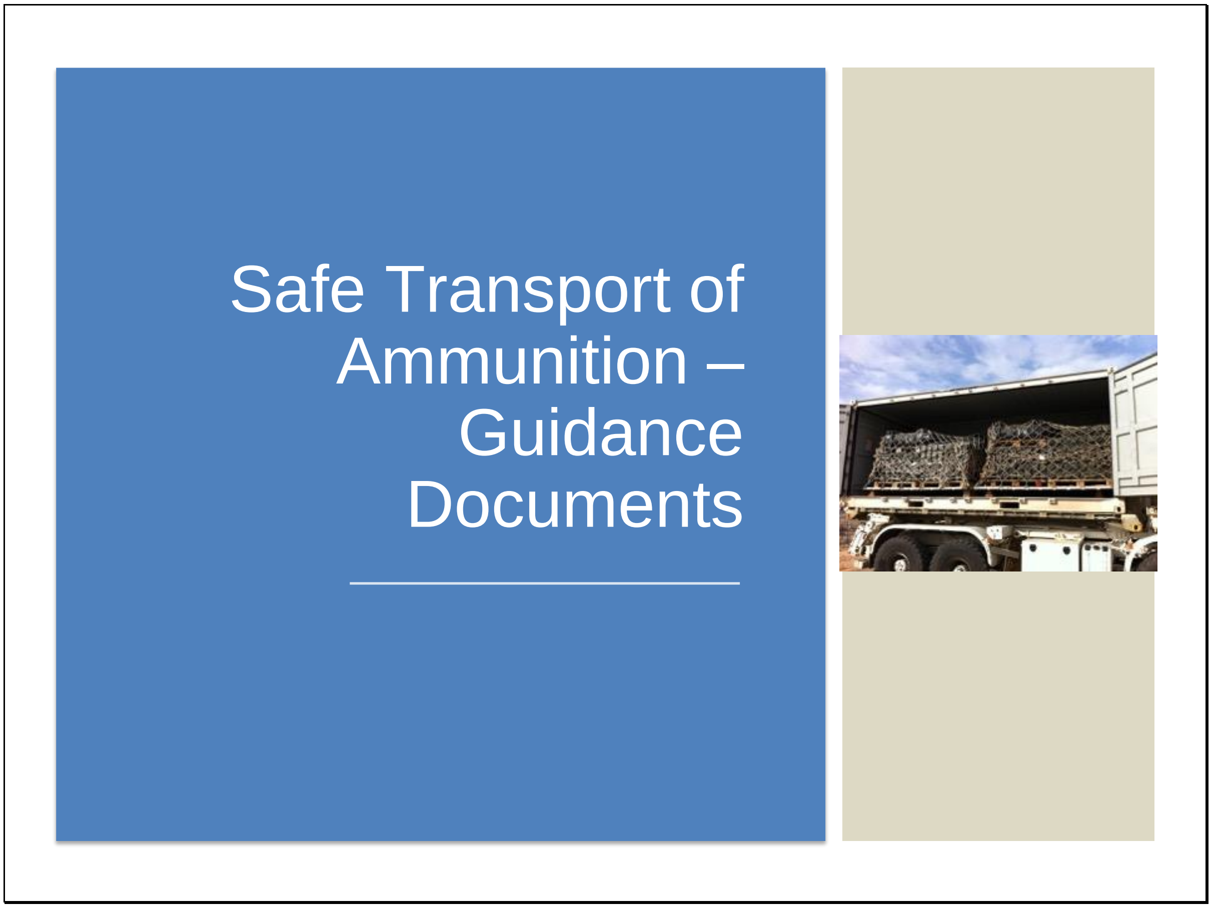
- Define good practices for ammunition transportation
- Discuss the application of HCC in respect to ammunition transportation
- Discuss additional application of safety considerations for the transportation of ammunition
- Apply good practices and safety considerations to the transportation of ammunition on a UN operation

**Main idea/objective for slide:**
**Introduce the Key Learning Points**

Key Learning Points

2.2.7.1 Define good practices for ammunition transportation
2.2.7.2 Discuss the application of HCC in respect to ammunition transportation
2.2.7.3 Discuss additional application of safety considerations for the transportation of ammunition
2.2.7.4 Apply good practices and safety considerations to the transportation of ammunition on a UN operation

Slide 4

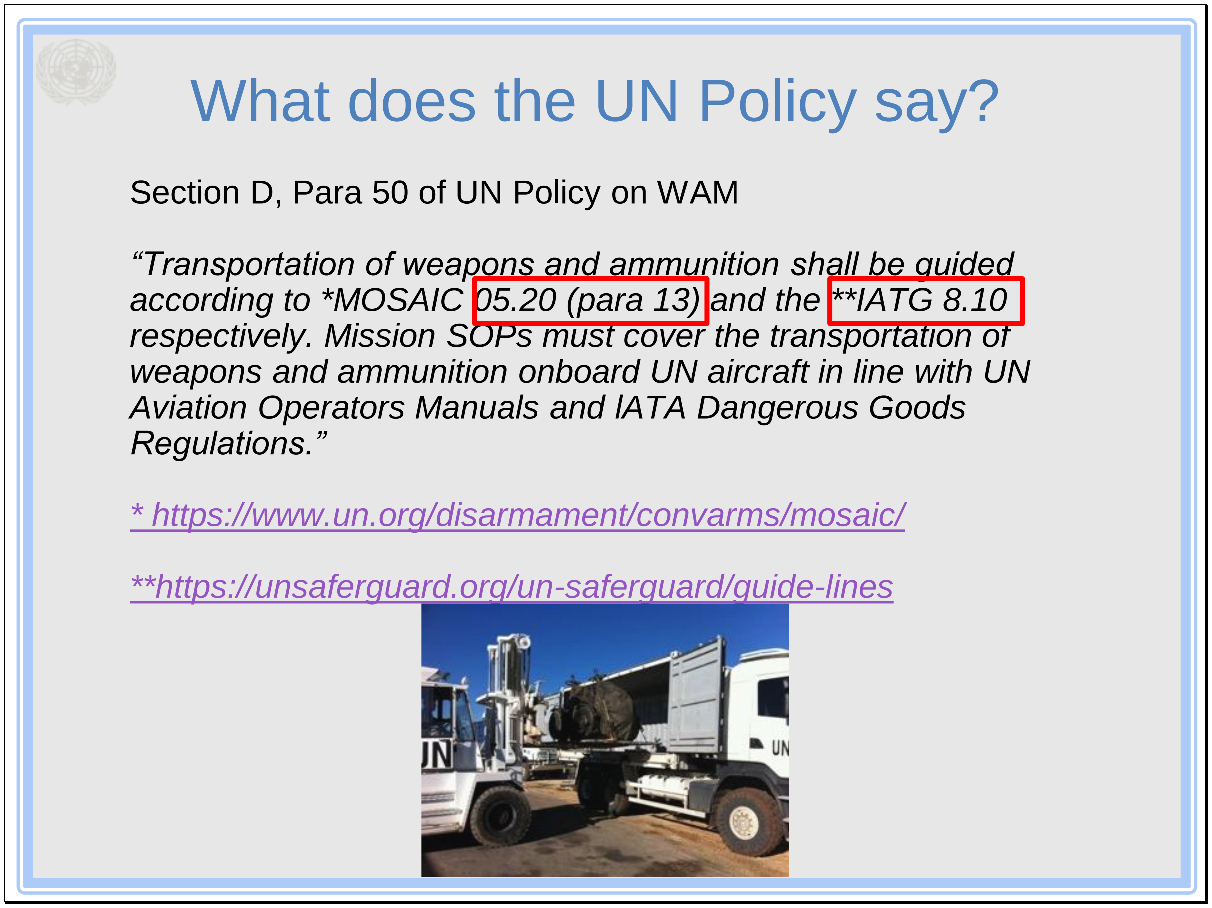


## Safe Transport of Ammunition – Guidance Documents

**Phase 1. Introduction (**Time allocation - 5 min**)**

Image provided by Hoplite Consulting Ltd.

Slide 5



## What does the UN Policy say?

Section D, Para 50 of UN Policy on WAM

*“Transportation of weapons and ammunition shall be guided according to *MOSAIC 05.20 (para 13) and the **IATG 8.10 respectively. Mission SOPs must cover the transportation of weapons and ammunition onboard UN aircraft in line with UN Aviation Operators Manuals and IATA Dangerous Goods Regulations.”*

** https://www.un.org/disarmament/convarms/mosaic/*

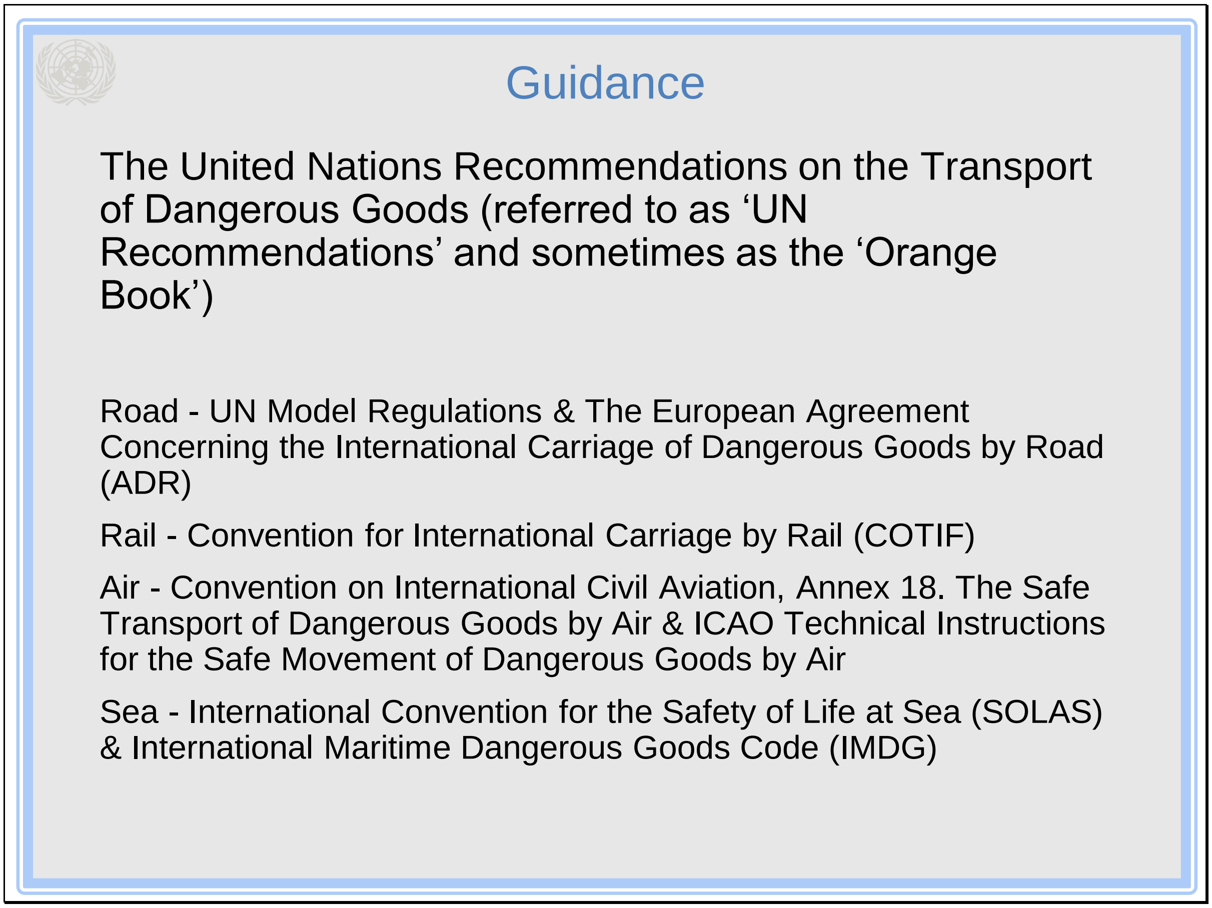
***https://unsaferguard.org/un-saferguard/guide-lines*

**<u>Main idea/objective for slide:</u>**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

<u>What the instructor should cover (in addition to slide content)</u>
Annex A of MOSAIC 05.10 outlines a model security plan for the stockpile management for SALW.

Image provided by Hoplite Consulting Ltd.

Slide 6



## Guidance

The United Nations Recommendations on the Transport of Dangerous Goods (referred to as ‘UN Recommendations’ and sometimes as the ‘Orange Book’)

Road - UN Model Regulations & The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)

Rail - Convention for International Carriage by Rail (COTIF)

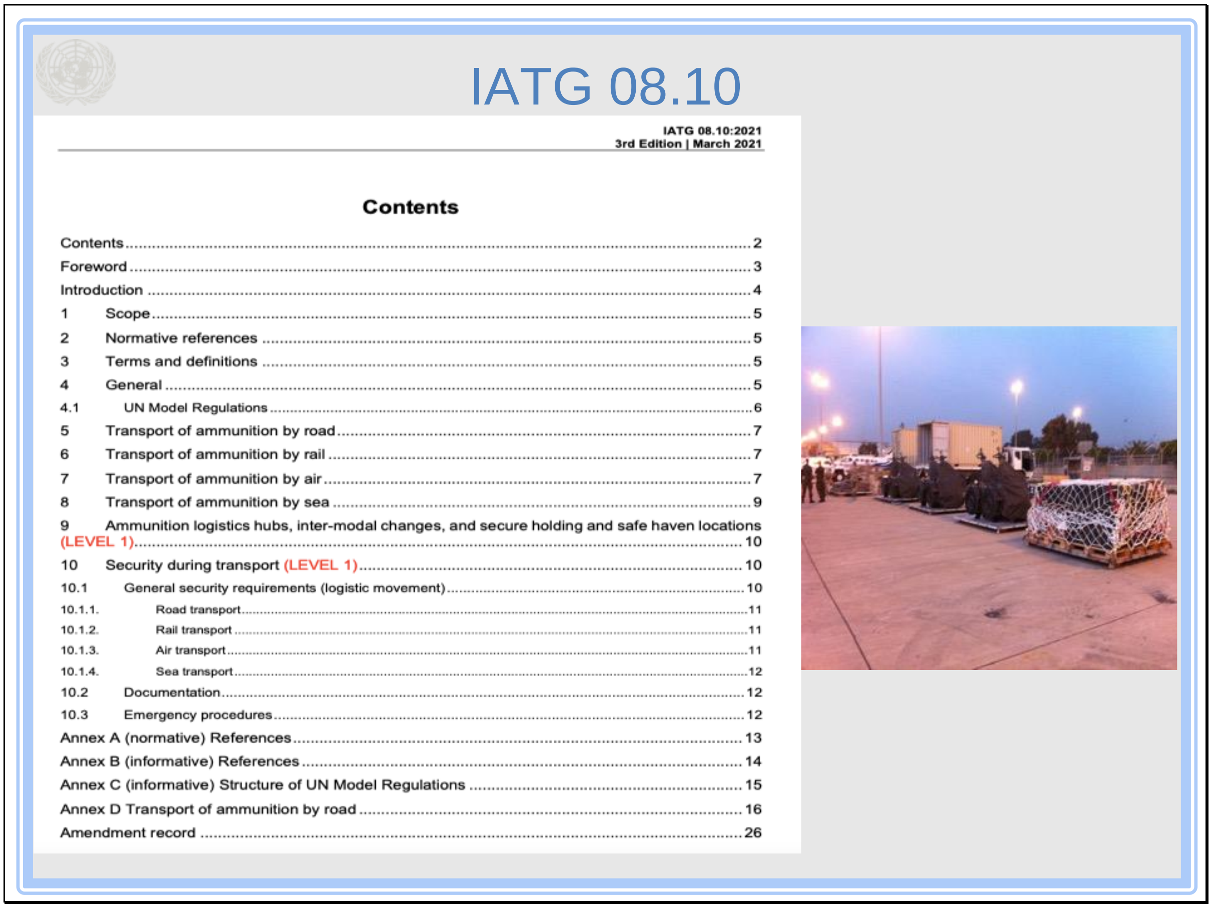
Air - Convention on International Civil Aviation, Annex 18. The Safe Transport of Dangerous Goods by Air & ICAO Technical Instructions for the Safe Movement of Dangerous Goods by Air

Sea - International Convention for the Safety of Life at Sea (SOLAS) & International Maritime Dangerous Goods Code (IMDG)

**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**
**Many guidance documents. Some are enshrined in law.**

What the instructor should cover (in addition to slide content)

Slide 7



IATG 08.10

IATG 08.10:2021
3rd Edition | March 2021

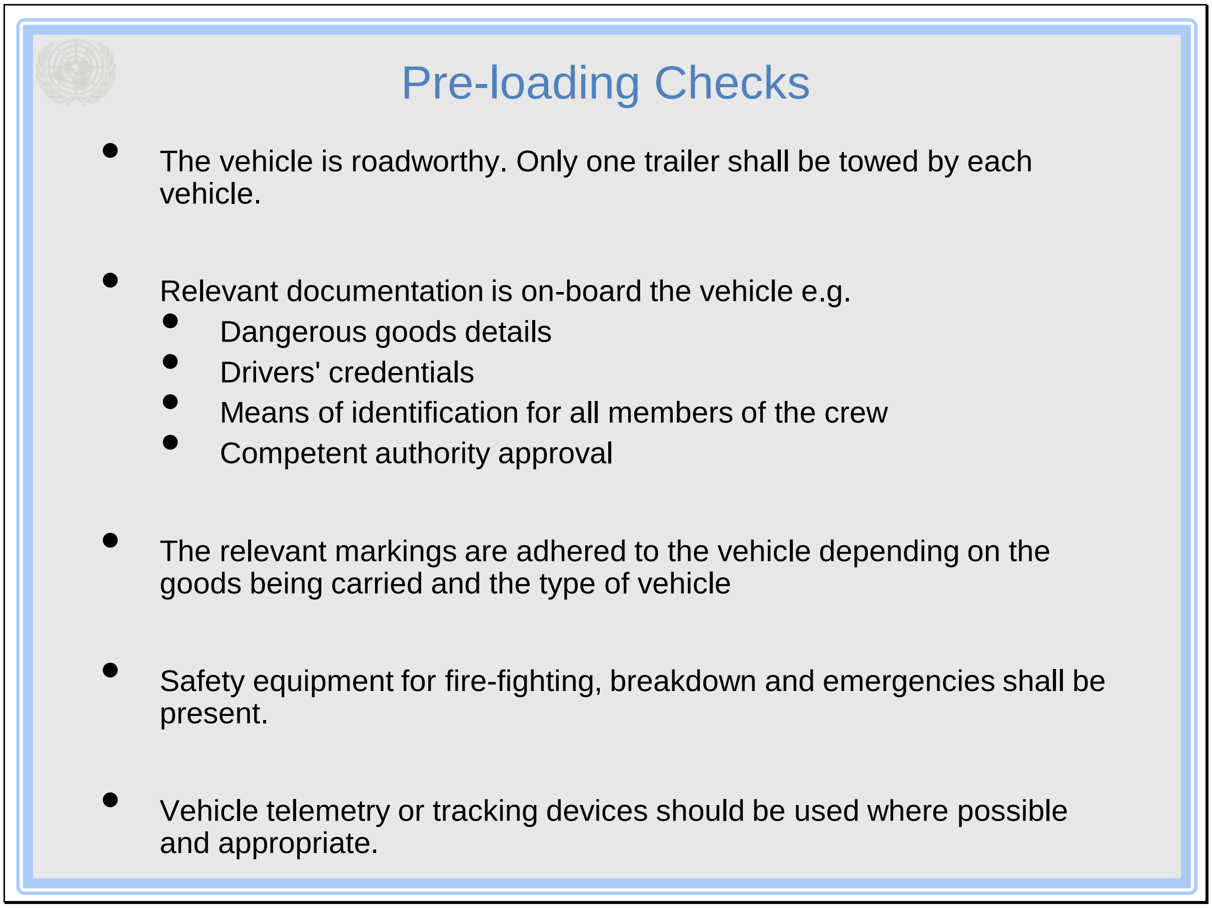
Contents

**<u>Main idea/objective for slide:</u>**

**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

Image provided by Hoplite Consulting Ltd.

Slide 8



## Pre-loading Checks

- The vehicle is roadworthy. Only one trailer shall be towed by each vehicle.
- Relevant documentation is on-board the vehicle e.g.
  - Dangerous goods details
  - Drivers' credentials
  - Means of identification for all members of the crew
  - Competent authority approval
- The relevant markings are adhered to the vehicle depending on the goods being carried and the type of vehicle
- Safety equipment for fire-fighting, breakdown and emergencies shall be present.
- Vehicle telemetry or tracking devices should be used where possible and appropriate.

**Main idea/objective for slide:**

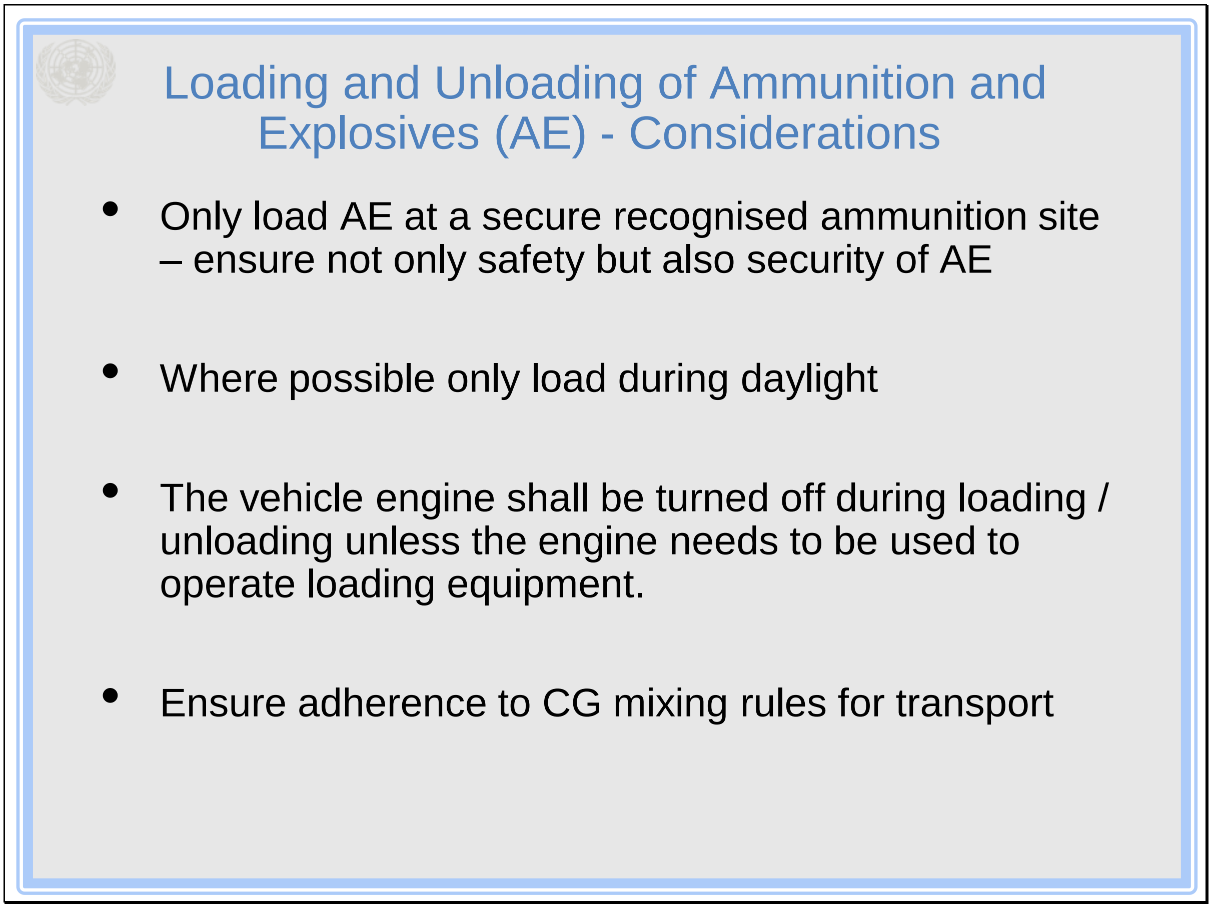
- **Describe the pre-loading safety precautions for vehicles.**

What the instructor should cover (in addition to slide content)

- Question participants to check recall from slide 8 and 9 of this lecture.
- Print out IATG 08.10 Annex D.

participant activity

- participants to open IATG 08.10 Annex D.
  - Ask the participants to pick out any challenges that they would have in a mission to meet the requirements. **Suggested answer:** Driver credentials do not meet the regulations in terms of minimum age for a heavy vehicle. **Solution:** Change driver or postpone the transit until a driver is found who meets the criteria.



## Loading and Unloading of Ammunition and Explosives (AE) - Considerations

- Only load AE at a secure recognised ammunition site – ensure not only safety but also security of AE
- Where possible only load during daylight
- The vehicle engine shall be turned off during loading / unloading unless the engine needs to be used to operate loading equipment.
- Ensure adherence to CG mixing rules for transport

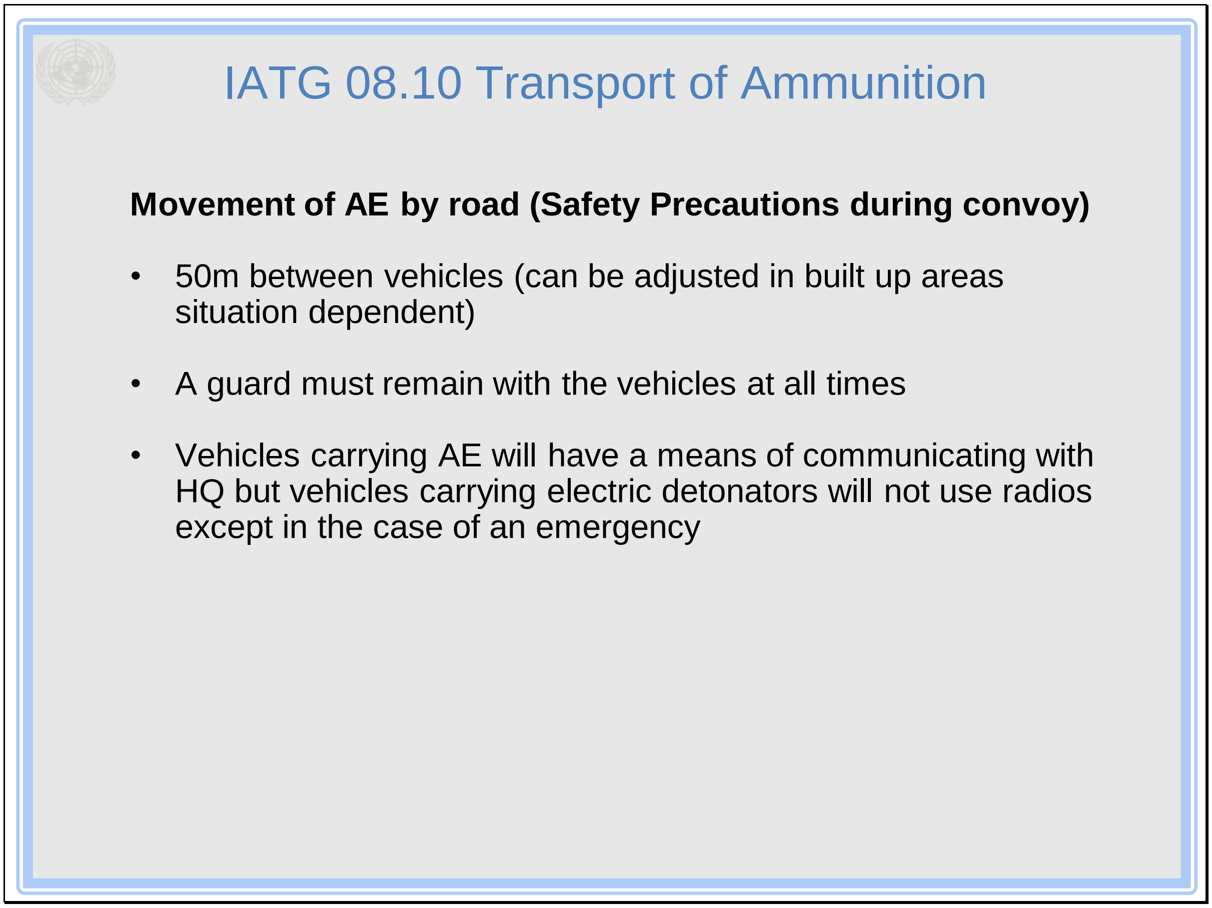
**Main idea/objective for slide:**

- **Understand basic considerations for loading and unloading of AE.**

What the instructor should cover (in addition to slide content)

What other considerations should be considered but may not be written explicitly? **Suggested answer:** The loading and unloading shall only take place on solid ground designed to withstand the weight of the fully loaded vehicle. Subsidence in the case of heavy rainfall should be considered.

Slide 10



## IATG 08.10 Transport of Ammunition

**Movement of AE by road (Safety Precautions during convoy)**

- 50m between vehicles (can be adjusted in built up areas situation dependent)
- A guard must remain with the vehicles at all times
- Vehicles carrying AE will have a means of communicating with HQ but vehicles carrying electric detonators will not use radios except in the case of an emergency

**Main idea/objective for slide:**

**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

What the instructor should cover (in addition to slide content)

Ask participants:

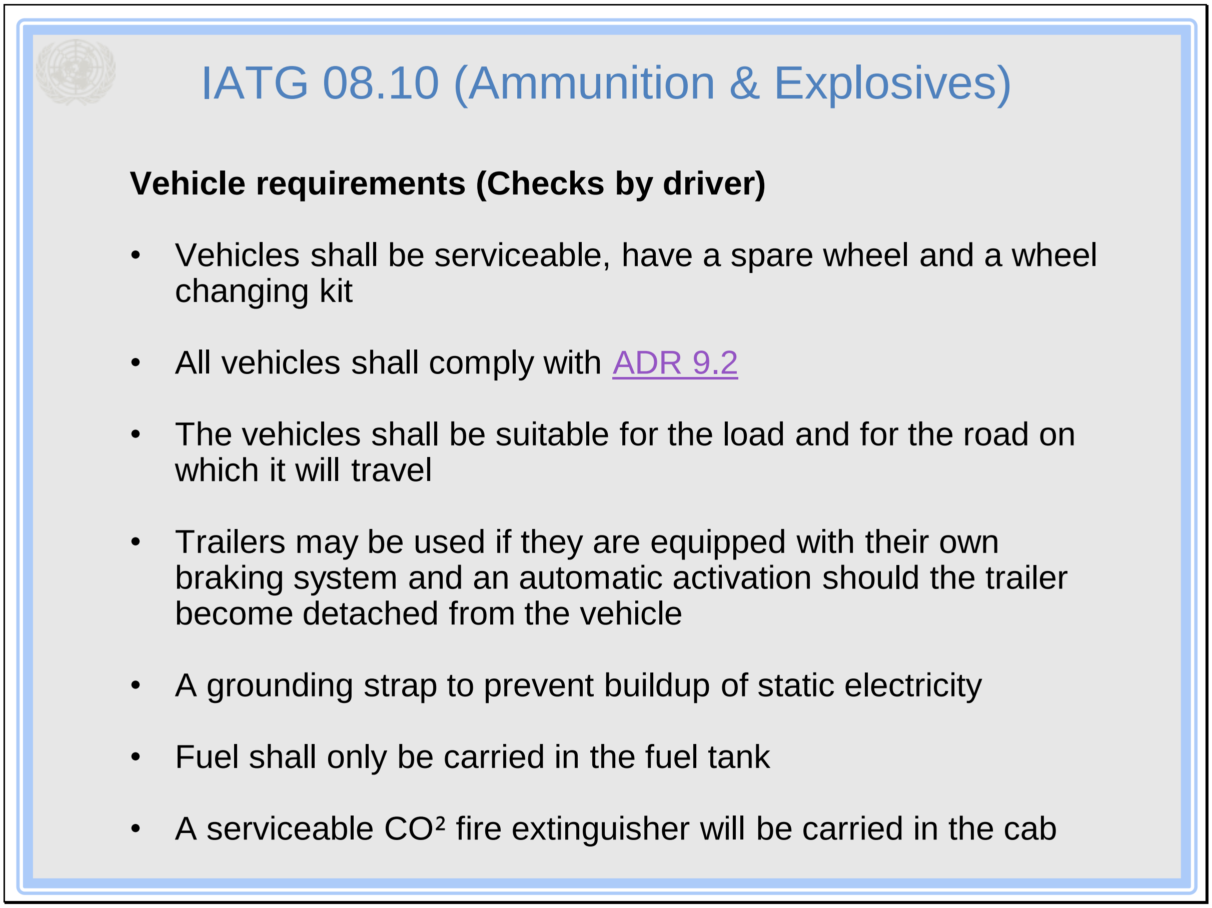
What type of communications might be used in a UN mission. **Answer:** UHF (Tetra), VHF (Motorola), HF, Satellite comms, mobile phones.

What are the concerns related to this? **Answer:** Electric initiators if transported need to be packaged correctly.

participant activity

participants are directed to find section 08.10 of the IATG and to follow the course material using the IATG and MOSAIC.

Slide 11



## IATG 08.10 (Ammunition & Explosives)

**Vehicle requirements (Checks by driver)**

- Vehicles shall be serviceable, have a spare wheel and a wheel changing kit
- All vehicles shall comply with ADR 9.2
- The vehicles shall be suitable for the load and for the road on which it will travel
- Trailers may be used if they are equipped with their own braking system and an automatic activation should the trailer become detached from the vehicle
- A grounding strap to prevent buildup of static electricity
- Fuel shall only be carried in the fuel tank
- A serviceable CO$^2$ fire extinguisher will be carried in the cab

**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

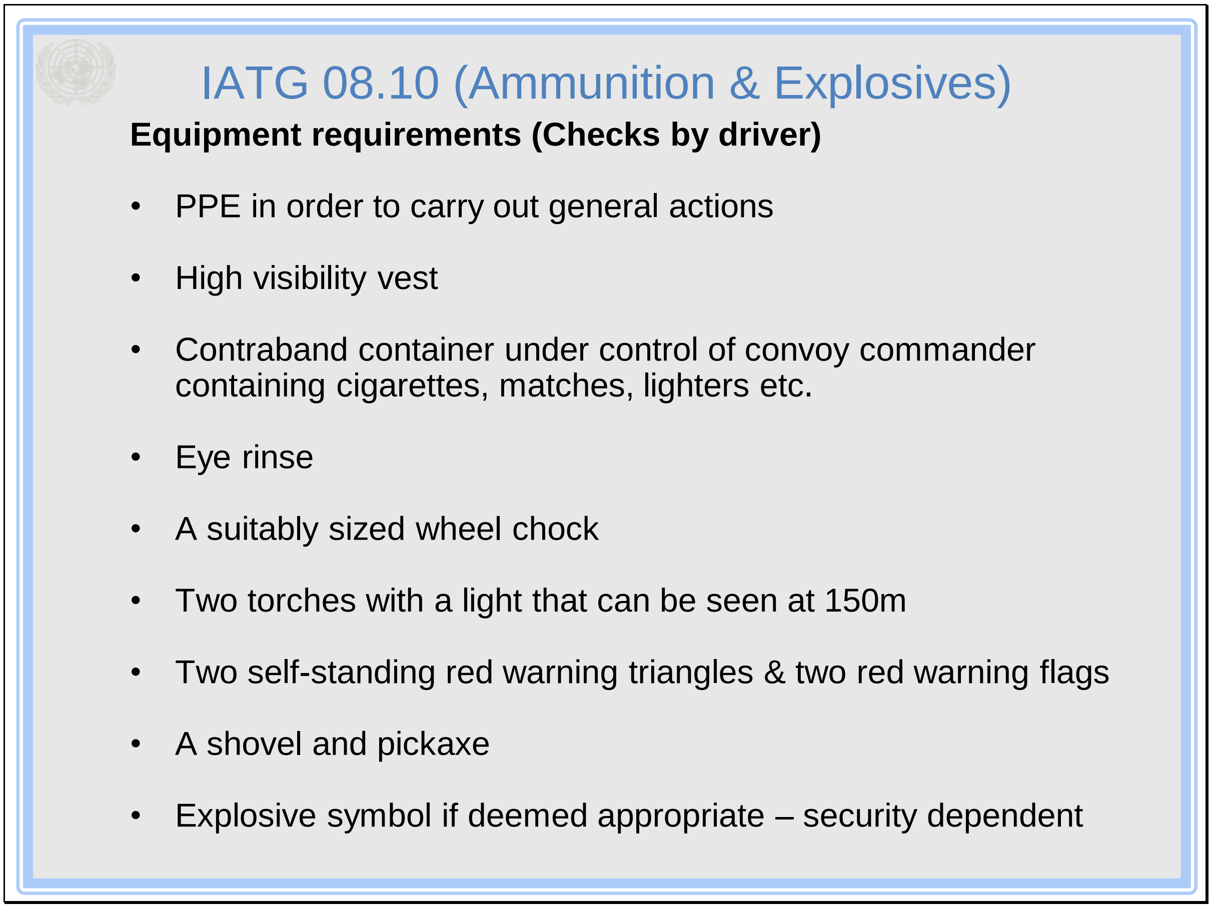
What the instructor should cover (in addition to slide content)

Spend 5 minutes familiarising the participants with ADR 9.2 by clicking on the link in the slide.

participant activity

Ask the class if any participant has experience with the ADRs

Slide 12



## IATG 08.10 (Ammunition & Explosives)

**Equipment requirements (Checks by driver)**

- PPE in order to carry out general actions
- High visibility vest
- Contraband container under control of convoy commander containing cigarettes, matches, lighters etc.
- Eye rinse
- A suitably sized wheel chock
- Two torches with a light that can be seen at 150m
- Two self-standing red warning triangles & two red warning flags
- A shovel and pickaxe
- Explosive symbol if deemed appropriate – security dependent

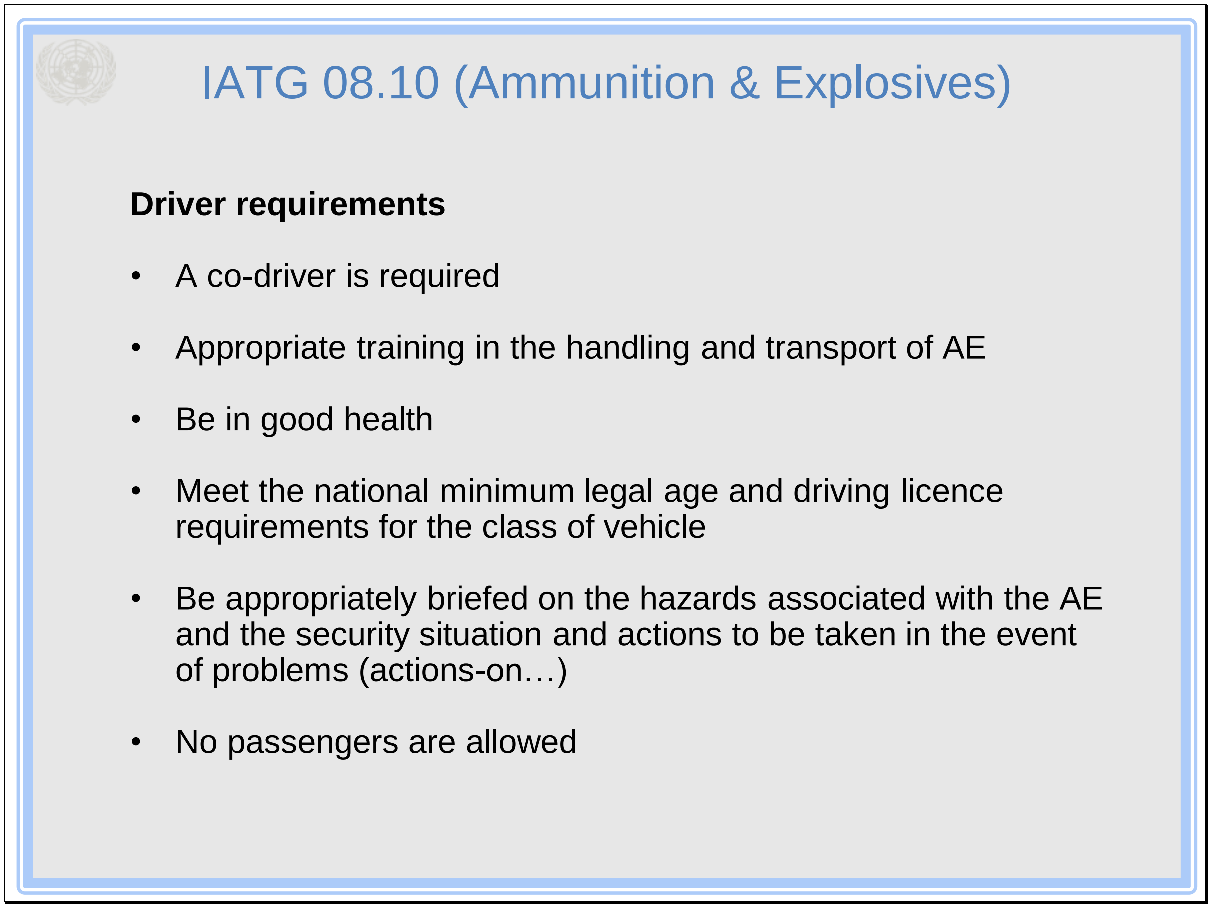
**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

What the instructor should cover (in addition to slide content)

Discuss with the class the feasibility of finding all of this equipment in a UN mission. Pre-planning is required to ensure full compliance.

participant activity

Discuss each of the equipment items and ask the participants why each item may be required.



## IATG 08.10 (Ammunition & Explosives)

**Driver requirements**

- A co-driver is required
- Appropriate training in the handling and transport of AE
- Be in good health
- Meet the national minimum legal age and driving licence requirements for the class of vehicle
- Be appropriately briefed on the hazards associated with the AE and the security situation and actions to be taken in the event of problems (actions-on…)
- No passengers are allowed

**Main idea/objective for slide:**

**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

What the instructor should cover (in addition to slide content)

How the UN licences drivers. **Answer:** According to national licencing from the T/PCC and subject to the contingent owned equipment inspections.

participant activity

Ask the participants to describe their experiences with inappropriately trained or uncurrent drivers in a mission environment. What are the dangers associated with this other than the breach in regulations?

Slide 14

## MOSAIC 05.20
## Small Arms Light Weapons (SALW)

MODULAR
SMALL-ARMS-CONTROL
IMPLEMENTATION COMPENDIUM

**MOSAIC**
**05.20**

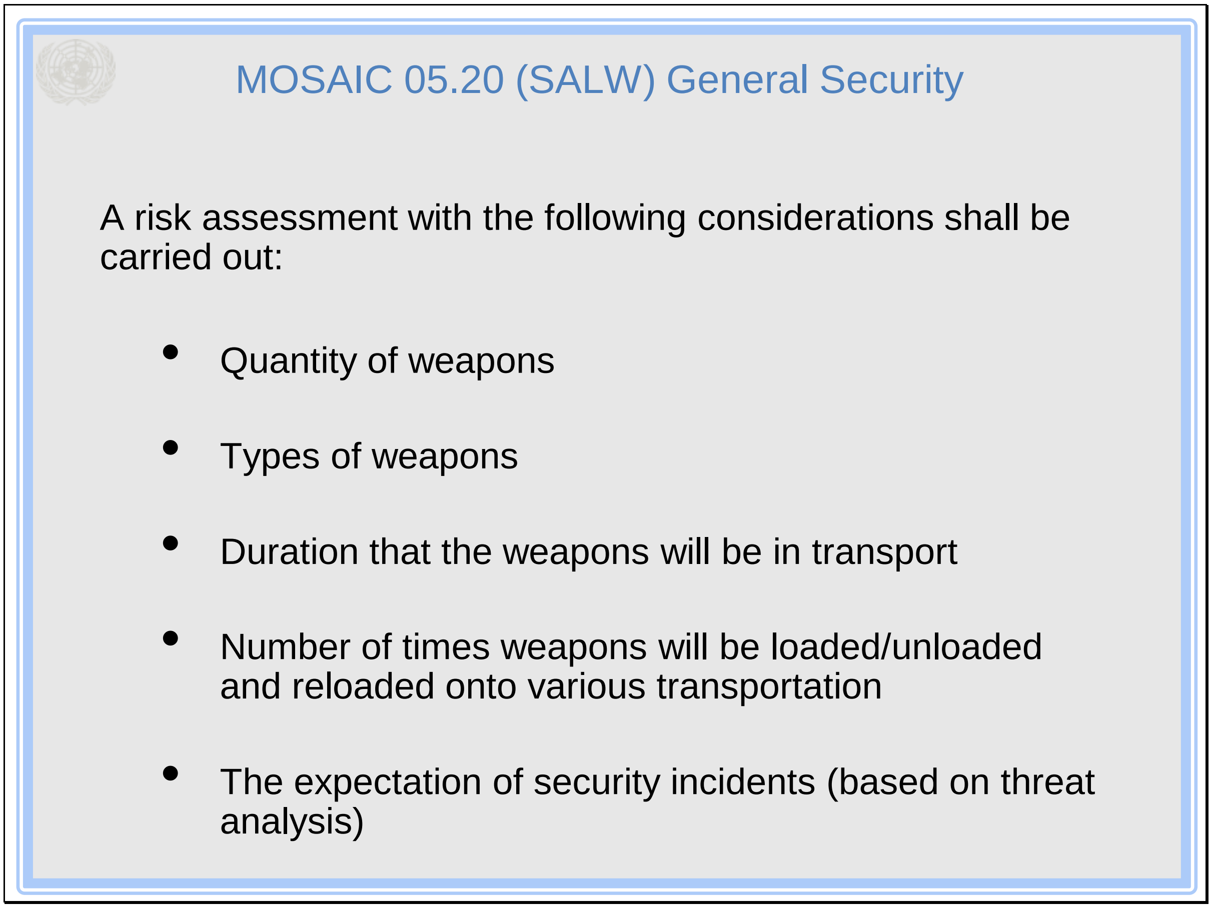
Version 1.0
2012-08-27

**Stockpile management: Weapons**

**Main idea/objective for slide:**
**Introduce the relevant module of MOSAIC dealing with the transport of SALW.**

What the instructor should cover (in addition to slide content)

Section 13 deals with transport. Ask the participants to open the relevant section using the link provided. Follow the class using the MOSAIC document.



## MOSAIC 05.20 (SALW) General Security

A risk assessment with the following considerations shall be carried out:

- Quantity of weapons
- Types of weapons
- Duration that the weapons will be in transport
- Number of times weapons will be loaded/unloaded and reloaded onto various transportation
- The expectation of security incidents (based on threat analysis)

**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

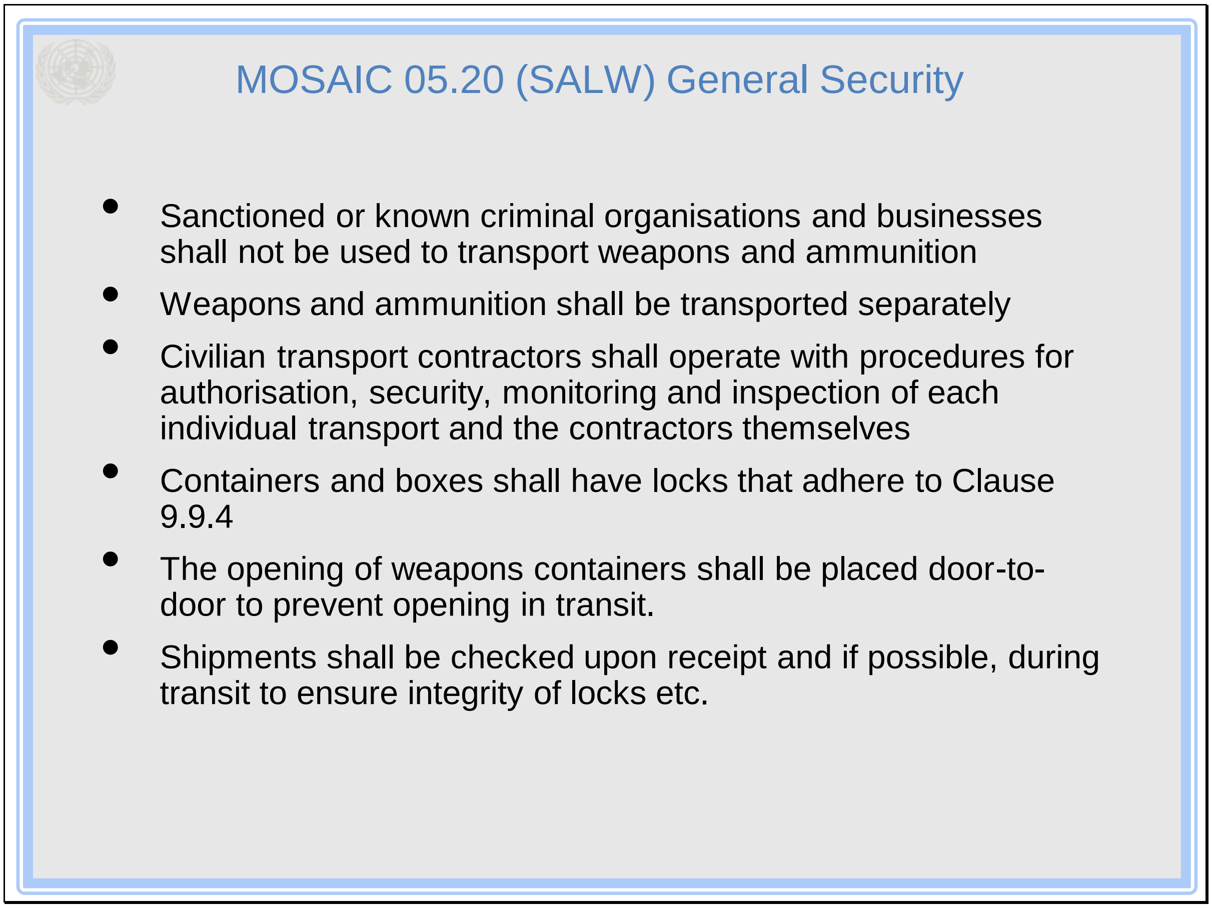
What the instructor should cover (in addition to slide content)

The instructor may ask the participants to identify other aspects of the risk assessment that they would include

participant activity

Write the considerations that they would add to the list on a flip chart and discuss each one with the class

Slide 16



## MOSAIC 05.20 (SALW) General Security

- Sanctioned or known criminal organisations and businesses shall not be used to transport weapons and ammunition
- Weapons and ammunition shall be transported separately
- Civilian transport contractors shall operate with procedures for authorisation, security, monitoring and inspection of each individual transport and the contractors themselves
- Containers and boxes shall have locks that adhere to Clause 9.9.4
- The opening of weapons containers shall be placed door-to-door to prevent opening in transit.
- Shipments shall be checked upon receipt and if possible, during transit to ensure integrity of locks etc.

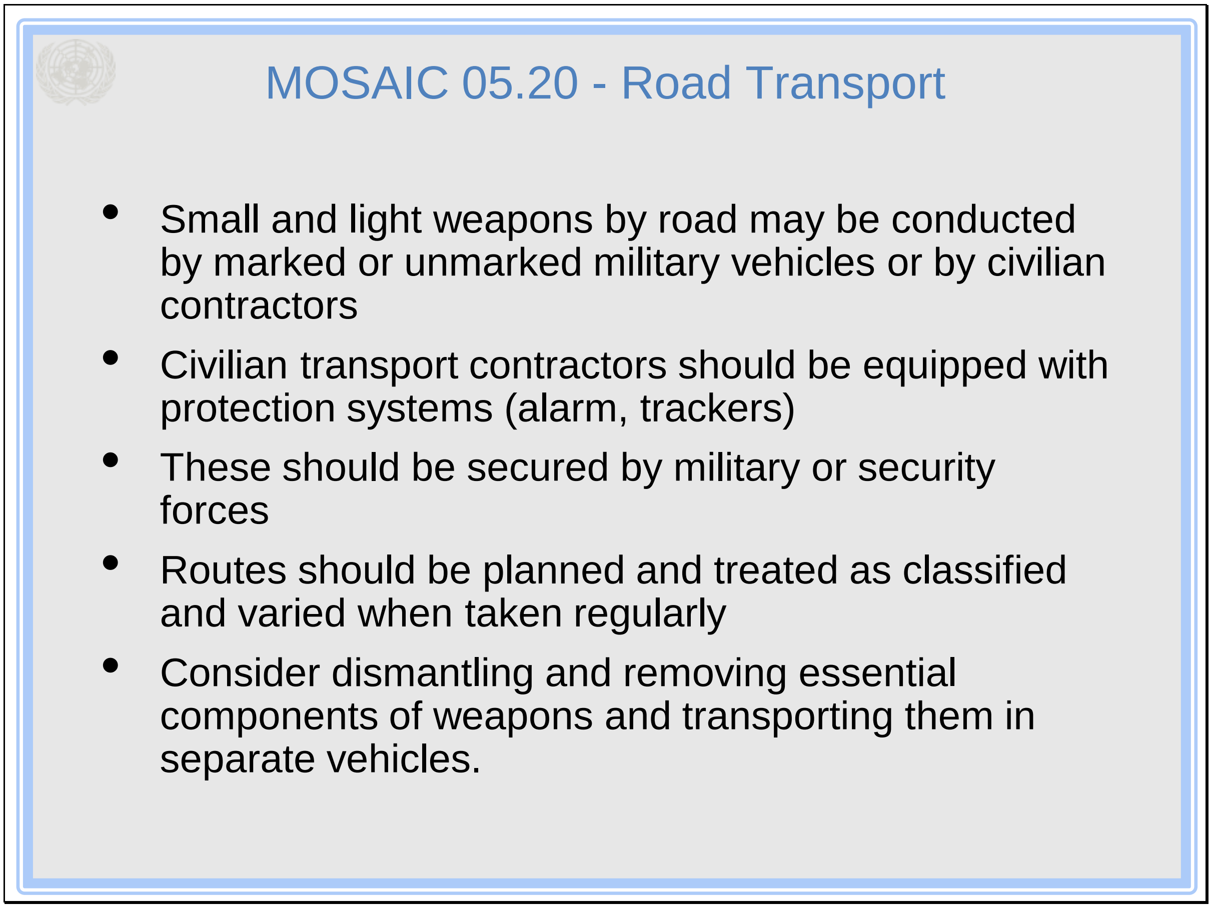
**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

What the instructor should cover (in addition to slide content)
Ask participants:

How would an ammunition team in the mission determine whether a business or transport agent was on the UN sanctions list? **Answer:** They would ask through their chain of command where it would be escalated to UNHQ.

What does clause 9.9.4 state? **Answer:** Locks and padlocks used on the doors and gates of weapons storage buildings should be compliant with EN 12320, Building hardware – Padlocks and padlock fittings – Requirements and test methods.

Slide 17



## MOSAIC 05.20 - Road Transport

- Small and light weapons by road may be conducted by marked or unmarked military vehicles or by civilian contractors
- Civilian transport contractors should be equipped with protection systems (alarm, trackers)
- These should be secured by military or security forces
- Routes should be planned and treated as classified and varied when taken regularly
- Consider dismantling and removing essential components of weapons and transporting them in separate vehicles.

**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

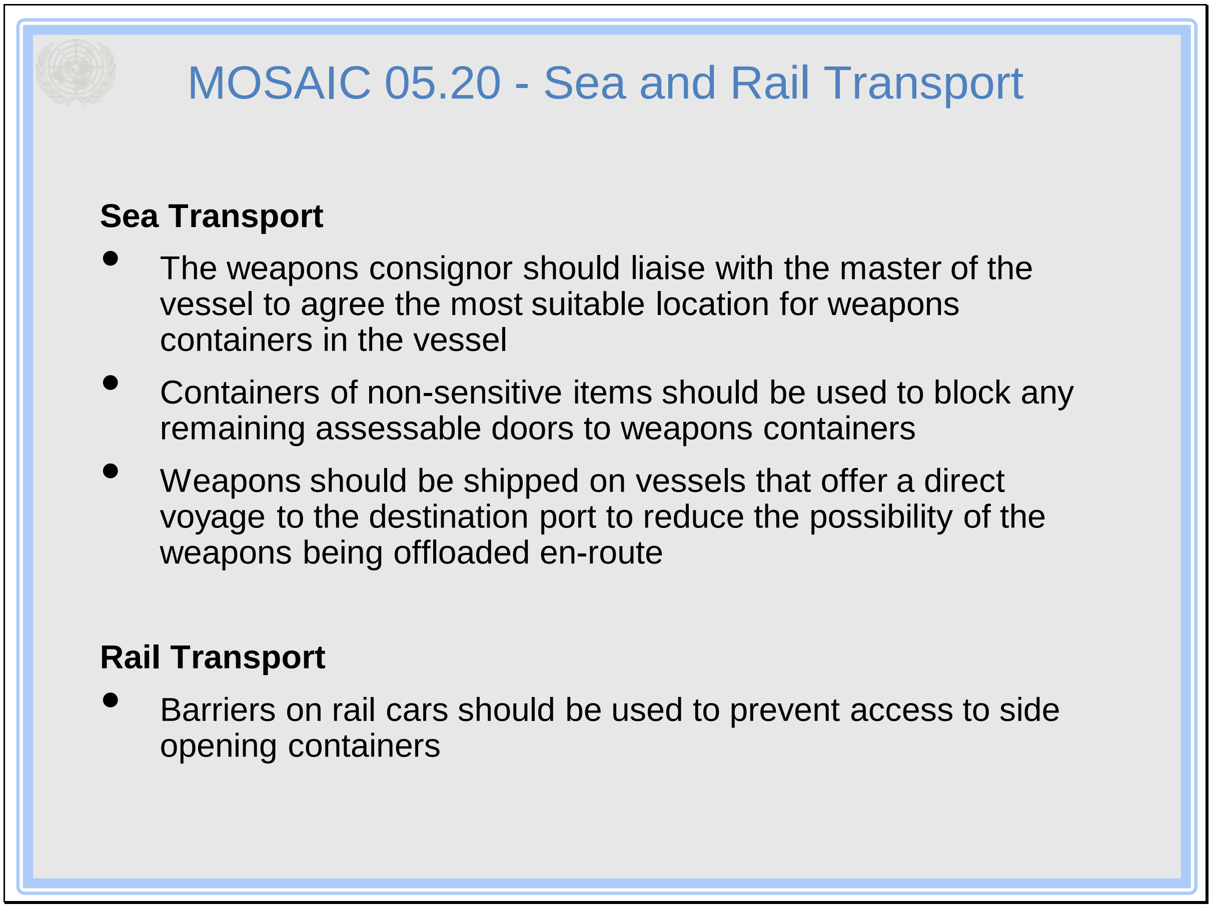
What the instructor should cover (in addition to slide content)

Explain why routes should be varied and weapons may be transported in unmarked vehicles. **Answer:** To prevent setting a routine and making an ambush more difficult. To prevent the convoy from being identified as high-value.

participant activity

What are the risks associated with dismantling the weapons and transporting them in different vehicles? **Answer:** Different components end up in the wrong weapons when reassembled or small components get mislaid.

Slide 18



## MOSAIC 05.20 - Sea and Rail Transport

**Sea Transport**

- The weapons consignor should liaise with the master of the vessel to agree the most suitable location for weapons containers in the vessel
- Containers of non-sensitive items should be used to block any remaining assessable doors to weapons containers
- Weapons should be shipped on vessels that offer a direct voyage to the destination port to reduce the possibility of the weapons being offloaded en-route

**Rail Transport**

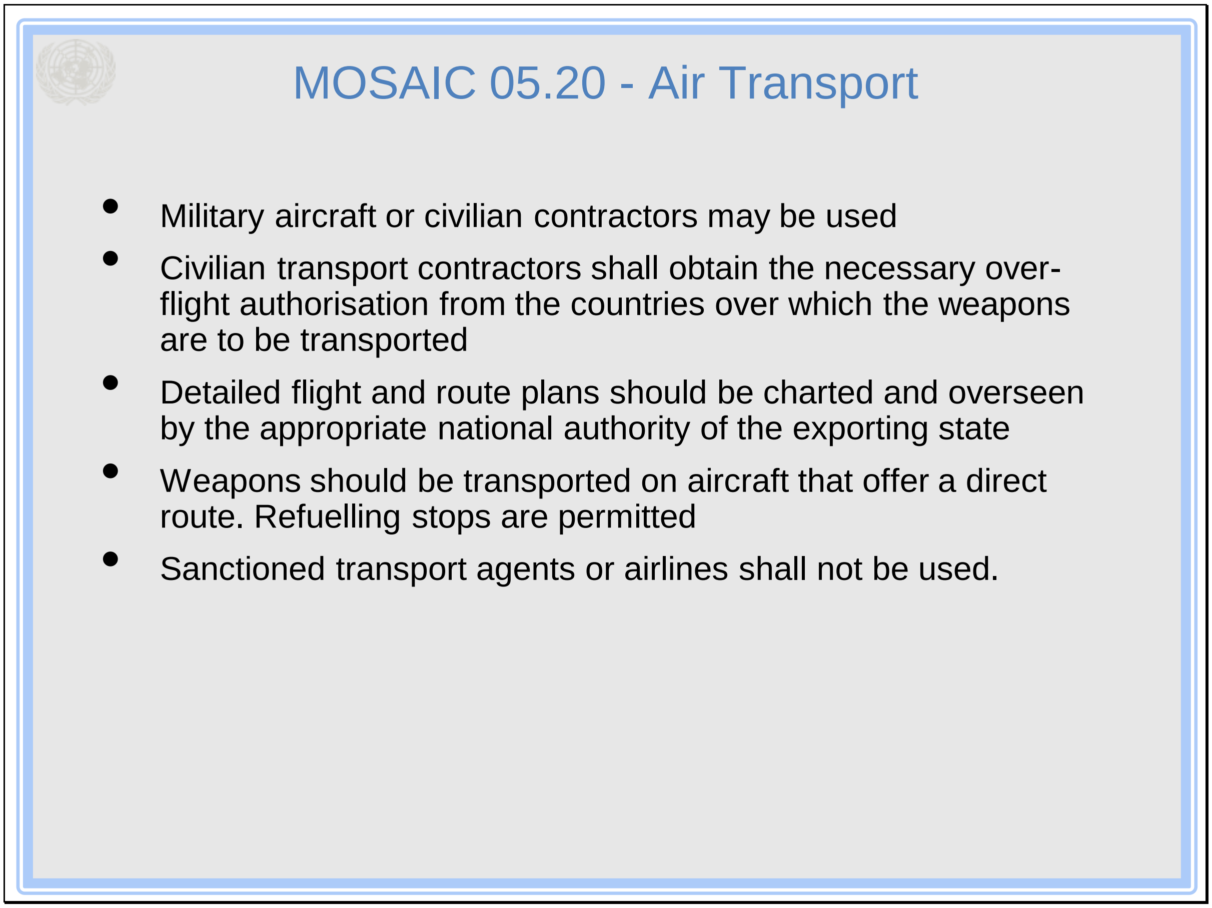
- Barriers on rail cars should be used to prevent access to side opening containers

**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

participant activity

Ask the participants if they have any experience of the transportation of weapons and ammunition by sea or rail.

Slide 19



## MOSAIC 05.20 - Air Transport

- Military aircraft or civilian contractors may be used
- Civilian transport contractors shall obtain the necessary over-flight authorisation from the countries over which the weapons are to be transported
- Detailed flight and route plans should be charted and overseen by the appropriate national authority of the exporting state
- Weapons should be transported on aircraft that offer a direct route. Refuelling stops are permitted
- Sanctioned transport agents or airlines shall not be used.

**Main idea/objective for slide:**
**Highlight the essential manuals and guidance documents that support the safe transport of ammunition and explosives on UN operations.**

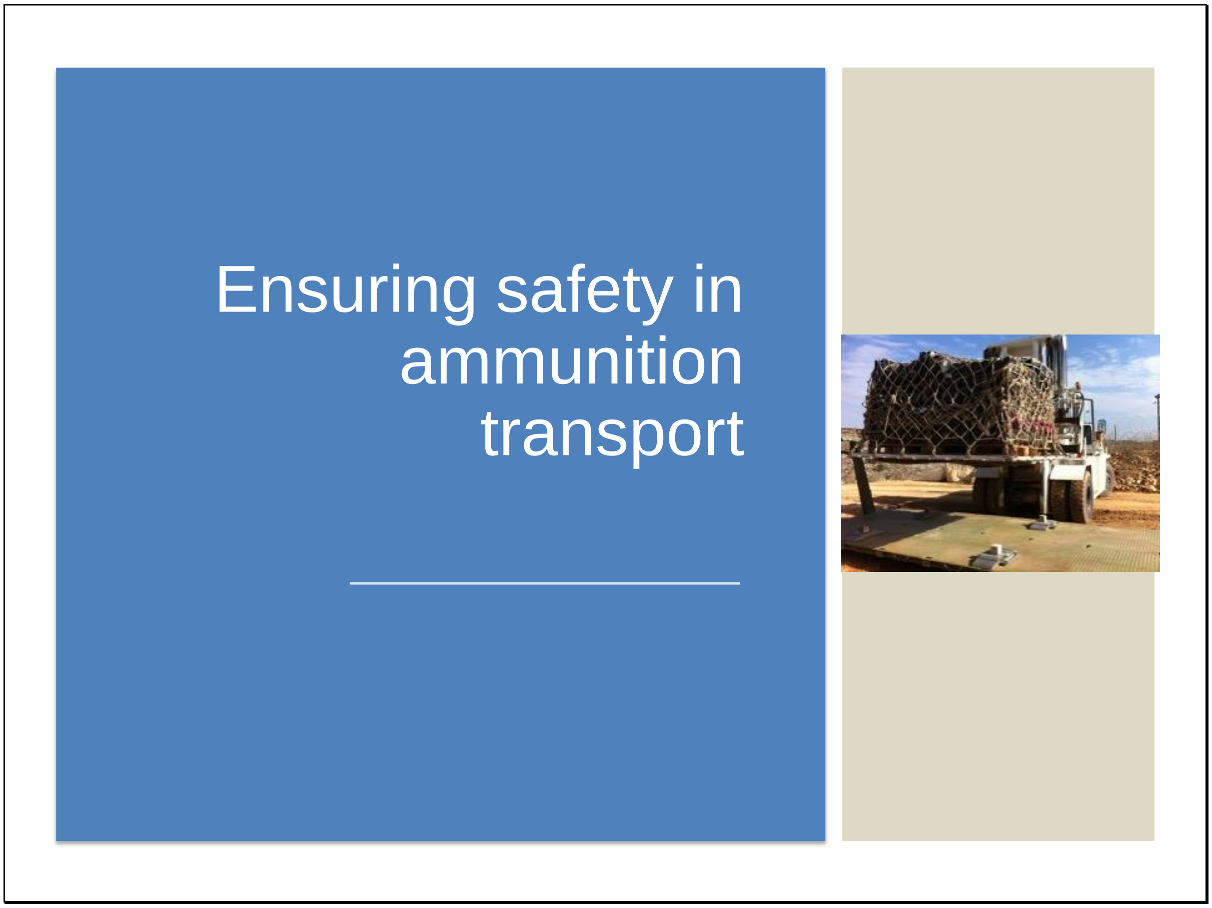
What the instructor should cover (in addition to slide content)

The importance of obtaining authorisation to overfly territories with ammunition and weapons, even if the aircraft will not land in that country.

participant activity

Ask the participants if they remember how to check if a transport agent or airline is on the sanction list. **Answer:** They would ask through their chain of command where it would be escalated to UNHQ.

Slide 20



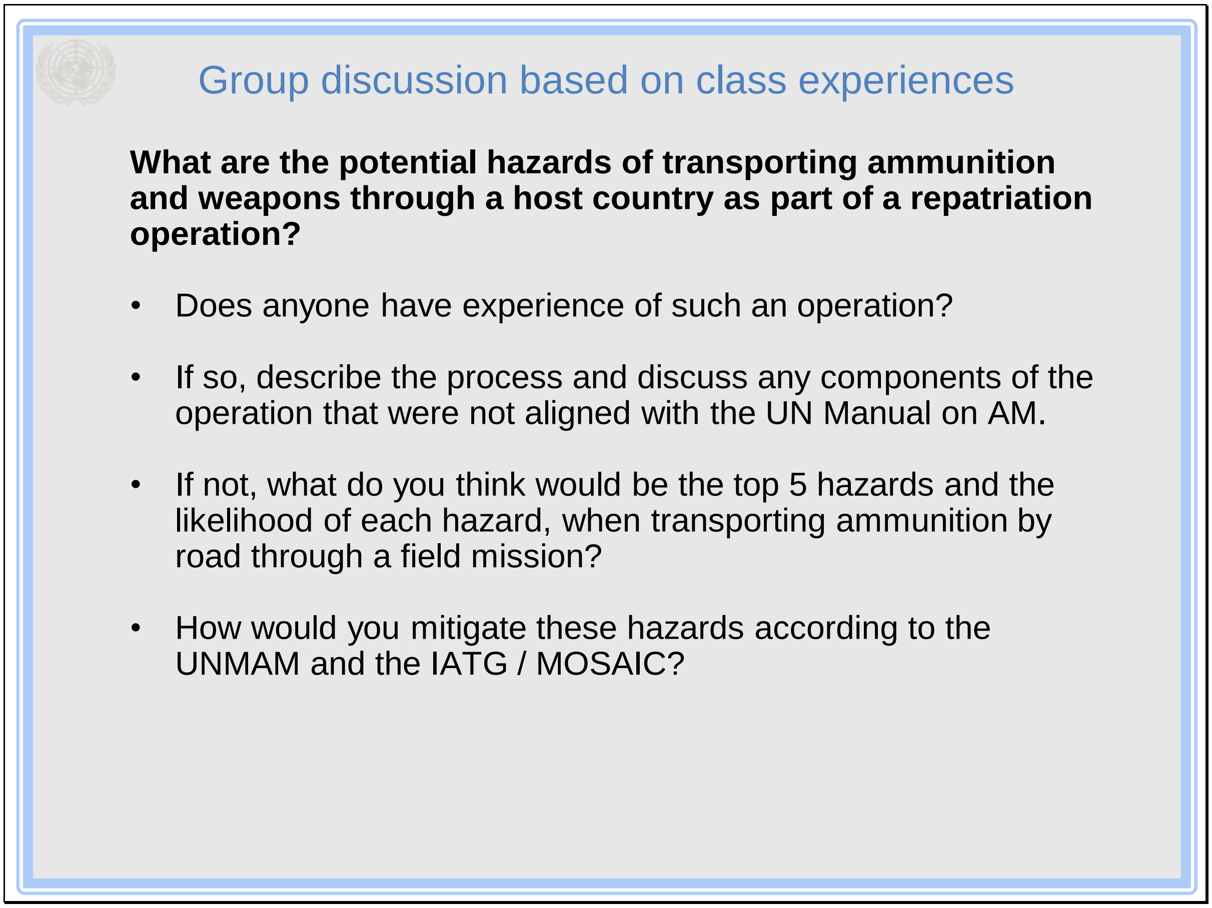
# Ensuring safety in ammunition transport

**Phase 2. Development (**Time allocation - 35 min**)**

Stage 1 (Time allocation 10 mins) – Ensuring safety in ammunition transport

Image provided by Hoplite Consulting Ltd.

Slide 21



## Group discussion based on class experiences

**What are the potential hazards of transporting ammunition and weapons through a host country as part of a repatriation operation?**

- Does anyone have experience of such an operation?
- If so, describe the process and discuss any components of the operation that were not aligned with the UN Manual on AM.
- If not, what do you think would be the top 5 hazards and the likelihood of each hazard, when transporting ammunition by road through a field mission?
- How would you mitigate these hazards according to the UNMAM and the IATG / MOSAIC?

**Main idea/objective for slide:**
**Group discussion on the various risks (hazards and likelihoods) associated with the transport of ammunition and explosives in a UN mission area.**

participant activity

- In groups, have the participants discuss the various risks (hazards and likelihoods) associated with the transport of ammunition and explosives in a UN mission area.

What the instructor should cover (in addition to slide content)

(Time allocation 10 mins)

Tailor the discussion according to participant's experiences.

- The instructor should question the groups and their findings in order to develop the depth of understanding of the explosive risks.
  - Instructors to write these hazards and risks onto the flipchart and post onto the wall.

Slide 22

Explosive Risk Assessments and Security Plan

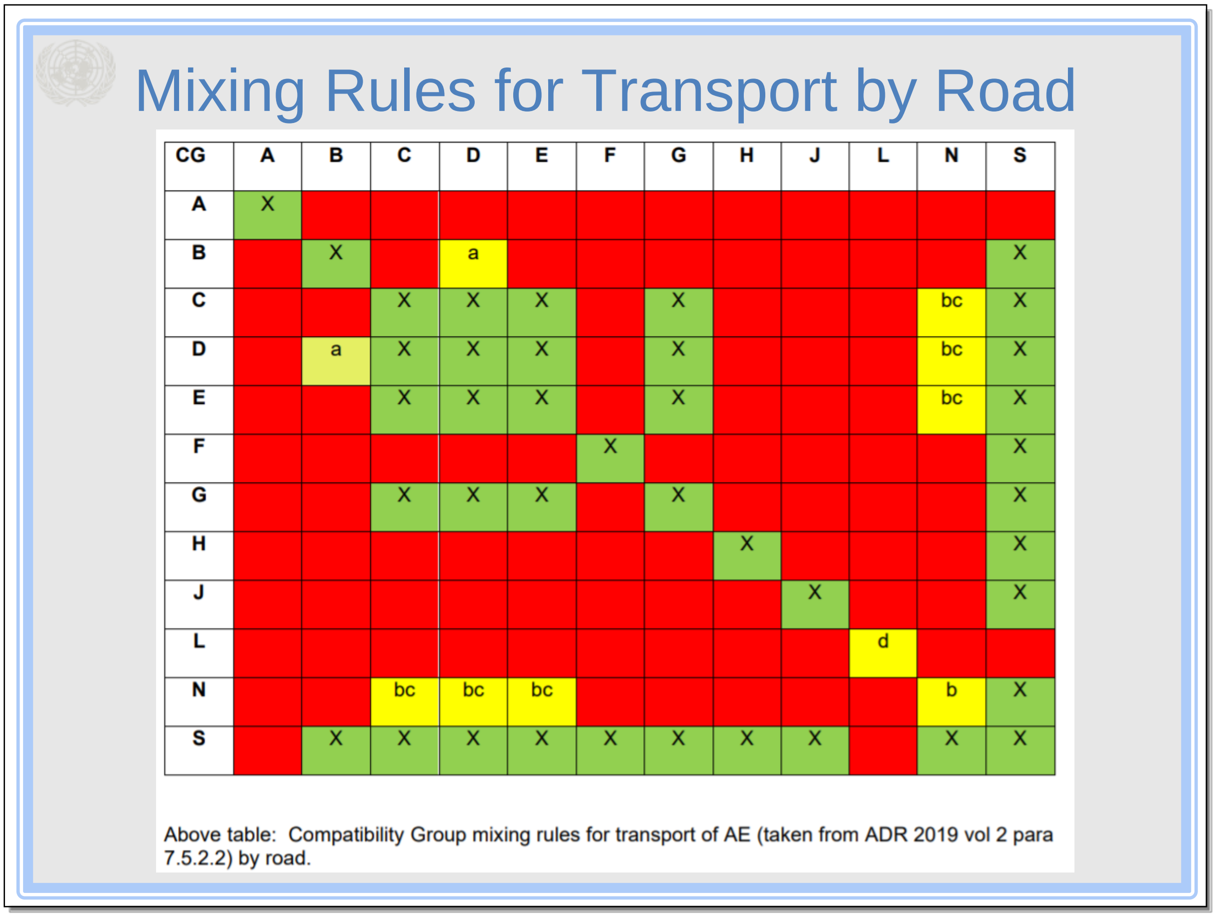
**Phase 2. Development (**Time allocation - 35 min**)**

Stage 2 (Time allocation 10 mins) – Hazard Class Codes and transporting ammunition

- Revise the UN hazard class code system, including compatibility groups and its mixing rules.
- Instructors ask questions to the class to reinforce this learning.
- Discuss with the participants the various activities and checks that should be undertaken by the transport driver and the ammunition technician on the vehicle prior to loading.
- Highlight the safety precautions that should be put in place for each vehicle which is to carry ammunition.

- Discuss the safety precautions to be considered during the convoy, along the route and during the loading and unloading of ammunition onto/from the vehicle.
- Provide the participants with a worked-out example of a basic risk assessment that manages this explosive risk.

Slide 23



## Mixing Rules for Transport by Road

| CG | A | B | C | D | E | F | G | H | J | L | N | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | X | | | | | | | | | | | |
| B | | X | | a | | | | | | | | X |
| C | | | X | X | X | | X | | | | bc | X |
| D | | a | X | X | X | | X | | | | bc | X |
| E | | | X | X | X | | X | | | | bc | X |
| F | | | | | | X | | | | | | X |
| G | | | X | X | X | | X | | | | | X |
| H | | | | | | | | X | | | | X |
| J | | | | | | | | | X | | | X |
| L | | | | | | | | | | d | | |
| N | | | bc | bc | bc | | | | | | b | X |
| S | | X | X | X | X | X | X | X | X | | X | X |

Above table: Compatibility Group mixing rules for transport of AE (taken from ADR 2019 vol 2 para 7.5.2.2) by road.

**<u>Main idea/objective for slide:</u>**

- **Revise the UN hazard class code system, including compatibility groups and its mixing rules.**

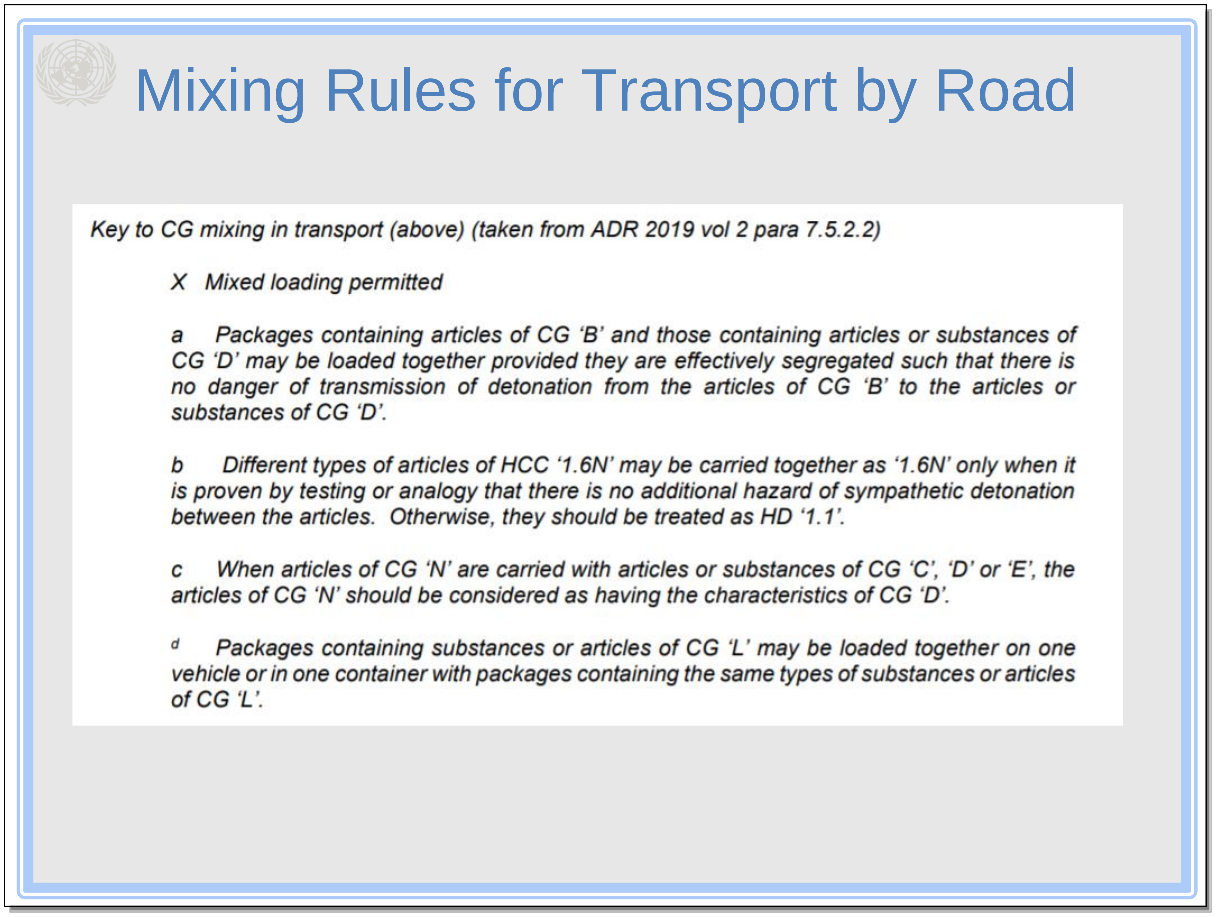
<u>What the instructor should cover (in addition to slide content)</u>

- Question participants to check recall
- Refer to lesson 8 if the participants recall is not sufficient

<u>participant activity</u>

- participants to open IATG 08.10

Slide 24



## Mixing Rules for Transport by Road

*Key to CG mixing in transport (above) (taken from ADR 2019 vol 2 para 7.5.2.2)*

*X Mixed loading permitted*

*a Packages containing articles of CG 'B' and those containing articles or substances of CG 'D' may be loaded together provided they are effectively segregated such that there is no danger of transmission of detonation from the articles of CG 'B' to the articles or substances of CG 'D'.*

*b Different types of articles of HCC '1.6N' may be carried together as '1.6N' only when it is proven by testing or analogy that there is no additional hazard of sympathetic detonation between the articles. Otherwise, they should be treated as HD '1.1'.*

*c When articles of CG 'N' are carried with articles or substances of CG 'C', 'D' or 'E', the articles of CG 'N' should be considered as having the characteristics of CG 'D'.*

*d Packages containing substances or articles of CG 'L' may be loaded together on one vehicle or in one container with packages containing the same types of substances or articles of CG 'L'.*

**Main idea/objective for slide:**

- **Revise the UN hazard class code system, including compatibility groups and its mixing rules.**

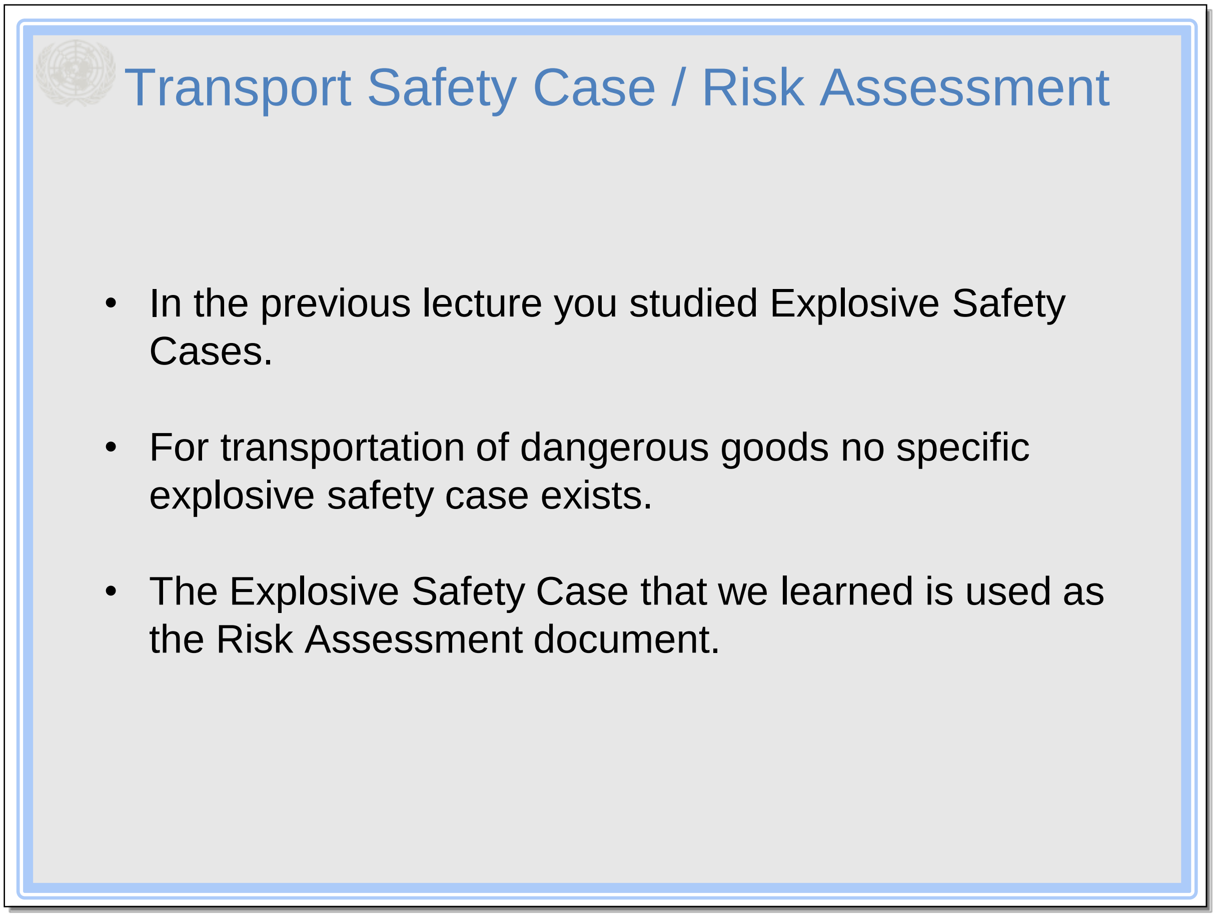
What the instructor should cover (in addition to slide content)

- Question participants to check recall
- Refer to lesson 8 if the participants recall is not sufficient

participant activity

- participants to open IATG 08.10

Slide 25



## Transport Safety Case / Risk Assessment

- In the previous lecture you studied Explosive Safety Cases.
- For transportation of dangerous goods no specific explosive safety case exists.
- The Explosive Safety Case that we learned is used as the Risk Assessment document.

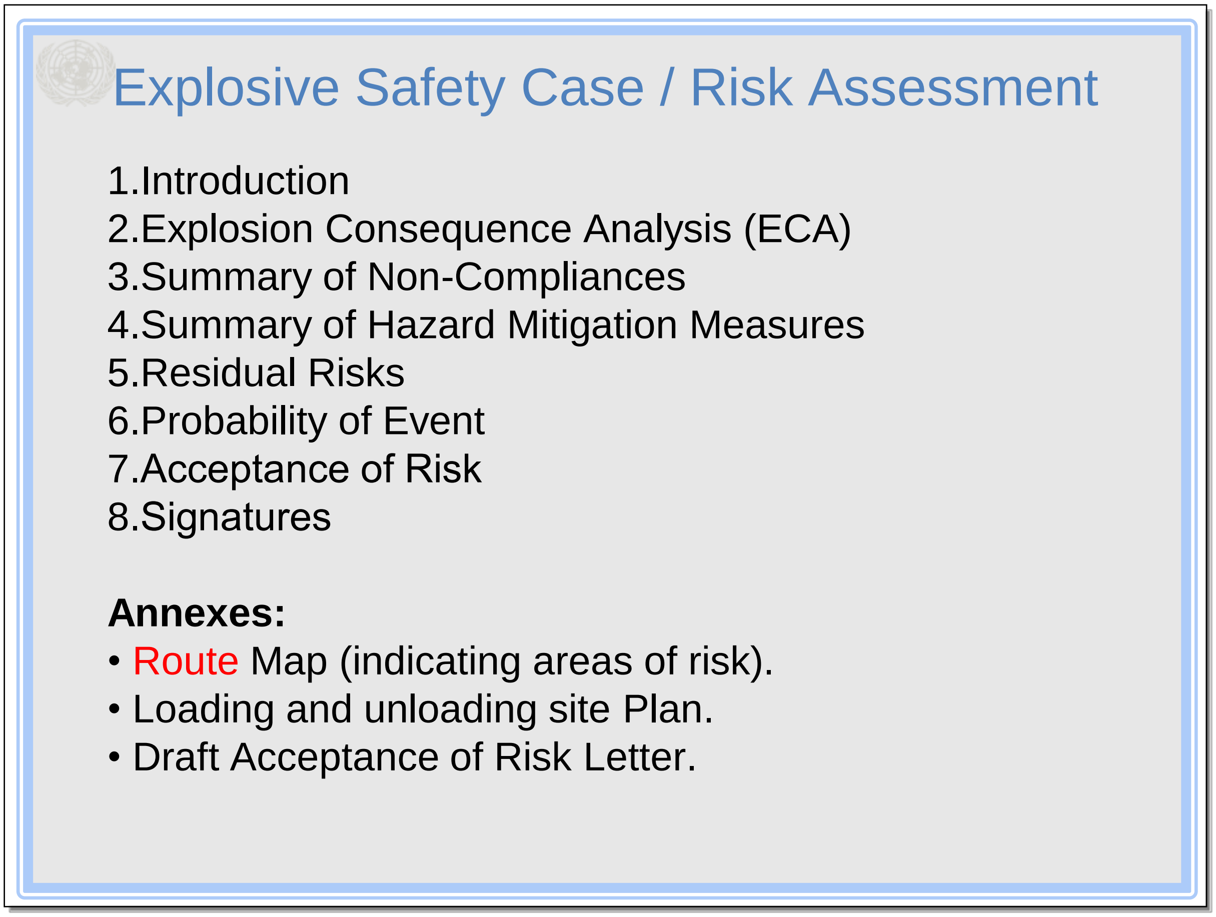
**Main idea/objective for slide:**

- **Introduce the concept of an explosive safety case for transport of AE**

What the instructor should cover (in addition to slide content)

- Question participants to check recall the details of the previous lecture.
- Refer to lesson 10 if the participants recall is not sufficient

Slide 26



## Explosive Safety Case / Risk Assessment

1. Introduction
2. Explosion Consequence Analysis (ECA)
3. Summary of Non-Compliances
4. Summary of Hazard Mitigation Measures
5. Residual Risks
6. Probability of Event
7. Acceptance of Risk
8. Signatures

**Annexes:**

- Route Map (indicating areas of risk).
- Loading and unloading site Plan.
- Draft Acceptance of Risk Letter.

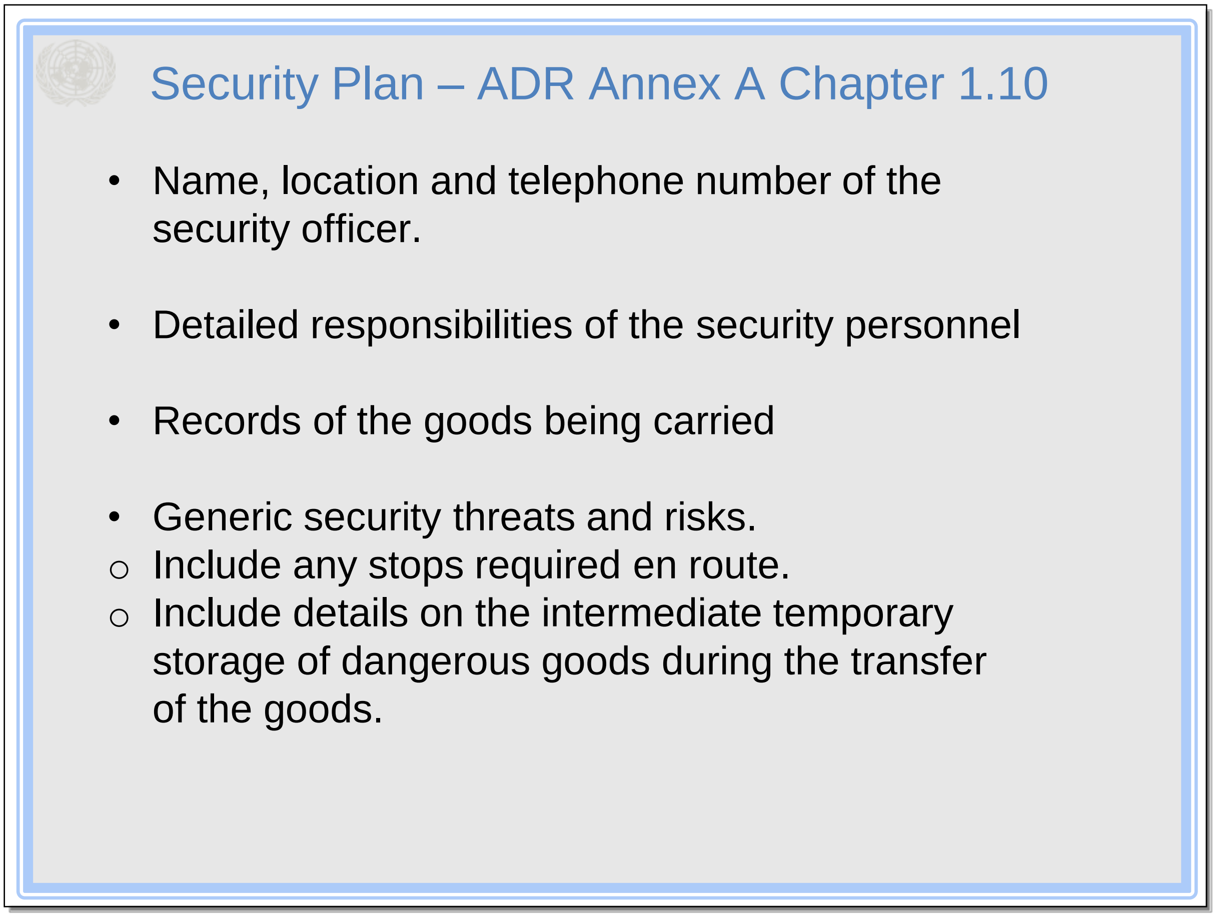
**Main idea/objective for slide:**

- **Revise the key headings of the explosive safety case.**

What the instructor should cover (in addition to slide content)

- Use the participants recent learning of ESC to discuss which sections are more and less relevant to the transport of AE.
- We have changed the Annexes to make them more relevant to the transport of ammunition.

Slide 27



## Security Plan – ADR Annex A Chapter 1.10

- Name, location and telephone number of the security officer.
- Detailed responsibilities of the security personnel
- Records of the goods being carried
- Generic security threats and risks.
  - Include any stops required en route.
  - Include details on the intermediate temporary storage of dangerous goods during the transfer of the goods.

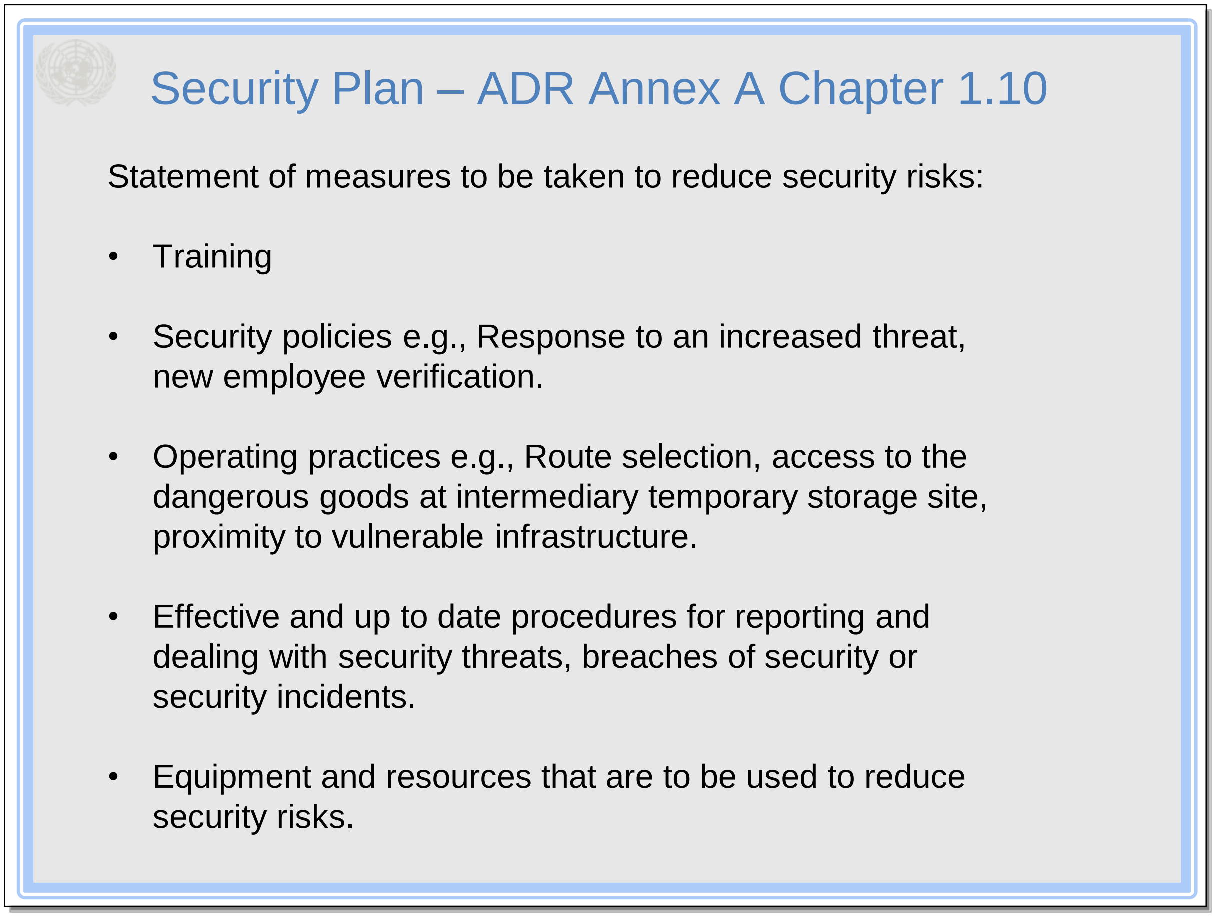
**<u>Main idea/objective for slide:</u>**

- **To describe the outline of a security plan as per ADR Annex A Chapter 1.1.**

<u>What the instructor should cover (in addition to slide content)</u>

- Use the participants experiences in peace operations to highlight the key inputs under each heading.
- List these on a whiteboard / flip chart.

Slide 28



## Security Plan – ADR Annex A Chapter 1.10

Statement of measures to be taken to reduce security risks:

- Training
- Security policies e.g., Response to an increased threat, new employee verification.
- Operating practices e.g., Route selection, access to the dangerous goods at intermediary temporary storage site, proximity to vulnerable infrastructure.
- Effective and up to date procedures for reporting and dealing with security threats, breaches of security or security incidents.
- Equipment and resources that are to be used to reduce security risks.

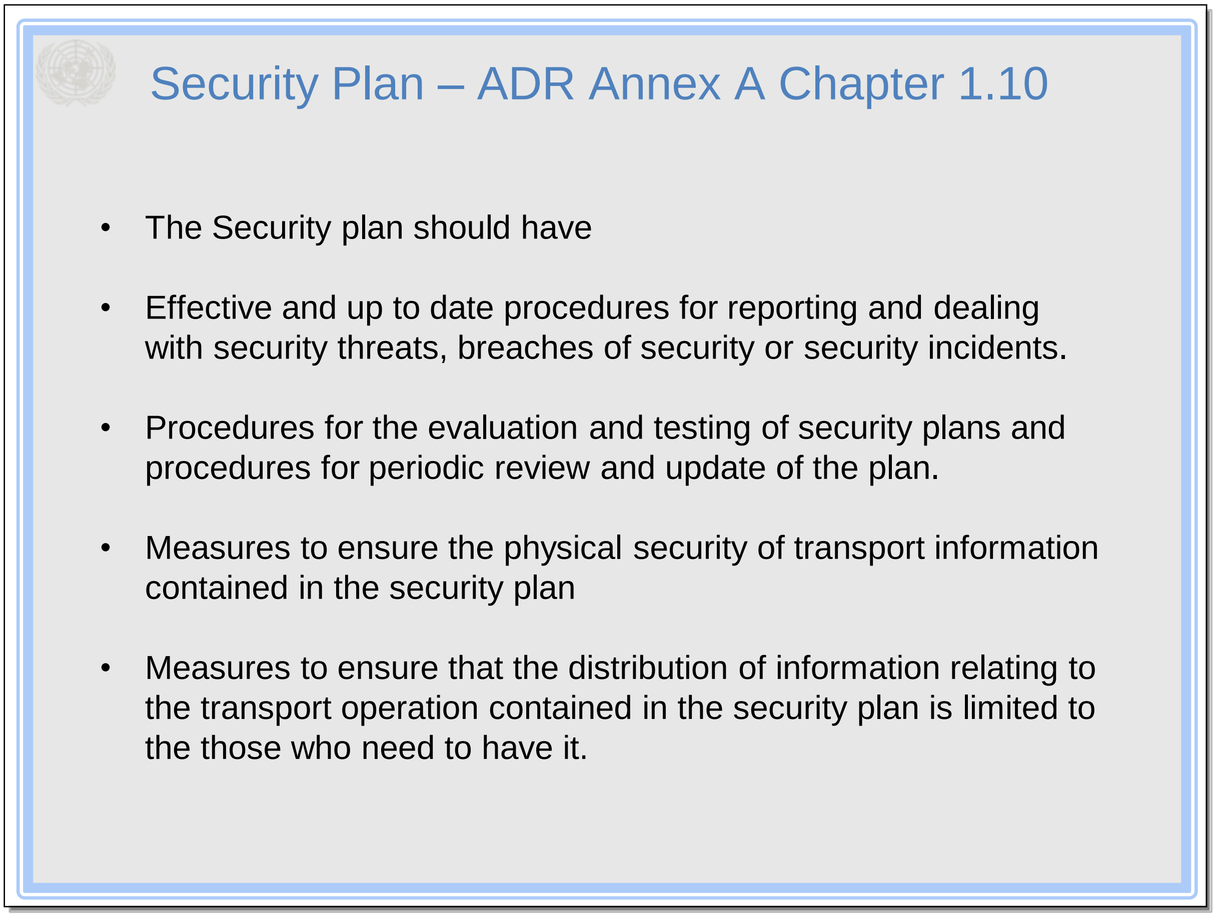
**Main idea/objective for slide:**

- **To describe the outline of a security plan as per ADR Annex A Chapter 1.1.**

What the instructor should cover (in addition to slide content)

- Use the participants experiences in peace operations to highlight the key inputs under each heading.
- List these on a whiteboard / flip chart.

Slide 29



## Security Plan – ADR Annex A Chapter 1.10

- The Security plan should have
- Effective and up to date procedures for reporting and dealing with security threats, breaches of security or security incidents.
- Procedures for the evaluation and testing of security plans and procedures for periodic review and update of the plan.
- Measures to ensure the physical security of transport information contained in the security plan
- Measures to ensure that the distribution of information relating to the transport operation contained in the security plan is limited to the those who need to have it.

**<u>Main idea/objective for slide:</u>**

- **To describe the outline of a security plan as per ADR Annex A Chapter 1.1.**

<u>What the instructor should cover (in addition to slide content)</u>

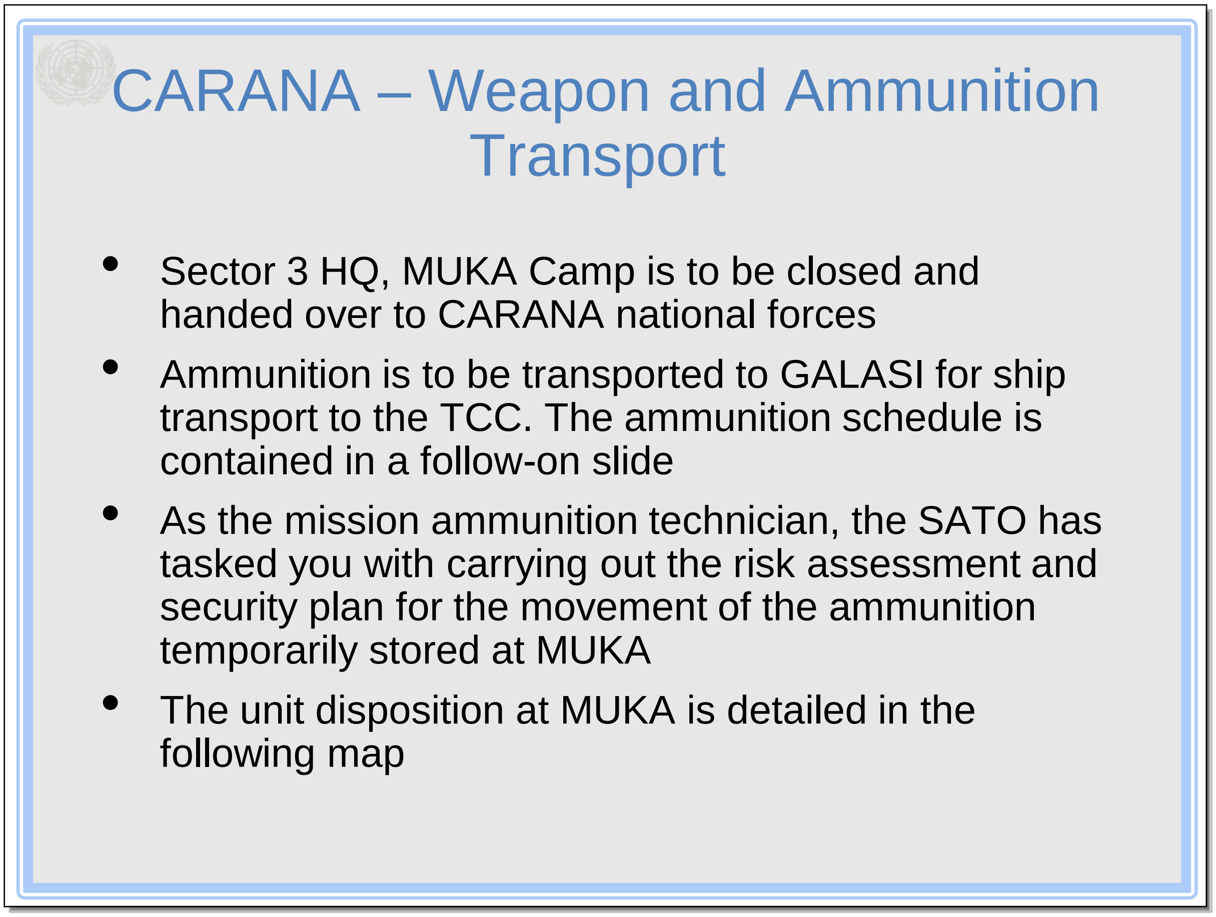
- Use the participants experiences in peace operations to highlight the key inputs under each heading.
- List these on a whiteboard / flip chart.

Slide 30

Participant Exercise

**Phase 2. Development (**Time allocation - 35 min**)**

Stage 3 (Time allocation 15 mins) – participant Exercise



## CARANA – Weapon and Ammunition Transport

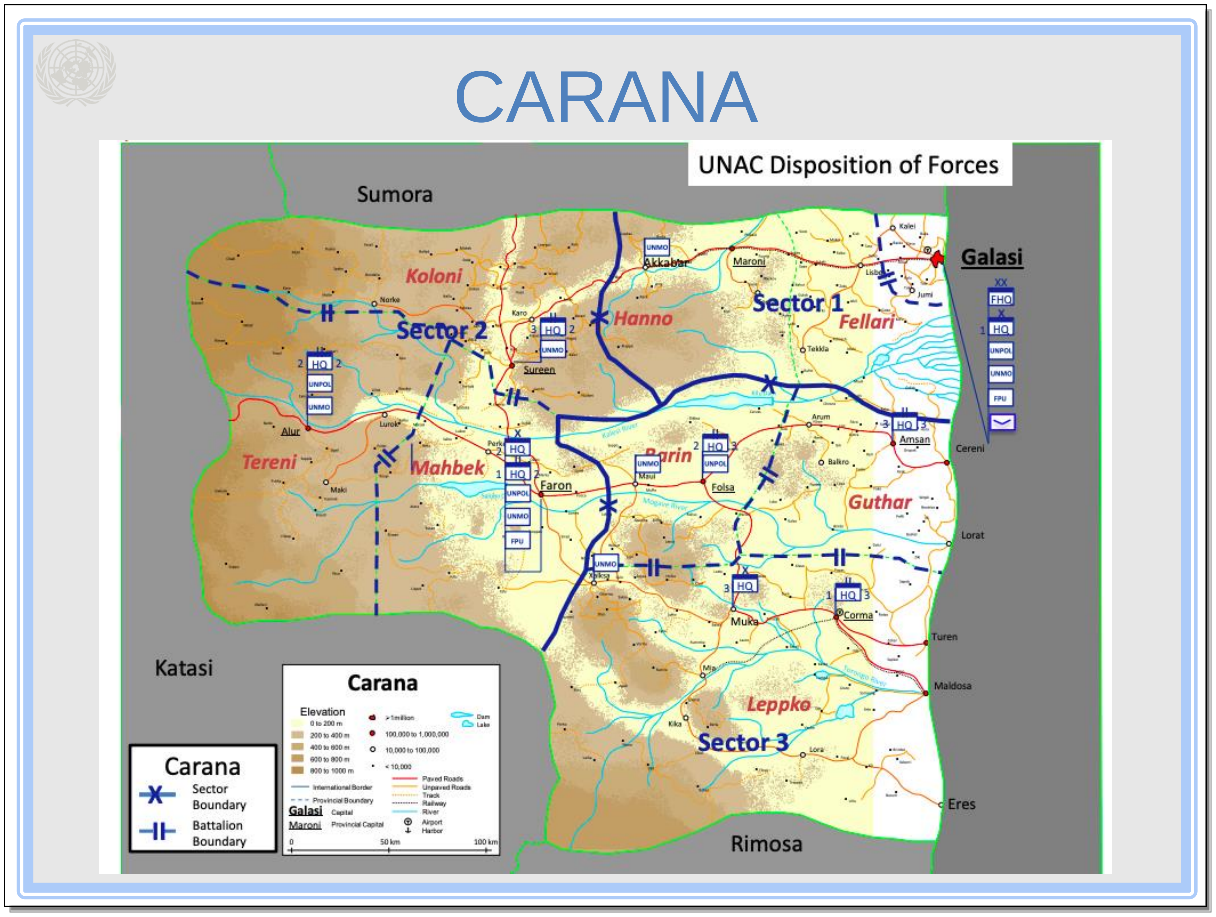
- Sector 3 HQ, MUKA Camp is to be closed and handed over to CARANA national forces
- Ammunition is to be transported to GALASI for ship transport to the TCC. The ammunition schedule is contained in a follow-on slide
- As the mission ammunition technician, the SATO has tasked you with carrying out the risk assessment and security plan for the movement of the ammunition temporarily stored at MUKA
- The unit disposition at MUKA is detailed in the following map

**Main idea/objective for slide:**
**Introduce CARANA scenario for participant exercise**

What the instructor should cover (in addition to slide content)

The threat assessment is High for CARANA.

Slide 32



CARANA

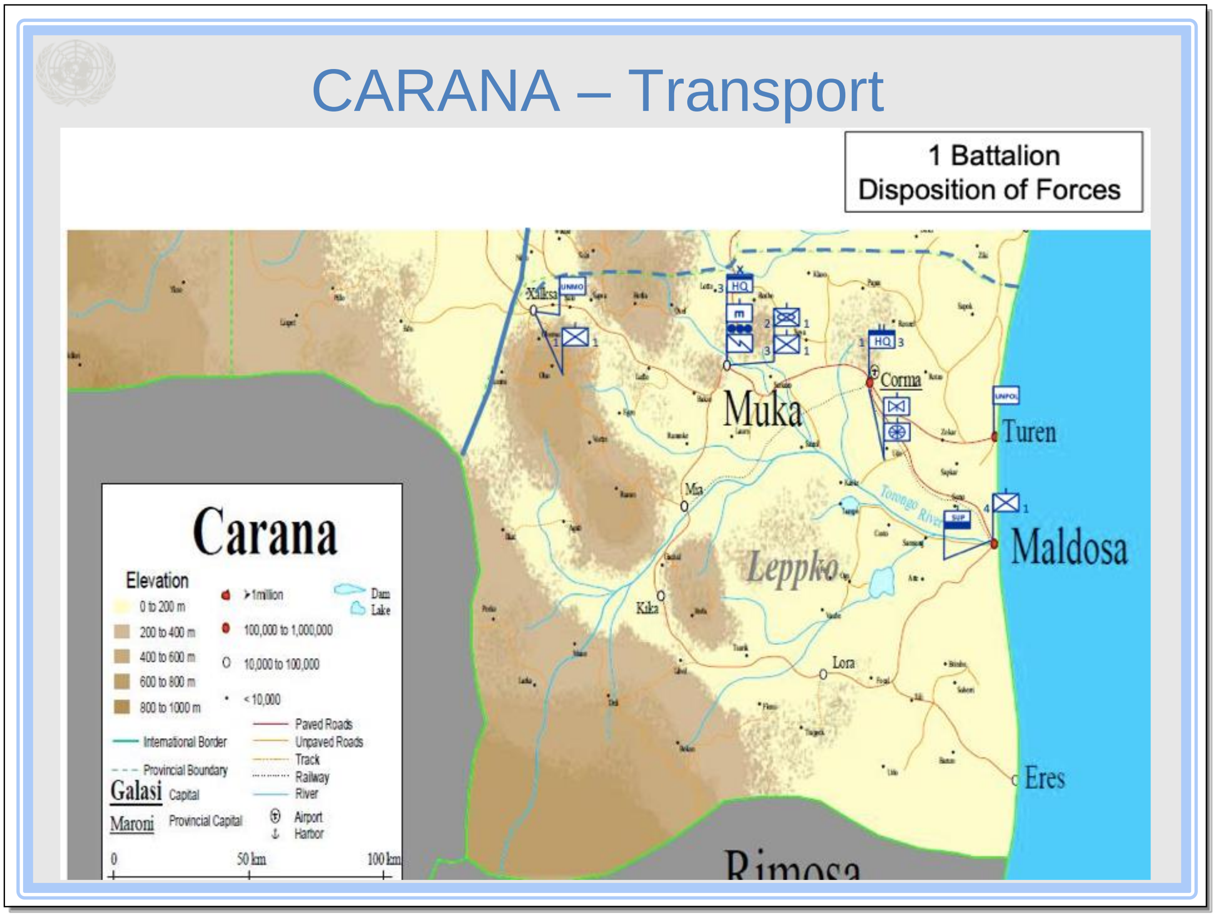
**Main idea/objective for slide:**

**Using the CARANA scenario, provide the participants with a basic situation update. Refer to the CARANA scenario included with the lessons. The threat level is assessed as HIGH.**

What the instructor should cover (in addition to slide content)

The disposition of friendly forces across the mission.

Slide 33



CARANA – Transport

1 Battalion
Disposition of Forces

**Main idea/objective for slide:**
**Introduce the location of MUKA and the units based there.**

participant activity
Are the participants familiar with the unit symbols? **Answer:** MUKA contains the battalion HQ, a field engineering company, a signals platoon, a mechanised infantry company and an infantry company.

Slide 34

## Weapons & Ammunition Schedule

Weapons

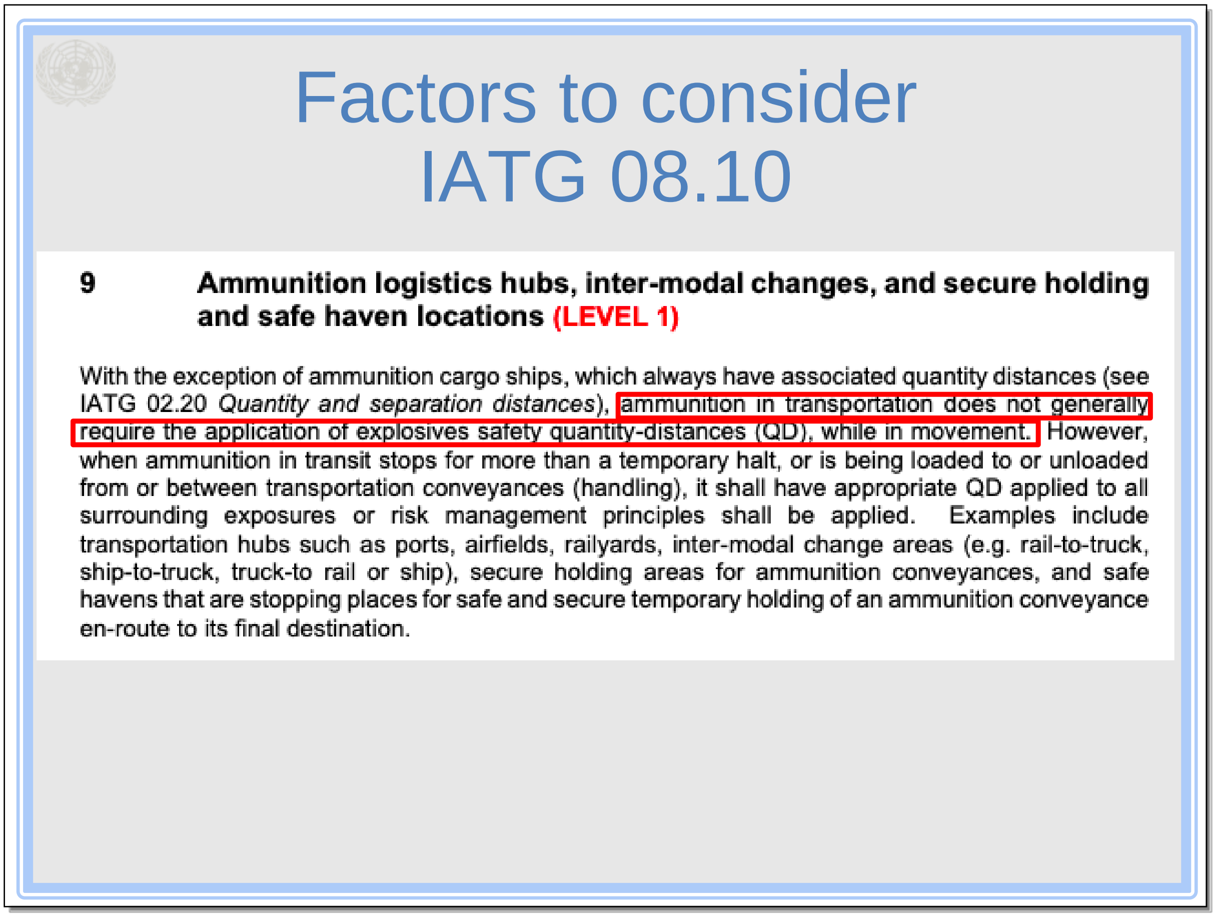
- 6 X 120mm mortars
- 6 X Carl Gustaf recoilless rifles
- 150 X M16 carbine rifles

Ammunition

- Rds RCL HE 441D X 24 boxes (6 per box)
- Rds RCL HEAT 551 X 10 boxes (6 per box)
- Rds Mortar 120mm HE 88 X 150 boxes (2 per box)
- PE No4 8oz Ctgs X 20 boxes (20 per box)
- Detonators L2A2 X 2 boxes (50 per box)

**<u>Main idea/objective for slide:</u>**
**Introduce AE schedule for the transportation requirement**

Slide 35



# Factors to consider
# IATG 08.10

**9 Ammunition logistics hubs, inter-modal changes, and secure holding and safe haven locations (LEVEL 1)**

With the exception of ammunition cargo ships, which always have associated quantity distances (see IATG 02.20 *Quantity and separation distances*), ammunition in transportation does not generally require the application of explosives safety quantity-distances (QD), while in movement. However, when ammunition in transit stops for more than a temporary halt, or is being loaded to or unloaded from or between transportation conveyances (handling), it shall have appropriate QD applied to all surrounding exposures or risk management principles shall be applied. Examples include transportation hubs such as ports, airfields, railyards, inter-modal change areas (e.g. rail-to-truck, ship-to-truck, truck-to rail or ship), secure holding areas for ammunition conveyances, and safe havens that are stopping places for safe and secure temporary holding of an ammunition conveyance en-route to its final destination.

**Main idea/objective for slide:**

**IATG 08.10 states that ammunition in transport does not generally require the application of explosive safety QD while in movement.**

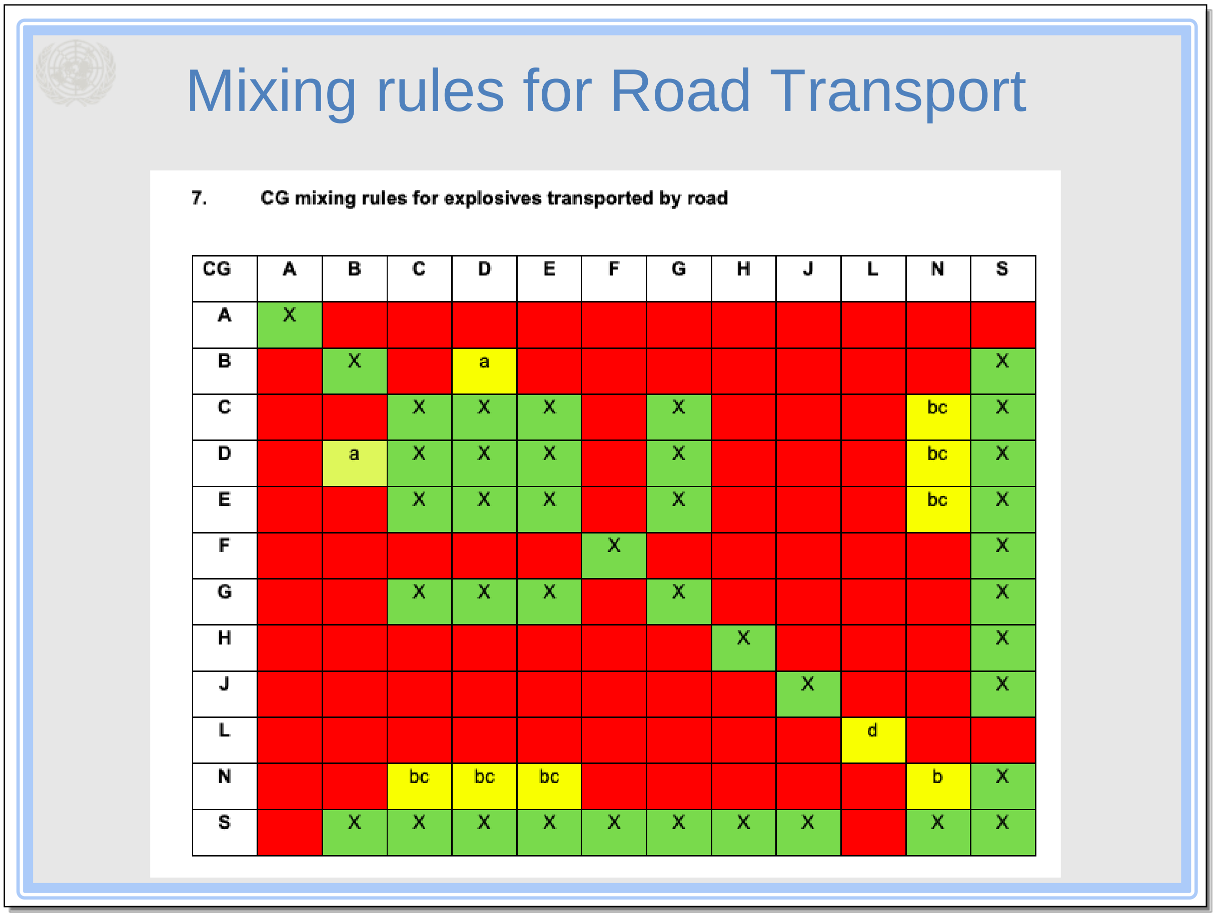
participant activity

Ask the participants what they think that the main issue with trying to maintain the QD in transit is. **Answer:** Its impracticable due to space and cost

What the instructor should cover (in addition to slide content)

Read the rest of the paragraph in the slide paying particular attention to the requirement to have appropriate QD when undergoing handling etc.

Slide 36



## Mixing rules for Road Transport

7. **CG mixing rules for explosives transported by road**

| CG | A | B | C | D | E | F | G | H | J | L | N | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | X | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 |
| B | 🟥 | X | 🟥 | a | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | X |
| C | 🟥 | 🟥 | X | X | X | 🟥 | X | 🟥 | 🟥 | 🟥 | bc | X |
| D | 🟥 | a | X | X | X | 🟥 | X | 🟥 | 🟥 | 🟥 | bc | X |
| E | 🟥 | 🟥 | X | X | X | 🟥 | X | 🟥 | 🟥 | 🟥 | bc | X |
| F | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | X | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | X |
| G | 🟥 | 🟥 | X | X | X | 🟥 | X | 🟥 | 🟥 | 🟥 | 🟥 | X |
| H | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | X | 🟥 | 🟥 | 🟥 | X |
| J | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | X | 🟥 | 🟥 | X |
| L | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | d | 🟥 | 🟥 |
| N | 🟥 | 🟥 | bc | bc | bc | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | b | X |
| S | 🟥 | X | X | X | X | X | X | X | X | 🟥 | X | X |

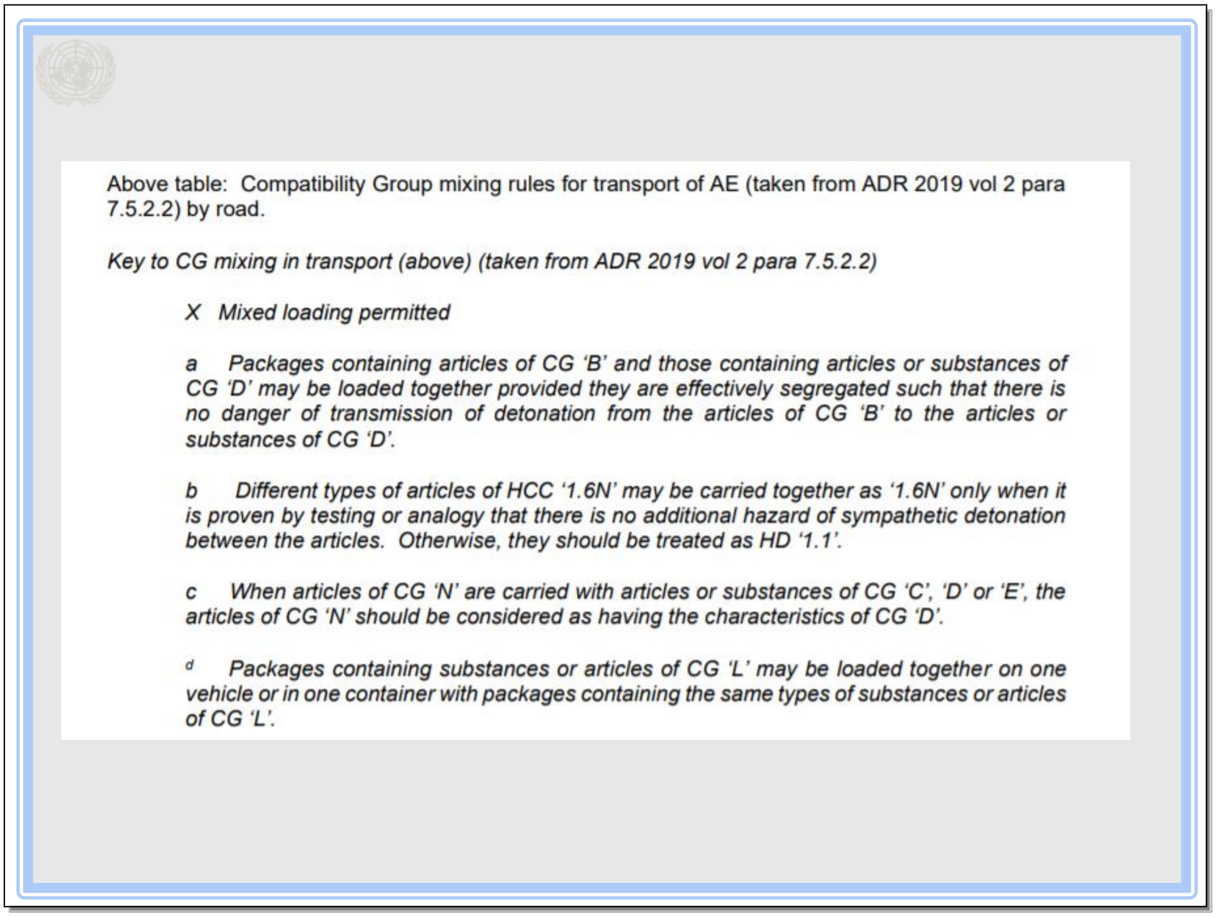
<u>**Main idea/objective for slide:**</u>
**Introduce CARANA scenario for participant exercise**

<u>participant activity</u>
Ask the participants to refer to lesson 8 and to compare the mixing rules for storage vs transport

<u>What the instructor should cover (in addition to slide content)</u>

Identify the differences between the mixing rules for storage and transport.

E.g. E and F are NOT compatible with B in transit.



Above table: Compatibility Group mixing rules for transport of AE (taken from ADR 2019 vol 2 para 7.5.2.2) by road.

*Key to CG mixing in transport (above) (taken from ADR 2019 vol 2 para 7.5.2.2)*

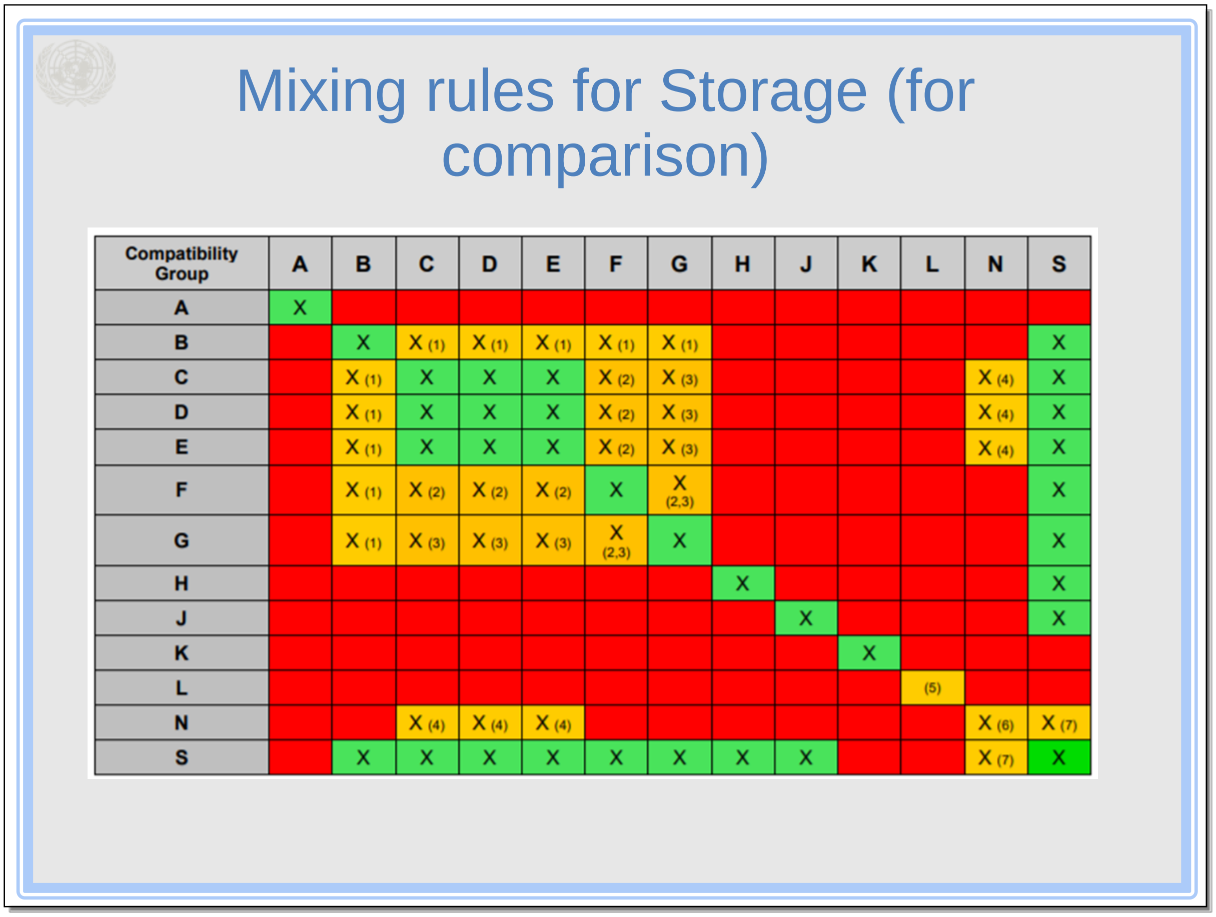
*X Mixed loading permitted*

*a Packages containing articles of CG 'B' and those containing articles or substances of CG 'D' may be loaded together provided they are effectively segregated such that there is no danger of transmission of detonation from the articles of CG 'B' to the articles or substances of CG 'D'.*

*b Different types of articles of HCC '1.6N' may be carried together as '1.6N' only when it is proven by testing or analogy that there is no additional hazard of sympathetic detonation between the articles. Otherwise, they should be treated as HD '1.1'.*

*c When articles of CG 'N' are carried with articles or substances of CG 'C', 'D' or 'E', the articles of CG 'N' should be considered as having the characteristics of CG 'D'.*

*d Packages containing substances or articles of CG 'L' may be loaded together on one vehicle or in one container with packages containing the same types of substances or articles of CG 'L'.*



## Mixing rules for Storage (for comparison)

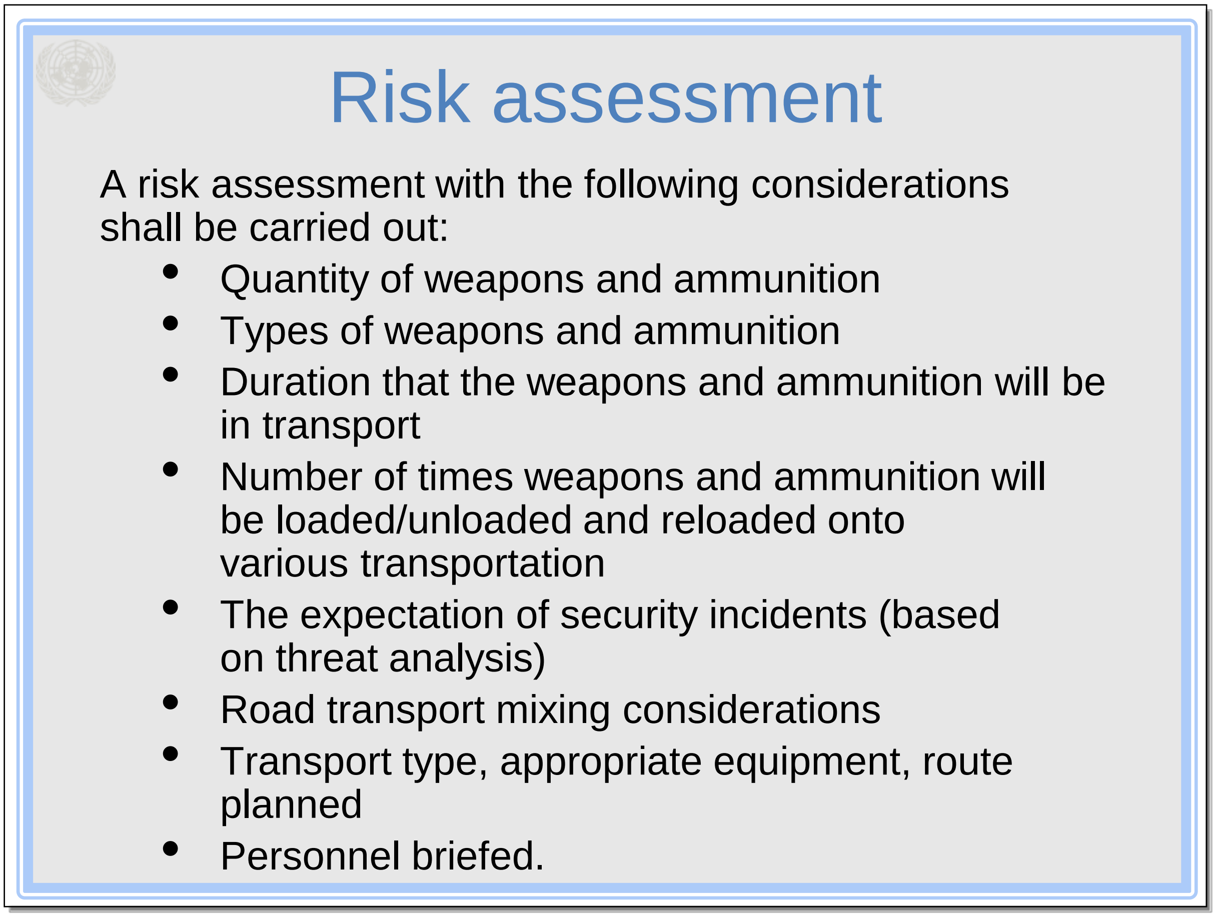
| Compatibility Group | A | B | C | D | E | F | G | H | J | K | L | N | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | X | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 |
| B | 🟥 | X | X (1) | X (1) | X (1) | X (1) | X (1) | 🟥 | 🟥 | 🟥 | 🟥 | 🟥 | X |
| C | 🟥 | X (1) | X | X | X | X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

**<u>Main idea/objective for slide:</u>**
**Refresh mixing rules for storage**

<u>participant activity</u>
Ask the participants to refer to lesson 8 and to compare the mixing rules for storage vs transport

<u>What the instructor should cover (in addition to slide content)</u>

> Identify the differences between the mixing rules for storage and transport.
>
> > E.g. E and F are NOT compatible with B in transit.



## Risk assessment

A risk assessment with the following considerations shall be carried out:

- Quantity of weapons and ammunition
- Types of weapons and ammunition
- Duration that the weapons and ammunition will be in transport
- Number of times weapons and ammunition will be loaded/unloaded and reloaded onto various transportation
- The expectation of security incidents (based on threat analysis)
- Road transport mixing considerations
- Transport type, appropriate equipment, route planned
- Personnel briefed.

**Main idea/objective for slide:**
**Introduce CARANA scenario for participant exercise**

participant activity

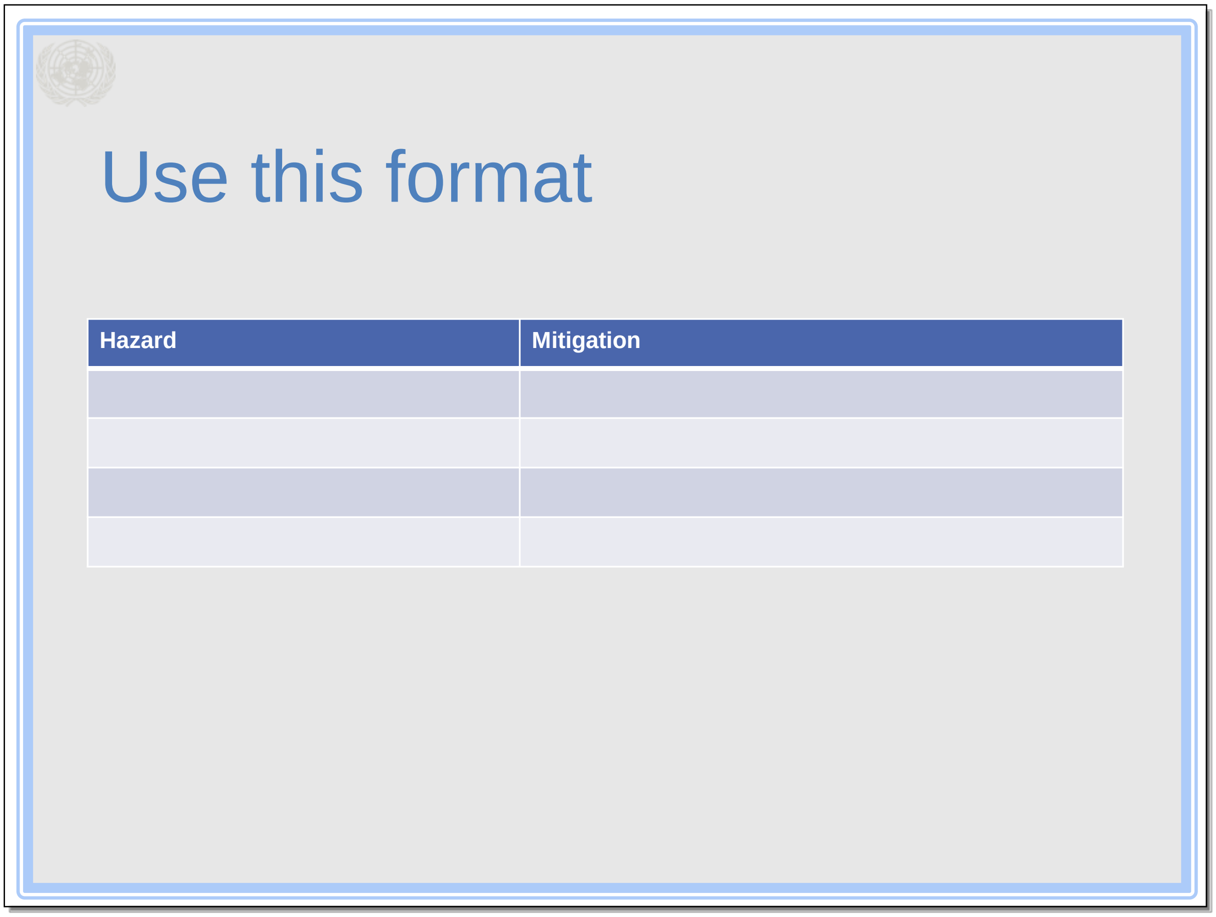
- In groups, the participants are to undertake a Risk Assessment for the transport of this ammunition and weapons from one UN camp to another, based on the UN CARANA scenario.
- Open discussion

What the instructor should cover (in addition to slide content)

- Use the ESC and the Security Plan templates that have been covered in this lecture.

- Instructors are to work closely with the groups to help them identify hazards, develop mitigating factors and ultimately produce a suitable explosive risk assessment for this operation.
- When the groups have completed their groupwork, work through the answers with the class and ask questions.

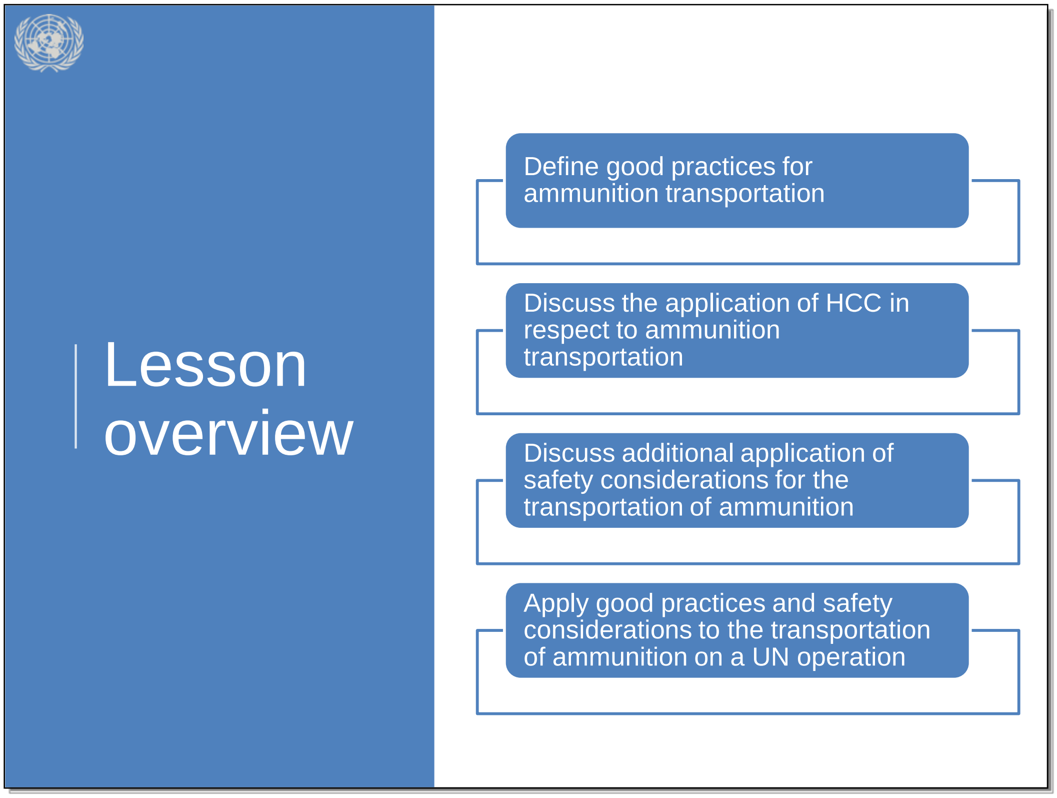
Slide 40



# Use this format

| Hazard | Mitigation |
|---|---|
| | |
| | |
| | |
| | |

Slide 41



## Lesson overview

- Define good practices for ammunition transportation
- Discuss the application of HCC in respect to ammunition transportation
- Discuss additional application of safety considerations for the transportation of ammunition
- Apply good practices and safety considerations to the transportation of ammunition on a UN operation

## Summary

In this lesson, participants delved into the application of good practices for the transportation of ammunition in UN peacekeeping operations. Key learning points included:

- Participants learned to define and understand the essential good practices necessary for the safe transportation of ammunition in UN peacekeeping operations.
- Engaging in discussions about the application of Hazard Classification Codes (HCC) in relation to the transportation of ammunition, ensuring compliance with safety standards and regulations.
- Participants explored additional safety considerations specific to the transportation of ammunition, addressing potential risks and implementing appropriate safety measures.
- Practical application of learned good practices and safety considerations to simulated scenarios, allowing participants to apply their knowledge and skills in real-world situations.

Slide 42

Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Ammunition Inspection

**Main idea/objective for slide:**

Look ahead to the next lesson of the course:

Ammunition Inspection

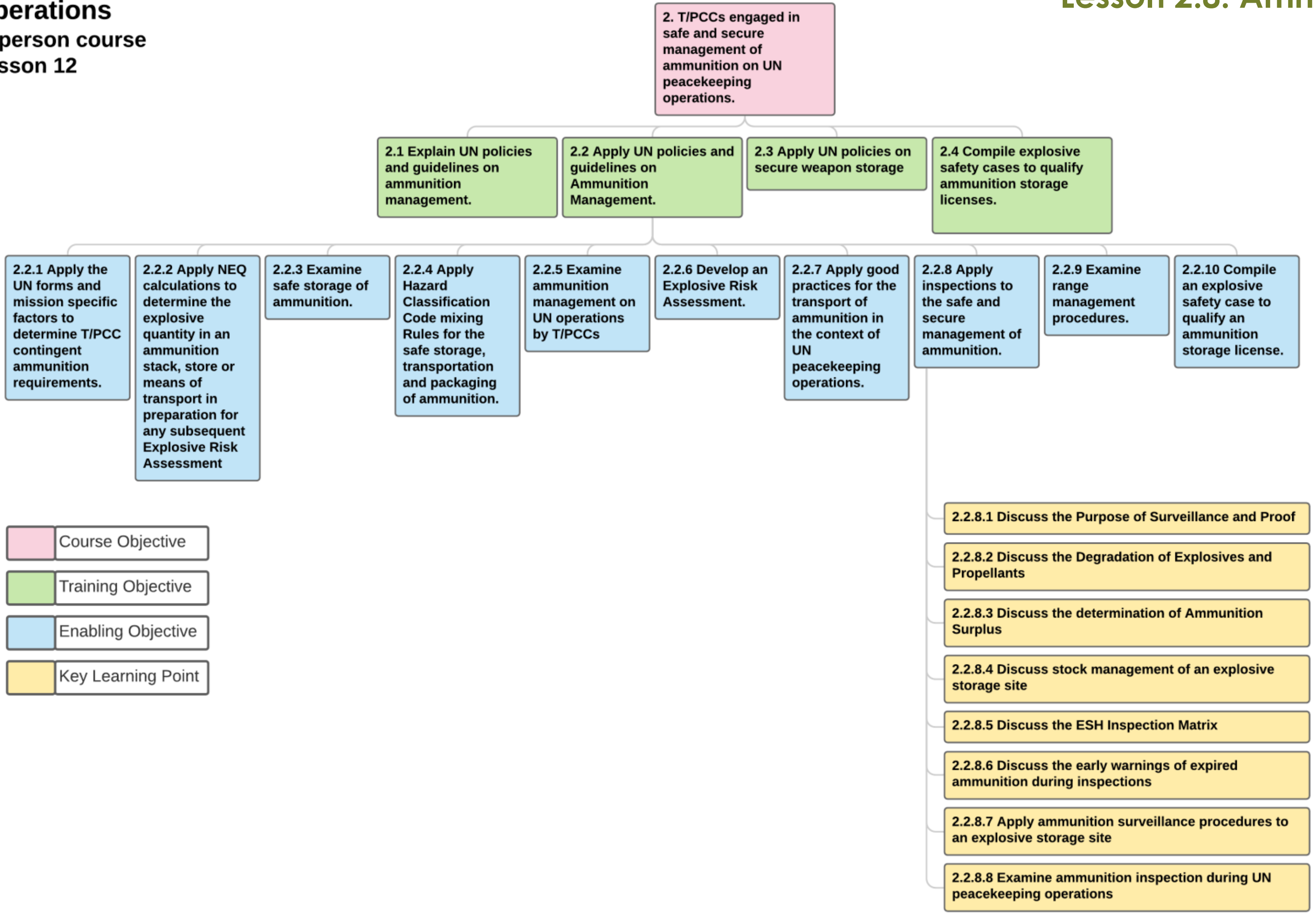
# Lesson
# 2.8

## Weapons and Ammunition Management in UN Peace Operations

**In-person course**

**Lesson 12**

## Lesson 2.8: Ammunition Inspection



**2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.**

**2.1 Explain UN policies and guidelines on ammunition management.**

**2.2 Apply UN policies and guidelines on Ammunition Management.**

**2.3 Apply UN policies on secure weapon storage**

**2.4 Compile explosive safety cases to qualify ammunition storage licenses.**

**2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.**

**2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment**

**2.2.3 Examine safe storage of ammunition.**

**2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.**

**2.2.5 Examine ammunition management on UN operations by T/PCCs**

**2.2.6 Develop an Explosive Risk Assessment.**

**2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.**

**2.2.8 Apply inspections to the safe and secure management of ammunition.**

**2.2.9 Examine range management procedures.**

**2.2.10 Compile an explosive safety case to qualify an ammunition storage license.**

**2.2.8.1 Discuss the Purpose of Surveillance and Proof**

**2.2.8.2 Discuss the Degradation of Explosives and Propellants**

**2.2.8.3 Discuss the determination of Ammunition Surplus**

**2.2.8.4 Discuss stock management of an explosive storage site**

**2.2.8.5 Discuss the ESH Inspection Matrix**

**2.2.8.6 Discuss the early warnings of expired ammunition during inspections**

**2.2.8.7 Apply ammunition surveillance procedures to an explosive storage site**

**2.2.8.8 Examine ammunition inspection during UN peacekeeping operations**

| | |
|---|---|
| 🟥 | Course Objective |
| 🟩 | Training Objective |
| 🟦 | Enabling Objective |
| 🟨 | Key Learning Point |

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L12. Ammunition Inspection |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 180 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.8 Apply inspections to the safe and secure management of ammunition. | 2.2.8.1 Discuss the Purpose of Surveillance and Proof<br>2.2.8.2 Discuss the Degradation of Explosives and Propellants<br>2.2.8.3 Discuss the determination of Ammunition Surplus<br>2.2.8.4 Discuss stock management of an explosive storage site<br>2.2.8.5 Discuss the ESH Inspection Matrix<br>2.2.8.6 Discuss the early warnings of expired ammunition during inspections<br>2.2.8.7 Apply ammunition surveillance procedures to an explosive storage site<br>2.2.8.8 Examine ammunition inspection during UN peacekeeping operations |
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Apply inspections to the safe and secure management of ammunition. |

| | |
|---|---|
| **Assessment Criteria:** | There is no final assessment for this exercise, however, Instructors will use informal class discussion, questioning of participants and review the work by the participants to enable a positive feedback loop to be established to enhance the effectiveness of the learning. |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom, projector, Screen, Flipchart, Whiteboard |
| **Instructional tools & materials** | • Images of examples of ammunition and explosives which have been degraded to unsafe conditions<br>• Imagery of munitions which are reaching the end of their serviceable life<br>• Range of images showing ammunition and explosives for the participant exercise<br>• Example ESH Inspection Matrix<br>• 5-6 Images of ammunition and/or ammunition packaging in various states of deterioration in storage, for participant exercise |
| **Participant Resources:** | • Full size printouts of some slides where required – see slide notes for details. |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: Health and safety checklist for classrooms (hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

## SECTION 2: LESSON PLAN

### Executive summary:

By the end of this training session the participant will have applied knowledge and skills of ammunition inspection in the management of ammunition stocks at an Explosive Storage Site. This will enable them to ensure that stored ammunition remains serviceable and fit for use when required. They will also examine how to recognise when munitions have reached their end of life or have degraded to a point where they must be replaced or destroyed, based on regular ammunition surveillance.

### Setup:

Phase 1, Phase 2 (stages 1 & 2) and Phase 3 will be delivered to the class as a single collective.

Phase 3 (stage 3) will be conducted in small groups (6-8 participants) each with a dedicated instructor.

### Conduct:

**Phase 1. Introduction (Time allocation - 20 min)**

- Introduce the objectives of the lesson.
- Discuss the importance of ammunition surveillance, stockpile management practices, determination of surplus and effective inspection regimes to ensure maximum safety in ammunition and explosive storage.
- Explore with participants the likelihood and the impact of a serious event when inadequate ammunition surveillance, stock management or poor inspection plans are in place.

**Phase 2. Development**

Stage 1 (Time allocation 50 mins) – Degradation of ammunition and explosives

- Discuss the effects of ageing and degradation of ammunition and explosives and the risks posed to the entire Field Storage Area.
- Discuss the early warnings of expired ammunition during inspections
- Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.
- Discuss the impact of chemical stability on explosives and propellants when subjected to poor climatic conditions or when they have aged beyond serviceable life.

- Emphasise the importance of the shelf life of ammunition and explosives and the need to monitor the age of all stored explosives.

Stage 2 (Time allocation 50 mins) – Surveillance and inspection plans

- Introduce the participants to the purpose of surveillance and in-service proof of their ammunition and explosive stocks and how this is achieved.
- Emphasise the requirements for effective surveillance and in-service proof activities, including the responsibilities of all key personnel involved.
- Outline the frequency of in-service inspections and provide imagery to participants of munitions which are reaching the end of their serviceable life.
- Discuss with the participants how to determine that their stored ammunition and explosives are at the upper age limit and what options are available to them.
- Participants are to be made aware of the critical information to be recorded at each inspection to ensure the effective management of their mission stocks, including the compilation of the ESH Inspection Matrix.

Stage 3 (Time allocation 50 mins) – Participant exercise

- Show exercise instructions from slide 37 and provide a range of images showing ammunition and explosives. Participants work in groups to review images and suggest the surveillance actions they will take in each case, providing rationale for doing so.
- Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- Each group is to review all images and then provide a back brief on one image.

**Phase 3. Consolidation (Time allocation - 10 min)**

- Review Enabling objective and Key Learning Points (see Section 1), drawing out any common themes.
- Look ahead to the next lesson of the course:
  - Range Management.

## Diagrams / Notes:

Slide 1

# Weapons and Ammunition Management in UN Peace Operations

## Ammunition Inspection

**Key Reference Documents for this lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)
- http://data.unsaferguard.org/iatg/en/IATG-07.20-Inspection-ammunition-IATG-V.3.pdf

Slide 2

Objective

Apply inspections to the safe and secure management of ammunition.

**Main idea/objective for slide:**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.8 Apply inspections to the safe and secure management of ammunition.)

What the instructor should cover (in addition to slide content)
By the end of this training session the participant will apply inspections to the safe and secure management of ammunition.

Slide 3

# Lesson overview

- Discuss the Purpose of Surveillance and Proof
- Discuss the Degradation of Explosives and Propellants
- Discuss the determination of ammunition surplus and stock management of an explosive storage site
- Discuss the ESH Inspection Matrix and early warnings of expired ammunition during inspections
- Apply ammunition surveillance procedures to an explosive storage site
- Examine ammunition inspection during UN peacekeeping operations

**<u>Main idea/objective for slide:</u>**
**Introduce the Key Learning Points**

<u>What the instructor should cover (in addition to slide content)</u>

Key Learning Points
2.2.8.1 Discuss the Purpose of Surveillance and Proof
2.2.8.2 Discuss the Degradation of Explosives and Propellants
2.2.8.3 Discuss the determination of Ammunition Surplus
2.2.8.4 Discuss stock management of an explosive storage site
2.2.8.5 Discuss the ESH Inspection Matrix
2.2.8.6 Discuss the early warnings of expired ammunition during inspections
2.2.8.7 Apply ammunition surveillance procedures to an explosive storage site
2.2.8.8 Examine ammunition inspection during UN peacekeeping operations

Slide 4

# The Importance of Ammunition Surveillance

UN Manual on Ammunition Management

CHAPTER 3

Shelf Life of Ammunition

UN Manual on Ammunition Management

CHAPTER 4

Expiration, Replenishment and Disposal of Ammunition

**Phase 1. Introduction (**Time allocation - 20 min**)**

Slide 5

What are the risks when there are poor or no ammunition surveillance and inspection plans?

**<u>Main idea/objective for slide:</u>**
**Ask participants to identify risks when there are poor or no ammunition surveillance and inspection plans**

**<u>What the instructor should cover (in addition to slide content)</u>**

- Explore with participants **the likelihood and the impact** of a serious event when inadequate ammunition surveillance, stock management or poor inspection plans are in place.
- Write ideas on a flipchart

Slide 6

## Why do we need Ammunition Surveillance?

- Ammunition contains high energy material and is designed to be as lethal as possible during its use.
- Ammunition has a shelf life which depends on:
  - Its design.
  - The chemistry of the propellants/explosives.
  - Its ease of deterioration/ decomposition.
- Ammunition deteriorates with age to dangerous levels

T/PCC Leadership must know the Shelf Life of ammunition within their camps

**<u>Main idea/objective for slide:</u>**

- **Discuss the importance of ammunition surveillance to ensure maximum safety in ammunition and explosive storage**

**<u>What the instructor should cover (in addition to slide content)</u>**

**UN Manual of Ammunition Management**

- Ammunition contains high energy material and is designed to be as lethal as possible during its use.
- It is also designed to be as safe as any other equipment during its transportation, handling and operation.
- Ammunition has an assigned shelf life which depends on its design, the chemistry of the propellants/explosives used and is prone to deterioration/ decomposition even under normal storage conditions.

- The quality of ammunition deteriorates with age due to environmental factors, including changes in safety, reliability and effectiveness.
- Accordingly, ammunition has an assigned shelf life, defined as the life of its subsystem with the lowest shelf life under normal conditions of storage.
- However, the operational exposure of ammunition varies, hence functional life may be different.
- It is imperative for mission leadership to understand the shelf life of ammunition in their camps to allow for an overall assessment of risk and replenishment requirements.

Slide 7

## Ammunition Surveillance in UN Missions

**Who:**

- Regular ammunition surveillance is the responsibility of T/PCCs.
- At least one ATO or a technical expert with each contingent.
- SATO shall monitor the surveillance of T/PCCs and confirm such during periodic inspections.

**Main idea/objective for slide:**

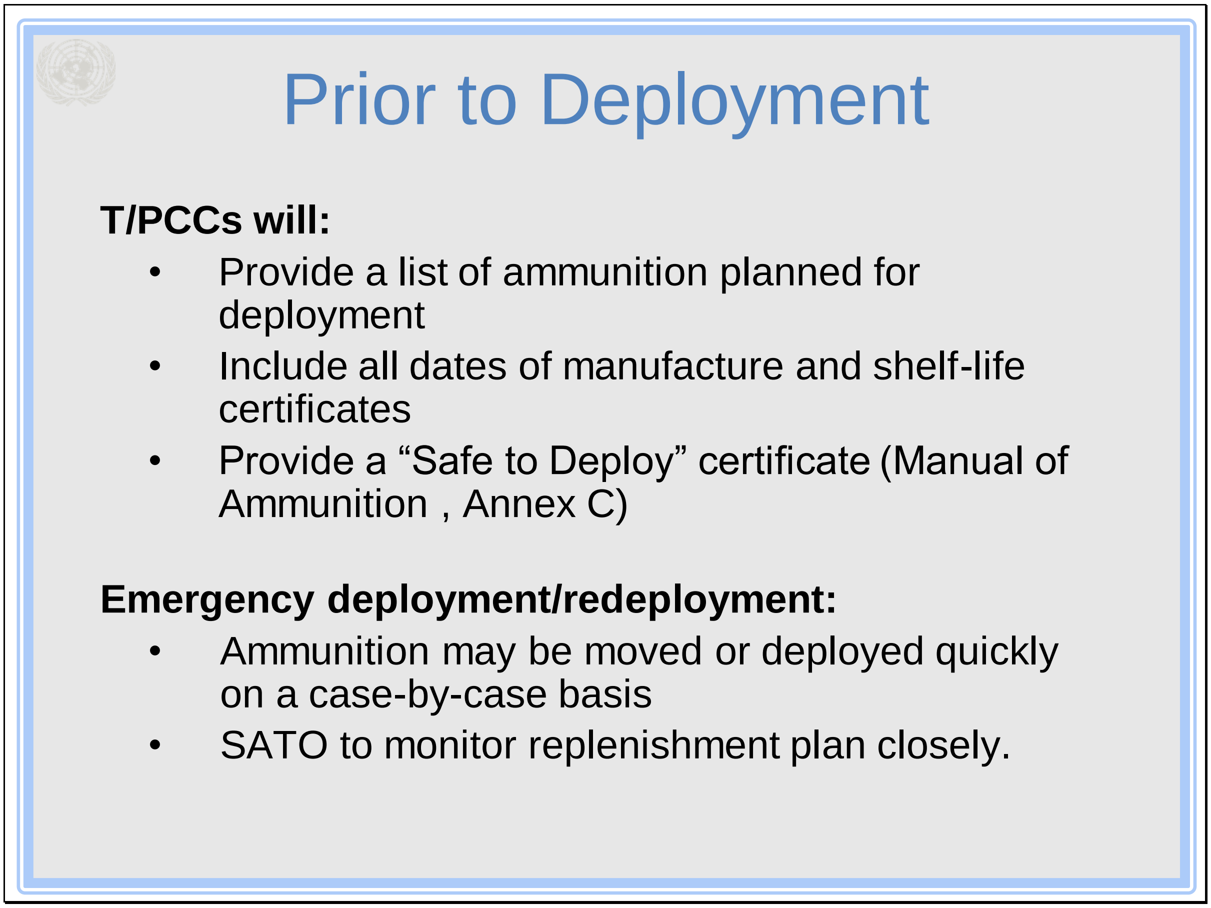
- **Discuss the importance of ammunition surveillance to ensure maximum safety in ammunition and explosive storage**

**What the instructor should cover (in addition to slide content)**

**UN Manual of Ammunition Management**

- In field missions, regular ammunition surveillance is the responsibility of T/PCCs. It requires the deployment of at least one ATO or a technical expert with each contingent as part of the prescribed troop strength.
- Technical support, if needed, shall be provided by the SATO.
- The SATO shall monitor the surveillance of T/PCCs and confirm such during periodic inspections, or as required.

Slide 8



# Prior to Deployment

**T/PCCs will:**

- Provide a list of ammunition planned for deployment
- Include all dates of manufacture and shelf-life certificates
- Provide a “Safe to Deploy” certificate (Manual of Ammunition , Annex C)

**Emergency deployment/redeployment:**

- Ammunition may be moved or deployed quickly on a case-by-case basis
- SATO to monitor replenishment plan closely.

**Main idea/objective for slide:**

- **Discuss ammunition management responsibilities of T/PCCs prior to deployment**

**References/further reading**

**UN Manual of Ammunition Management**

- Prior to deployment, T/PCCs must provide a list of ammunition planned for deployment along with the date of manufacture and remaining shelf life.
- The PDV Team shall confirm the remaining shelf life and condition of ammunition in accordance with these guidelines.
- T/PCCs are to provide ‘safe to deploy’ certificates as per Form IATG 04.10, Annex C during PDV.

- In case of redeployment from one mission to another, and emergency deployment where T/PCCs might have ammunition which does not meet the above criteria, exceptions may be provided to deploy it on a case-by-case basis.
- In these cases, T/PCCs may be allowed to deploy with existing ammunition on the condition that they replace it as soon as possible.
- The replenishment plan for such ammunition will be monitored by the SATO during the COE operational readiness inspections.

Slide 9

## Shelf-Life of Ammunition

- Provided by the manufacturer.
- Is the expiration date that will be adhered to by all T/PCCs.
- T/PCCs are to provide adequate storage conditions to avoid the reduction in shelf life due to degradation.
- SATO can deem the ammunition unserviceable, if:
  - T/PCCs do not have the Shelf-Life Certificate.
  - The ammunition has signs of physical deterioration.

**Main idea/objective for slide:**

- **Emphasise the importance of the shelf life of ammunition and explosives and the need to monitor the age of all stored explosives.**

**What the instructor should cover (in addition to slide content)**

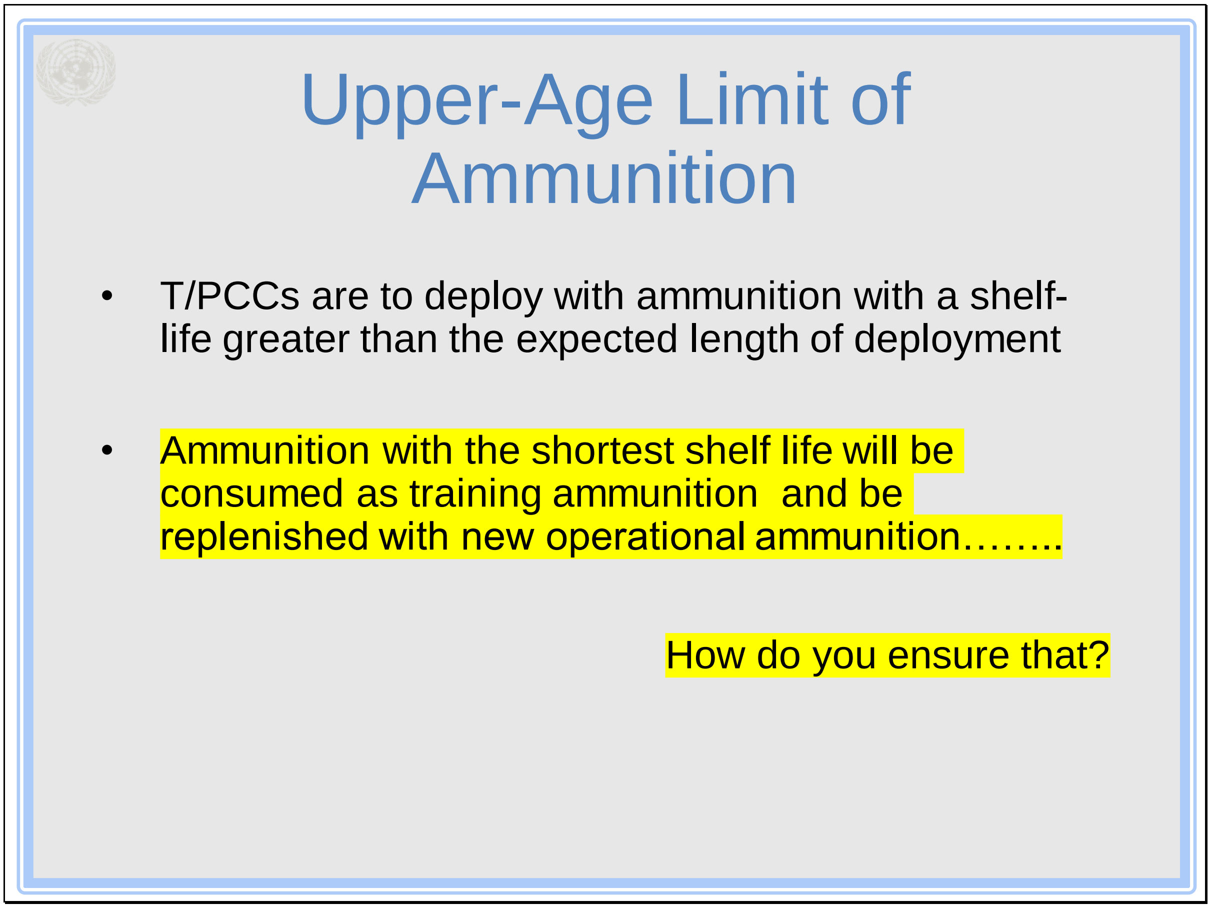
Ask the participants how they can find out about the shelf life of their service ammunition – who can they ask?

**References/further reading**

**UN Manual of Ammunition Management**

- The shelf life of ammunition is provided by the manufacturer.
- T/PCCs shall provide the date of manufacture to ascertain the balance of ammunition shelf life.
- This should be provided during the PDV and on deployment.

- The shelf life of the ammunition stored under ideal conditions (specified by the manufacturer) shall be considered the shelf life as stated by its manufacturer.
- The T/PCCs are to make every effort to provide the ammunition containers with adequate temperature and humidity control to avoid reduction in shelf life due to climatic conditions.
- When such measures are not provided, the T/PCC must conduct regular tests of their ammunition and provide shelf life certificates.
- When the T/PCC fails to provide shelf life certificates before the ammunition's expiration, the mission SATO can declare the ammunition unserviceable.
- The SATO may declare any ammunition unserviceable based on the physical deterioration signs.



## Upper-Age Limit of Ammunition

- T/PCCs are to deploy with ammunition with a shelf-life greater than the expected length of deployment
- Ammunition with the shortest shelf life will be consumed as training ammunition and be replenished with new operational ammunition……..

How do you ensure that?

**Main idea/objective for slide:**

- **Emphasise the importance of the shelf life of ammunition and explosives and the need to monitor the age of all stored explosives.**

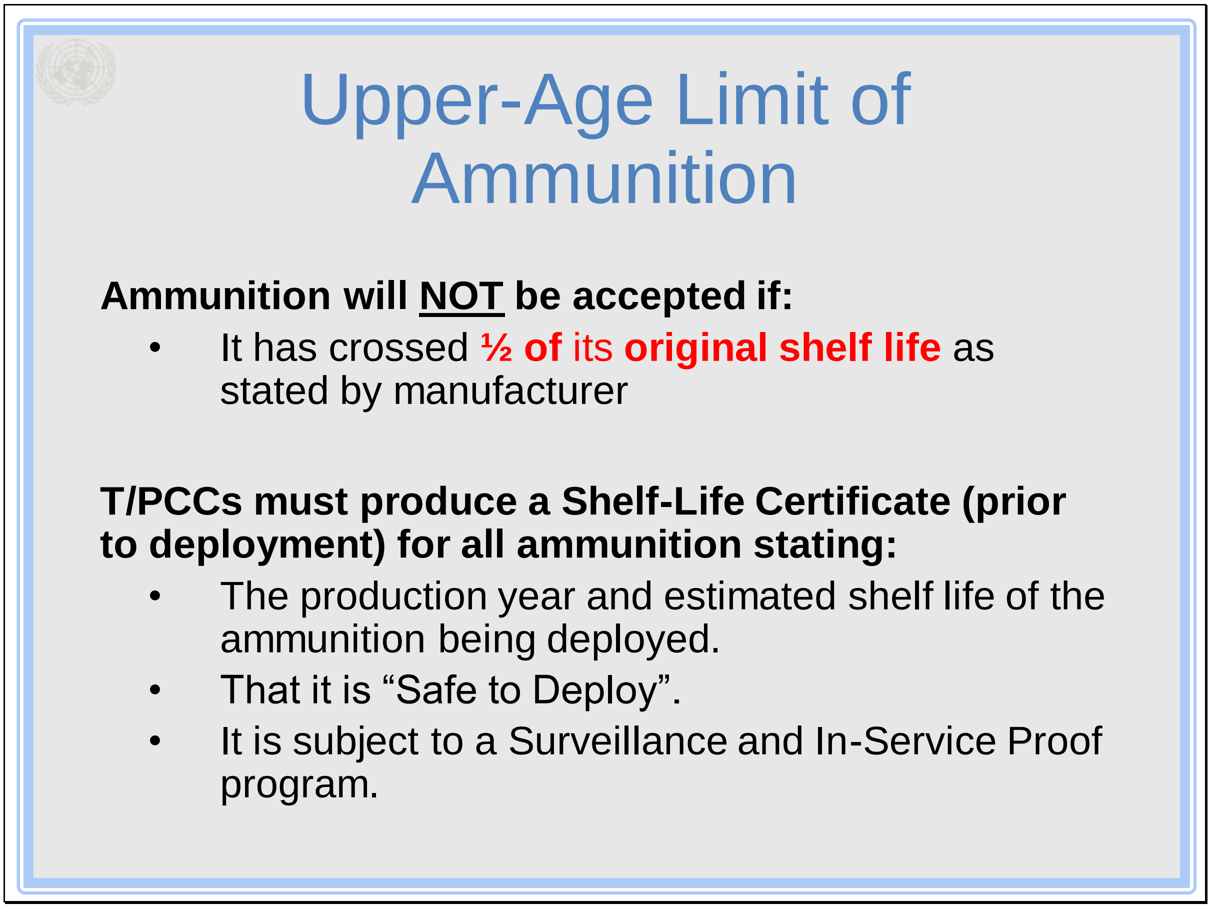
**References/further reading**

**UN Manual of Ammunition Management**

- T/PCCs are supposed to deploy to the mission with ammunition with an expected life in excess of the anticipated length of deployment as per COE Manual A/72/288, Chapter 3, Annex A, paragraph 31.
- It is necessary to fix the upper age limit of ammunition being deployed in the mission area assuming that the ammunition was stored under ideal conditions by the T/PCCs or the conditions otherwise specified by the T/PCC to avoid the untimely disposal of shelf life expired ammunition.

- Under ideal conditions, ammunition with the shortest shelf life will be consumed as training ammunition for standard training and be replenished with new operational ammunition.

Slide 11



## Upper-Age Limit of Ammunition

**Ammunition will <u>NOT</u> be accepted if:**

- It has crossed **½ of** its **original shelf life** as stated by manufacturer

**T/PCCs must produce a Shelf-Life Certificate (prior to deployment) for all ammunition stating:**

- The production year and estimated shelf life of the ammunition being deployed.
- That it is "Safe to Deploy".
- It is subject to a Surveillance and In-Service Proof program.

**<u>Main idea/objective for slide:</u>**

- **Emphasise the importance of the shelf life of ammunition and explosives and the need to monitor the age of all stored explosives.**

**<u>What the instructor should cover (in addition to slide content)</u>**

Put strong emphasis on the rule that ammunition that has less than half of its shelf life left must not be sent to a UN mission.
The "Safe To Deploy' Form, must be included for all ammunition natures.

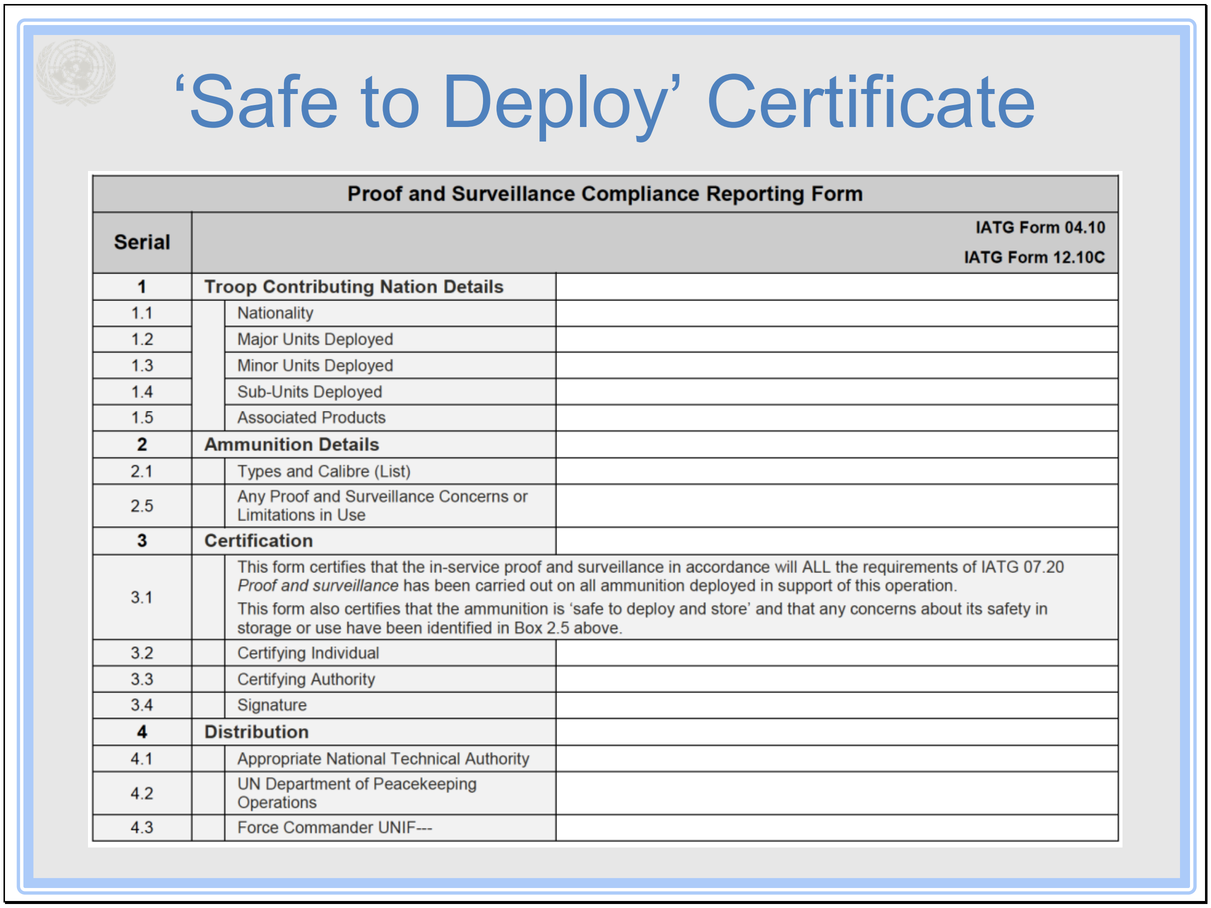
**<u>References/further reading</u>**

**UN Manual of Ammunition Management**

- No ammunition will be accepted for deployment which has crossed ½ **of** its **original shelf life** as stated by manufacturer.

- T/PCCs shall produce a manufacturer's certificate stating the production year and estimated shelf life of the ammunition being deployed in the mission area.
- T/PCCs shall certify that all ammunition deployed in support of national contingents is "safe to deploy" and is subject to a surveillance and proof program fully in compliance with the requirements of IATG 07.20 Surveillance and Proof as per IATG 04.10.
- The Form at IATG 04.10 Temporary Storage, Annex C which shall be completed and distributed as indicated on the form.

Slide 12



## ‘Safe to Deploy’ Certificate

| Proof and Surveillance Compliance Reporting Form | | |
|---|---|---|
| **Serial** | | **IATG Form 04.10**<br>**IATG Form 12.10C** |
| **1** | **Troop Contributing Nation Details** | |
| 1.1 | Nationality | |
| 1.2 | Major Units Deployed | |
| 1.3 | Minor Units Deployed | |
| 1.4 | Sub-Units Deployed | |
| 1.5 | Associated Products | |
| **2** | **Ammunition Details** | |
| 2.1 | Types and Calibre (List) | |
| 2.5 | Any Proof and Surveillance Concerns or Limitations in Use | |
| **3** | **Certification** | |
| 3.1 | This form certifies that the in-service proof and surveillance in accordance will ALL the requirements of IATG 07.20 *Proof and surveillance* has been carried out on all ammunition deployed in support of this operation.<br>This form also certifies that the ammunition is ‘safe to deploy and store’ and that any concerns about its safety in storage or use have been identified in Box 2.5 above. | |
| 3.2 | Certifying Individual | |
| 3.3 | Certifying Authority | |
| 3.4 | Signature | |
| **4** | **Distribution** | |
| 4.1 | Appropriate National Technical Authority | |
| 4.2 | UN Department of Peacekeeping Operations | |
| 4.3 | Force Commander UNIF--- | |

**Main idea/objective for slide:**

- **Discuss the early warnings of expired ammunition during inspections**

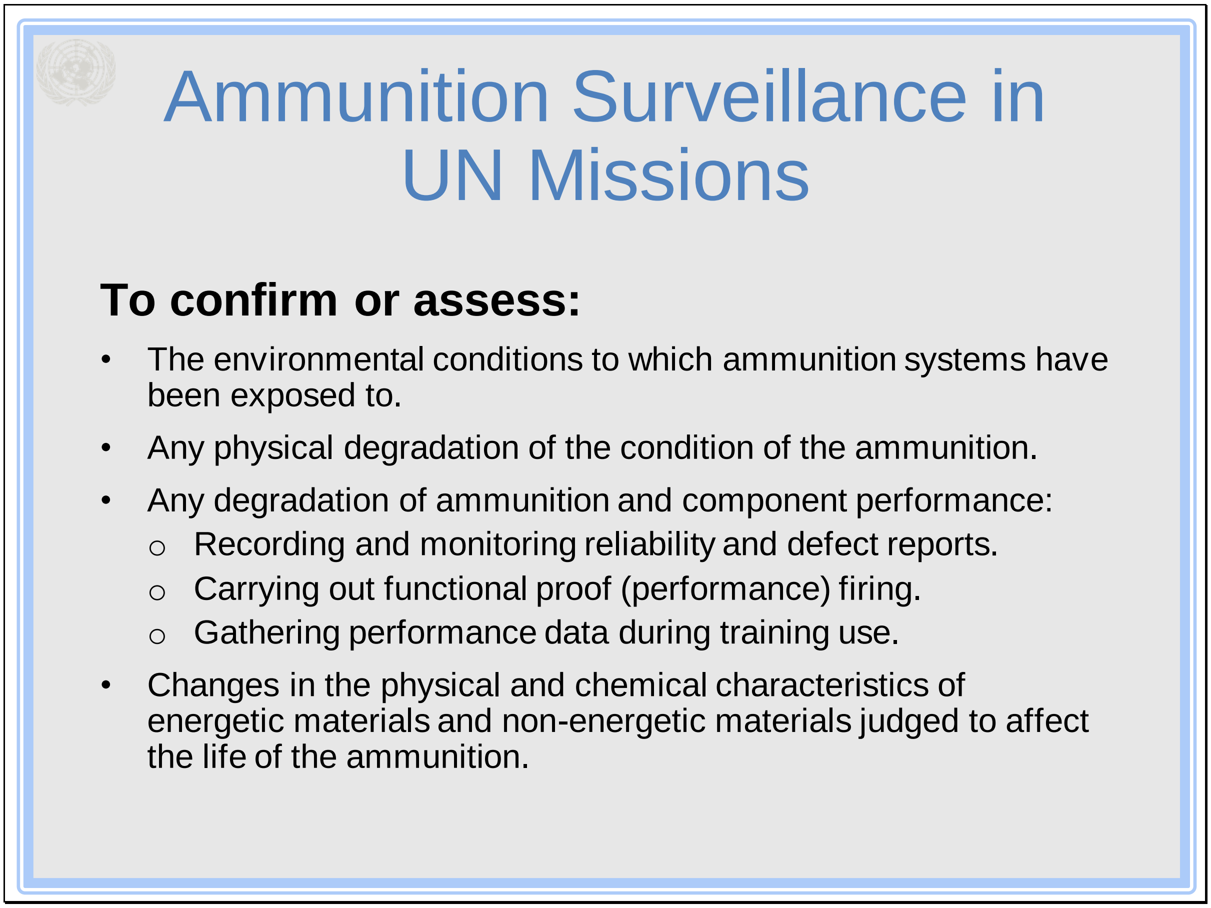
**What the instructor should cover (in addition to slide content)**

Give this Certificate as a Hand-out to participants

**References/further reading**

**IATG 04.10 Temporary Storage**

- Annex C



## Ammunition Surveillance in UN Missions

**To confirm or assess:**

- The environmental conditions to which ammunition systems have been exposed to.
- Any physical degradation of the condition of the ammunition.
- Any degradation of ammunition and component performance:
  - Recording and monitoring reliability and defect reports.
  - Carrying out functional proof (performance) firing.
  - Gathering performance data during training use.
- Changes in the physical and chemical characteristics of energetic materials and non-energetic materials judged to affect the life of the ammunition.

**Main idea/objective for slide:**

- **Discuss the importance of ammunition surveillance to ensure maximum safety in ammunition and explosive storage**

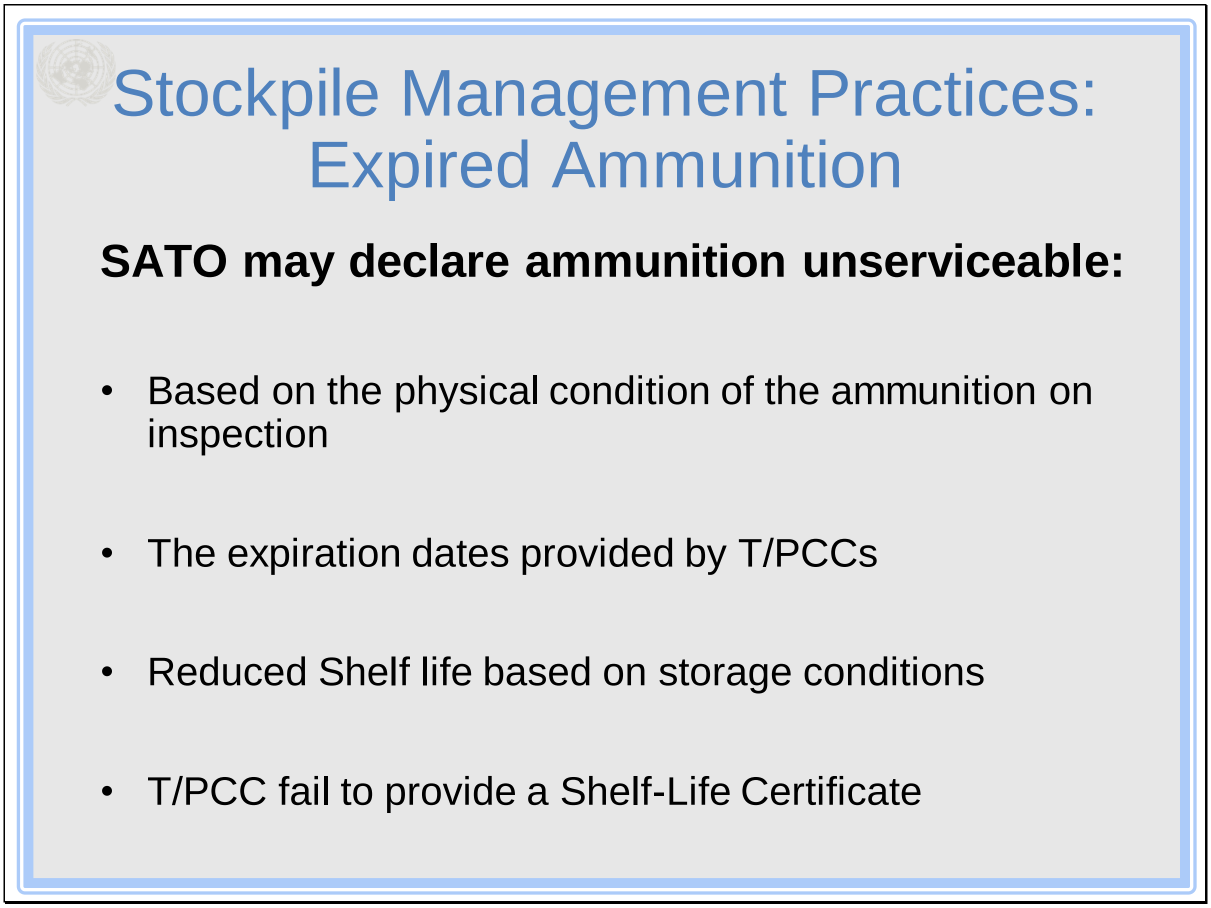
**What the instructor should cover (in addition to slide content)**

**UN Manual of Ammunition Management**

- T/PCCs shall regularly conduct surveillance to confirm or assess:
  - The environmental conditions to which ammunition systems have been exposed during their storage and deployment to date. This information can be used to confirm either ammunition stock records or data from environmental data logs;
  - Any physical degradation of the condition of the ammunition;

  - Any degradation of ammunition and component performance, which is possible through:
  - Recording and monitoring reliability and defect reports concerning in-service usage of the ammunition system;
  - Carrying out functional proof (performance) firing if facilities are available; and/or,
  - Gathering performance data during training use, if ranges are available.
  - Changes in the physical and chemical characteristics of energetic materials and non-energetic materials judged to affect the life of the ammunition, when a laboratory is available, or a field test is possible
- The design of the ammunition surveillance program should be determined by the complexity of the ammunition and the likely failure mechanisms. Analysis of these factors should then determine the types and frequency of inspections and tests that are required to make assessments of future in-service /shelf life.

Slide 14



## Stockpile Management Practices: Expired Ammunition

**SATO may declare ammunition unserviceable:**

- Based on the physical condition of the ammunition on inspection
- The expiration dates provided by T/PCCs
- Reduced Shelf life based on storage conditions
- T/PCC fail to provide a Shelf-Life Certificate

**Main idea/objective for slide:**

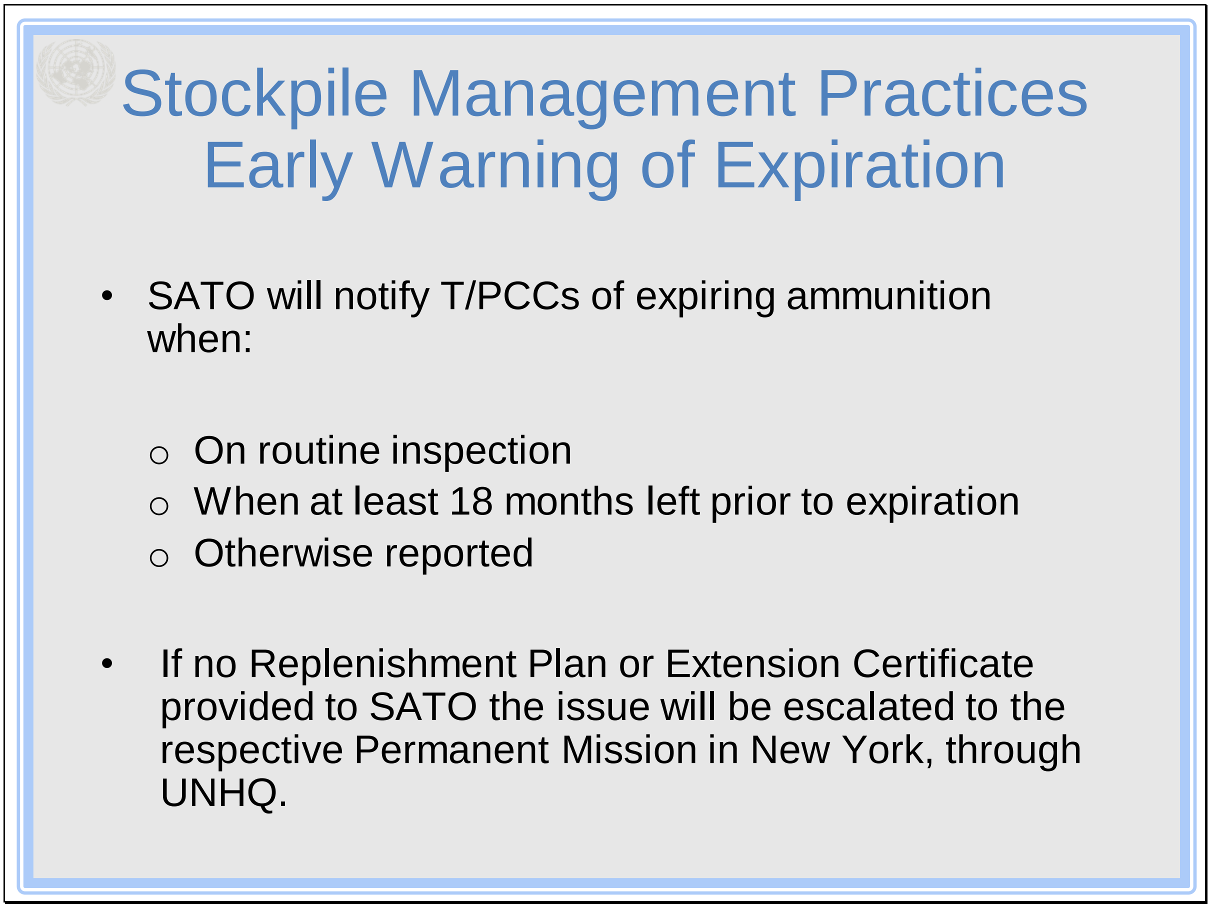
- **Discuss the importance of stockpile management practices to ensure maximum safety in ammunition and explosive storage**

**What the instructor should cover (in addition to slide content)**

**UN Manual of Ammunition Management**

- As described in Chapter 3, the Mission **S**ATO or appropriate representatives will confirm the expiration of ammunition shelf life during the inspection and can declare it unserviceable based on its physical condition, the expiration dates, reduced shelf life based on storage conditions or when T/PCCs fail to provide the certificate of extended or balance of shelf life.
- T/PCCs are responsible to plan and process for the replenishment of ammunition nearing expiration well in advance.

- Upon receiving the warning of ammunition proceeding towards expiration, T/PCCs may request a shelf life extension certificate from their national technical authority following the process described in IATG 07.20 or may request the replenishment of said ammunition.
- This process of shelf life extension or replenishment must be completed before the expiration of the ammunition and its subsequent disposal.



## Stockpile Management Practices Early Warning of Expiration

- SATO will notify T/PCCs of expiring ammunition when:
    - On routine inspection
    - When at least 18 months left prior to expiration
    - Otherwise reported
- If no Replenishment Plan or Extension Certificate provided to SATO the issue will be escalated to the respective Permanent Mission in New York, through UNHQ.

**Main idea/objective for slide:**

- **Discuss the importance of stockpile management practices to ensure maximum safety in ammunition and explosive storage**

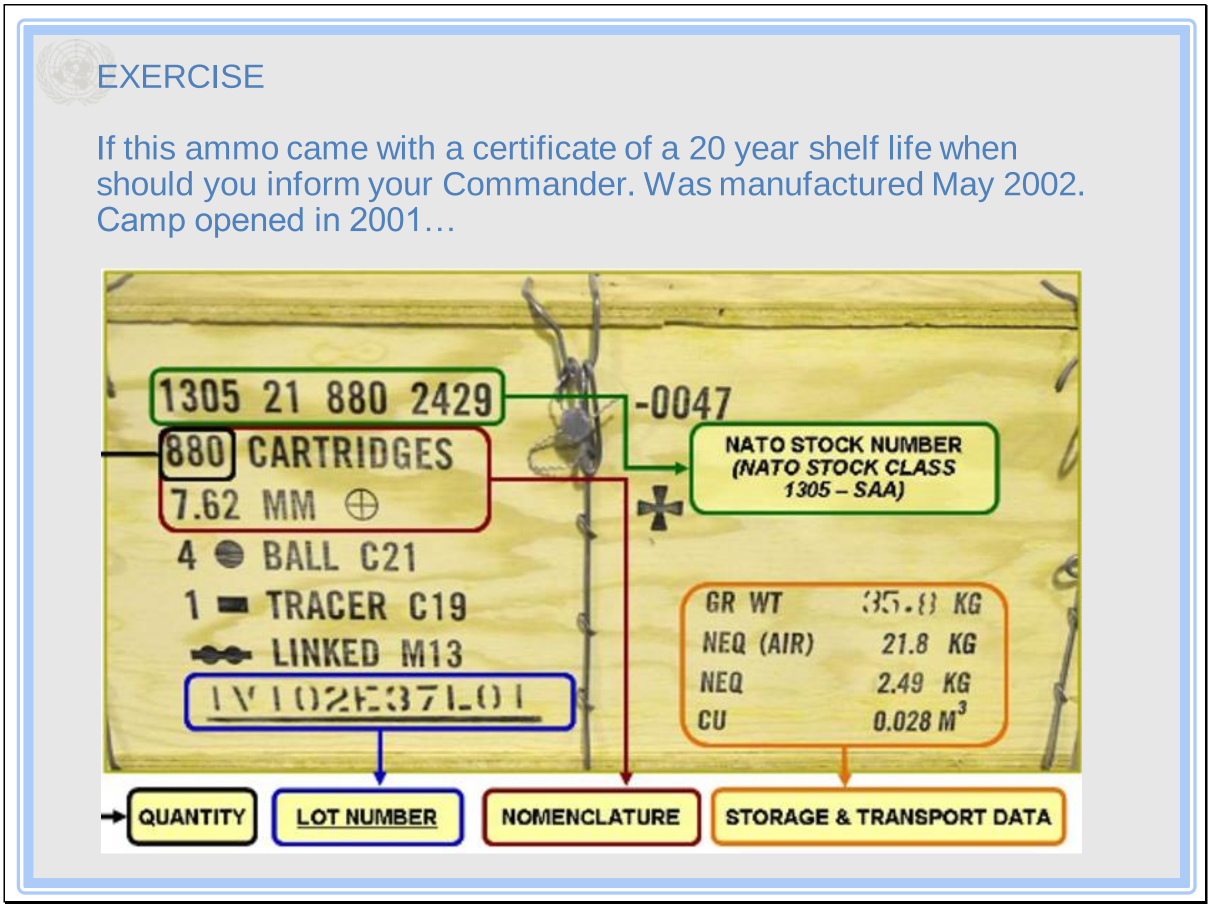
**What the instructor should cover (in addition to slide content)**

**UN Manual of Ammunition Management**

- As per mission-specific guidelines (based on this manual) the shelf life of ammunition will be determined by the mission SATO.
- Accordingly, when at least 18 months are left before expiration of any type of ammunition, as identified during inspection or otherwise reported, T/PCCs will be notified about the state of the expiring ammunition through their contingent commanders or the contingent ATOs/technical experts.

- If no action is taken by the T/PCC for the replenishment of such ammunition, or provision of extension of shelf life certificate within six months, the mission will request UNHQ to raise this issue with the respective Permanent Mission in New York.
- Upon confirmation of expiring ammunition, T/PCCs will obtain clearance from the mission SATO/COE Unit for processing its replenishment.
- In this case, the SATO/COE Unit will check the records for its initial deployment and confirm that the ammunition was deployed in the mission with considerable shelf life remaining as specified in these guidelines and has lost its shelf life being deployed in the mission area.
- Thereafter, the Force/Police HQ will recommend the ammunition for replenishment.
- If the T/PCCs are unable to provide the shelf life extension certificate for the ammunition which has expired (as specified by the manufacturer, this manual or as otherwise instructed by appropriate authority, the SATO or his/her appropriate representative will declare the ammunition unserviceable according to COE procedures regardless of its physical condition.
- Weapons without serviceable ammunition will also be declared unserviceable until the replenishment is completed.

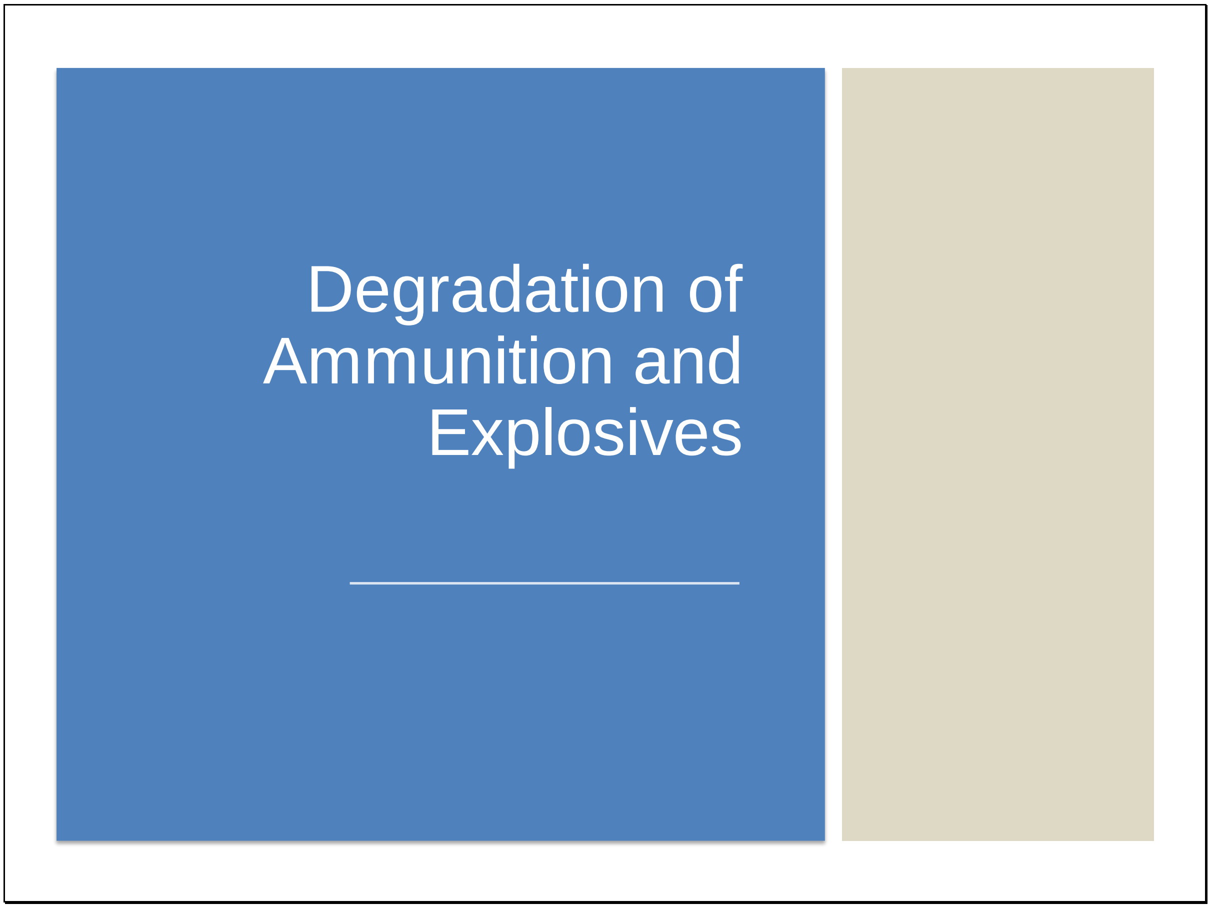
Slide 16



EXERCISE

If this ammo came with a certificate of a 20 year shelf life when should you inform your Commander. Was manufactured May 2002. Camp opened in 2001…

Slide 17

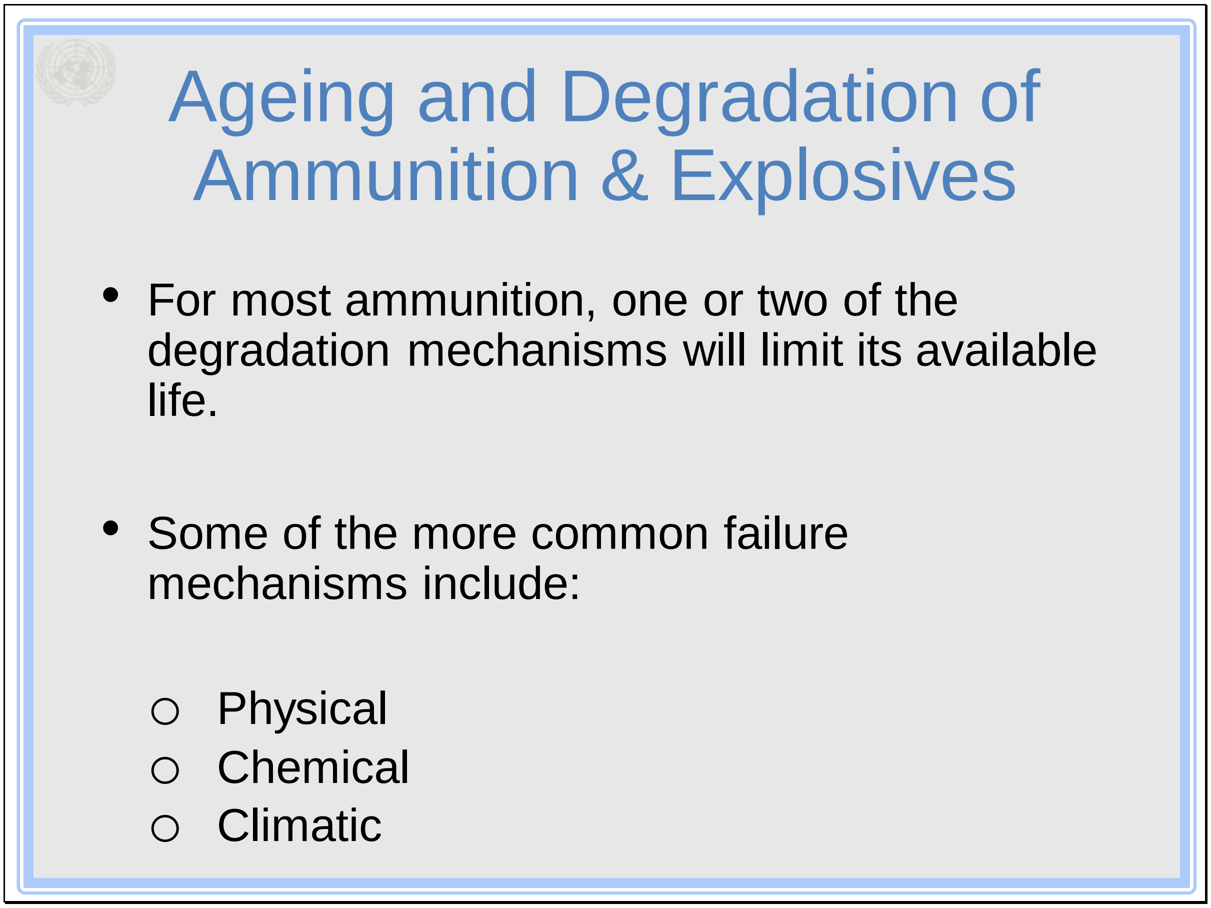


Degradation of Ammunition and Explosives

**Phase 2. Development (**Time allocation - 150 min**)**

Stage 1 (Time allocation 50 mins) – Degradation of ammunition and explosives

Slide 18



## Ageing and Degradation of Ammunition & Explosives

- For most ammunition, one or two of the degradation mechanisms will limit its available life.
- Some of the more common failure mechanisms include:
  - Physical
  - Chemical
  - Climatic

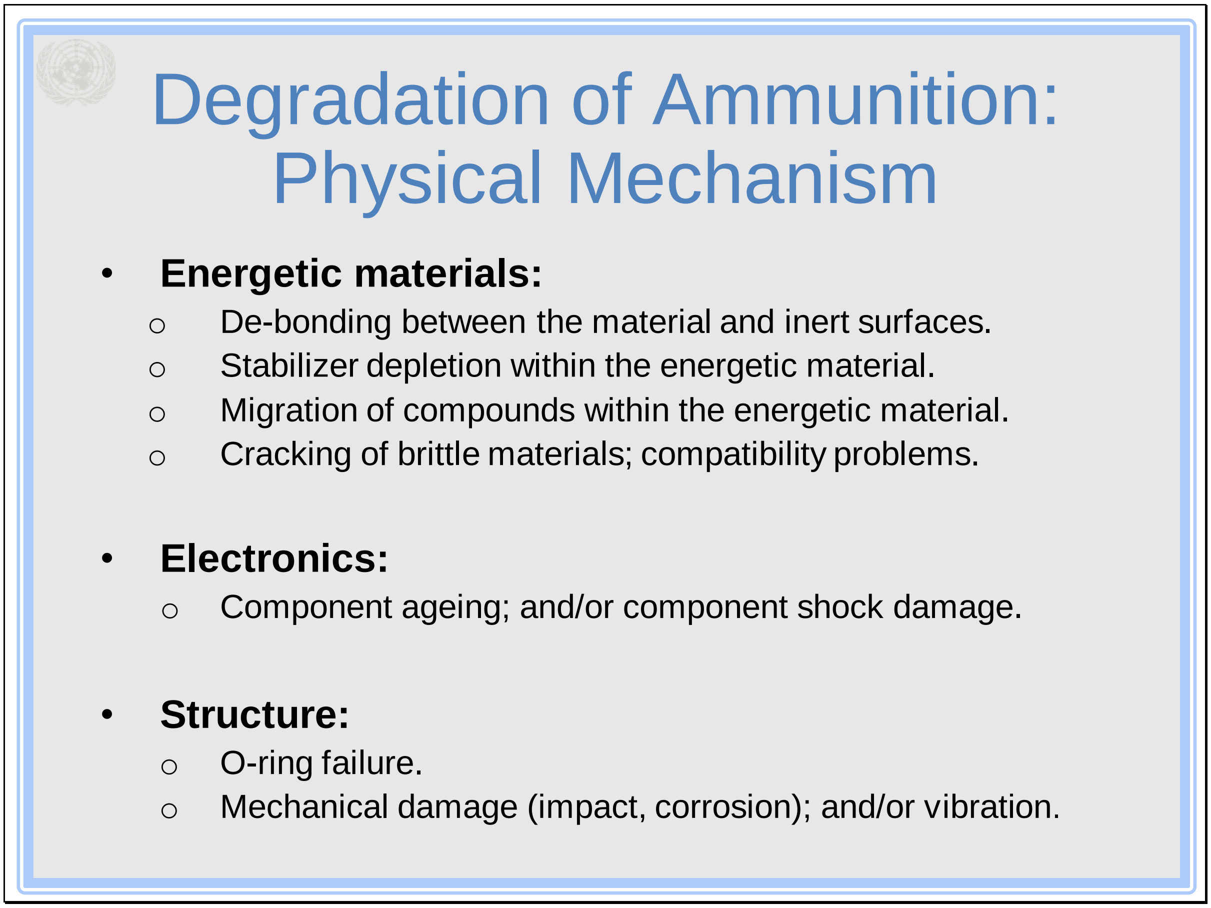
**Main idea/objective for slide:**

- **Discuss the effects of ageing and degradation of ammunition and explosives and the risks posed to the entire Field Storage Area.**

What the instructor should cover (in addition to slide content)

Ask the participant questions to clarify they understand the difference between Physical, Chemical and Climatic failure

Slide 19



# Degradation of Ammunition: Physical Mechanism

- **Energetic materials:**
    - De-bonding between the material and inert surfaces.
    - Stabilizer depletion within the energetic material.
    - Migration of compounds within the energetic material.
    - Cracking of brittle materials; compatibility problems.

- **Electronics:**
    - Component ageing; and/or component shock damage.

- **Structure:**
    - O-ring failure.
    - Mechanical damage (impact, corrosion); and/or vibration.

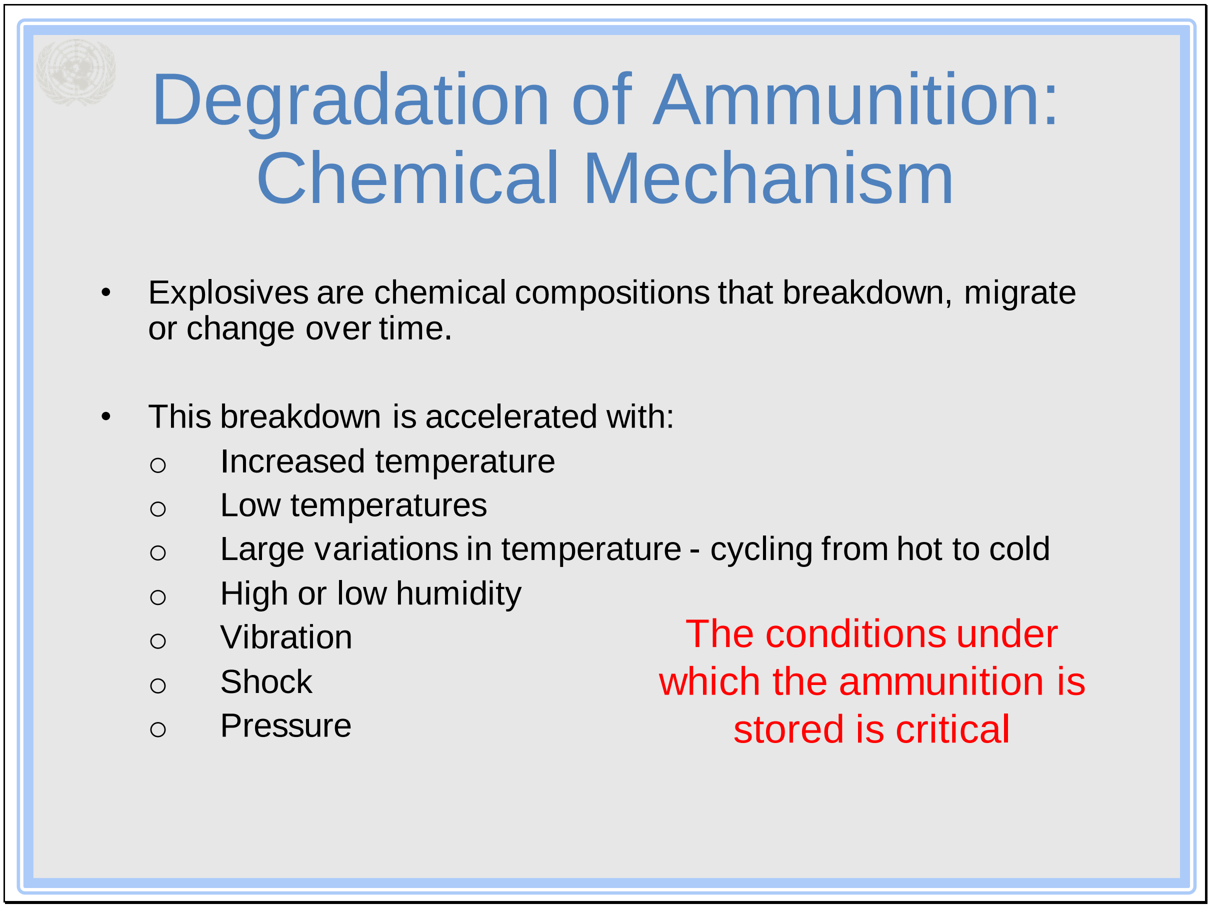
**<u>Main idea/objective for slide:</u>**

- **Discuss the effects of ageing and degradation of ammunition and explosives and the risks posed to the entire Field Storage Area.**

<u>What the instructor should cover (in addition to slide content)</u>

Discuss the early warnings of expired ammunition during inspections

Slide 20



# Degradation of Ammunition: Chemical Mechanism

- Explosives are chemical compositions that breakdown, migrate or change over time.
- This breakdown is accelerated with:
  - Increased temperature
  - Low temperatures
  - Large variations in temperature - cycling from hot to cold
  - High or low humidity
  - Vibration
  - Shock
  - Pressure

The conditions under which the ammunition is stored is critical

**<u>Main idea/objective for slide:</u>**

**Discuss the impact of chemical stability on explosives and propellants when subjected to poor climatic conditions or when they have aged beyond serviceable life.**

<u>What the instructor should cover (in addition to slide content)</u>

Before showing this slide, ask the participants what types of activity can accelerate the degradation of ammunition

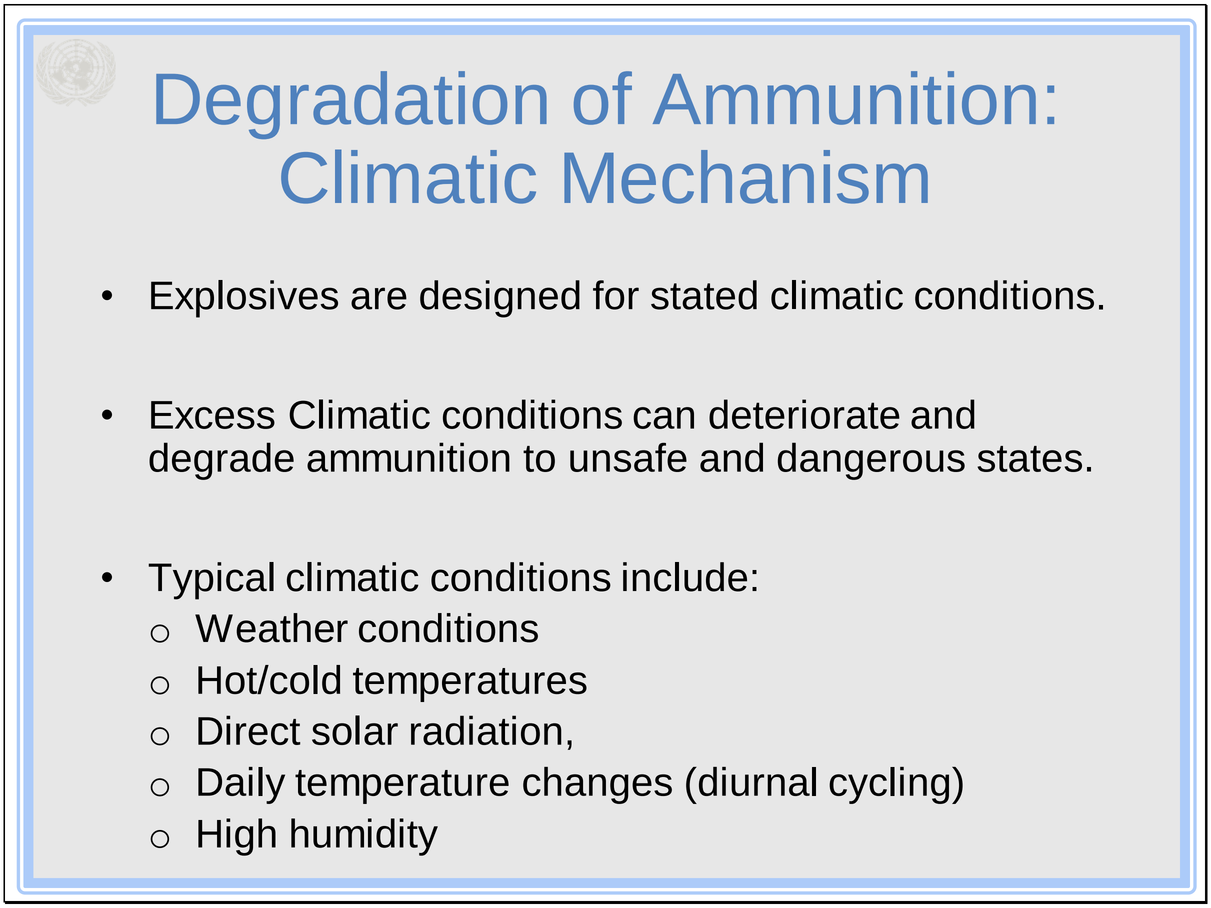
<u>References/further reading</u>

**UN Manual of Ammunition Management**

- In addition to the physical damage caused by shock and vibration, ammunition also degrades chemically.

- The energetic items that cause the explosive effect are invariably of organic chemical composition and, in common with all other chemical compositions' breakdown, migrate or change over time.
- This change is normally accelerated with increased temperature.
- Degradation is be hastened by: large variations in temperature (i.e., cycling from hot to cold); low temperatures; high or low humidity; vibration; shock; and/or pressure.
- The conditions under which ammunition is stored, maintained and transported during its normal in-service life will eventually have an impact on the ammunition and a critical failure mode will be reached, which will be the service-life limiting factor

Slide 21



# Degradation of Ammunition: Climatic Mechanism

- Explosives are designed for stated climatic conditions.
- Excess Climatic conditions can deteriorate and degrade ammunition to unsafe and dangerous states.
- Typical climatic conditions include:
  - Weather conditions
  - Hot/cold temperatures
  - Direct solar radiation,
  - Daily temperature changes (diurnal cycling)
  - High humidity

**Main idea/objective for slide:**
**Discuss the impact of chemical stability on explosives and propellants when subjected to poor climatic conditions or when they have aged beyond serviceable life.**

What the instructor should cover (in addition to slide content)
Before showing this slide, ask the participants what climatic conditions can accelerate the degradation of ammunition

References/further reading
**UN Manual of Ammunition Management**

- The effects of weather, hot/cold temperatures, direct solar radiation, daily temperature changes (diurnal cycling) and high humidity may rapidly degrade the performance and safety of explosives.
- Ammunition is designed for use under stated climatic conditions, and its service life will be significantly reduced if it is stored under climatic conditions for which it was not designed.
- In cases of severe climatic change, ammunition may rapidly become unserviceable and dangerous to use.

Slide 22

## Examples of Ammunition

**<u>Main idea/objective for slide:</u>**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**<u>What the instructor should cover (in addition to slide content)</u>**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

Slide 23

## Examples of Ammunition

**<u>Main idea/objective for slide:</u>**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**<u>What the instructor should cover (in addition to slide content)</u>**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

## Examples of Ammunition

**Main idea/objective for slide:**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**What the instructor should cover (in addition to slide content)**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

Slide 25

Examples of Ammunition

**Main idea/objective for slide:**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**What the instructor should cover (in addition to slide content)**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

Slide 26

Examples of Ammunition

**Main idea/objective for slide:**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**What the instructor should cover (in addition to slide content)**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

# Examples of Ammunition

**Main idea/objective for slide:**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**What the instructor should cover (in addition to slide content)**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

Slide 28

# Examples of Ammunition

**Main idea/objective for slide:**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**What the instructor should cover (in addition to slide content)**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

Examples of Ammunition

**Main idea/objective for slide:**

- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**What the instructor should cover (in addition to slide content)**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

## Examples of Expired Ammunition

**Main idea/objective for slide:**

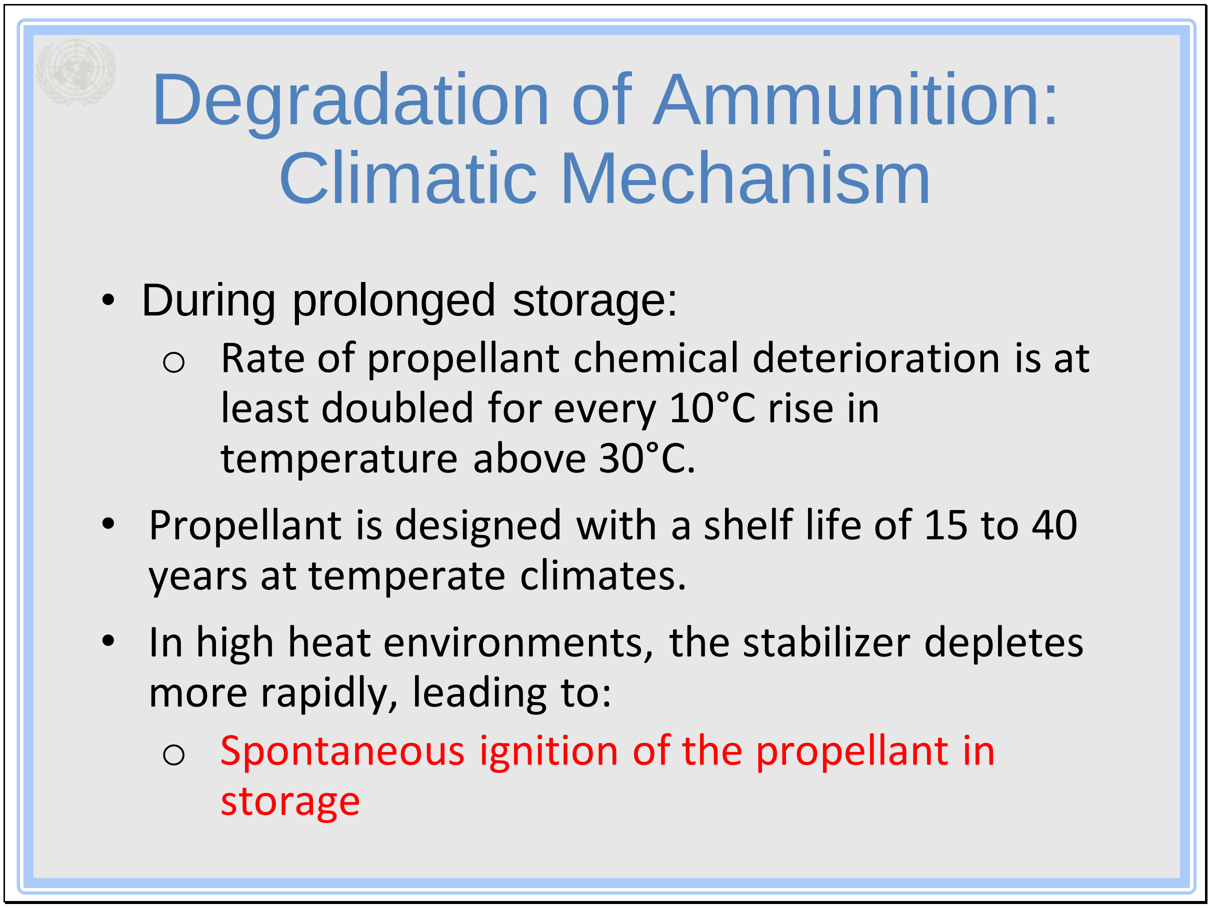
- **Using relevant imagery, provide the participants with examples of ammunition and explosives which have been degraded to unsafe conditions whether through age or other environmental factors.**

**What the instructor should cover (in addition to slide content)**

Using the images provided, go through each image and ask the participants to comment on:

- What signs of degradation can they see?
- What do they believe caused this degradation?
- What is the most likely outcome if this is not rectified

Slide 31



## Degradation of Ammunition: Climatic Mechanism

- During prolonged storage:
  - Rate of propellant chemical deterioration is at least doubled for every 10°C rise in temperature above 30°C.
- Propellant is designed with a shelf life of 15 to 40 years at temperate climates.
- In high heat environments, the stabilizer depletes more rapidly, leading to:
  - Spontaneous ignition of the propellant in storage

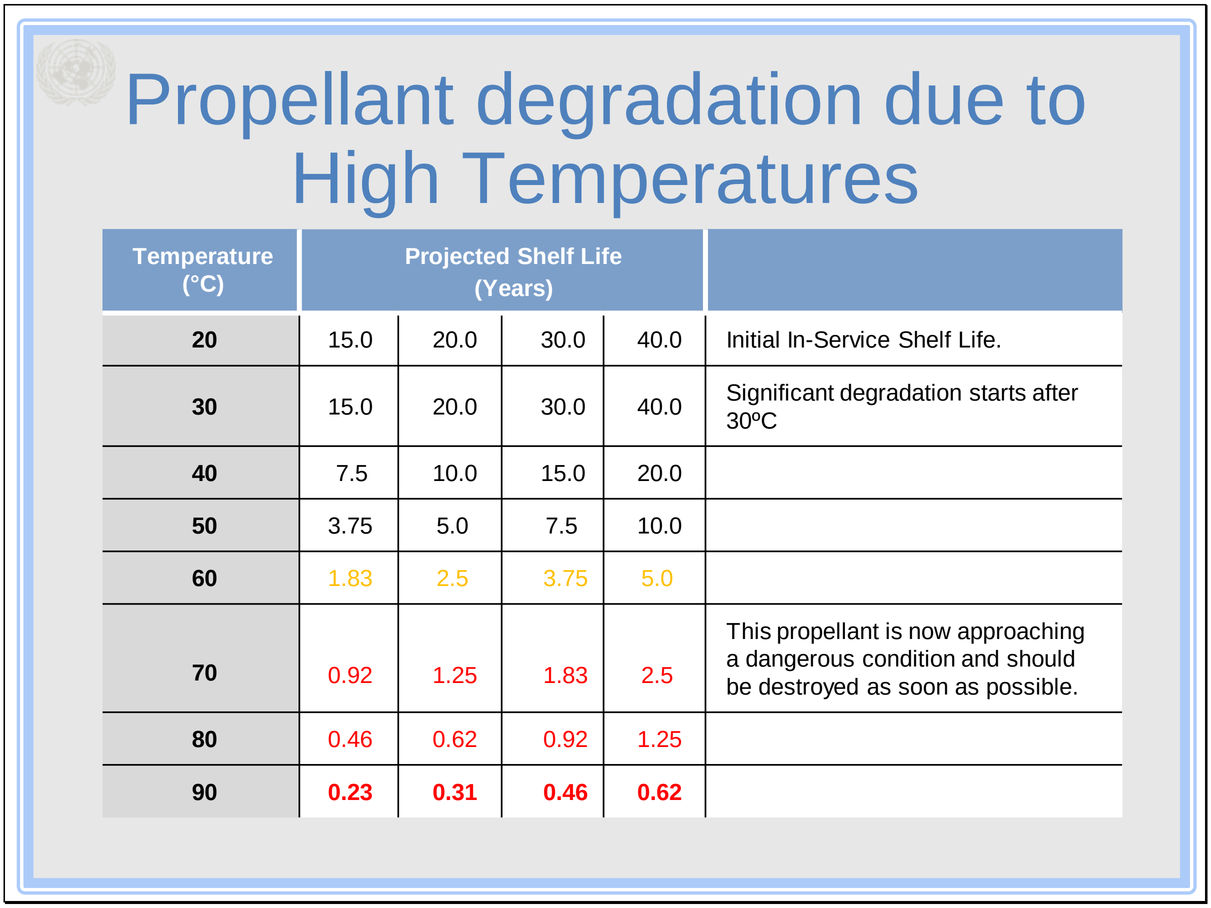
**Main idea/objective for slide:**
**Discuss the impact of chemical stability on explosives and propellants when subjected to poor climatic conditions or when they have aged beyond serviceable life.**

**What the instructor should cover (in addition to slide content)**
Discuss why propellant is more prone to this type of degradation.
Put heavy emphasis on the potential for auto-ignition – ensure the participants understand the consequences and possible likelihood of such an event

**References/further reading**
**UN Manual of Ammunition Management**

- During prolonged periods of storage, the rate of propellant chemical deterioration is approximately doubled for every 10°C rise in temperature above 30°C.
- Most propellants, dependent on design, have a shelf life of at least 15 to 40 years when stored at a constant 30°C, and will last much longer in temperate climates.
- In high heat environments the stabilizer is depleted far quicker and the probability of spontaneous combustion due to autocatalytic ignition becomes much higher.
- If a T/PCC is unable to provide constant storage conditions below 30°C or provide specific in-service proof and surveillance details, the mission SATO can reduce the accepted shelf life according to IATG 7.10 Para 7.3.
- Necessary early replenishment of ammunition is a national responsibility.

Slide 32



# Propellant degradation due to High Temperatures

| Temperature (°C) | Projected Shelf Life (Years) | | | | |
|---|---|---|---|---|---|
| **20** | 15.0 | 20.0 | 30.0 | 40.0 | Initial In-Service Shelf Life. |
| **30** | 15.0 | 20.0 | 30.0 | 40.0 | Significant degradation starts after 30ºC |
| **40** | 7.5 | 10.0 | 15.0 | 20.0 | |
| **50** | 3.75 | 5.0 | 7.5 | 10.0 | |
| **60** | 1.83 | 2.5 | 3.75 | 5.0 | |
| **70** | 0.92 | 1.25 | 1.83 | 2.5 | This propellant is now approaching a dangerous condition and should be destroyed as soon as possible. |
| **80** | 0.46 | 0.62 | 0.92 | 1.25 | |
| **90** | **0.23** | **0.31** | **0.46** | **0.62** | |

**<u>Main idea/objective for slide:</u>**
**Discuss the impact of chemical stability on explosives and propellants when subjected to poor climatic conditions or when they have aged beyond serviceable life.**

**<u>What the instructor should cover (in addition to slide content)</u>**
Provide this table as a Hand-out to participants

**<u>References/further reading</u>**
**IATG 04.10 – Temporary Storage**

- Clause 8.1 indicated that ammunition could theoretically reach external surface temperatures of 101ºC in the Middle East, although internal temperatures would be substantially less.

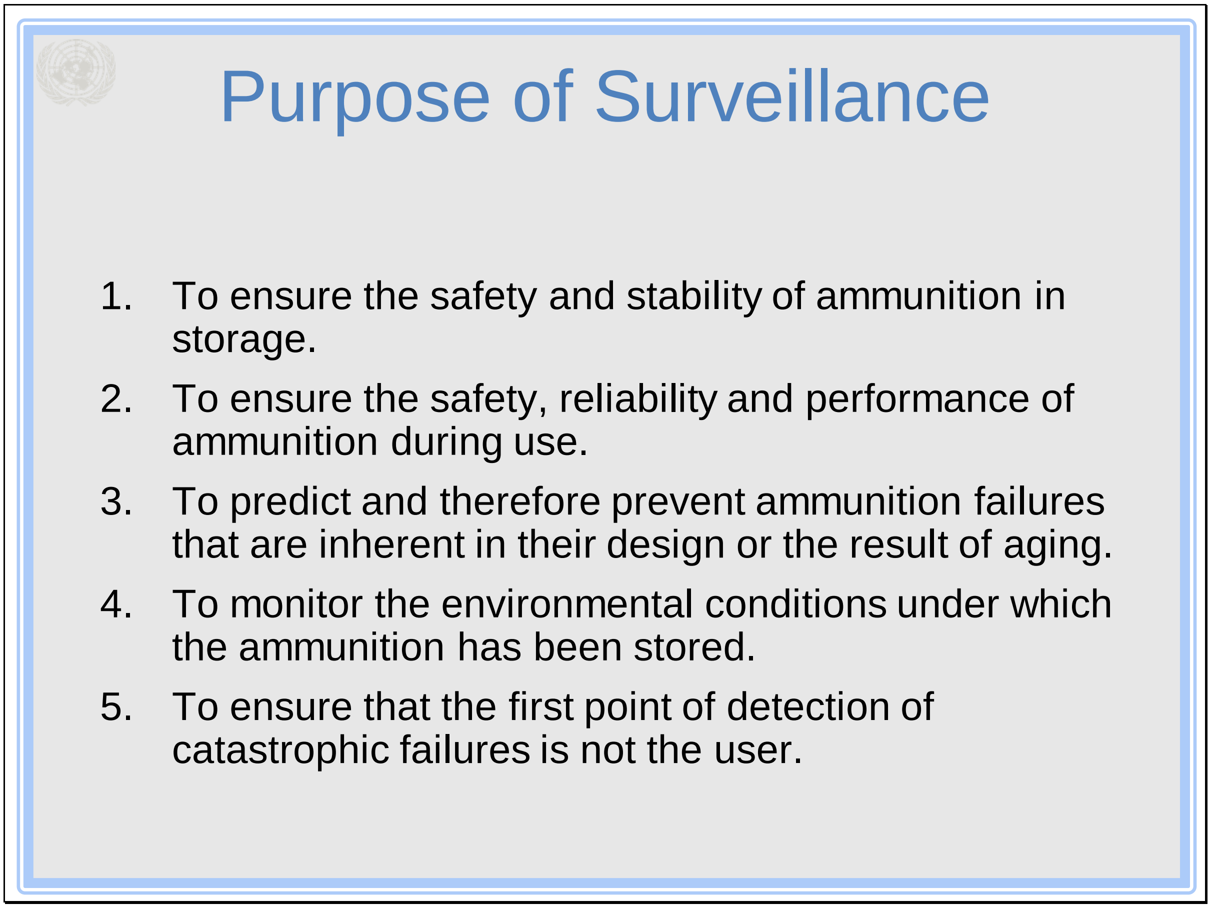
- Propellant degradation and stabiliser depletion is not linear, and the decay rate reduces during the night when the ammunition cools.
- Yet it is clear that field and temporary storage conditions for propellant in these types of temperature extremes would not be a particularly sensible idea.
- If operationally necessary the propellant should be separated from the parent ammunition wherever possible during Temporary Field Storage in such climatic conditions.
- IATG 07.20:2015[E] *Surveillance and proof* contains further technical information on the degradation of explosives and should be consulted prior to undertaking field or temporary storage of ammunition.

Slide 33

Surveillance and Inspection Plans

**Phase 2. Development (**Time allocation - 150 min**)**

Stage 2 (Time allocation 50 mins) – Surveillance and inspection plans



## Purpose of Surveillance

1. To ensure the safety and stability of ammunition in storage.
2. To ensure the safety, reliability and performance of ammunition during use.
3. To predict and therefore prevent ammunition failures that are inherent in their design or the result of aging.
4. To monitor the environmental conditions under which the ammunition has been stored.
5. To ensure that the first point of detection of catastrophic failures is not the user.

**Main idea/objective for slide:**

- **Introduce the participants to the purpose of surveillance and in-service proof of their ammunition and explosive stocks and how this is achieved.**

**What the instructor should cover (in addition to slide content)**

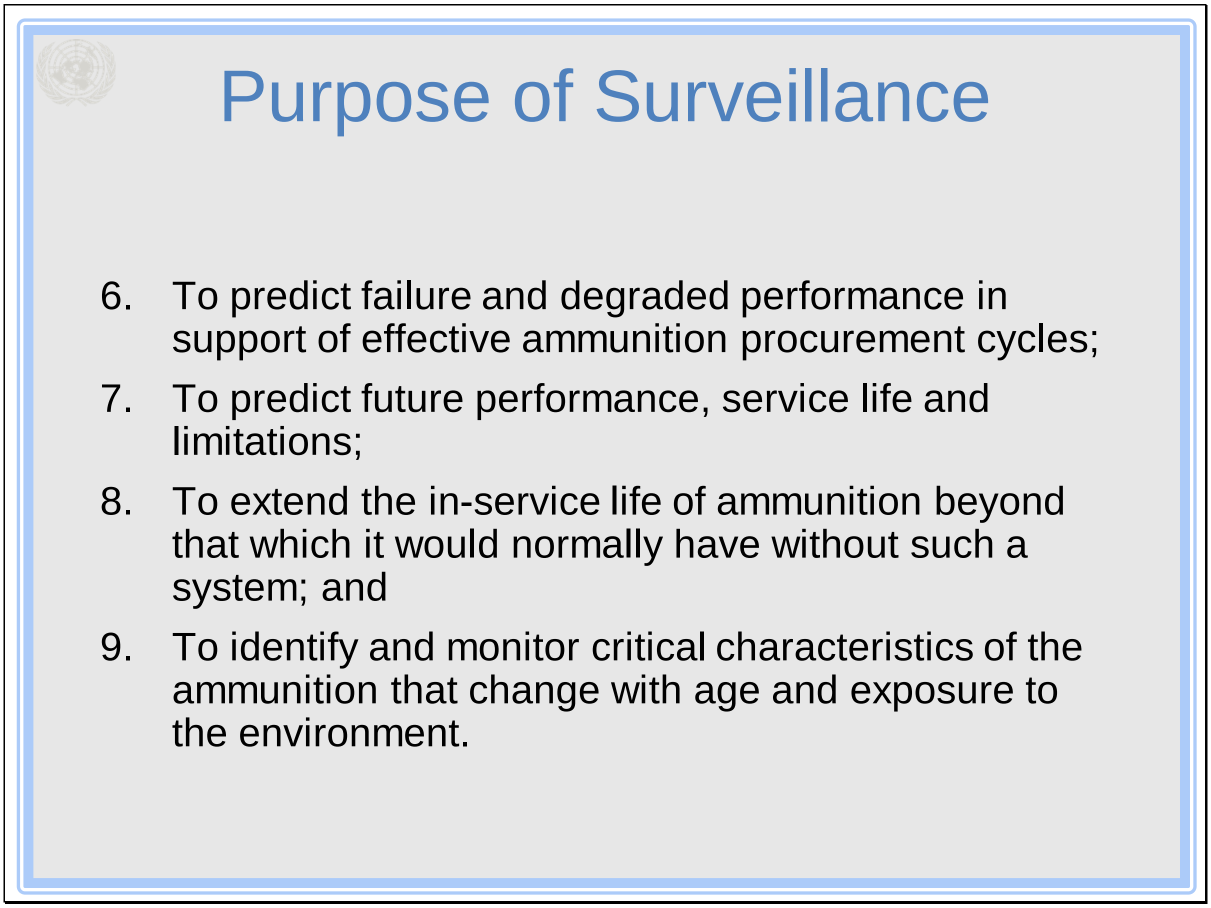
Ask the participants to give reasons why we must put in place a surveillance plan and what should it involve?
Write these answers on the white board

**References/further reading**

**UN Manual of Ammunition Management**

- The safety and stability of ammunition in storage can only be established by a comprehensive 'Ammunition Surveillance' system that uses a methodology of both physical inspection by trained personnel and chemical analysis.

- The surveillance is carried out systematically by evaluating the characteristics and properties the ammunition type possesses and measuring how the ammunition performs throughout its entire life cycle to allow assessment of the safety, reliability and operational effectiveness of the ammunition.
- Surveillance and in-service proof can be used to extend the shelf life of ammunition if appropriate.



## Purpose of Surveillance

6. To predict failure and degraded performance in support of effective ammunition procurement cycles;
7. To predict future performance, service life and limitations;
8. To extend the in-service life of ammunition beyond that which it would normally have without such a system; and
9. To identify and monitor critical characteristics of the ammunition that change with age and exposure to the environment.

**Main idea/objective for slide:**

- **Introduce the participants to the purpose of surveillance and in-service proof of their ammunition and explosive stocks and how this is achieved.**

**What the instructor should cover (in addition to slide content)**

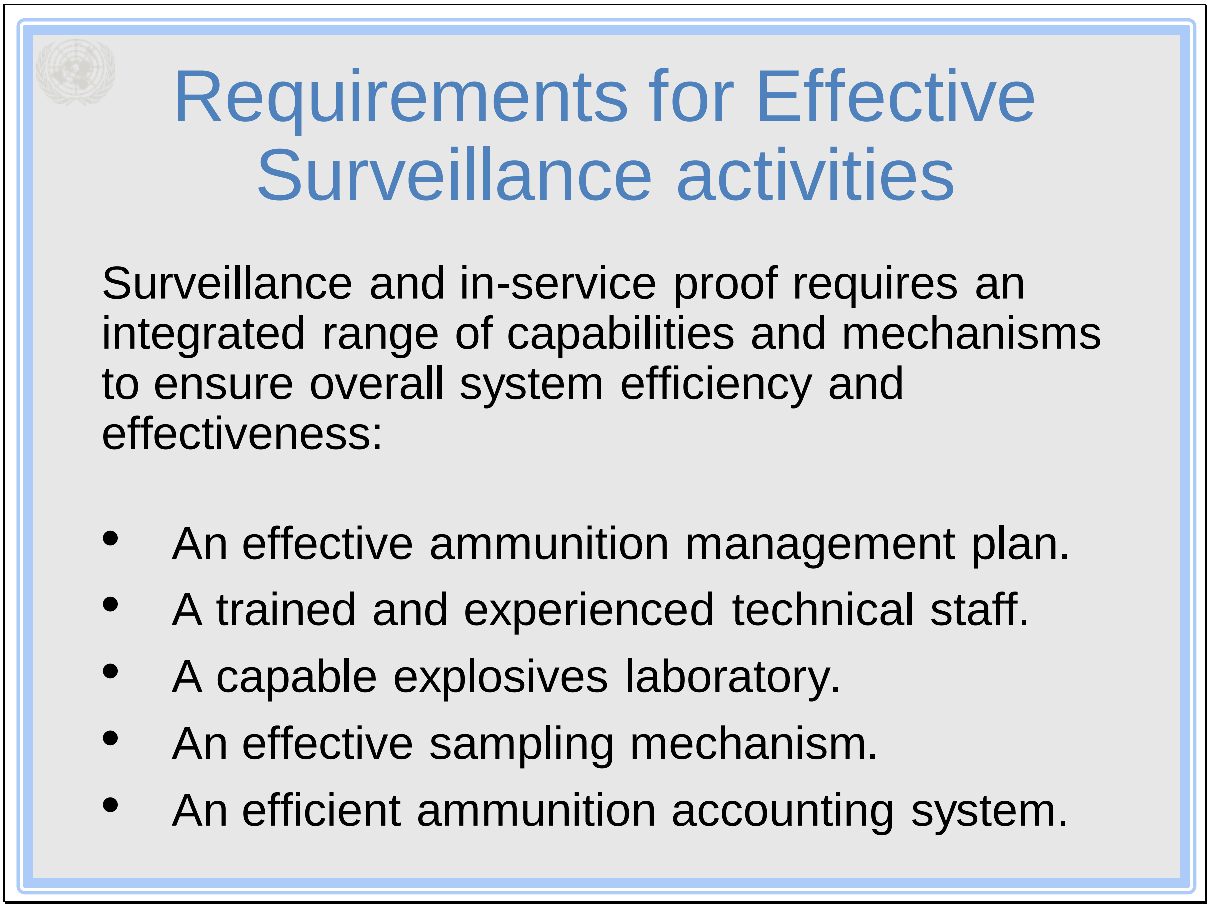
Ask the participants to give reasons why we must put in place a surveillance plan and what should it involve?
Write these answers on the white board

**References/further reading**

**UN Manual of Ammunition Management**

- The safety and stability of ammunition in storage can only be established by a comprehensive 'Ammunition Surveillance' system that uses a methodology of both physical inspection by trained personnel and chemical analysis.

- The surveillance is carried out systematically by evaluating the characteristics and properties the ammunition type possesses and measuring how the ammunition performs throughout its entire life cycle to allow assessment of the safety, reliability and operational effectiveness of the ammunition.
- Surveillance and in-service proof can be used to extend the shelf life of ammunition if appropriate.



## Requirements for Effective Surveillance activities

Surveillance and in-service proof requires an integrated range of capabilities and mechanisms to ensure overall system efficiency and effectiveness:

- An effective ammunition management plan.
- A trained and experienced technical staff.
- A capable explosives laboratory.
- An effective sampling mechanism.
- An efficient ammunition accounting system.

**Main idea/objective for slide:**

- **Emphasise the requirements for effective surveillance and in-service proof activities, including the responsibilities of all key personnel involved**

**What the instructor should cover (in addition to slide content)**

Ask the participants to give reasons why we must put in place a surveillance plan and what should it involve?
Write these answers on the white board

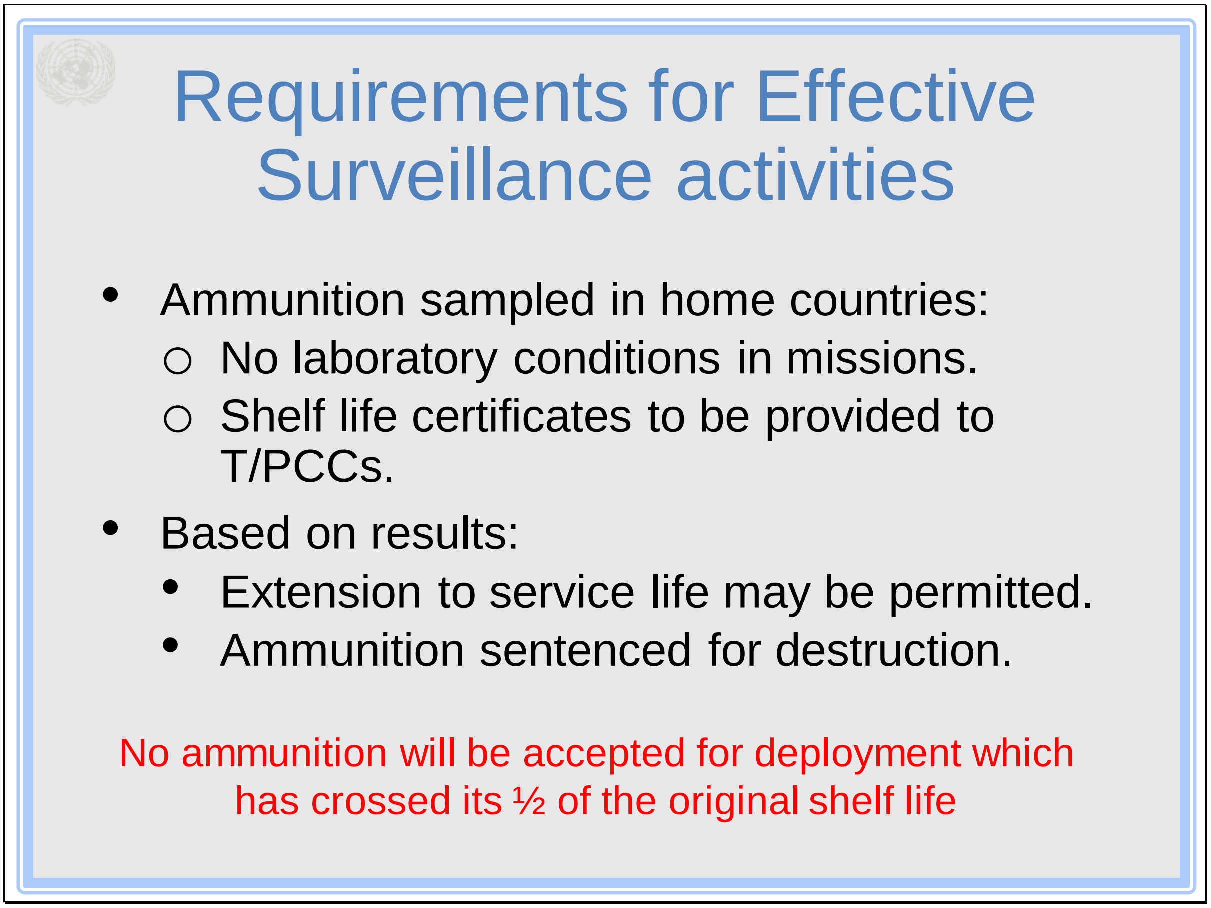
**References/further reading**

**UN Manual of Ammunition Management**

- The safety and stability of ammunition in storage can only be established by a comprehensive 'Ammunition Surveillance' system that uses a methodology of both physical inspection by trained personnel and chemical analysis.

- The surveillance is carried out systematically by evaluating the characteristics and properties the ammunition type possesses and measuring how the ammunition performs throughout its entire life cycle to allow assessment of the safety, reliability and operational effectiveness of the ammunition.
- Surveillance and in-service proof can be used to extend the shelf life of ammunition if appropriate.

Slide 37



## Requirements for Effective Surveillance activities

- Ammunition sampled in home countries:
  - No laboratory conditions in missions.
  - Shelf life certificates to be provided to T/PCCs.
- Based on results:
  - Extension to service life may be permitted.
  - Ammunition sentenced for destruction.

No ammunition will be accepted for deployment which has crossed its ½ of the original shelf life

**Main idea/objective for slide:**

- **Emphasise the requirements for effective surveillance and in-service proof activities, including the responsibilities of all key personnel involved**

**What the instructor should cover (in addition to slide content)**

Ask the participants to give reasons why we must put in place a surveillance plan and what should it involve?
Write these answers on the white board

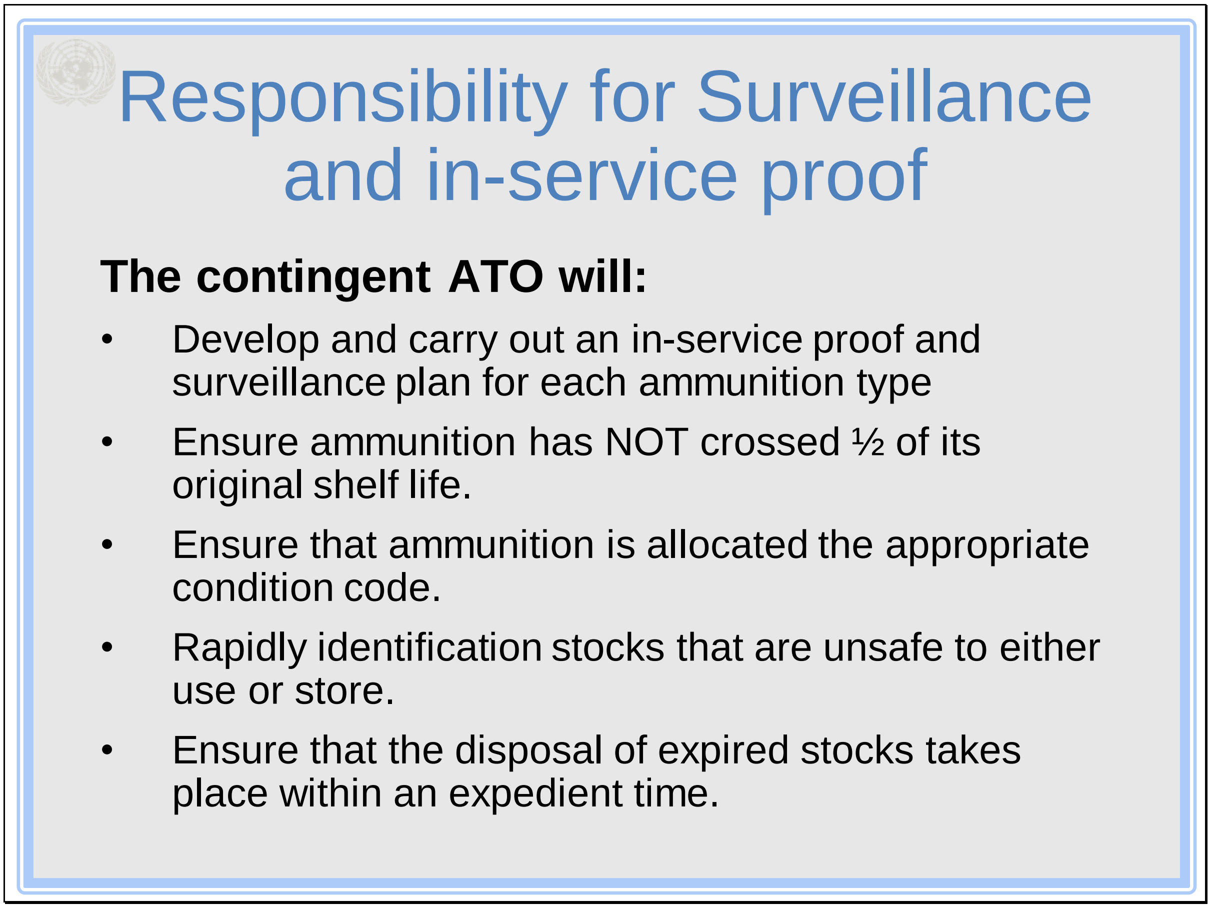
**References/further reading**

**UN Manual of Ammunition Management**

- An effective system of surveillance and in-service proof requires an integrated range of capabilities and mechanisms to ensure overall system efficiency and effectiveness.

- These are:
    - An effective ammunition management plan;
    - A trained and experienced technical staff;
    - A capable explosives laboratory;
    - An effective sampling mechanism; and
    - An efficient ammunition accounting system.
- An explosives laboratory and the ability to conduct sample tests are not available in-mission, the T/PCCs shall conduct these tests, preferably on ammunition from the same batch and stored in similar conditions, in their home countries and provide certificates of balance of shelf life for the deployed ammunition.
- Based on the results of the surveillance and in-service proof, decisions may be taken on the extension of the in- service life of an ammunition, or the need for its destruction. T
- o simplify and reduce these difficult procedures as much as possible, no ammunition will be accepted for deployment which has crossed its ½ of the original shelf life as described under 3.5.2.
- This can only be waivered by the Head of Mission, based on the WAAB recommendation.

Slide 38



# Responsibility for Surveillance and in-service proof

**The contingent ATO will:**

- Develop and carry out an in-service proof and surveillance plan for each ammunition type
- Ensure ammunition has NOT crossed ½ of its original shelf life.
- Ensure that ammunition is allocated the appropriate condition code.
- Rapidly identification stocks that are unsafe to either use or store.
- Ensure that the disposal of expired stocks takes place within an expedient time.

**Main idea/objective for slide:**

- **Emphasise the requirements for effective surveillance and in-service proof activities, including the responsibilities of all key personnel involved**

**What the instructor should cover (in addition to slide content)**

Before showing this slide, ask the participants what the duties of a Contingent ATO are?
Write these on a white board

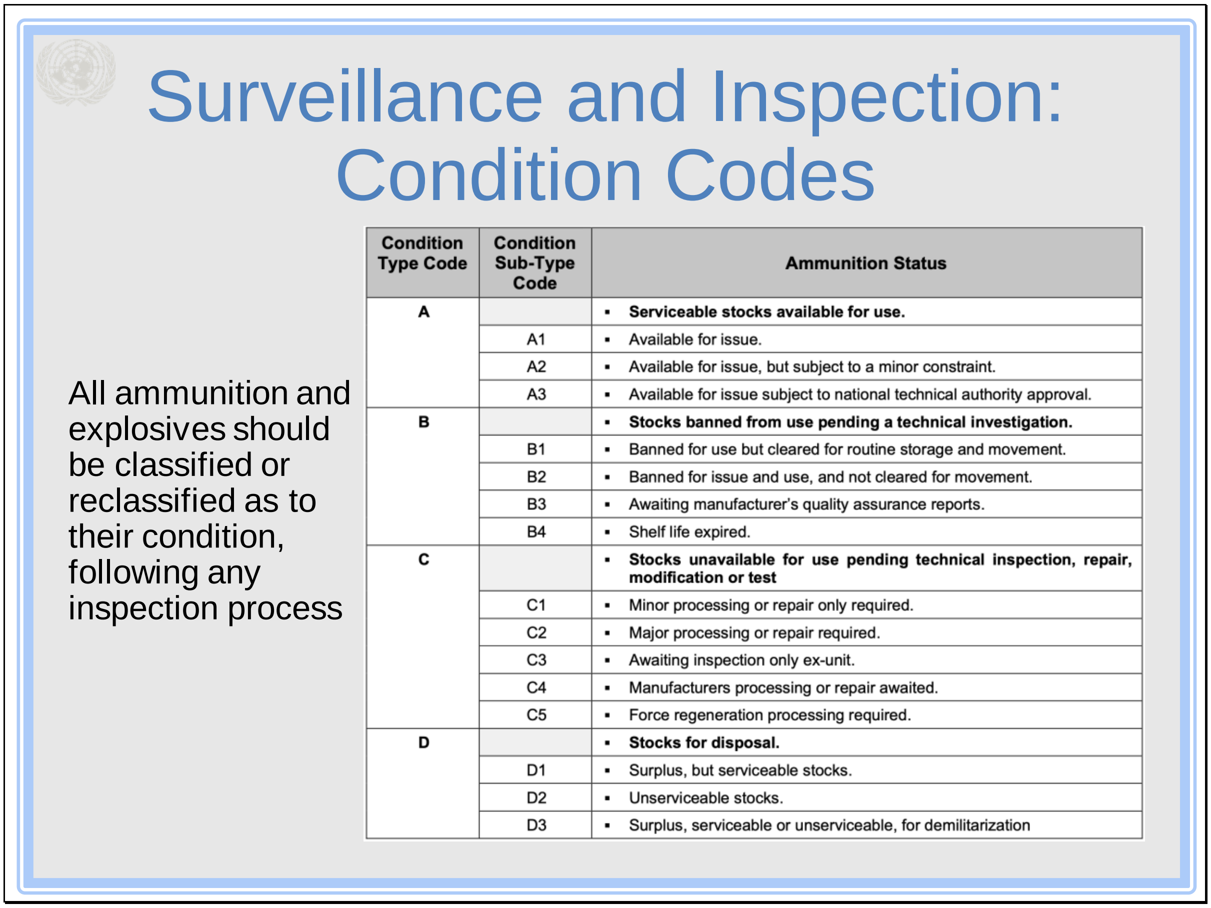
**References/further reading**

**UN Manual of Ammunition Management**

The contingent ammunition technical officer or a technical expert should be responsible for:

- The development and promulgation of an in-service proof and surveillance plan for each ammunition type in the national inventory;
- Ensuring that the plan is carried out;
- Coordination with their respective national authorities on the requirement of tests, provision of certificates and delivery of ammunition that has NOT crossed ½ of its original shelf life.
- Ensuring that ammunition is allocated the appropriate condition code;
- Rapid identification of stocks that are unsafe to either use or store; and,
- Ensuring that the disposal of expired stocks takes place within an expedient time period following in-service proof and surveillance.

Slide 39



# Surveillance and Inspection: Condition Codes

All ammunition and explosives should be classified or reclassified as to their condition, following any inspection process

| Condition Type Code | Condition Sub-Type Code | Ammunition Status |
|---|---|---|
| A | | ▪ **Serviceable stocks available for use.** |
| | A1 | ▪ Available for issue. |
| | A2 | ▪ Available for issue, but subject to a minor constraint. |
| | A3 | ▪ Available for issue subject to national technical authority approval. |
| B | | ▪ **Stocks banned from use pending a technical investigation.** |
| | B1 | ▪ Banned for use but cleared for routine storage and movement. |
| | B2 | ▪ Banned for issue and use, and not cleared for movement. |
| | B3 | ▪ Awaiting manufacturer's quality assurance reports. |
| | B4 | ▪ Shelf life expired. |
| C | | ▪ **Stocks unavailable for use pending technical inspection, repair, modification or test** |
| | C1 | ▪ Minor processing or repair only required. |
| | C2 | ▪ Major processing or repair required. |
| | C3 | ▪ Awaiting inspection only ex-unit. |
| | C4 | ▪ Manufacturers processing or repair awaited. |
| | C5 | ▪ Force regeneration processing required. |
| D | | ▪ **Stocks for disposal.** |
| | D1 | ▪ Surplus, but serviceable stocks. |
| | D2 | ▪ Unserviceable stocks. |
| | D3 | ▪ Surplus, serviceable or unserviceable, for demilitarization |

**Main idea/objective for slide:**

- **Highlight the requirements for using Condition Codes across ammunition and providing information that is understandable at all levels through common reporting formats**

**What the instructor should cover (in addition to slide content)**

participants are to be made aware of the condition codes that are used to provide consistent understanding at all levels as to the condition of ammunition under inspection.

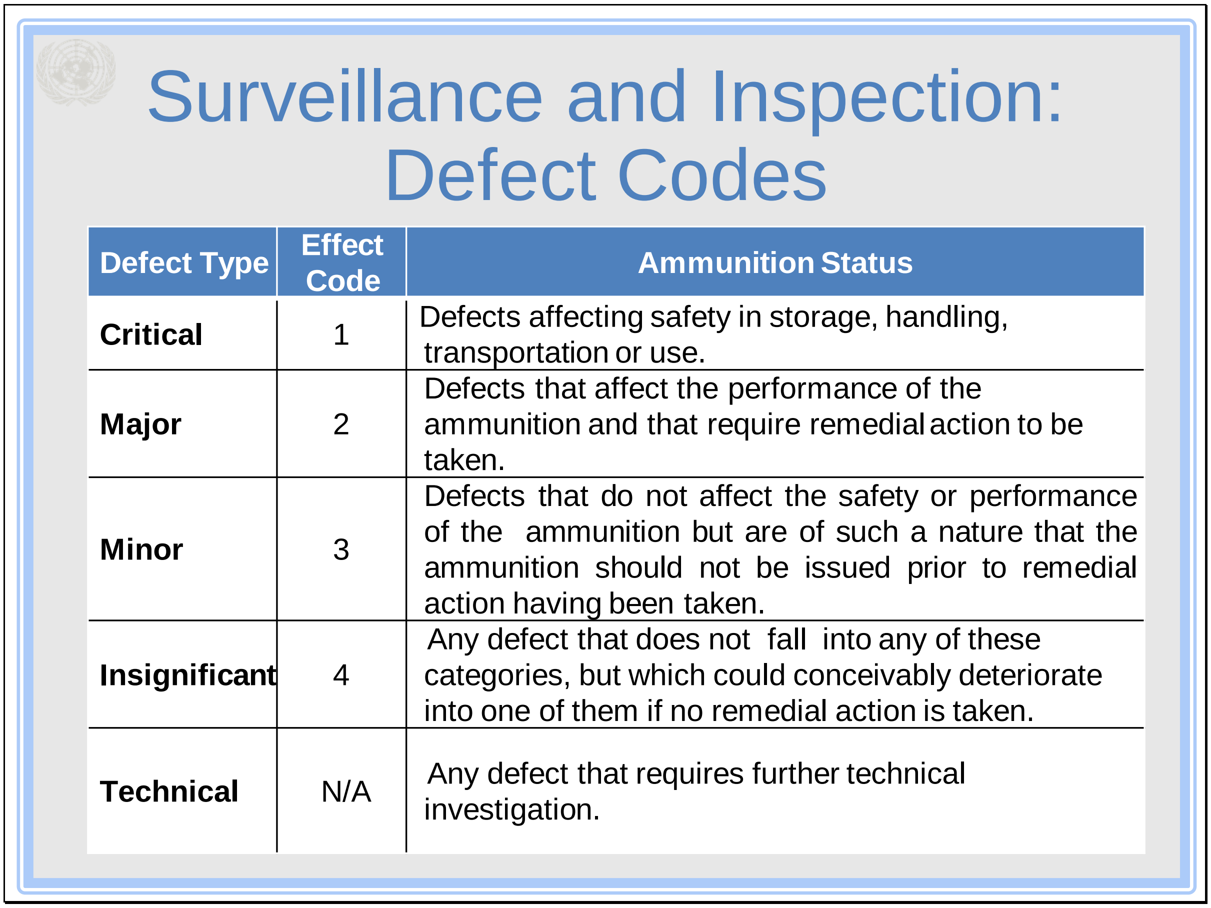
Provide the table as a handout

**References/further reading**

**IATG 07.20 Inspection of Ammunition, Page 10**

- The following groupings and codes can be used as a means of classifying the condition of ammunition stocks

Slide 40



# Surveillance and Inspection: Defect Codes

| Defect Type | Effect Code | Ammunition Status |
|---|---|---|
| **Critical** | 1 | Defects affecting safety in storage, handling, transportation or use. |
| **Major** | 2 | Defects that affect the performance of the ammunition and that require remedial action to be taken. |
| **Minor** | 3 | Defects that do not affect the safety or performance of the ammunition but are of such a nature that the ammunition should not be issued prior to remedial action having been taken. |
| **Insignificant** | 4 | Any defect that does not fall into any of these categories, but which could conceivably deteriorate into one of them if no remedial action is taken. |
| **Technical** | N/A | Any defect that requires further technical investigation. |

**Main idea/objective for slide:**

- **Highlight the requirements for using Defect Codes across ammunition and providing information that is understandable at all levels through common reporting formats**

**What the instructor should cover (in addition to slide content)**

participants are to be made aware of the Defect codes that are used to provide consistent understanding at all levels as to the condition of ammunition under inspection.

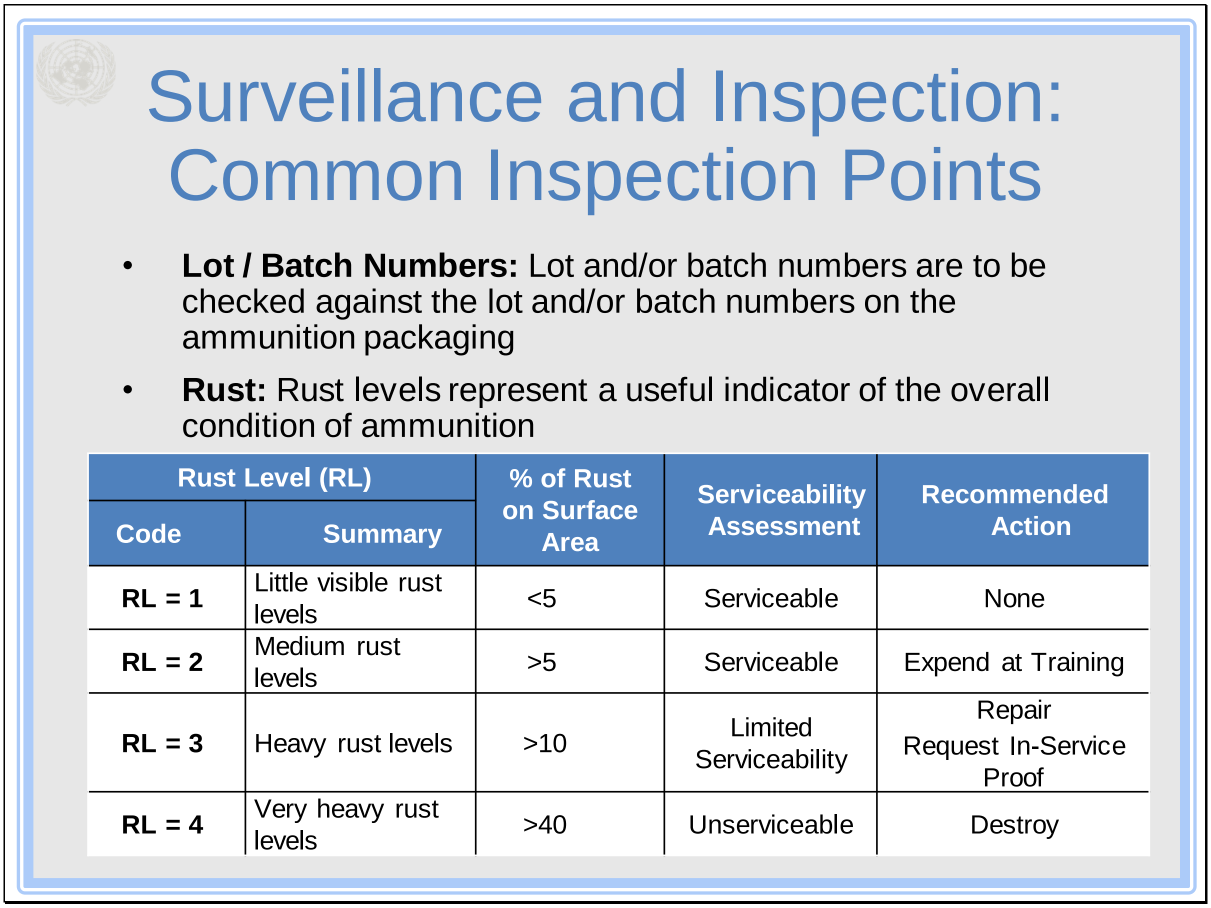
Provide the table as a handout

**References/further reading**

**IATG 07.20 Inspection of Ammunition, Page 10**

- When ammunition is subject to inspection and surveillance, which should be good stockpile management practice, it is inevitable that defects will be found.
- These defects shall determine within which ‘Condition Type’ the ammunition item is placed, the Effect Code allocated to it, and how it is categorised according to the table

Slide 41



# Surveillance and Inspection: Common Inspection Points

- **Lot / Batch Numbers:** Lot and/or batch numbers are to be checked against the lot and/or batch numbers on the ammunition packaging
- **Rust:** Rust levels represent a useful indicator of the overall condition of ammunition

| Rust Level (RL) | | % of Rust on Surface Area | Serviceability Assessment | Recommended Action |
|---|---|---|---|---|
| Code | Summary | | | |
| **RL = 1** | Little visible rust levels | <5 | Serviceable | None |
| **RL = 2** | Medium rust levels | >5 | Serviceable | Expend at Training |
| **RL = 3** | Heavy rust levels | >10 | Limited Serviceability | Repair<br>Request In-Service Proof |
| **RL = 4** | Very heavy rust levels | >40 | Unserviceable | Destroy |

**Main idea/objective for slide:**

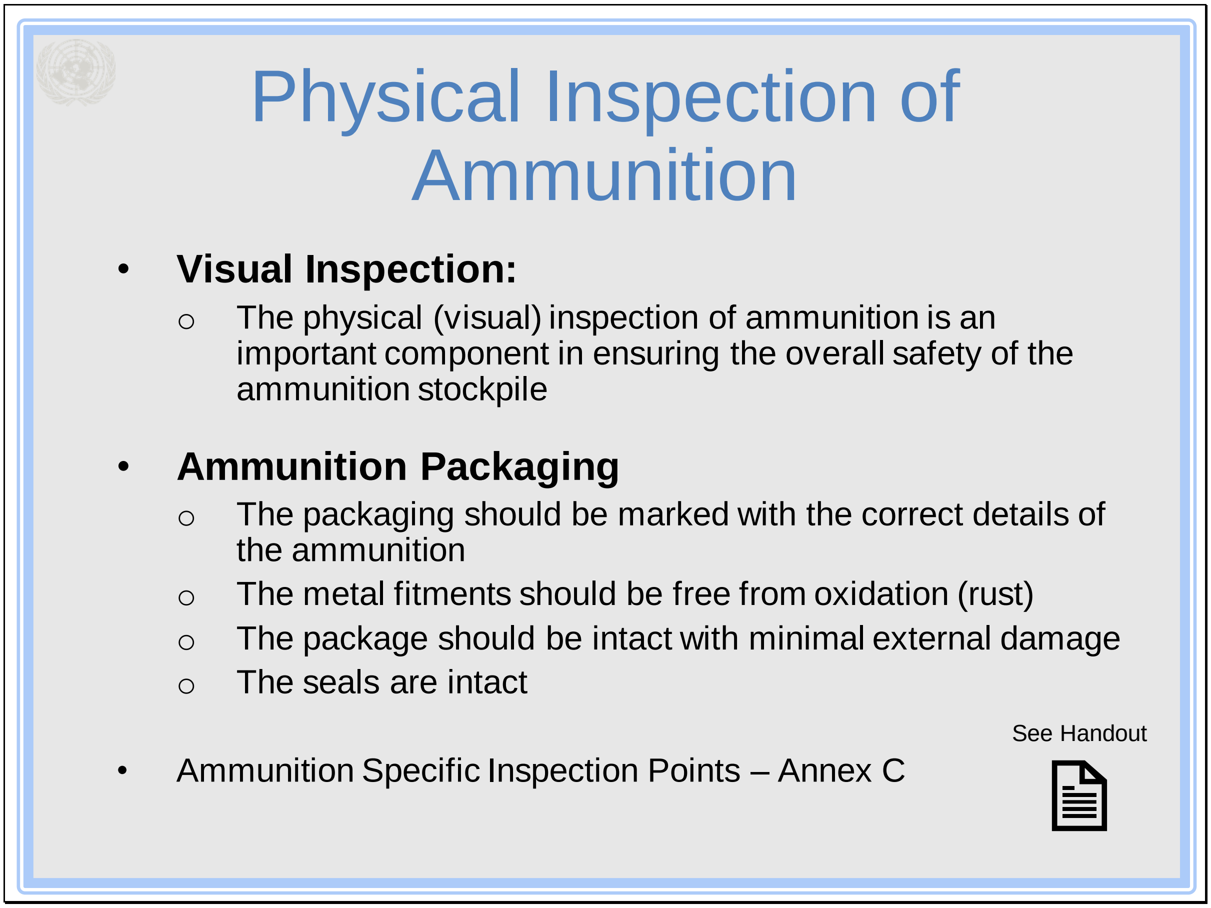
- **Emphasise the requirements for observing common inspection points across ammunition and providing information that is understandable at all levels through common reporting formats**

**What the instructor should cover (in addition to slide content)**

- participants are to be made aware of the common Inspection Points for ammunition that are used to provide consistent understanding at all levels as to the condition of ammunition under inspection.
- Provide the table as a handout

**References/further reading**

**IATG 07.20 Inspection of Ammunition, Page 12**



## Physical Inspection of Ammunition

- **Visual Inspection:**
  - The physical (visual) inspection of ammunition is an important component in ensuring the overall safety of the ammunition stockpile
- **Ammunition Packaging**
  - The packaging should be marked with the correct details of the ammunition
  - The metal fitments should be free from oxidation (rust)
  - The package should be intact with minimal external damage
  - The seals are intact
- Ammunition Specific Inspection Points – Annex C

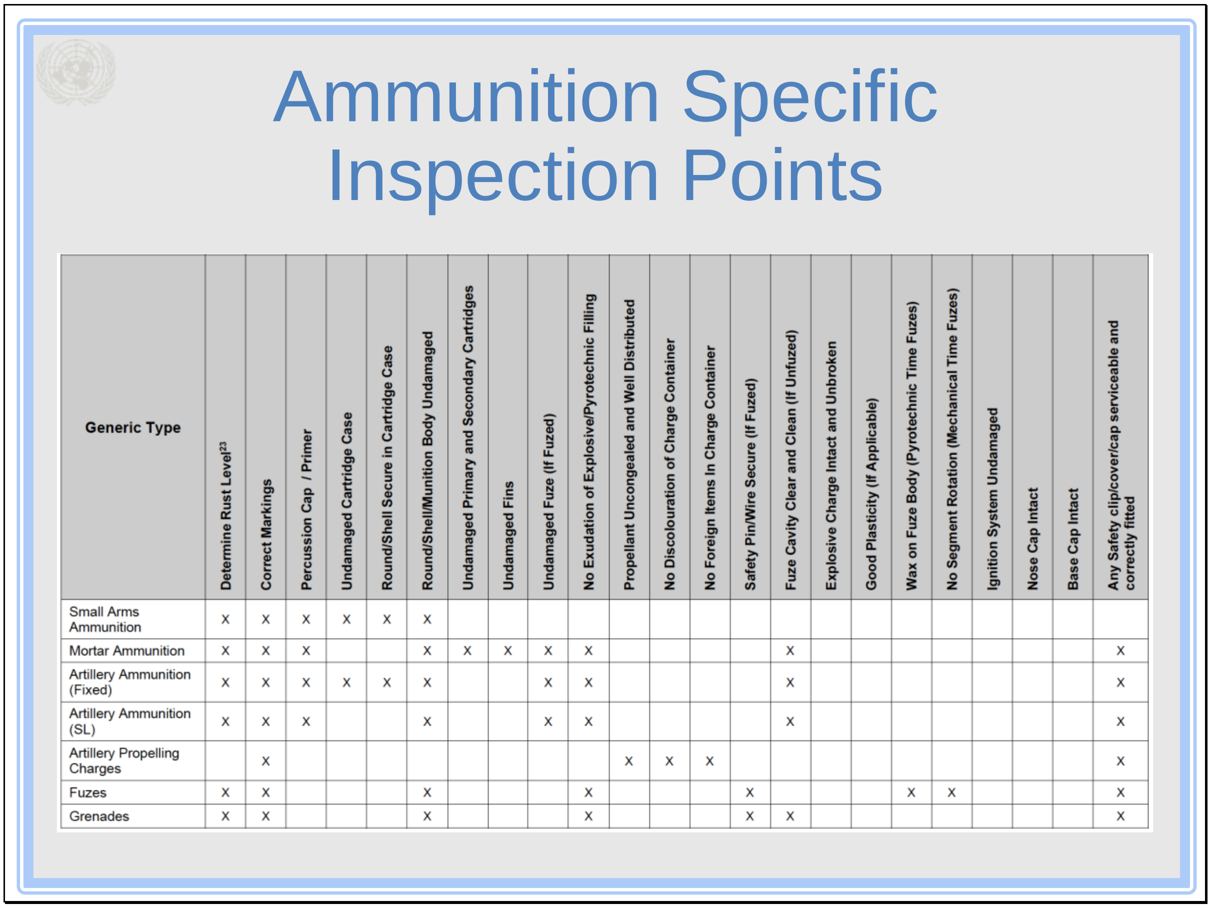
See Handout

**Main idea/objective for slide:**
**Discuss with the participants how to physically inspect ammunition and what are the most common inspection points to observe and record**

**What the instructor should cover (in addition to slide content)**
Outline the various parts and components of ammunition that should be inspected and the observations recorded.
Print appropriate inspection points list from IATG 07.20

References/further reading
**IATG 07.20 Inspection of Ammunition, Annex C "Guidance on physical inspection of ammunition"**

Slide 43



## Ammunition Specific Inspection Points

| Generic Type | Determine Rust Level[23] | Correct Markings | Percussion Cap / Primer | Undamaged Cartridge Case | Round/Shell Secure in Cartridge Case | Round/Shell/Munition Body Undamaged | Undamaged Primary and Secondary Cartridges | Undamaged Fins | Undamaged Fuze (If Fuzed) | No Exudation of Explosive/Pyrotechnic Filling | Propellant Uncongealed and Well Distributed | No Discolouration of Charge Container | No Foreign Items In Charge Container | Safety Pin/Wire Secure (If Fuzed) | Fuze Cavity Clear and Clean (If Unfuzed) | Explosive Charge Intact and Unbroken | Good Plasticity (If Applicable) | Wax on Fuze Body (Pyrotechnic Time Fuzes) | No Segment Rotation (Mechanical Time Fuzes) | Ignition System Undamaged | Nose Cap Intact | Base Cap Intact | Any Safety clip/cover/cap serviceable and correctly fitted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Small Arms Ammunition | x | x | x | x | x | x | | | | | | | | | | | | | | | | | |
| Mortar Ammunition | x | x | x | | | x | x | x | x | x | | | | | x | | | | | | | | x |
| Artillery Ammunition (Fixed) | x | x | x | x | x | x | | | x | x | | | | | x | | | | | | | | x |
| Artillery Ammunition (SL) | x | x | x | | | x | | | x | x | | | | | x | | | | | | | | x |
| Artillery Propelling Charges | | x | | | | | | | | | x | x | x | | | | | | | | | | x |
| Fuzes | x | x | | | | x | | | | x | | | | x | | | | x | x | | | | x |
| Grenades | x | x | | | | x | | | | x | | | | x | x | | | | | | | | x |

**Main idea/objective for slide:**

- **Discuss with the participants how to use the Specific Inspection Point table to acquire guidance as to what to inspect on each ammunition type.**

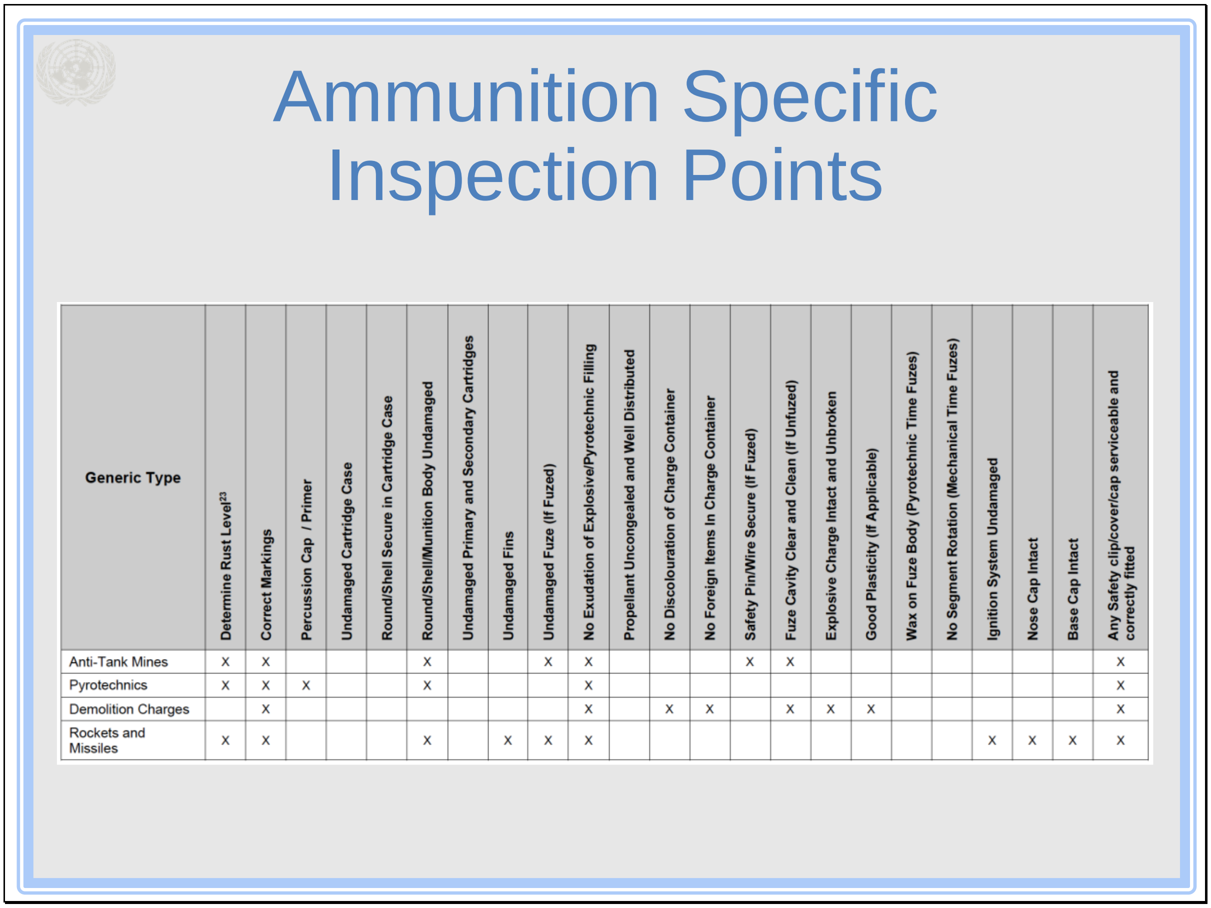
**What the instructor should cover (in addition to slide content)**

Provide hand-out to participant and work through the table, explaining how to use it

**References/further reading**

**IATG 07.20 Inspection of Ammunition, Annex C "Guidance on physical inspection of ammunition"**

Slide 44



# Ammunition Specific Inspection Points

| Generic Type | Determine Rust Level[23] | Correct Markings | Percussion Cap / Primer | Undamaged Cartridge Case | Round/Shell Secure in Cartridge Case | Round/Shell/Munition Body Undamaged | Undamaged Primary and Secondary Cartridges | Undamaged Fins | Undamaged Fuze (If Fuzed) | No Exudation of Explosive/Pyrotechnic Filling | Propellant Uncongealed and Well Distributed | No Discolouration of Charge Container | No Foreign Items In Charge Container | Safety Pin/Wire Secure (If Fuzed) | Fuze Cavity Clear and Clean (If Unfuzed) | Explosive Charge Intact and Unbroken | Good Plasticity (If Applicable) | Wax on Fuze Body (Pyrotechnic Time Fuzes) | No Segment Rotation (Mechanical Time Fuzes) | Ignition System Undamaged | Nose Cap Intact | Base Cap Intact | Any Safety clip/cover/cap serviceable and correctly fitted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anti-Tank Mines | x | x | | | | x | | | x | x | | | | x | x | | | | | | | | x |
| Pyrotechnics | x | x | x | | | x | | | | x | | | | | | | | | | | | | x |
| Demolition Charges | | x | | | | | | | | x | | x | x | | x | x | x | | | | | | x |
| Rockets and Missiles | x | x | | | | x | | x | x | x | | | | | | | | | | x | x | x | x |

**Main idea/objective for slide:**

**Discuss with the participants how to use the Specific Inspection Point table to acquire guidance as to what to inspect on each ammunition type.**

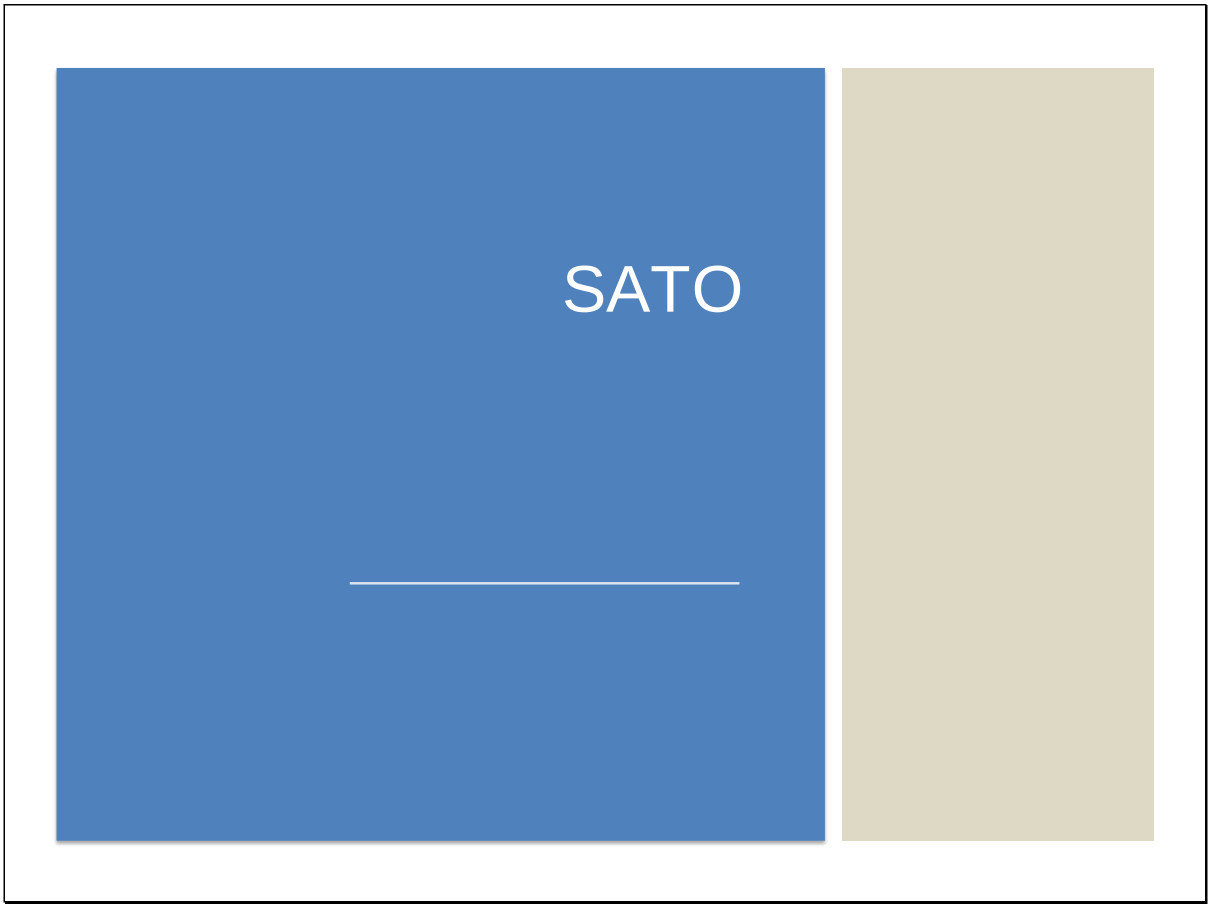
What the instructor should cover (in addition to slide content)

Provide hand-out to participant and work through the table, explaining how to use it

References/further reading

**IATG 07.20 Inspection of Ammunition, Annex C "Guidance on physical inspection of ammunition"**

Slide 45



SATO

**Phase 2. Development (**Time allocation - 150 min**)**

Stage 2 (Time allocation 50 mins) – Surveillance and inspection plans

## SATO - Competencies

SATO Must be qualified through a national Ammunition Technical Officer's Course according to IATG 01.90, Annex L.

He/she should:

- Have the knowledge and understanding of DPO Ammunition Management Guidelines for Peacekeeping Operations, as well as IATG and IATG-recommended ammunition management standards and guidelines
- Have solid knowledge of Risk Management and practical knowledge of risk mitigation measures concerning ammunition management and storage

Cont…

**Main idea/objective for slide:**

- Describe the Competencies of SATO deployed in the field mission.

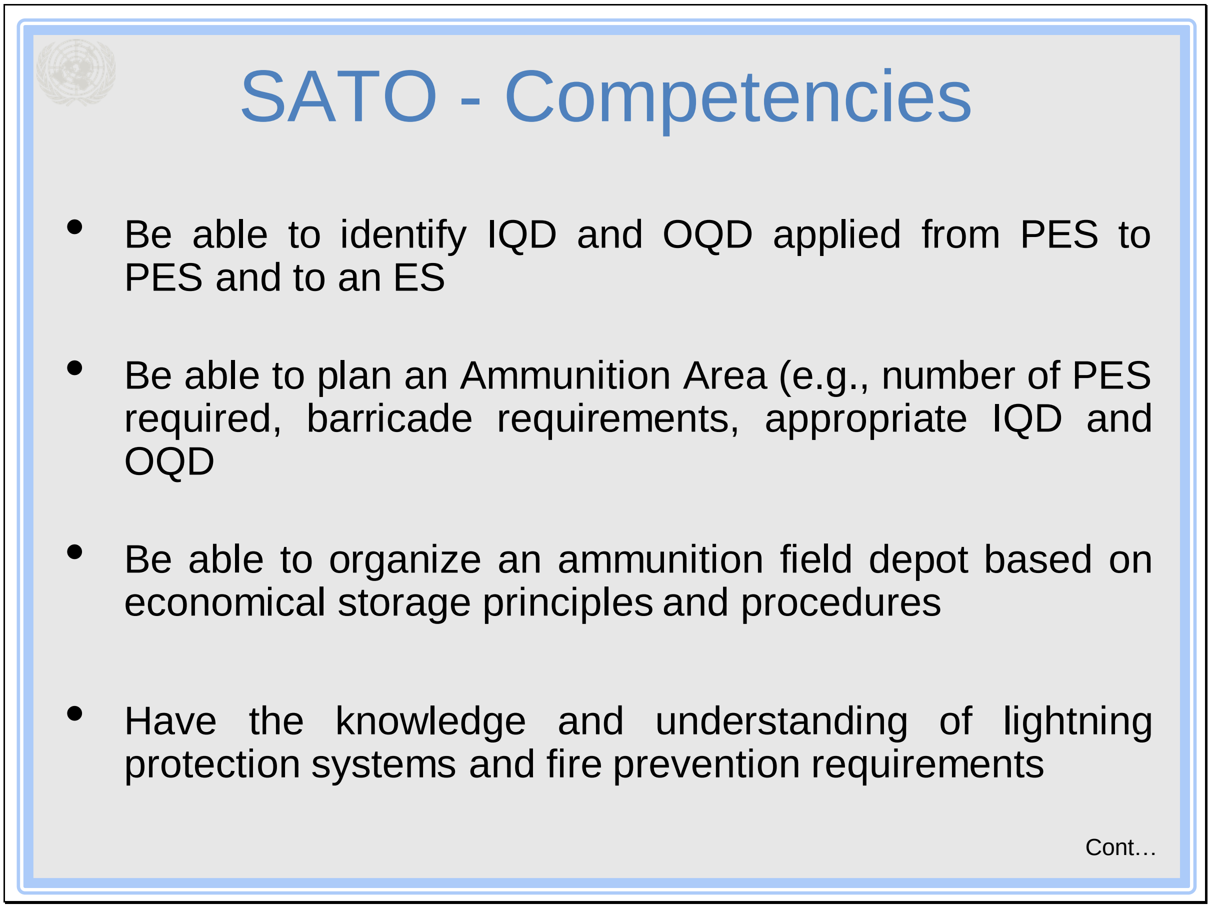
**What the instructor should cover (in addition to slide content)**

- Participants are to be made aware of the competencies of SATO that are considered while selecting/nominating SATO in any field mission by UNHQ.

**References/further reading**

- Annex D of UNMAM, Page 43

Slide 47



## SATO - Competencies

- Be able to identify IQD and OQD applied from PES to PES and to an ES
- Be able to plan an Ammunition Area (e.g., number of PES required, barricade requirements, appropriate IQD and OQD
- Be able to organize an ammunition field depot based on economical storage principles and procedures
- Have the knowledge and understanding of lightning protection systems and fire prevention requirements

Cont…

**Main idea/objective for slide:**

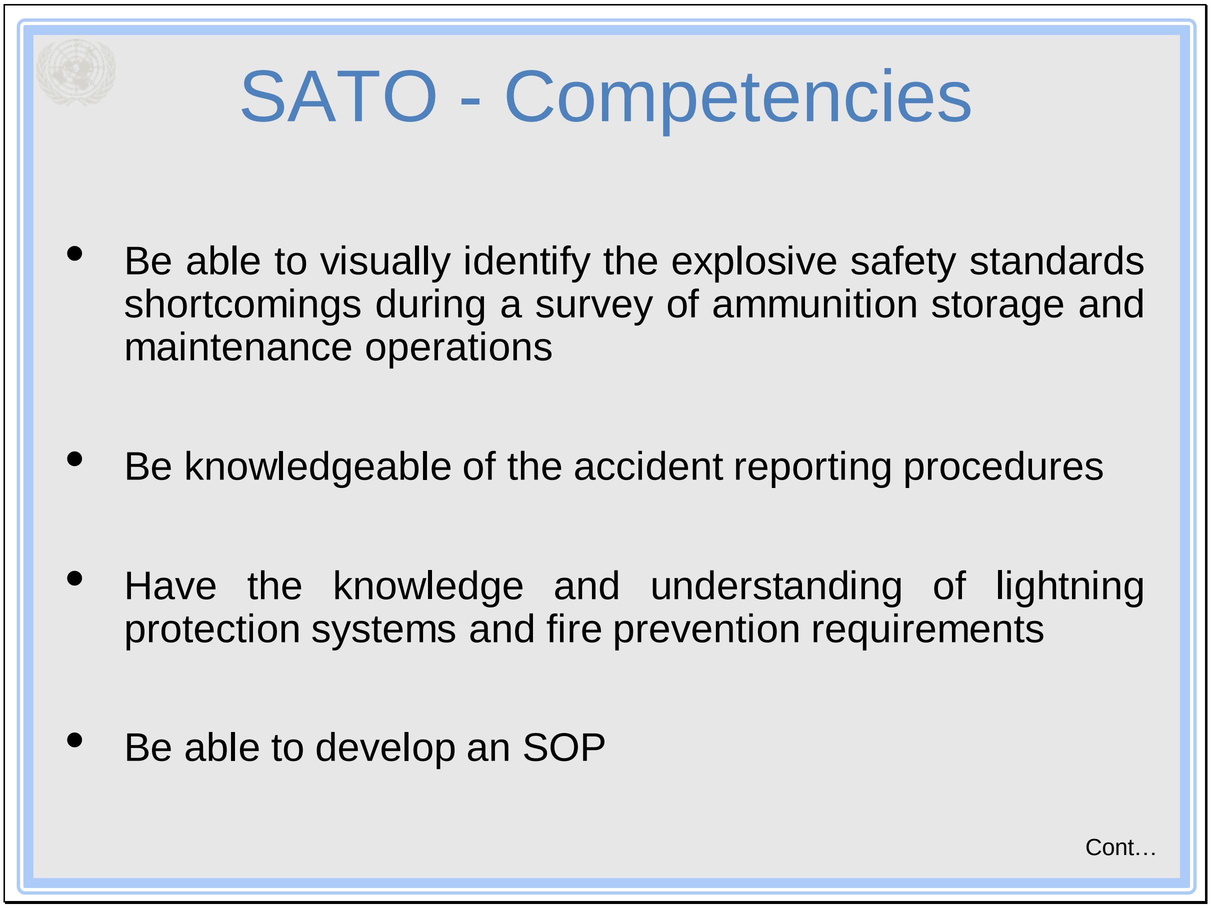
- Describe the Competencies of SATO deployed in the field mission.

**What the instructor should cover (in addition to slide content)**

- Participants are to be made aware of the competencies of SATO that are considered while selecting/nominating SATO in any field mission by UNHQ.

**References/further reading**

- Annex D of UNMAM, Page 43



## SATO - Competencies

- Be able to visually identify the explosive safety standards shortcomings during a survey of ammunition storage and maintenance operations
- Be knowledgeable of the accident reporting procedures
- Have the knowledge and understanding of lightning protection systems and fire prevention requirements
- Be able to develop an SOP

Cont…

**Main idea/objective for slide:**

- Describe the Competencies of SATO deployed in the field mission.

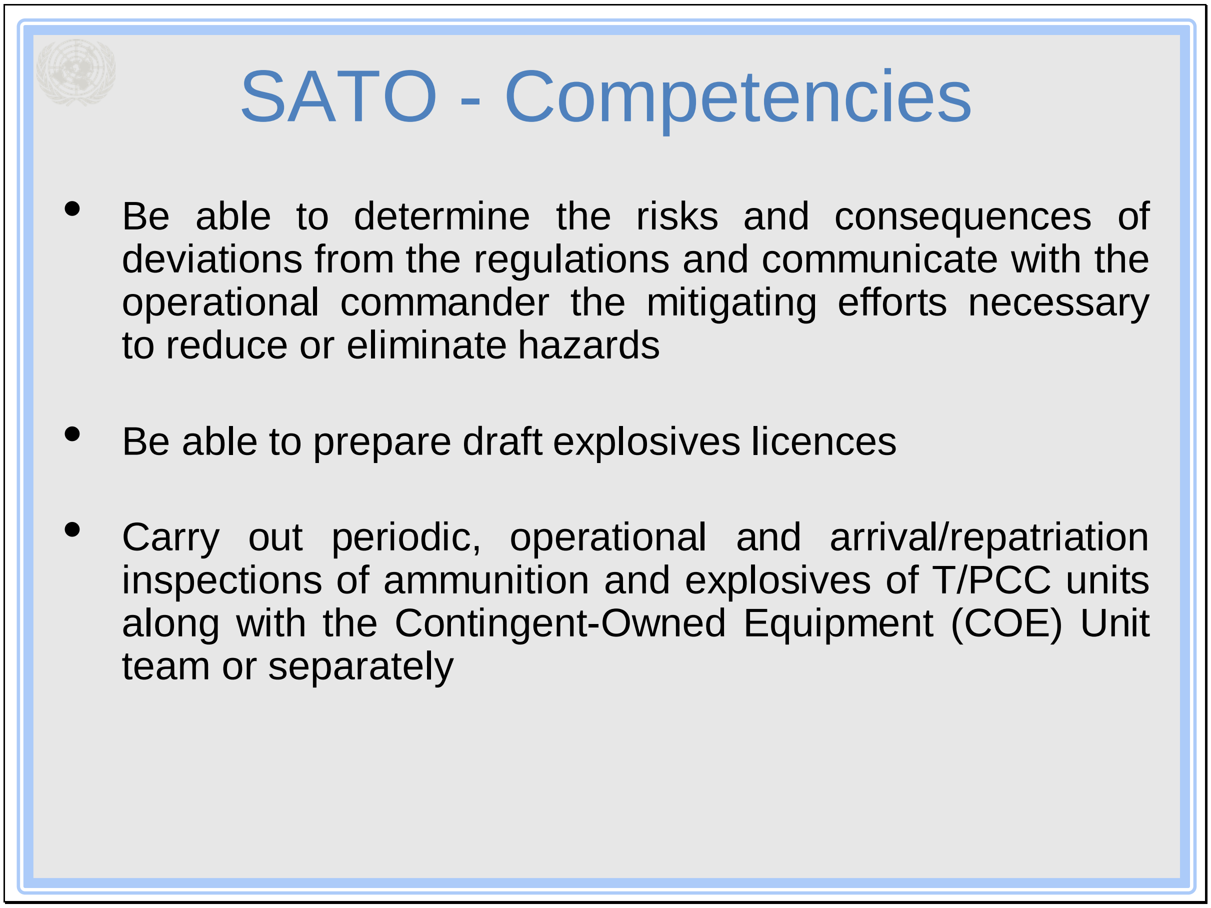
**What the instructor should cover (in addition to slide content)**

- Participants are to be made aware of the competencies of SATO that are considered while selecting/nominating SATO in any field mission by UNHQ.

**References/further reading**

- Annex D of UNMAM, Page 43

Slide 49



## SATO - Competencies

- Be able to determine the risks and consequences of deviations from the regulations and communicate with the operational commander the mitigating efforts necessary to reduce or eliminate hazards
- Be able to prepare draft explosives licences
- Carry out periodic, operational and arrival/repatriation inspections of ammunition and explosives of T/PCC units along with the Contingent-Owned Equipment (COE) Unit team or separately

**Main idea/objective for slide:**

- Describe the Competencies of SATO deployed in the field mission.

**What the instructor should cover (in addition to slide content)**

- Participants are to be made aware of the competencies of SATO that are considered while selecting/nominating SATO in any field mission by UNHQ.

**References/further reading**

- Annex D of UNMAM, Page 43

# Responsibilities of SATO

- Act as the senior ammunition specialist and safety officer and be responsible for advising the Force Commander on all ammunition and explosives safety matters
- Provide direction and advice on all technical matters related to ammunition/explosives
- Conduct special inspections of unserviceable, expired and segregated ammunition and explosives and recommend their disposal (in the mission area) to the concerned force EOD units/UNMAS
- Provide technical assistance and advice in connection with the safety, storage and maintenance standards of ammunition and explosives

Cont…

**Main idea/objective for slide:**

- Describe the Responsibilities of SATO deployed in the field mission.

**What the instructor should cover (in addition to slide content)**

- Participants are to be made aware of the responsibilities of SATO that are required to be performed by SATO in the field missions.

**References/further reading**

- Annex D of UNMAM, Page 43

Slide 51

## Responsibilities of SATO

- Conduct Dangerous Goods (DG)-Ammunition / Explosives inspections
- Coordinate risk assessments
- Prepare/update all necessary Ammunition and Explosives Regulations and technical SOPs
- Develop and operate of the ammunition storage licensing system

Cont…

**Main idea/objective for slide:**

- Describe the Responsibilities of SATO deployed in the field mission.

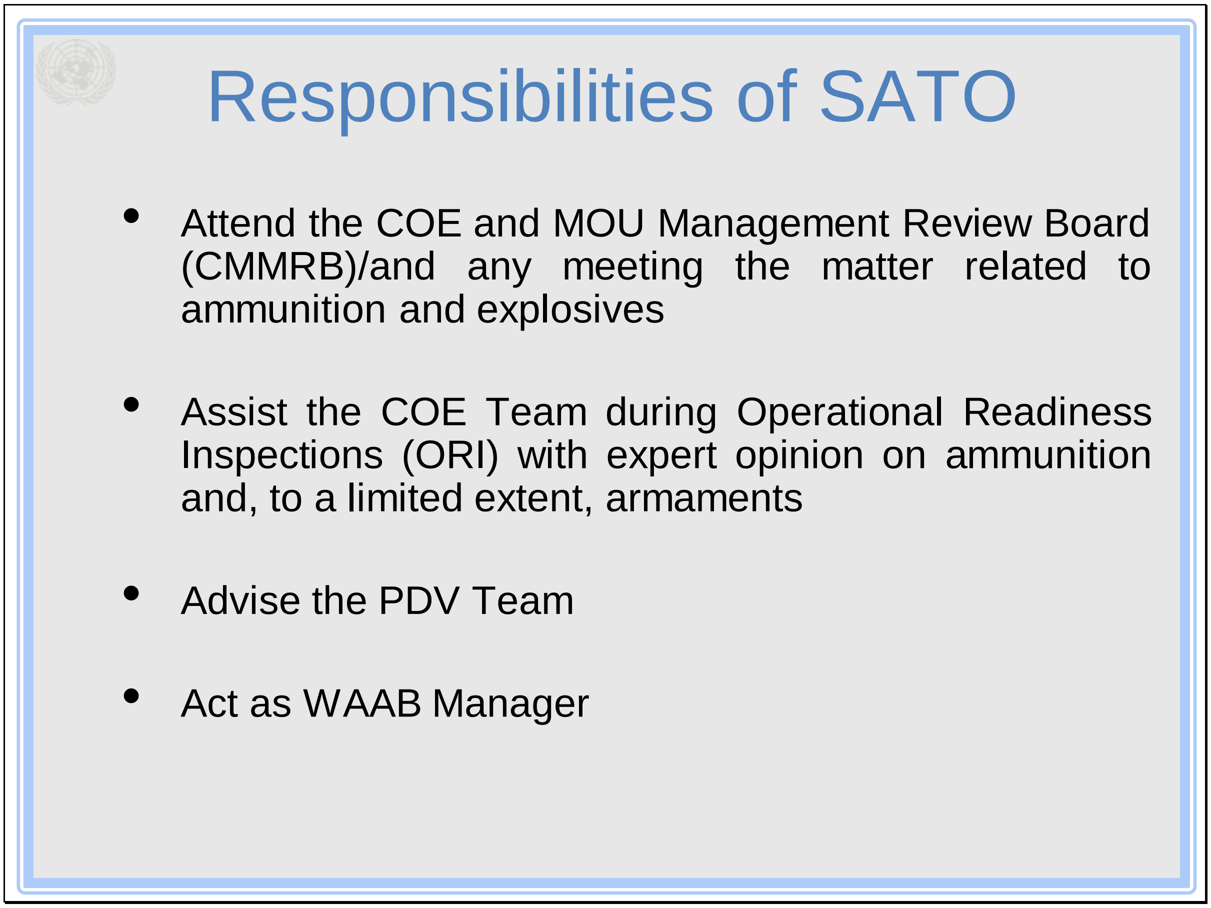
**What the instructor should cover (in addition to slide content)**

- Participants are to be made aware of the responsibilities of SATO that are required to be performed by SATO in the field missions.

**References/further reading**

- Annex D of UNMAM, Page 43

Slide 52



## Responsibilities of SATO

- Attend the COE and MOU Management Review Board (CMMRB)/and any meeting the matter related to ammunition and explosives
- Assist the COE Team during Operational Readiness Inspections (ORI) with expert opinion on ammunition and, to a limited extent, armaments
- Advise the PDV Team
- Act as WAAB Manager

**Main idea/objective for slide:**

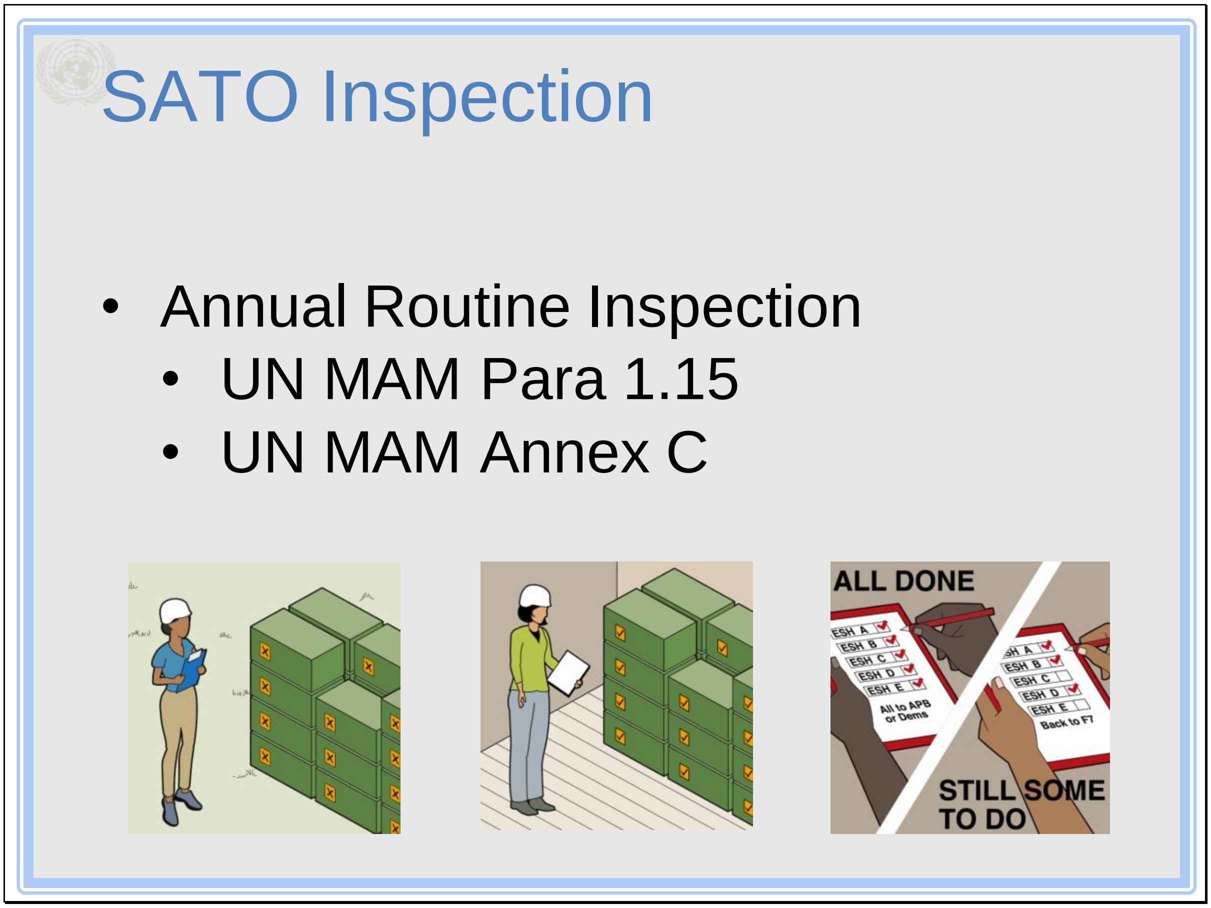
- Describe the Responsibilities of SATO deployed in the field mission.

**What the instructor should cover (in addition to slide content)**

- Participants are to be made aware of the responsibilities of SATO that are required to be performed by SATO in the field missions.

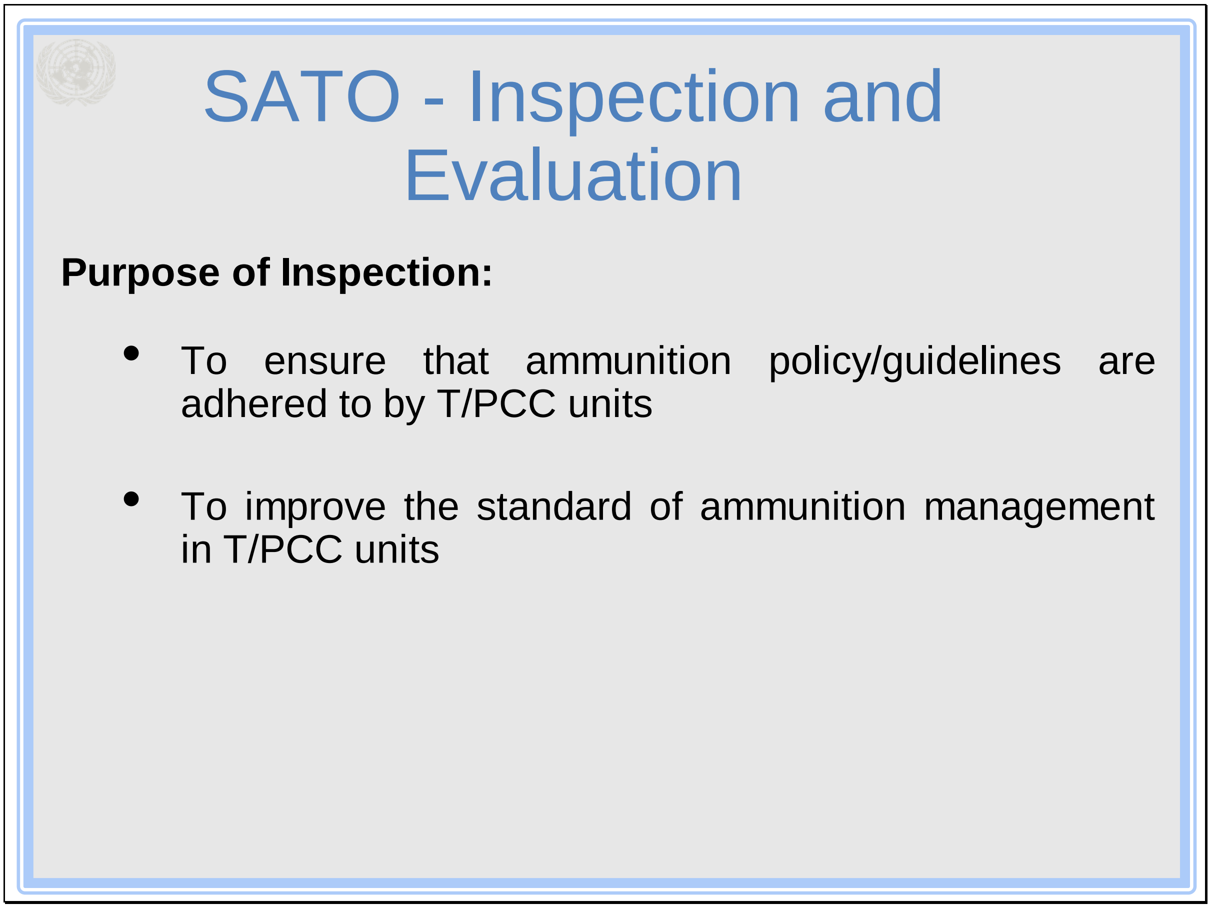
**References/further reading**

- Annex D of UNMAM, Page 43



# SATO Inspection

- Annual Routine Inspection
  - UN MAM Para 1.15
  - UN MAM Annex C



# SATO - Inspection and Evaluation

**Purpose of Inspection:**

- To ensure that ammunition policy/guidelines are adhered to by T/PCC units
- To improve the standard of ammunition management in T/PCC units

**Main idea/objective for slide:**
Discuss with the participants about the purpose of inspection.

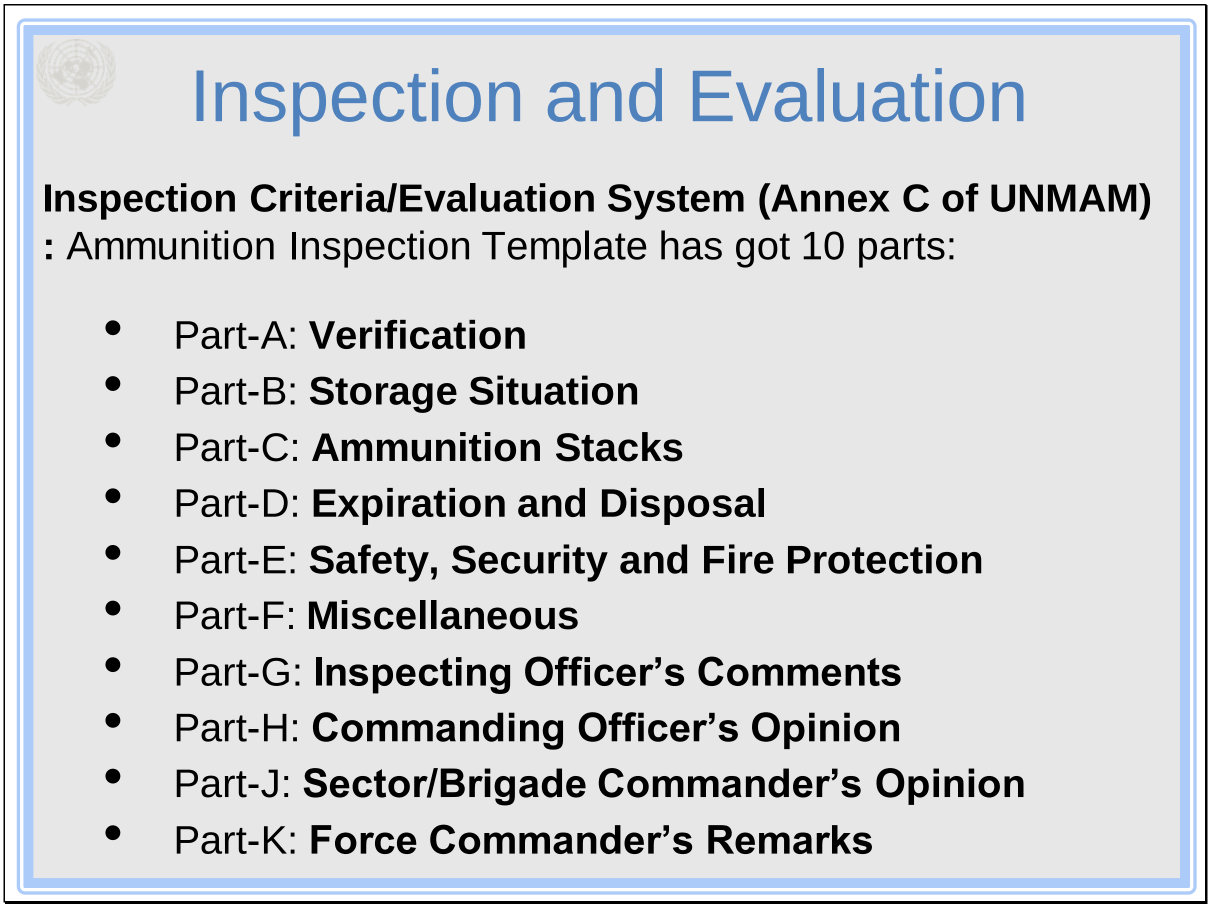
**What the instructor should cover (in addition to slide content)**

- Highlight the importance of inspection as ammunition contains high energy material and is designed to be as lethal as possible, it is highly desired that it is safe, reliable and effective during operation, transportation and handling.

**References/further reading**

- UNMAM-2020
- IATG 07.20 Inspection of Ammunition, Annex C "Guidance on physical inspection of ammunition"

Slide 55



# Inspection and Evaluation

**Inspection Criteria/Evaluation System (Annex C of UNMAM)** **:** Ammunition Inspection Template has got 10 parts:

- Part-A: **Verification**
- Part-B: **Storage Situation**
- Part-C: **Ammunition Stacks**
- Part-D: **Expiration and Disposal**
- Part-E: **Safety, Security and Fire Protection**
- Part-F: **Miscellaneous**
- Part-G: **Inspecting Officer’s Comments**
- Part-H: **Commanding Officer’s Opinion**
- Part-J: **Sector/Brigade Commander’s Opinion**
- Part-K: **Force Commander’s Remarks**

**Main idea/objective for slide:**

Discuss with the participants about the frequency of inspection and how to physically inspect ammunition and what are the most common inspection points to observe and record

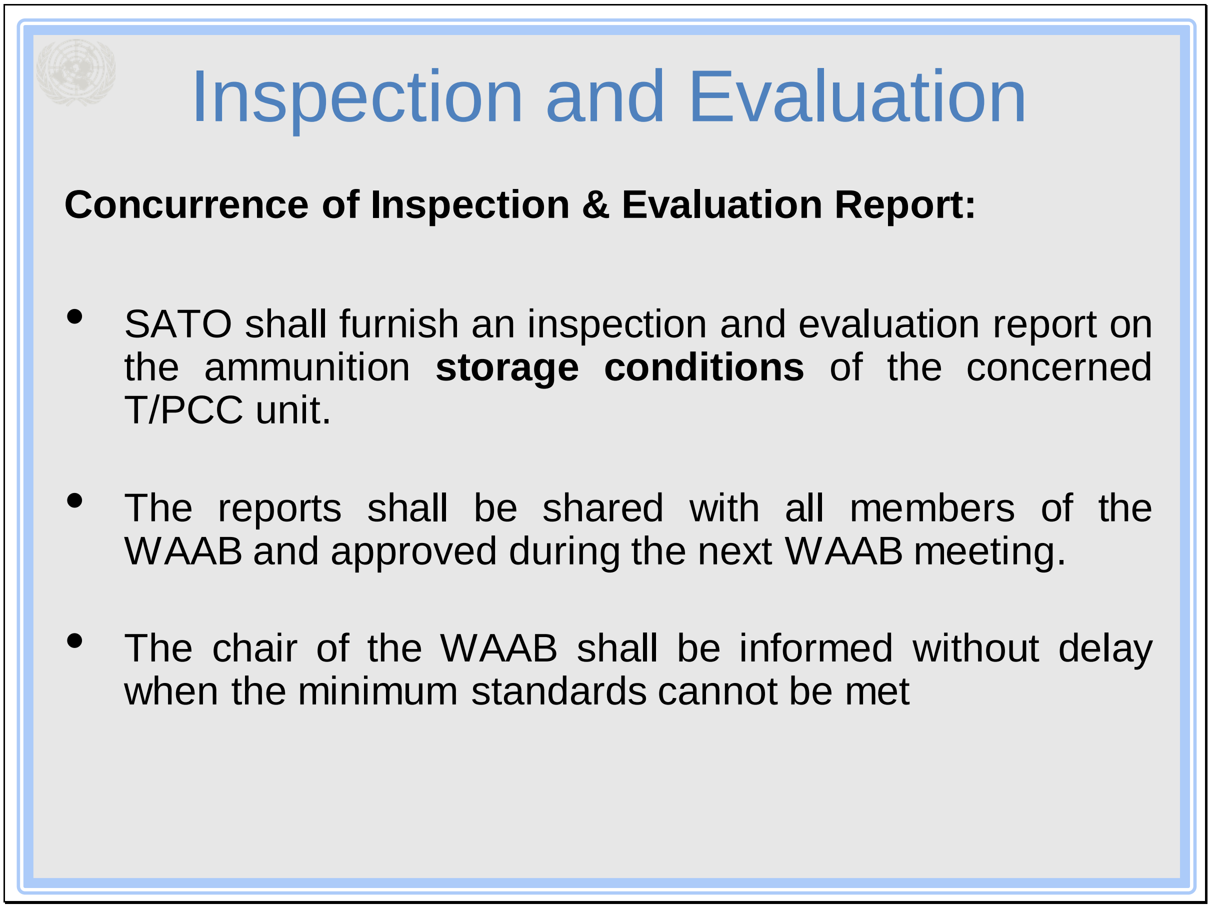
**What the instructor should cover (in addition to slide content)**

- Outline the various parts and components of ammunition that should be inspected and the observations recorded.

- Print template from UNMAM

**References/further reading**

- UNMAM-2020
- IATG 07.20 Inspection of Ammunition, Annex C "Guidance on physical inspection of ammunition"



## Inspection and Evaluation

**Concurrence of Inspection & Evaluation Report:**

- SATO shall furnish an inspection and evaluation report on the ammunition **storage conditions** of the concerned T/PCC unit.
- The reports shall be shared with all members of the WAAB and approved during the next WAAB meeting.
- The chair of the WAAB shall be informed without delay when the minimum standards cannot be met

**Main idea/objective for slide:**

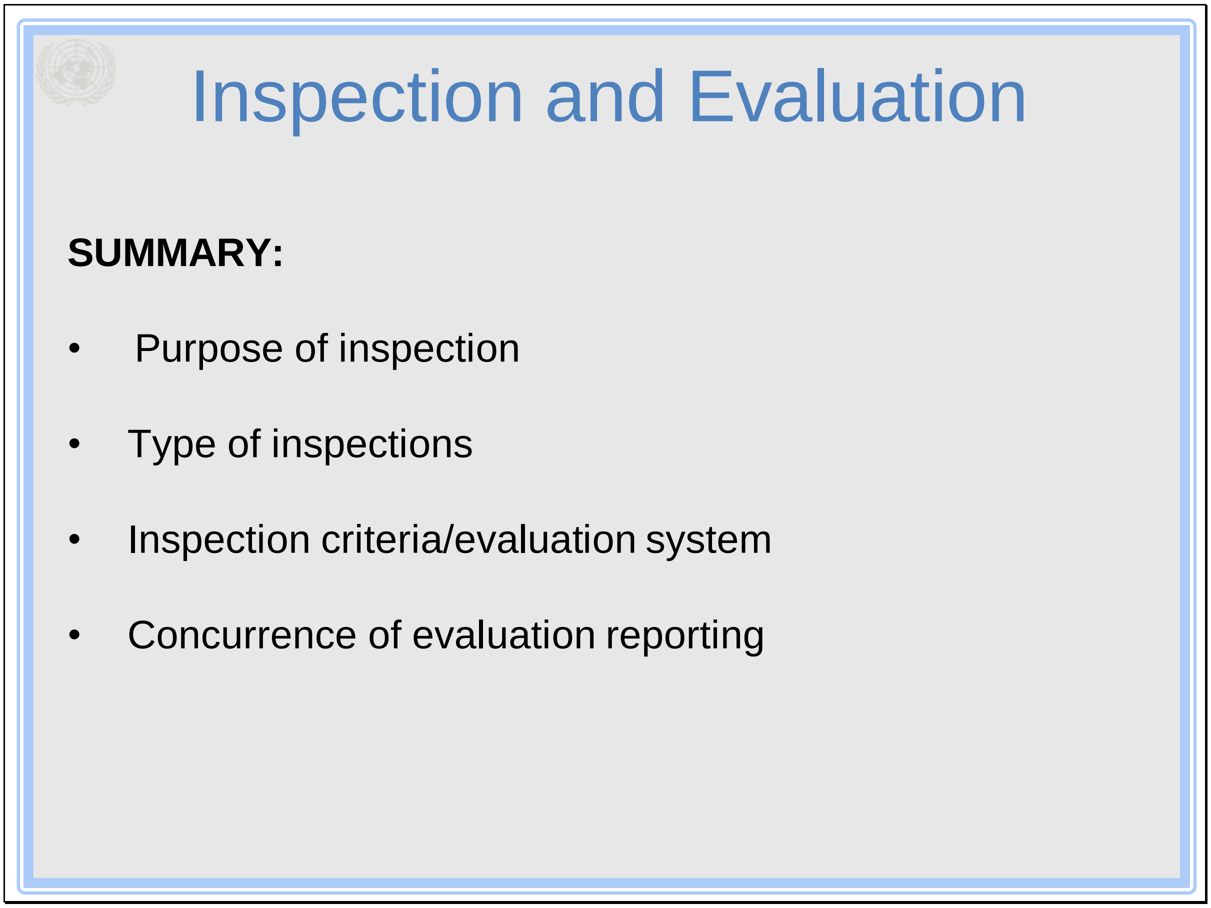
Discuss with the participants about the concurrence of Inspection and Evaluation Report by WAAB.

**What the instructor should cover (in addition to slide content)**

Highlight the importance of concurrence by WAAB as well as non-compliance.

**References/further reading**

UNMAM-2020



# Inspection and Evaluation

**SUMMARY:**

- Purpose of inspection
- Type of inspections
- Inspection criteria/evaluation system
- Concurrence of evaluation reporting

**Main idea/objective for slide:**

- Discuss with the participants about summary.

**What the instructor should cover (in addition to slide content)**

Summarized the topic

**References/further reading**

- UNMAM-2020
- IATG 07.20 Inspection of Ammunition, Annex C "Guidance on physical inspection of ammunition"

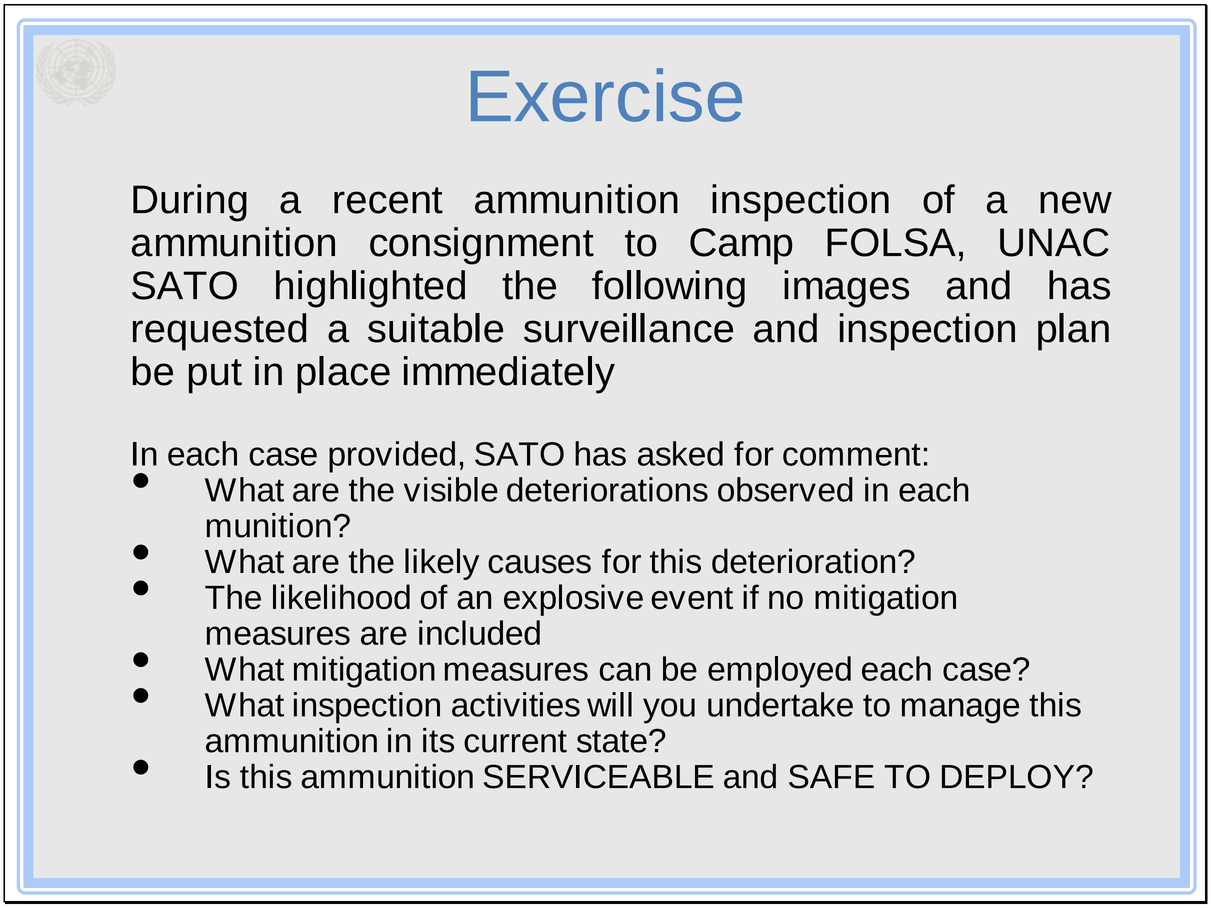
Slide 58

Participant
Exercise

**Phase 2. Development (**Time allocation - 150 min**)**

Stage 3 (Time allocation 50 mins) – participant Exercise

Slide 59



# Exercise

During a recent ammunition inspection of a new ammunition consignment to Camp FOLSA, UNAC SATO highlighted the following images and has requested a suitable surveillance and inspection plan be put in place immediately

In each case provided, SATO has asked for comment:

- What are the visible deteriorations observed in each munition?
- What are the likely causes for this deterioration?
- The likelihood of an explosive event if no mitigation measures are included
- What mitigation measures can be employed each case?
- What inspection activities will you undertake to manage this ammunition in its current state?
- Is this ammunition SERVICEABLE and SAFE TO DEPLOY?

**Main idea/objective for slide:**

- **participant exercise to suggest appropriate surveillance actions for different images, providing rationale for each action**

**What the instructor should cover (in addition to slide content)**

- In groups, participants will be provided a range of images showing ammunition and explosives. Instructors are to move around the class and help participants where required. Teamwork is permitted where preferred.
- When complete, work through the answers with the class and ask questions

**participant Activity**

participants must review the images provided, suggest the surveillance actions they will take in each case, providing rationale for doing so.

Each group, will provide a back brief on one image. participants must review all images in the manner above.
The Instructor will select the image to be briefed by the group.

Slide 60

# Lesson overview

- Discuss the Purpose of Surveillance and Proof
- Discuss the Degradation of Explosives and Propellants
- Discuss the determination of Ammunition Surplus and stock management of an explosive storage site
- Discuss the ESH Inspection Matrix and early warnings of expired ammunition during inspections
- Apply ammunition surveillance procedures to an explosive storage site
- Examine ammunition inspection during UN peacekeeping operations

## Summary

In this training session, participants applied their knowledge and skills of ammunition inspection to effectively manage ammunition stocks at Explosive Storage Sites. Key learning points included:

- Participants explored the purpose and importance of surveillance and proof processes in ensuring the serviceability and reliability of stored ammunition.
- Engage in discussions about the factors and processes leading to the degradation of explosives and propellants, highlighting the importance of monitoring for signs of degradation.
- Participants learned about methods for determining ammunition surplus and managing stock levels at Explosive Storage Sites, ensuring efficient inventory management.
- Explore the ESH Inspection Matrix and its role in identifying early warnings of expired ammunition during inspections, emphasizing proactive measures for maintaining ammunition serviceability.
- Practice applying ammunition surveillance procedures to simulated scenarios at Explosive Storage Sites, demonstrating proficiency in monitoring and maintaining ammunition serviceability.
- Discuss the importance of ammunition inspection in UN peacekeeping operations and its role in ensuring mission readiness and operational effectiveness.

Slide 61

Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Range Management

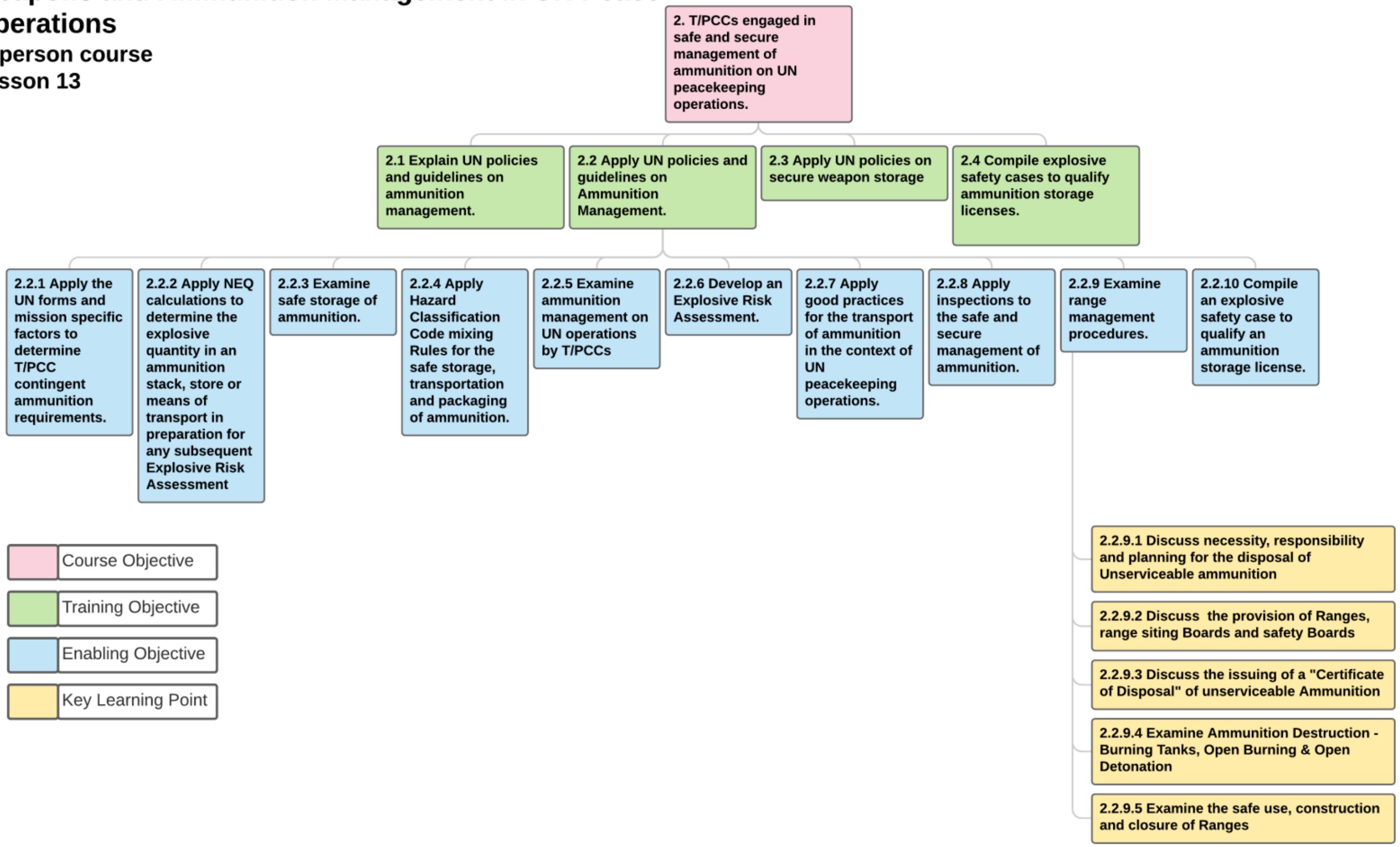
**Main idea/objective for slide:**
Look ahead to the next lesson of the course:
Range Management

# Lesson 2.9

## Lesson 2.9: Range management

### Weapons and Ammunition Management in UN Peace Operations

**In-person course**
**Lesson 13**



2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.

- 2.1 Explain UN policies and guidelines on ammunition management.
- 2.2 Apply UN policies and guidelines on Ammunition Management.
  - 2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.
  - 2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment
  - 2.2.3 Examine safe storage of ammunition.
  - 2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.
  - 2.2.5 Examine ammunition management on UN operations by T/PCCs
  - 2.2.6 Develop an Explosive Risk Assessment.
  - 2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.
  - 2.2.8 Apply inspections to the safe and secure management of ammunition.
  - 2.2.9 Examine range management procedures.
    - 2.2.9.1 Discuss necessity, responsibility and planning for the disposal of Unserviceable ammunition
    - 2.2.9.2 Discuss the provision of Ranges, range siting Boards and safety Boards
    - 2.2.9.3 Discuss the issuing of a "Certificate of Disposal" of unserviceable Ammunition
    - 2.2.9.4 Examine Ammunition Destruction - Burning Tanks, Open Burning & Open Detonation
    - 2.2.9.5 Examine the safe use, construction and closure of Ranges
  - 2.2.10 Compile an explosive safety case to qualify an ammunition storage license.
- 2.3 Apply UN policies on secure weapon storage
- 2.4 Compile explosive safety cases to qualify ammunition storage licenses.

🟥 Course Objective
🟩 Training Objective
🟦 Enabling Objective
🟨 Key Learning Point

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L13. Range management |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 90 mins |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.9 Examine range management procedures. | 2.2.9.1 Discuss necessity, responsibility and planning for the disposal of Unserviceable ammunition<br>2.2.9.2 Discuss the provision of Ranges, range siting Boards and safety Boards<br>2.2.9.3 Discuss the issuing of a "Certificate of Disposal" of unserviceable Ammunition<br>2.2.9.4 Examine Ammunition Destruction - Burning Tanks, Open Burning & Open Detonation<br>2.2.9.5 Examine the safe use, construction and closure of Ranges |
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Examine range management procedures. |
| **Assessment Criteria:** | There is no final assessment for this exercise, however, Instructors will use informal class discussion, questioning of participants and review the work by the participants to enable a positive feedback loop to be established to enhance the effectiveness of the learning. |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | 1:6 in syndicates. Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom, projector and screen, flipchart, whiteboard |
| **Instructional tools & materials** | • Range Clear certificate Template<br>• Images showing best practice range management |
| **Participant Resources:** | Full size printouts of some slides where required – see slide notes for details. |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: Health and safety checklist for classrooms (hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

## SECTION 2: LESSON PLAN

### Executive summary:

During this lesson participants will examine range management procedures related to ammunition management on UN T/PCC operations. They will discuss the necessity, responsibility and planning for the disposal of unserviceable ammunition. Specifically, they will look at the provision of ranges, range siting and safety boards, and the issuing of a "Certificate of Disposal" of unserviceable ammunition. They will also examine ammunition destruction (burning tanks, open burning & open detonation); along with the safe use, construction and closure of ranges.

### Setup:

Phase 1, Phase 2 (stages 1 & 2) and Phase 3 will be delivered to the class as a single collective.

Phase 3 (stage 3) will be conducted in small groups (6-8 participants) each with a dedicated instructor.

### Conduct

### Phase 1. Introduction (Time allocation - 15 min)

- Introduce the objectives of the lesson.
- Highlight the content in the 3 key reference documents that relate to the effective and safe range management on operational missions.
- Discuss necessity, responsibility and planning for the disposal of Unserviceable ammunition

### Phase 2. Development

Stage 1 (Time allocation 20 mins) – Range Safety Boards and their roles

- Discuss in depth the need for effective range management practices on a UN mission paying particular attention to the safety of troops and non-military personnel.
- Introduce and discuss the composition of the range siting board and safety board, their roles and responsibilities and the various documents required to ensure the safe management of all firing ranges.

Stage 2 (Time allocation 25 mins) – Conduct of firing ranges

- Provide examples to the class of times when firing ranges are required, to include training of personnel, disposal of time expired or unserviceable ammunition and EOD activities. Use effective imagery where possible to describe best practice.

- Discuss the safe practices required to conduct safe use, construction and closure of ranges.
- Discuss the issuing of a "Certificate of Disposal" of unserviceable Ammunition
- Introduce and explain the completion of the range clear safety certificate and outline how and when this certificate is completed.
- Discuss the various mechanisms used for the destruction of time expired ammunition and explosives (Burning Tanks, Open Burning & Open Detonation) and describe how these range practices are conducted safely.
- Emphasise the requirement to remove all lead shots from ranges which are decommissioned prior to handing over.
- Ask questions to the class at each stage to check understanding.

Stage 3 (Time allocation 20 mins) – Participant exercise

- See exercise detail and instructions on slides 26 - 28
- In groups, participants discuss the risks associated with ranges and have them develop a range of mitigating factors which can be employed to reduce the risk.
- Participants to practice completing a range safety certificate, based on UN CARANA scenario.
- When the groups have completed their groupwork, work through the answers with the class and ask questions.

**Phase 3. Consolidation (Time allocation - 10 min)**

- Review Enabling Objective and Key Learning Points (see Section 1), drawing out any common themes.
- Look ahead to the next lesson of the course:
    - Safeguarding

Slide 1

Weapons and Ammunition Management in UN Peace Operations

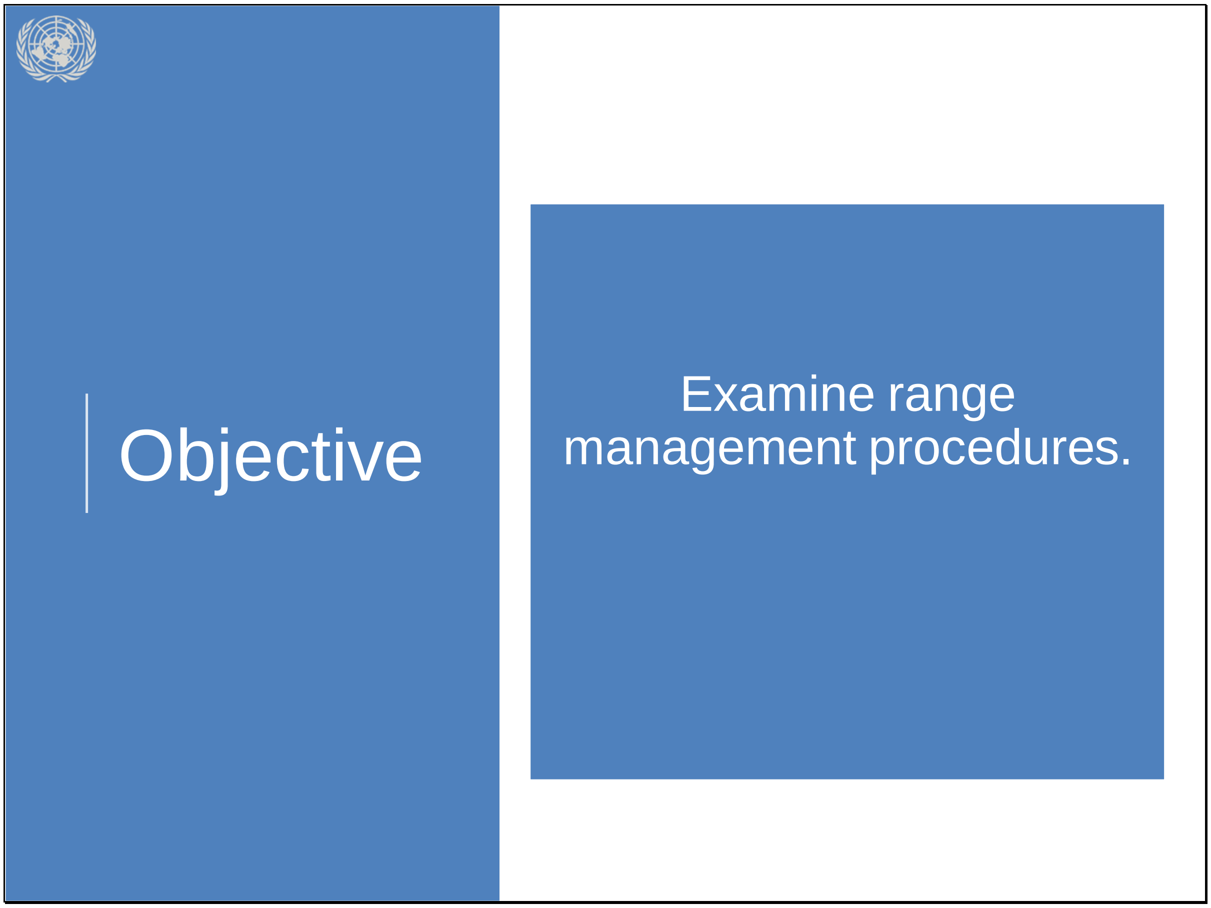
Range Management

**Key Reference Documents for this lesson:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2



Objective

Examine range management procedures.

**Main idea/objective for slide:**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.9 Examine range management procedures.)

What the instructor should cover (in addition to slide content)
By the end of this training session the participant will examine range management procedures.

Slide 3

Lesson overview

- Discuss necessity, responsibility and planning for the disposal of unserviceable ammunition
- Discuss the provision of Ranges, Range Siting Boards and Safety Boards
- Discuss issuing a "Certificate of Disposal" for unserviceable ammunition
- Examine Ammunition Destruction - Burning Tanks, Open Burning & Open Detonation
- Examine the safe use, construction and closure of Ranges

**Main idea/objective for slide:**
**Introduce the Key Learning Points**

What the instructor should cover (in addition to slide content)

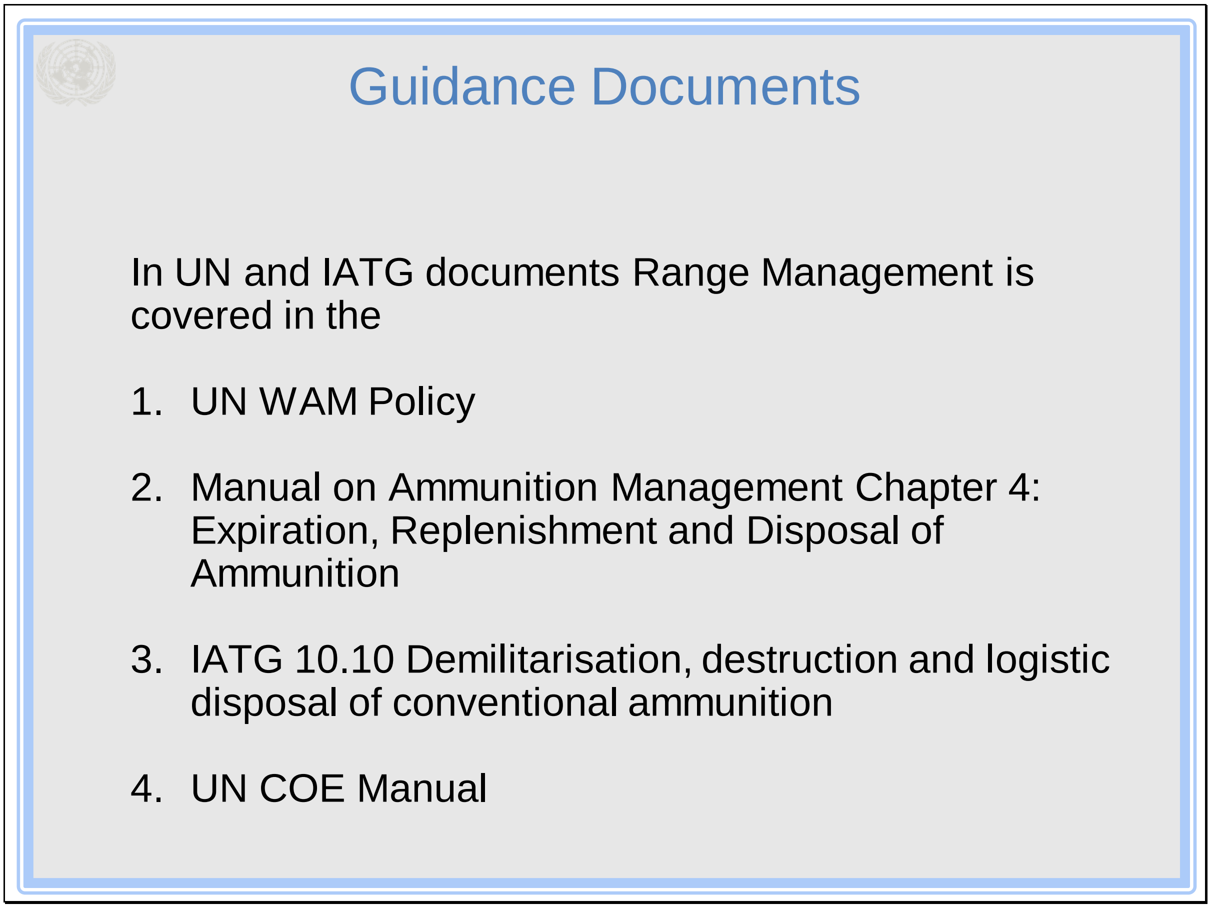
Key Learning Points
2.2.9.1 Discuss necessity, responsibility and planning for the disposal of Unserviceable ammunition
2.2.9.2 Discuss the provision of Ranges, range siting Boards and safety Boards
2.2.9.3 Discuss the issuing of a "Certificate of Disposal" of unserviceable Ammunition
2.2.9.4 Examine Ammunition Destruction - Burning Tanks, Open Burning & Open Detonation
2.2.9.5 Examine the safe use, construction and closure of Ranges

Slide 4

UN Range Management – Guidance Documents

**Phase 1. Introduction (**Time allocation - 15 min**)**

Slide 5



## Guidance Documents

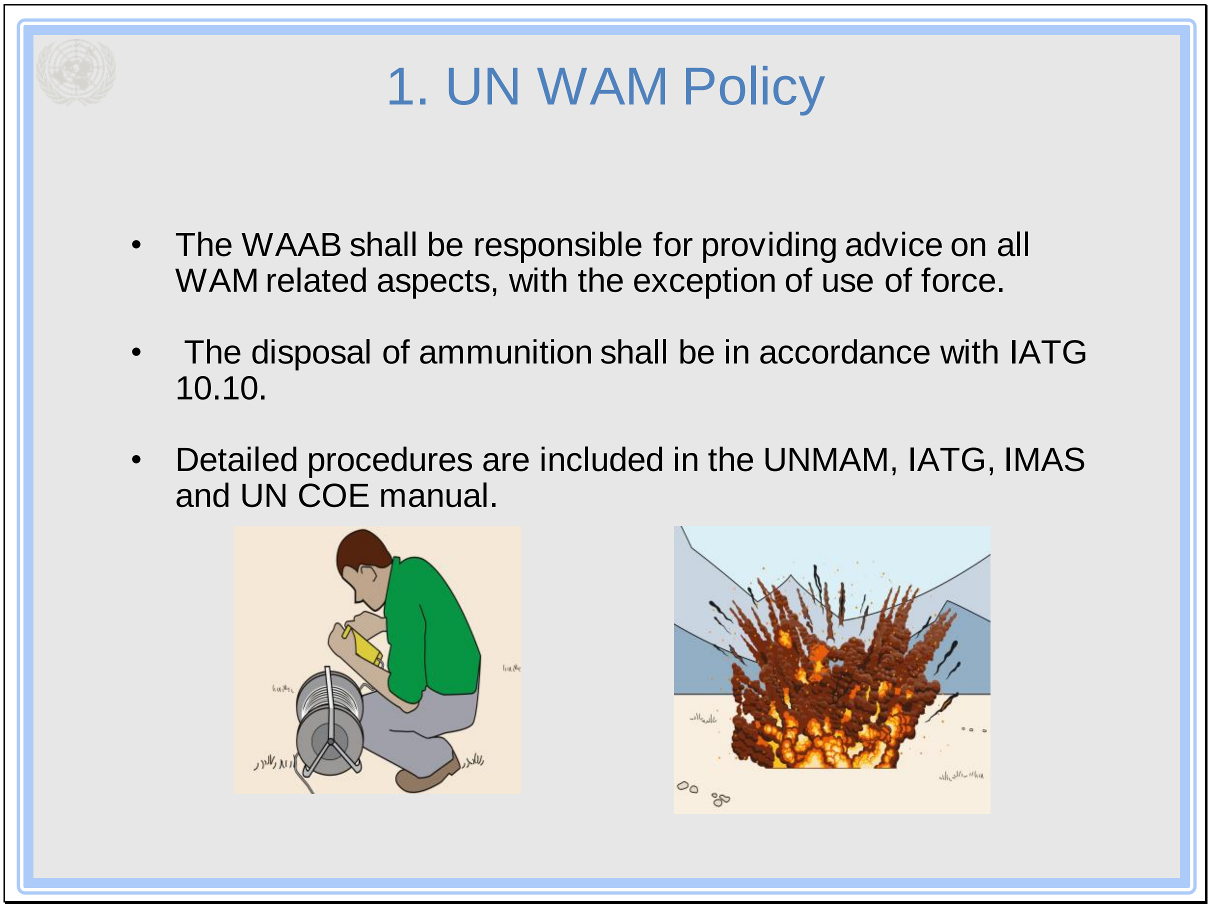
In UN and IATG documents Range Management is covered in the

1. UN WAM Policy
2. Manual on Ammunition Management Chapter 4: Expiration, Replenishment and Disposal of Ammunition
3. IATG 10.10 Demilitarisation, destruction and logistic disposal of conventional ammunition
4. UN COE Manual

**<u>Main idea/objective for slide:</u>**

- **Highlight the 4 key reference documents that relate to the effective and safe range management on operational missions.**

Slide 6



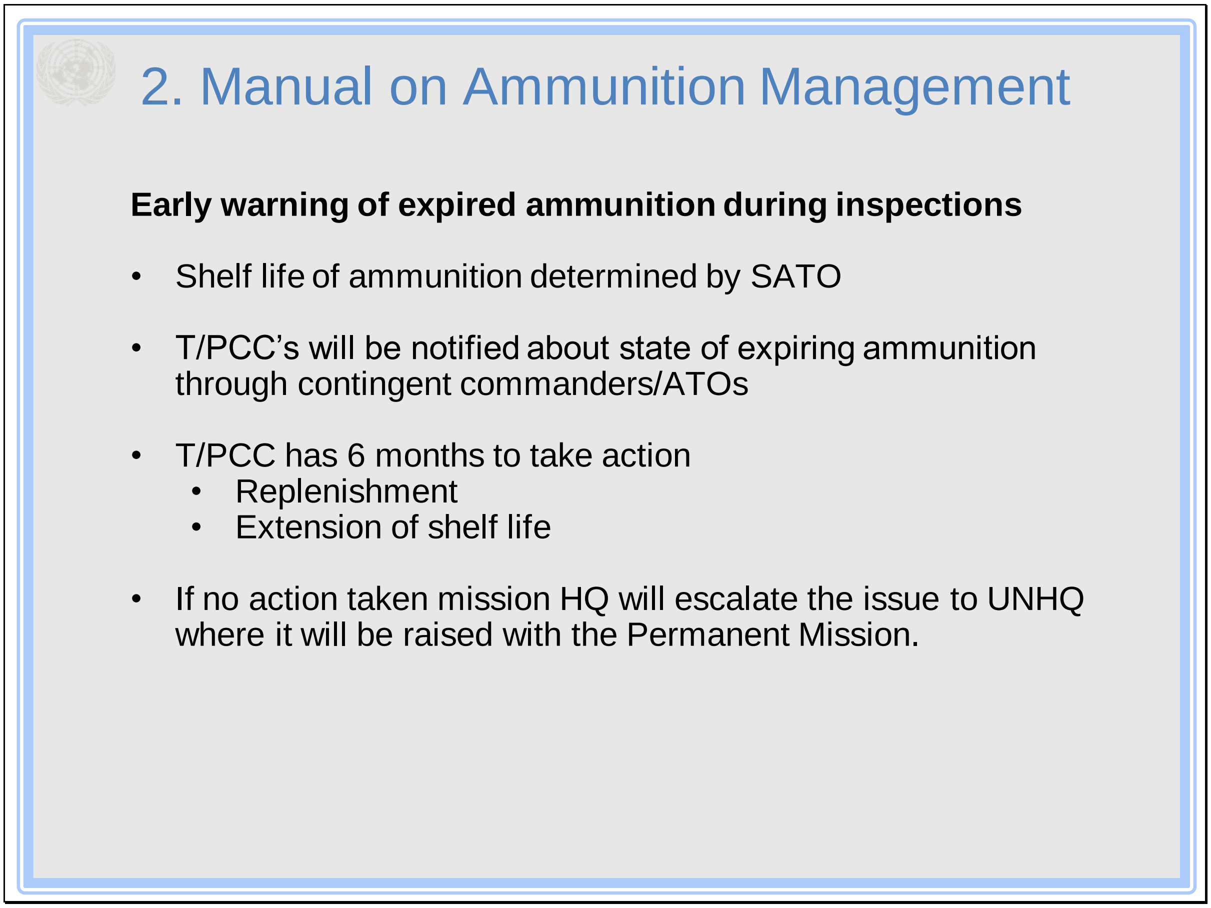
# 1. UN WAM Policy

- The WAAB shall be responsible for providing advice on all WAM related aspects, with the exception of use of force.
- The disposal of ammunition shall be in accordance with IATG 10.10.
- Detailed procedures are included in the UNMAM, IATG, IMAS and UN COE manual.

**<u>Main idea/objective for slide:</u>**

- **Highlight the content in the UN WAM Policy that relates to the effective and safe range management on operational missions.**

Slide 7



## 2. Manual on Ammunition Management

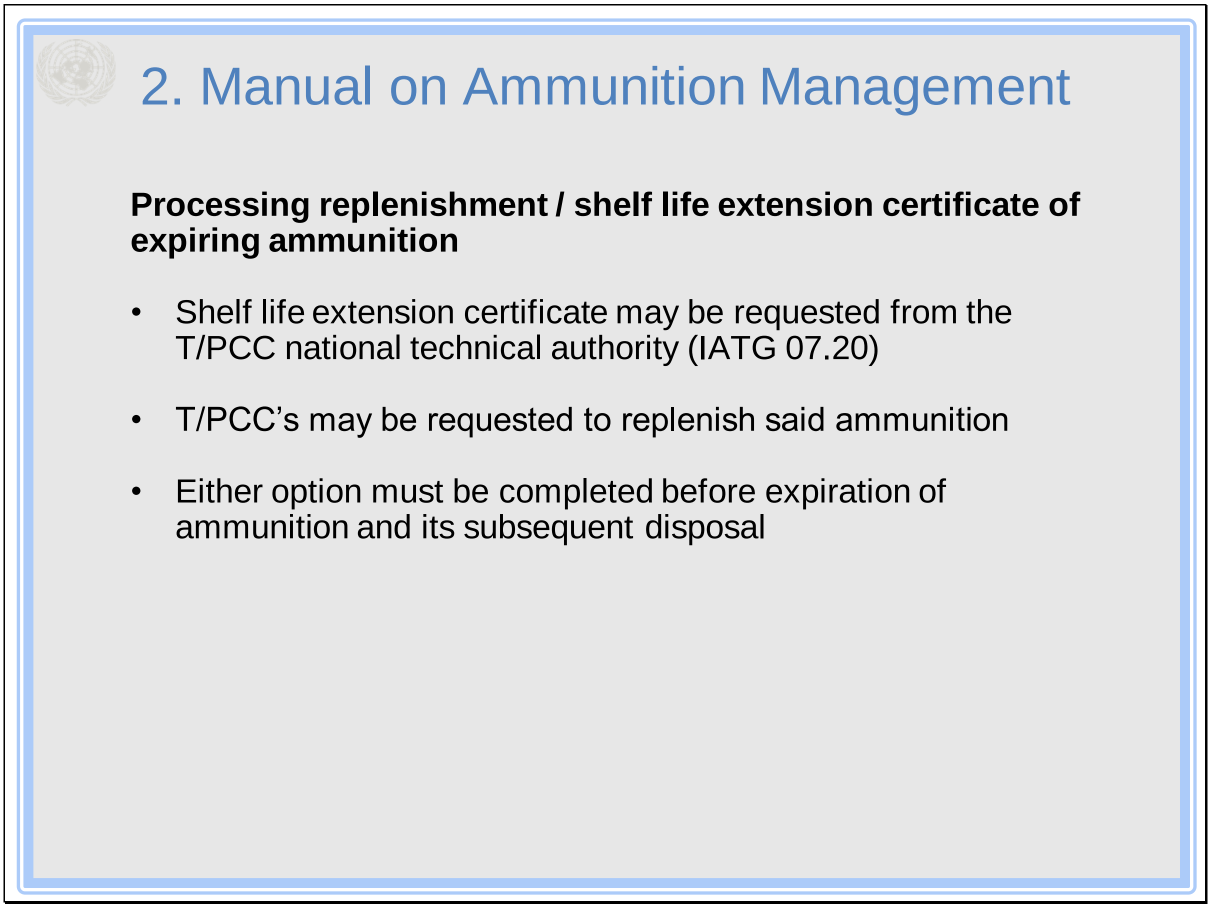
**Early warning of expired ammunition during inspections**

- Shelf life of ammunition determined by SATO
- T/PCC's will be notified about state of expiring ammunition through contingent commanders/ATOs
- T/PCC has 6 months to take action
  - Replenishment
  - Extension of shelf life
- If no action taken mission HQ will escalate the issue to UNHQ where it will be raised with the Permanent Mission.

**Main idea/objective for slide:**

- **Highlight the content in the Manual on Ammunition Management that relates to the effective and safe range management on operational missions.**

Slide 8



## 2. Manual on Ammunition Management

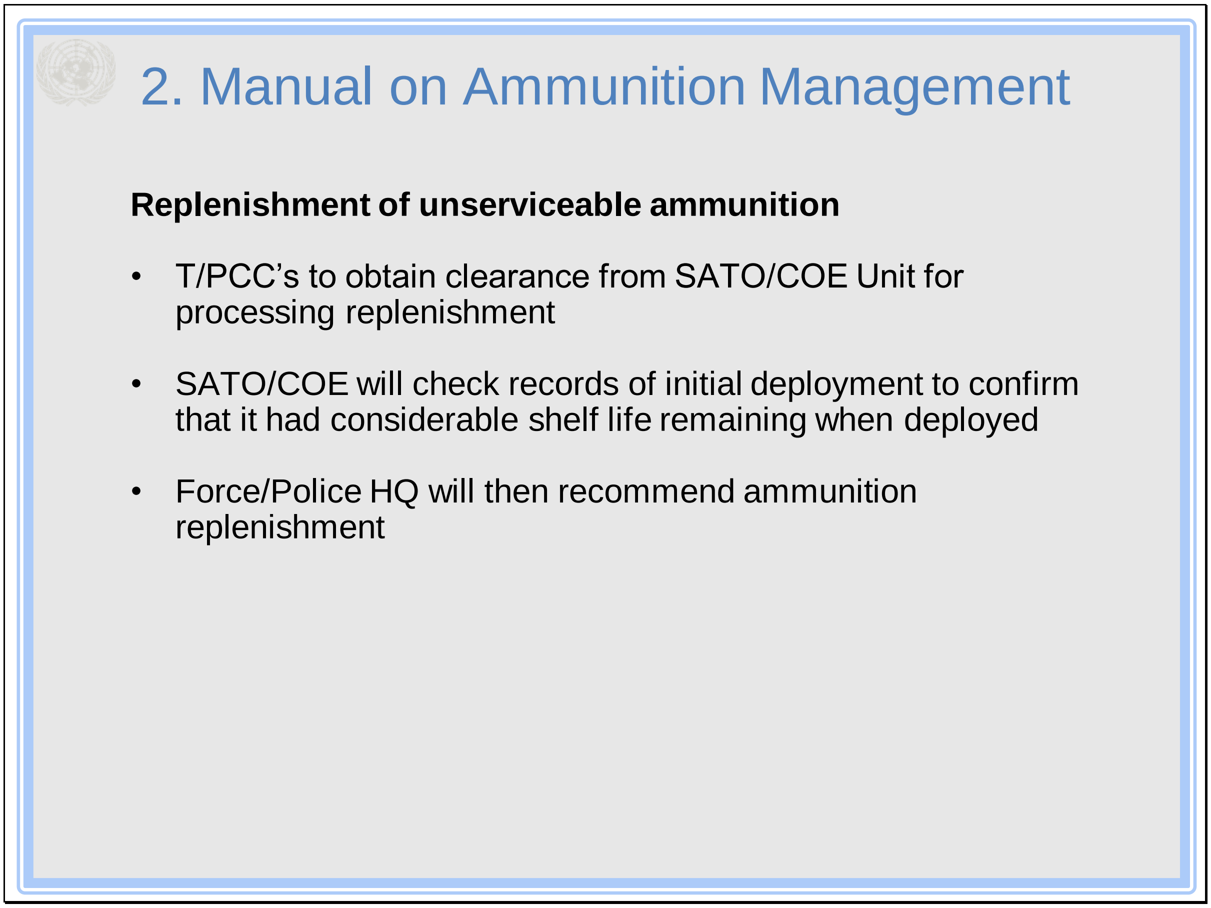
**Processing replenishment / shelf life extension certificate of expiring ammunition**

- Shelf life extension certificate may be requested from the T/PCC national technical authority (IATG 07.20)
- T/PCC's may be requested to replenish said ammunition
- Either option must be completed before expiration of ammunition and its subsequent disposal

**Main idea/objective for slide:**

- **Highlight the content in the Manual on Ammunition Management that relates to the effective and safe range management on operational missions.**

Slide 9



## 2. Manual on Ammunition Management

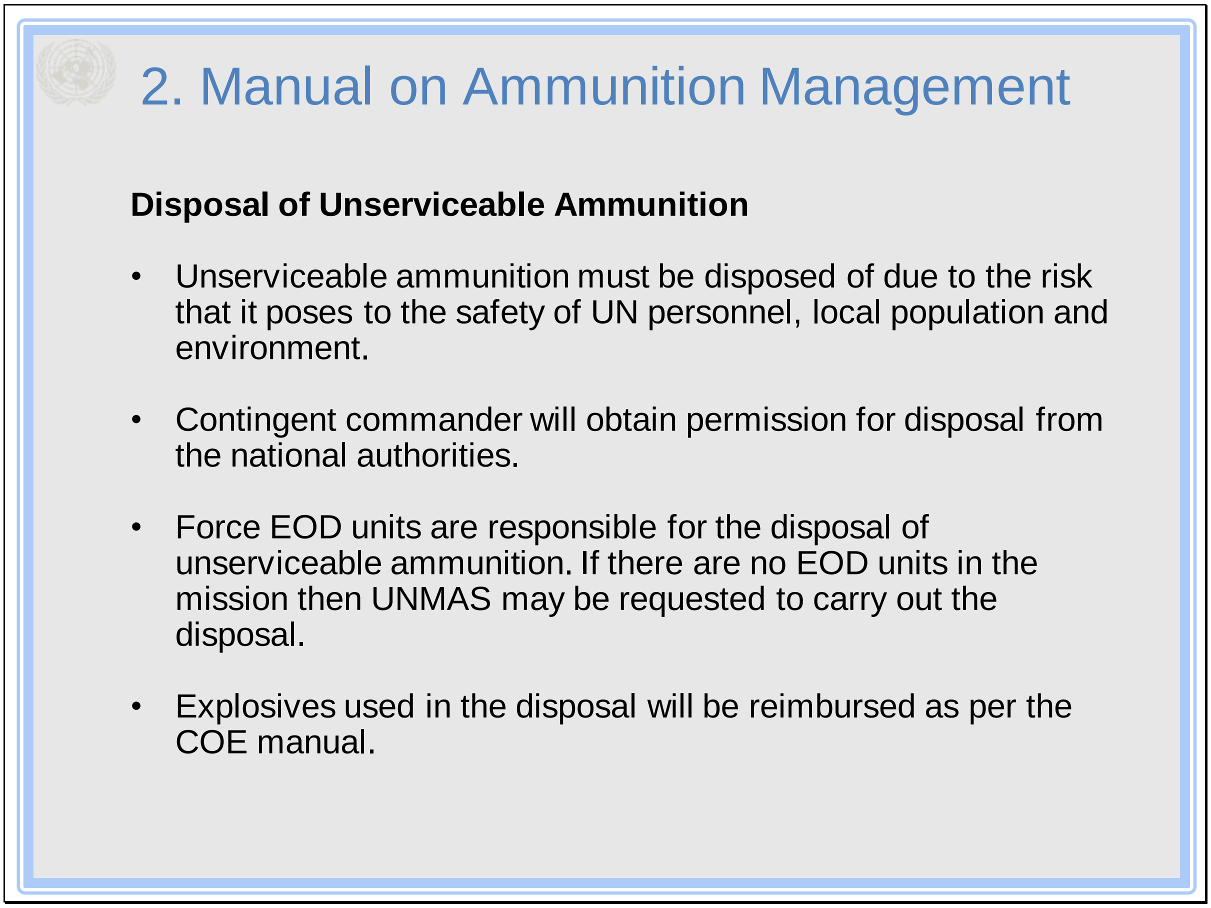
**Replenishment of unserviceable ammunition**

- T/PCC's to obtain clearance from SATO/COE Unit for processing replenishment
- SATO/COE will check records of initial deployment to confirm that it had considerable shelf life remaining when deployed
- Force/Police HQ will then recommend ammunition replenishment

**<u>Main idea/objective for slide:</u>**

- **Highlight the content in the Manual on Ammunition Management that relates to the effective and safe range management on operational missions.**

Slide 10



## 2. Manual on Ammunition Management

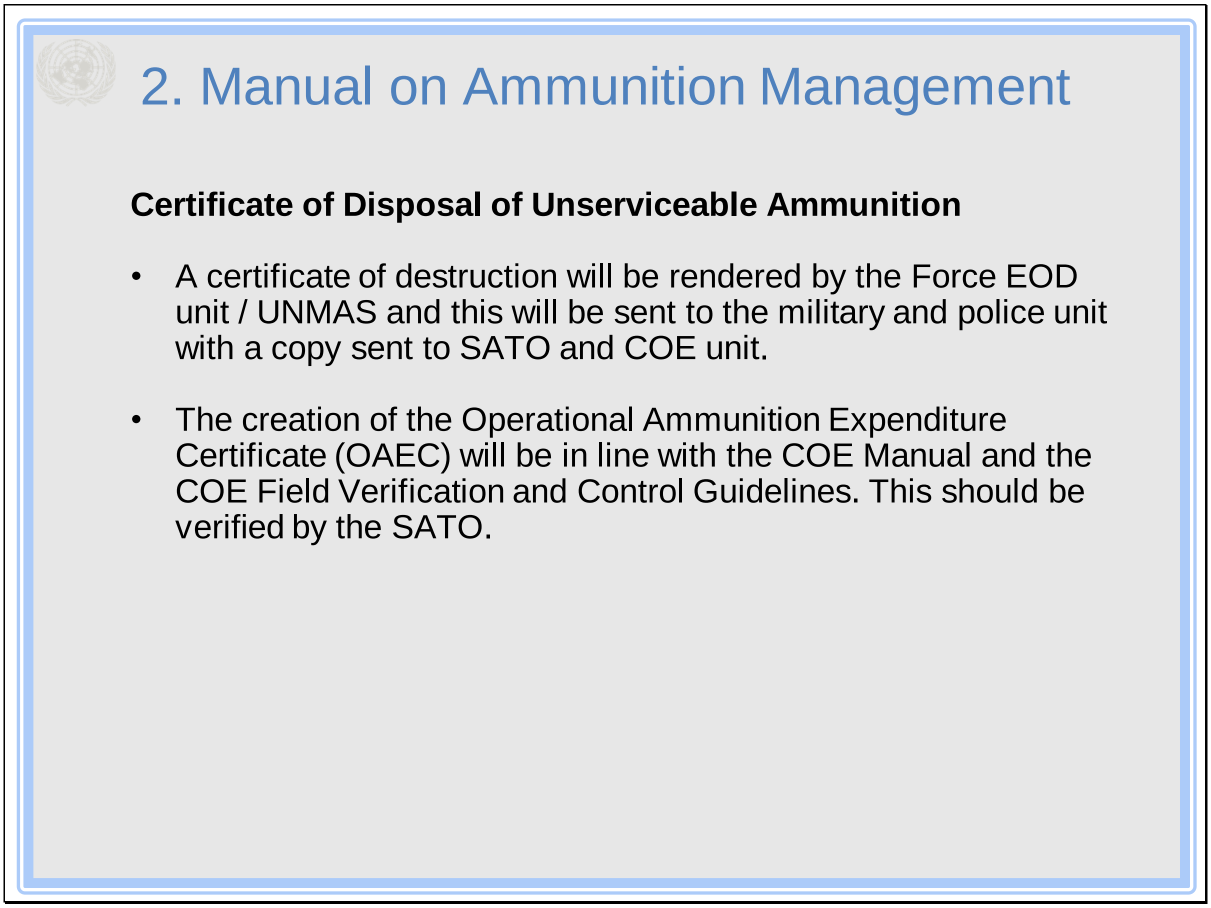
**Disposal of Unserviceable Ammunition**

- Unserviceable ammunition must be disposed of due to the risk that it poses to the safety of UN personnel, local population and environment.
- Contingent commander will obtain permission for disposal from the national authorities.
- Force EOD units are responsible for the disposal of unserviceable ammunition. If there are no EOD units in the mission then UNMAS may be requested to carry out the disposal.
- Explosives used in the disposal will be reimbursed as per the COE manual.

**<u>Main idea/objective for slide:</u>**

- **Highlight the content in the Manual on Ammunition Management that relates to the effective and safe range management on operational missions.**

<u>What the instructor should cover (in addition to slide content)</u>
Discuss necessity, responsibility and planning for the disposal of Unserviceable ammunition



## 2. Manual on Ammunition Management

**Certificate of Disposal of Unserviceable Ammunition**

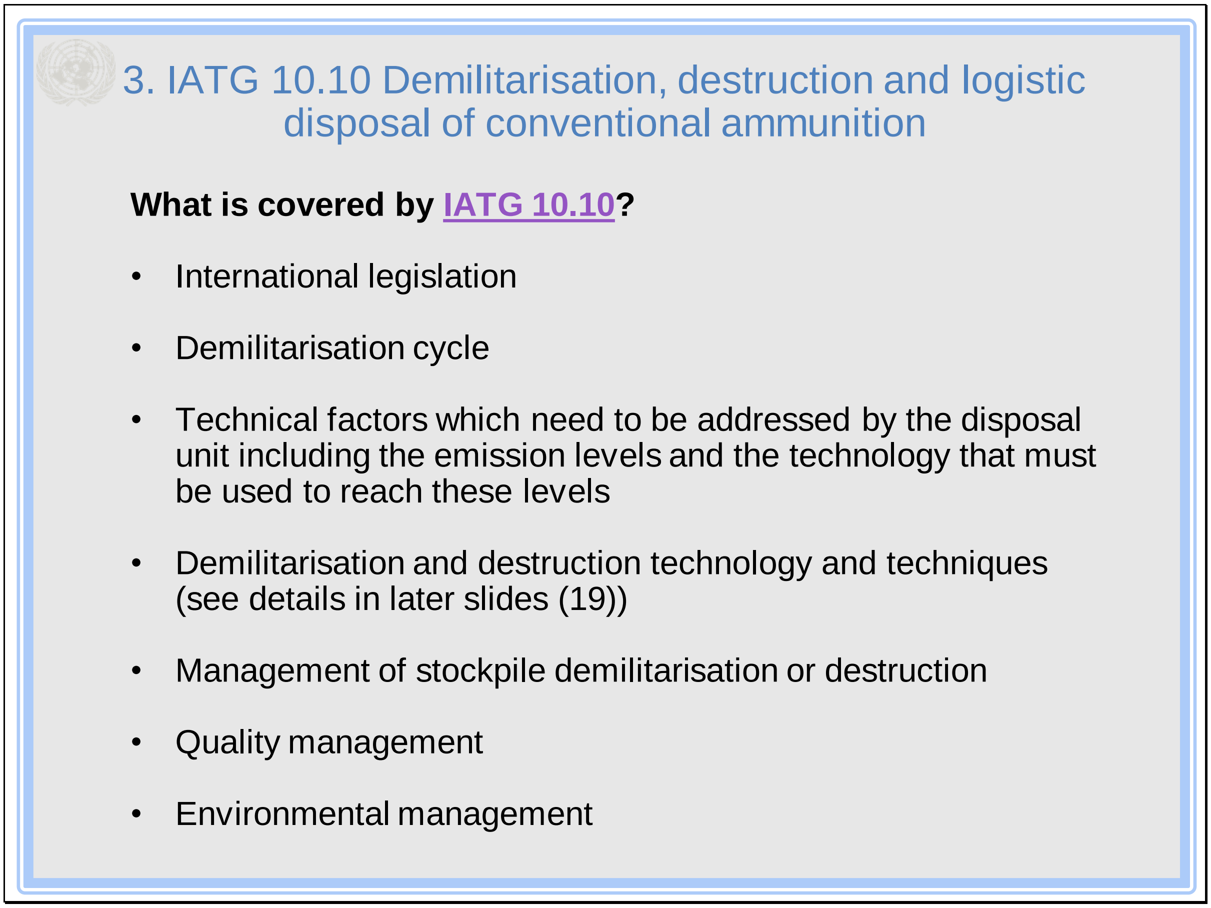
- A certificate of destruction will be rendered by the Force EOD unit / UNMAS and this will be sent to the military and police unit with a copy sent to SATO and COE unit.
- The creation of the Operational Ammunition Expenditure Certificate (OAEC) will be in line with the COE Manual and the COE Field Verification and Control Guidelines. This should be verified by the SATO.

**Main idea/objective for slide:**

- **Highlight the content in the Manual on Ammunition Management that relates to the effective and safe range management on operational missions.**
- Discuss the issuing of a "Certificate of Disposal" of unserviceable Ammunition

What the instructor should cover (in addition to slide content)

Discuss necessity, responsibility and planning for the disposal of Unserviceable ammunition



## 3. IATG 10.10 Demilitarisation, destruction and logistic disposal of conventional ammunition

**What is covered by IATG 10.10?**

- International legislation
- Demilitarisation cycle
- Technical factors which need to be addressed by the disposal unit including the emission levels and the technology that must be used to reach these levels
- Demilitarisation and destruction technology and techniques (see details in later slides (19))
- Management of stockpile demilitarisation or destruction
- Quality management
- Environmental management

**Main idea/objective for slide:**

- **Highlight the content in IATG 10.10 that relates to the effective and safe range management on operational missions.**

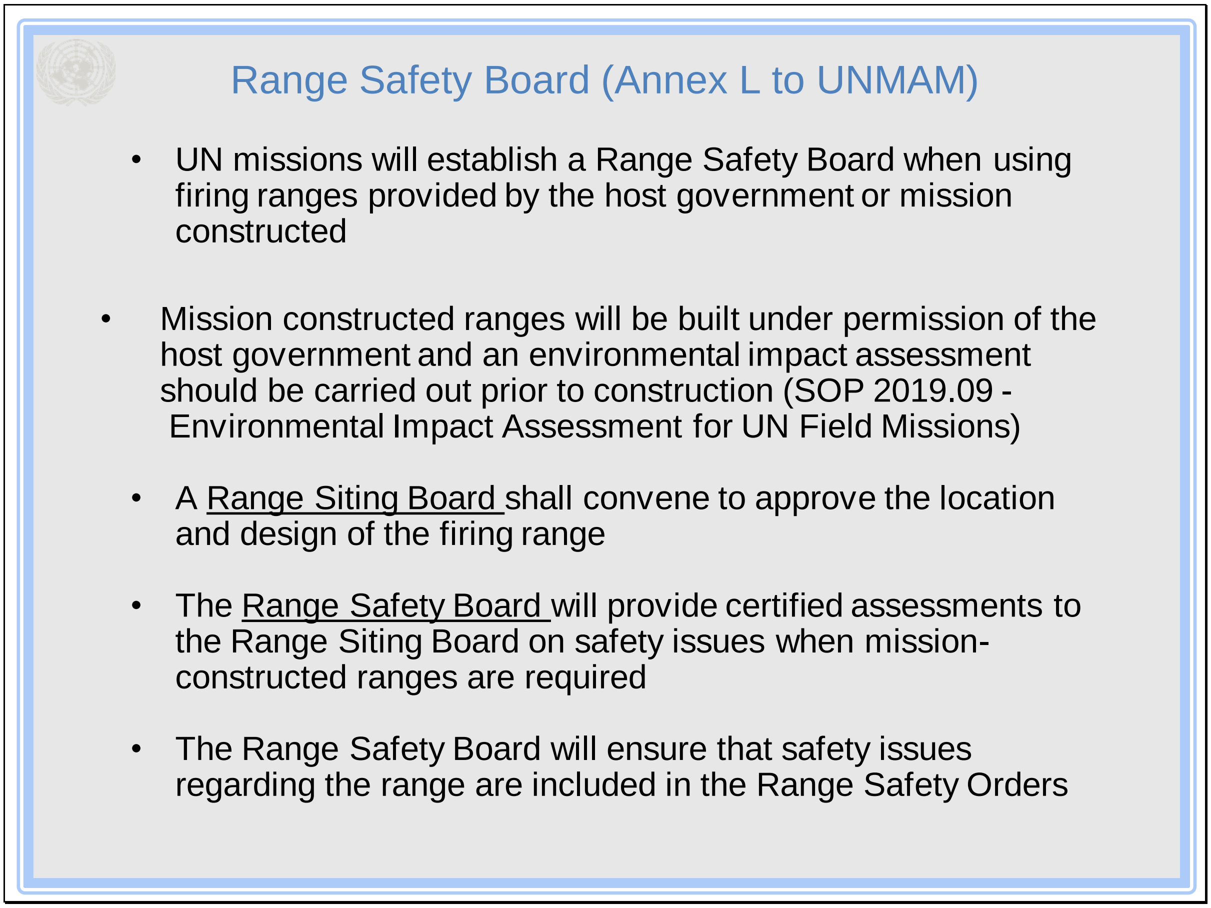
Slide 13

Range Safety Boards and their roles

**Phase 2. Development (**Time allocation - 65 min**)**

Stage 1 (Time allocation 20 mins) – Range Safety Boards and their roles

Slide 14



## Range Safety Board (Annex L to UNMAM)

- UN missions will establish a Range Safety Board when using firing ranges provided by the host government or mission constructed
- Mission constructed ranges will be built under permission of the host government and an environmental impact assessment should be carried out prior to construction (SOP 2019.09 - Environmental Impact Assessment for UN Field Missions)
- A <u>Range Siting Board</u> shall convene to approve the location and design of the firing range
- The <u>Range Safety Board</u> will provide certified assessments to the Range Siting Board on safety issues when mission-constructed ranges are required
- The Range Safety Board will ensure that safety issues regarding the range are included in the Range Safety Orders

**<u>Main idea/objective for slide:</u>**

- **Discuss in depth the need for effective range management practices on a UN mission paying particular attention to the safety of troops and non-military personnel.**

<u>participant Activity</u>

Ask participants to list who they think make up the Range Siting Board.

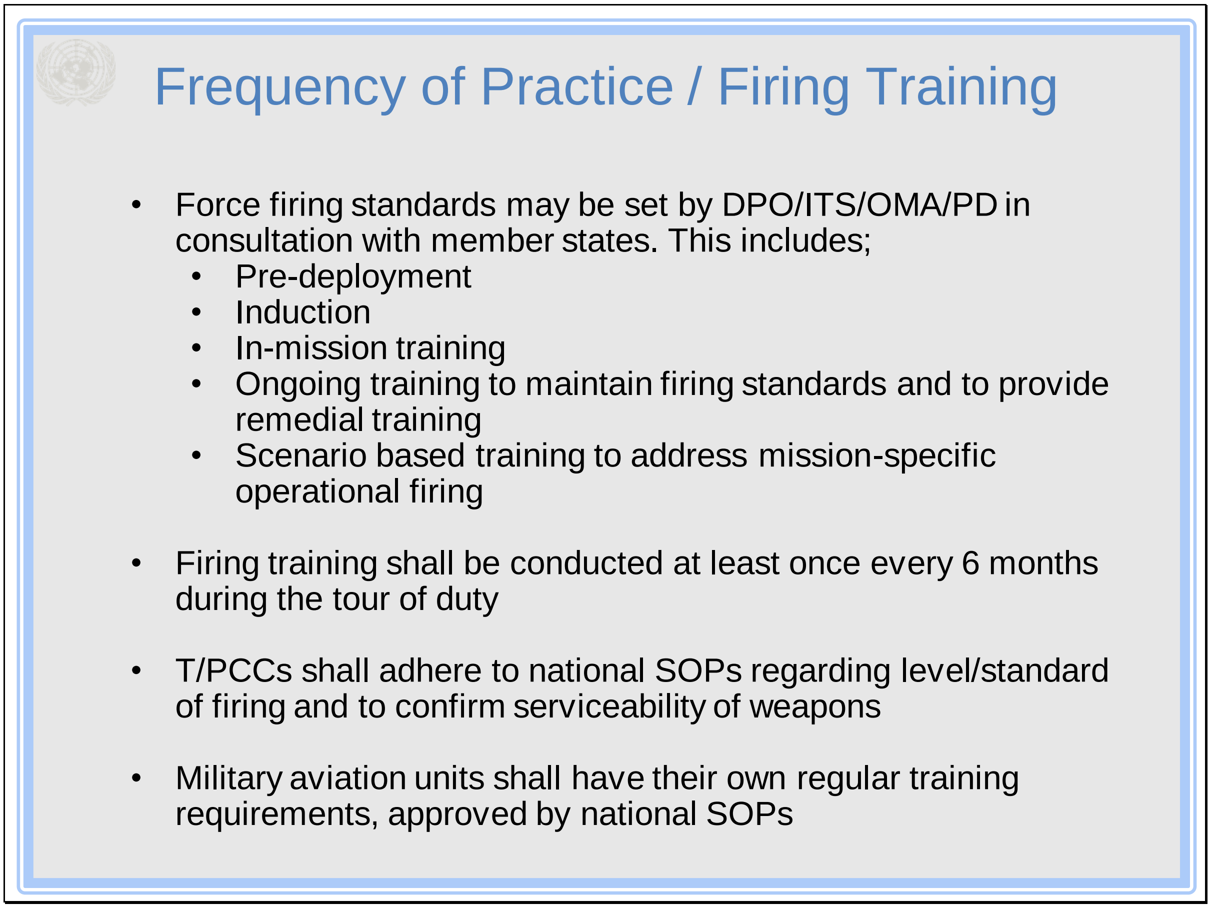
<u>What the instructor should cover (in addition to slide content)</u>

- Introduce and list the members of the Range Siting Board:
    - Senior military officer of rank Lieutenant Colonel (Lt Col) or above to act as chairman • Senior civilian officer P5 or above • Senior police official • Military engineer • Civilian engineer • Ammunition technical officer • Mission environmental officer

- Introduce and list the members of the Range Safety Board:
    - Senior military officer of rank Lt. Col. or above to act as chairman. • Senior civilian officer P-5, or above. • Senior police official. • Ammunition technical officer. • Contingent representative (x 2 if appropriate).

- Range Siting Board considerations:
    - The proposed range site, range orientation, topography, drainage and vegetation. • Weapon firing templates and range danger zones for the weapons and ammunition approved for use. • Local human and animal populations. • Possible human and animal site encroachment. • Environmental issues. • Noise and noise attenuation if required. • Other issues.

Slide 15



## Frequency of Practice / Firing Training

- Force firing standards may be set by DPO/ITS/OMA/PD in consultation with member states. This includes;
  - Pre-deployment
  - Induction
  - In-mission training
  - Ongoing training to maintain firing standards and to provide remedial training
  - Scenario based training to address mission-specific operational firing
- Firing training shall be conducted at least once every 6 months during the tour of duty
- T/PCCs shall adhere to national SOPs regarding level/standard of firing and to confirm serviceability of weapons
- Military aviation units shall have their own regular training requirements, approved by national SOPs

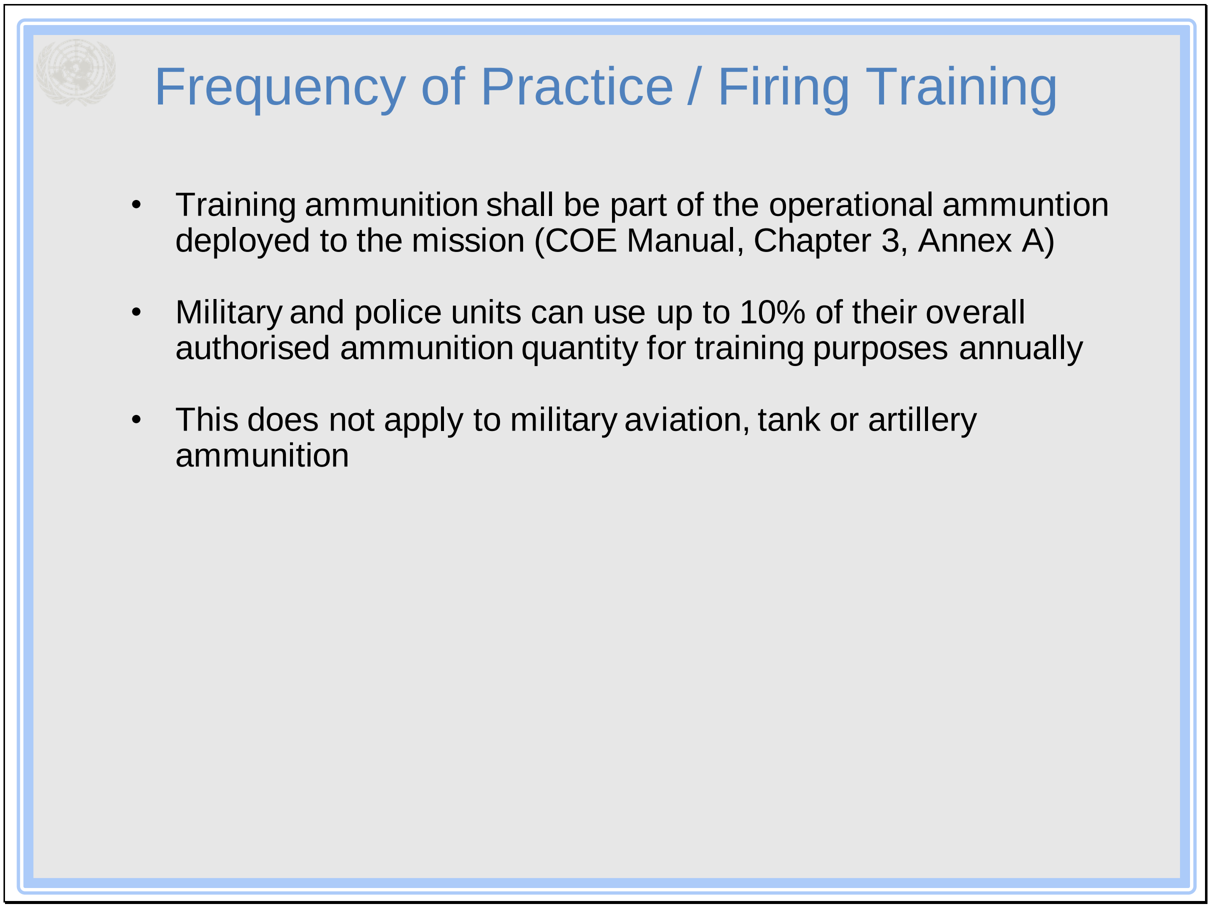
**Main idea/objective for slide:**

- **Discuss importance of firing training**

What the instructor should cover (in addition to slide content)

DPO/ITS/OMA/PD: Department of Peace Operations, Integrated Training Service / Office of Military Affairs / Procurement Department

Slide 16



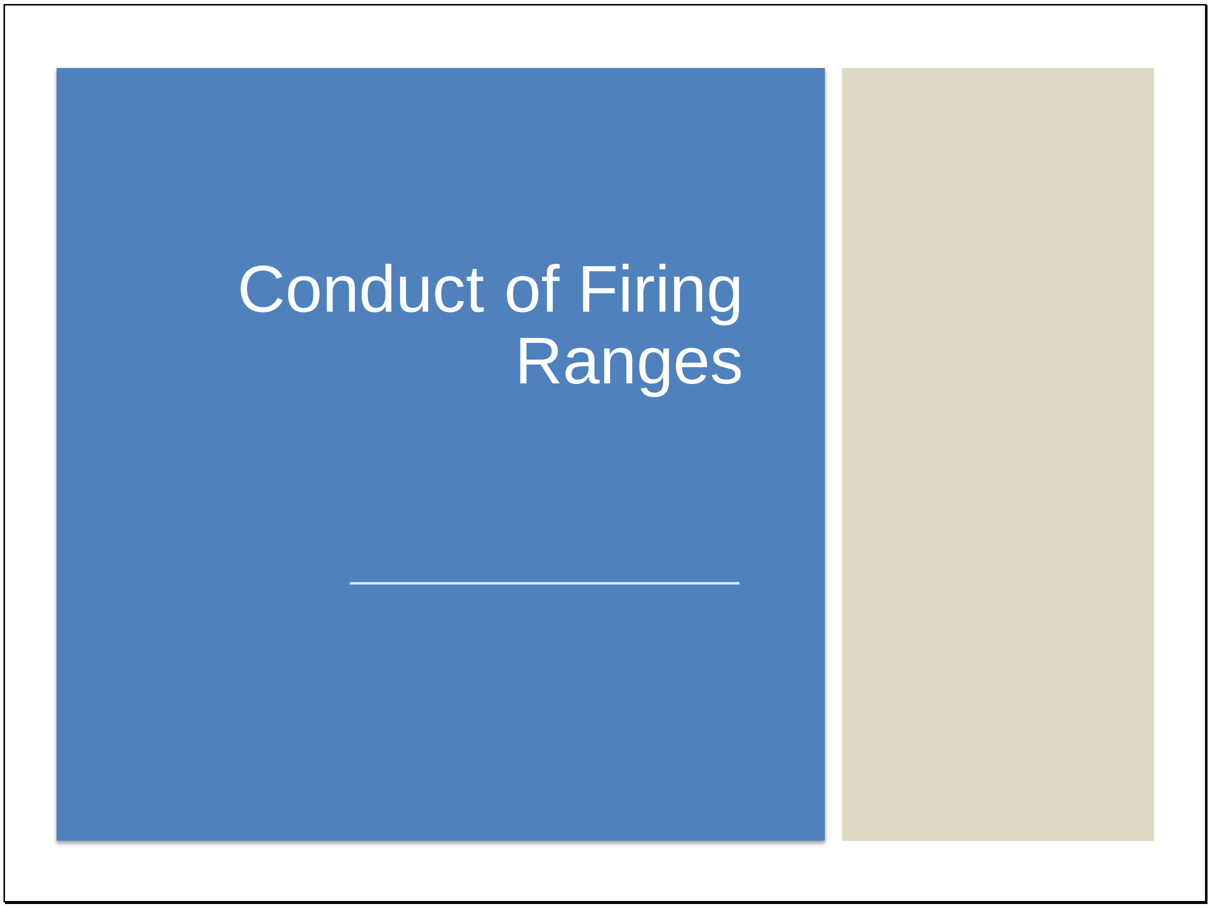
## Frequency of Practice / Firing Training

- Training ammunition shall be part of the operational ammuntion deployed to the mission (COE Manual, Chapter 3, Annex A)
- Military and police units can use up to 10% of their overall authorised ammunition quantity for training purposes annually
- This does not apply to military aviation, tank or artillery ammunition

**Main idea/objective for slide:**

- **Discuss importance of firing training**

Slide 17

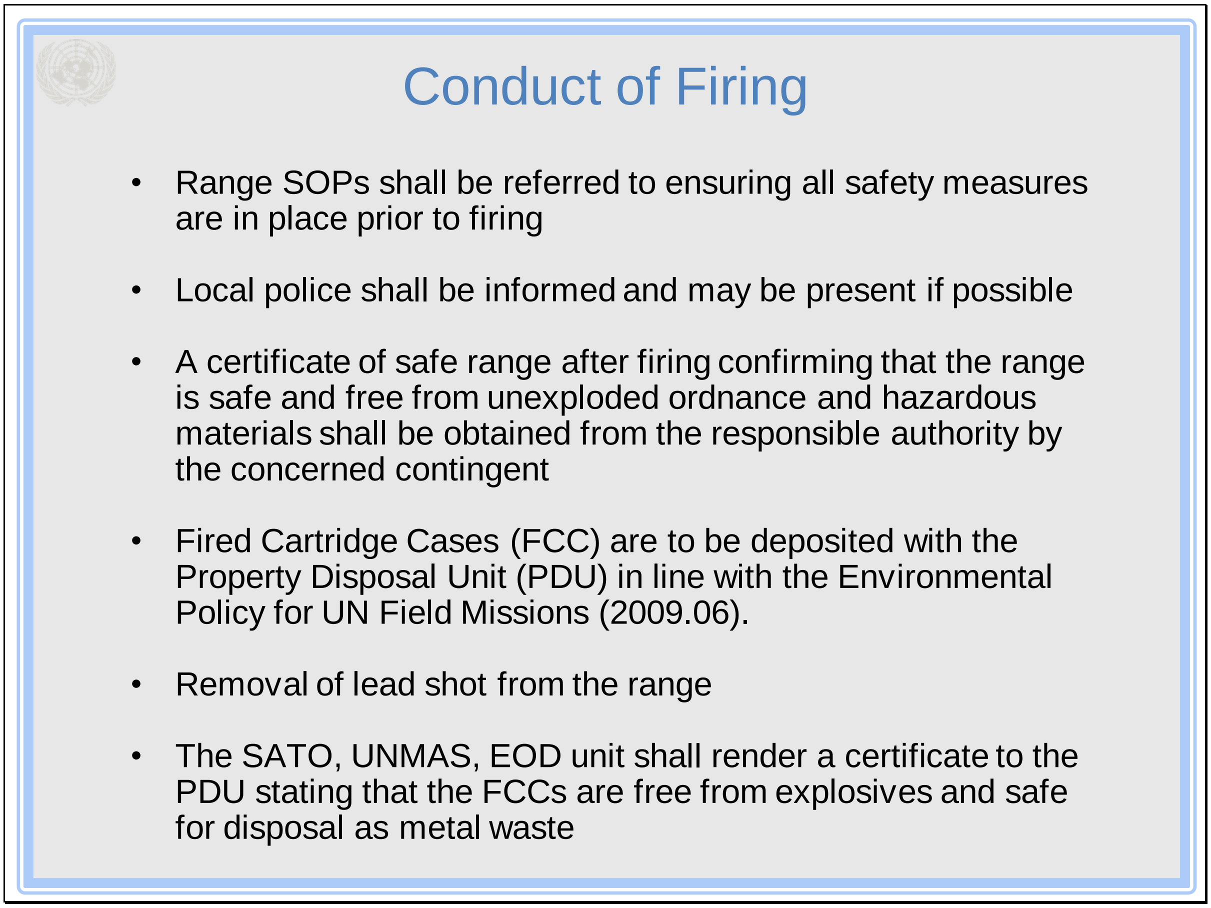


Conduct of Firing Ranges

**Phase 2. Development (**Time allocation - 65 min**)**

Stage 2 (Time allocation 25 mins) – Conduct of firing ranges

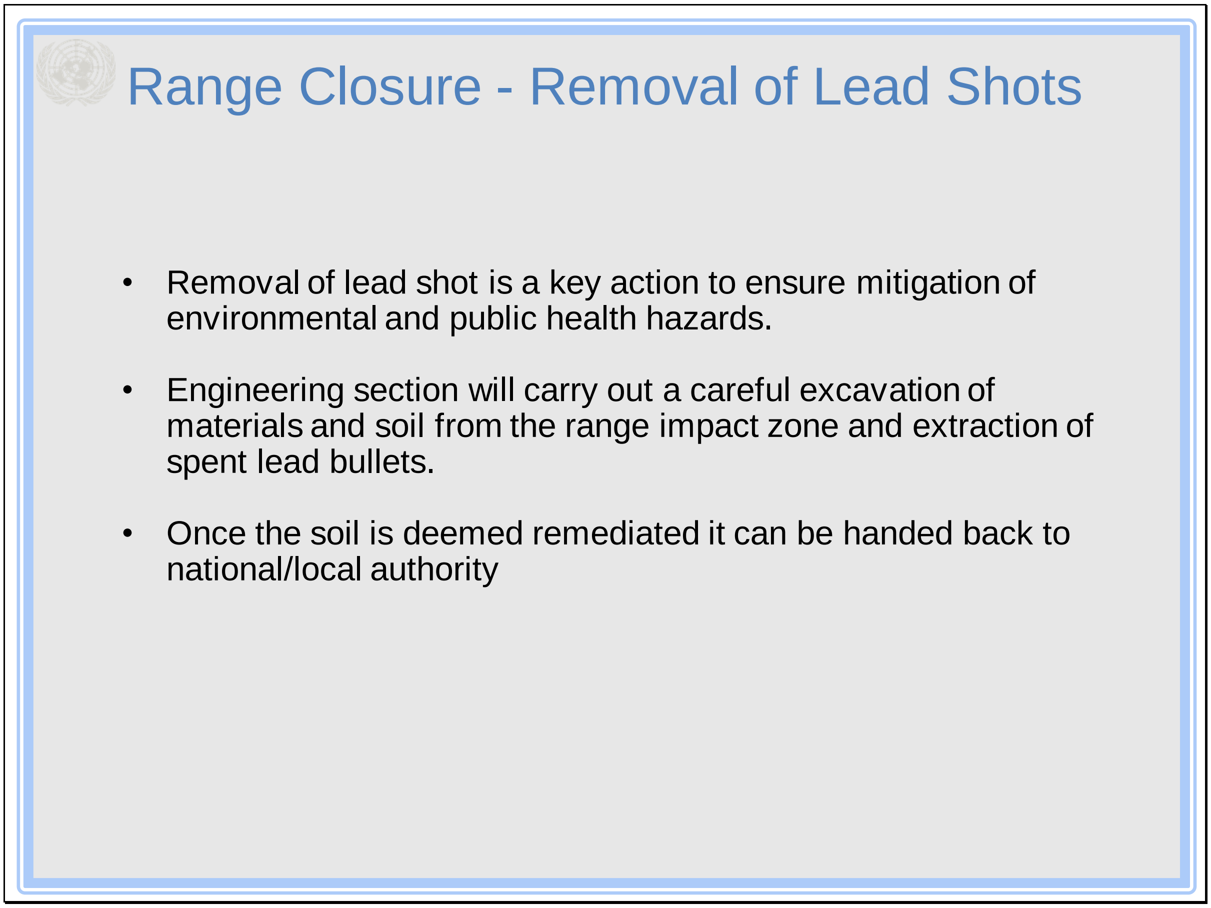
Slide 18



## Conduct of Firing

- Range SOPs shall be referred to ensuring all safety measures are in place prior to firing
- Local police shall be informed and may be present if possible
- A certificate of safe range after firing confirming that the range is safe and free from unexploded ordnance and hazardous materials shall be obtained from the responsible authority by the concerned contingent
- Fired Cartridge Cases (FCC) are to be deposited with the Property Disposal Unit (PDU) in line with the Environmental Policy for UN Field Missions (2009.06).
- Removal of lead shot from the range
- The SATO, UNMAS, EOD unit shall render a certificate to the PDU stating that the FCCs are free from explosives and safe for disposal as metal waste

**<u>Main idea/objective for slide:</u>**
**Discuss the safe practices required to conduct safe use, construction and closure of ranges.**
Introduce and explain the completion of the range clear safety certificate and outline how and when this certificate is completed.



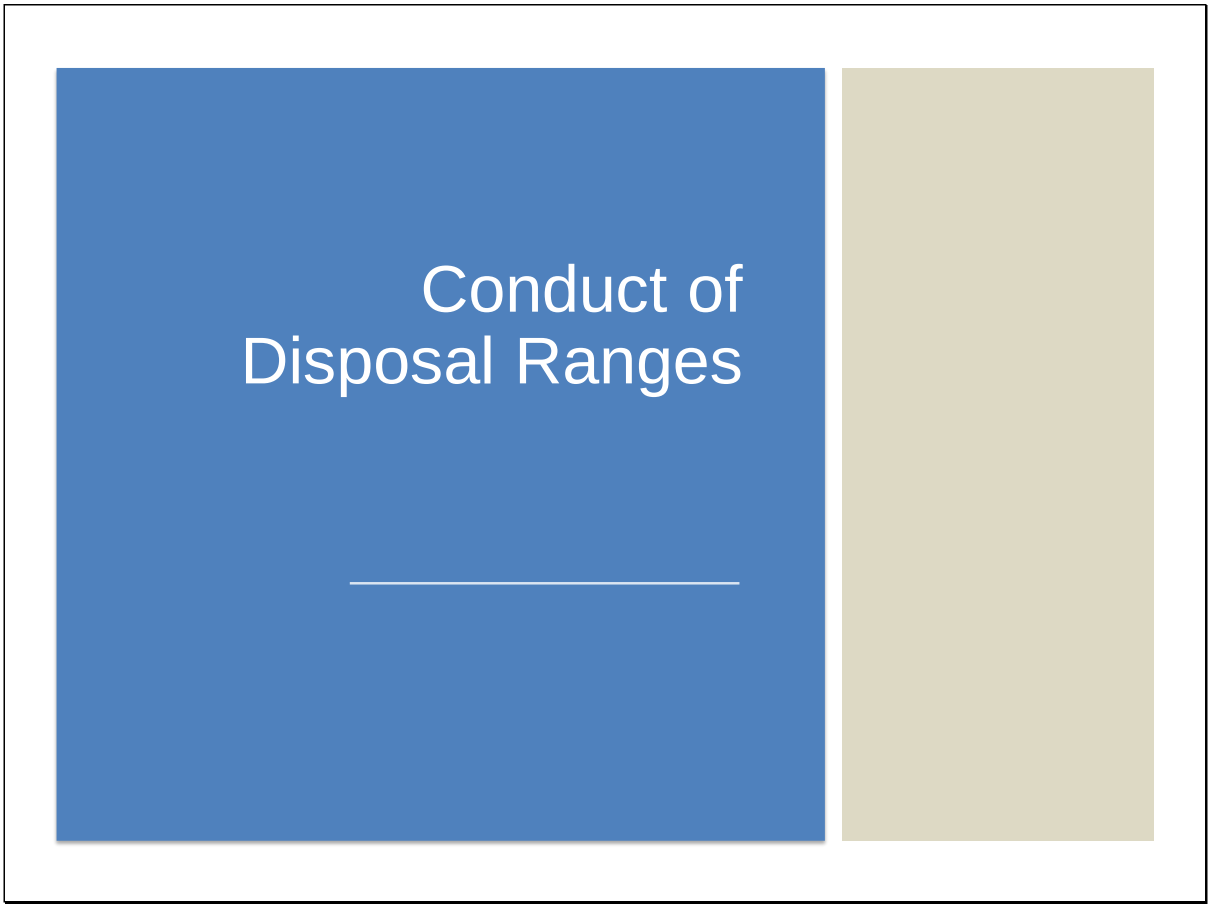
## Range Closure - Removal of Lead Shots

- Removal of lead shot is a key action to ensure mitigation of environmental and public health hazards.
- Engineering section will carry out a careful excavation of materials and soil from the range impact zone and extraction of spent lead bullets.
- Once the soil is deemed remediated it can be handed back to national/local authority

**<u>Main idea/objective for slide:</u>**

- **Emphasise the requirement to remove all lead shots from ranges which are decommissioned prior to handing over.**

Slide 20

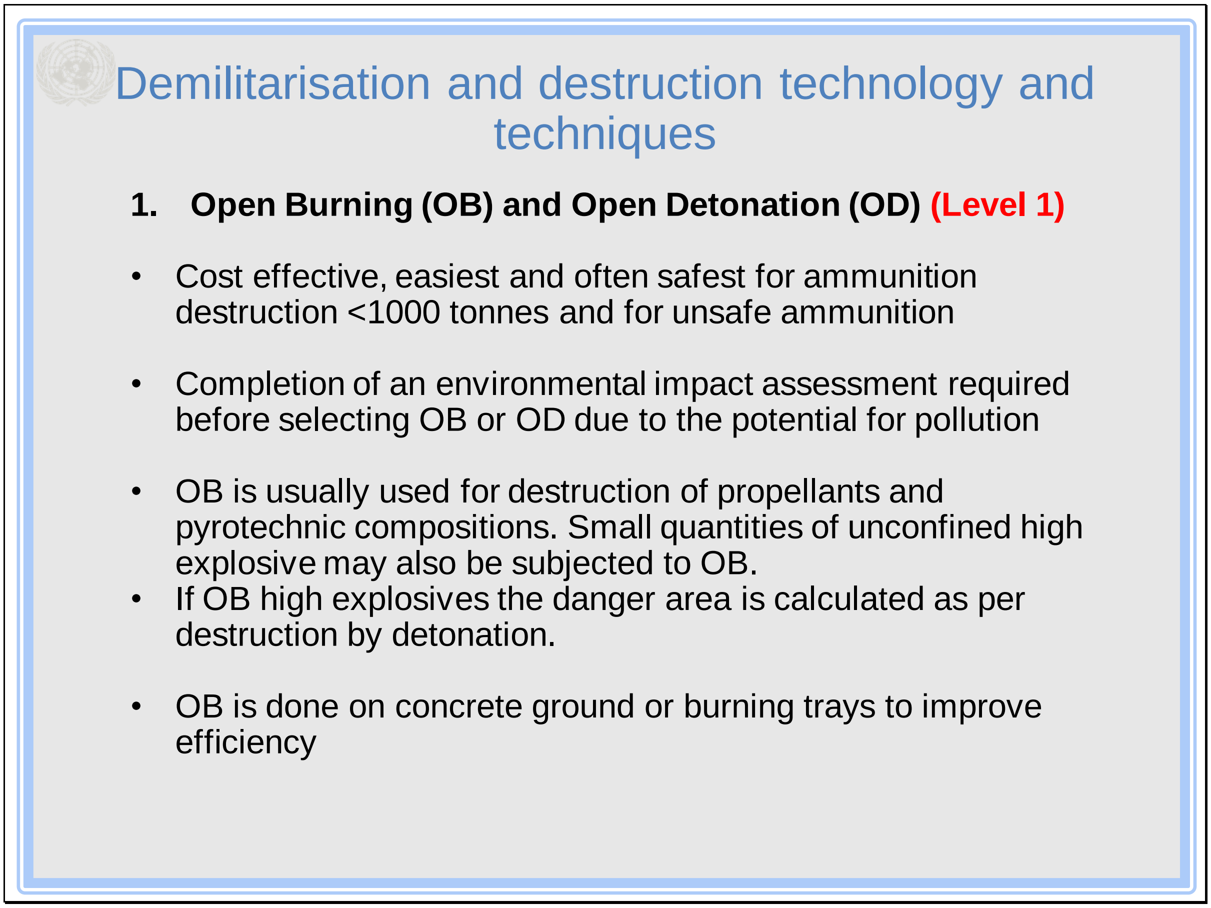


Conduct of
Disposal Ranges

**Phase 2. Development (**Time allocation - 65 min**)**

Stage 2 (Time allocation 25 mins) – Conduct of firing ranges

Slide 21



## Demilitarisation and destruction technology and techniques

1. **Open Burning (OB) and Open Detonation (OD) (Level 1)**

- Cost effective, easiest and often safest for ammunition destruction <1000 tonnes and for unsafe ammunition

- Completion of an environmental impact assessment required before selecting OB or OD due to the potential for pollution

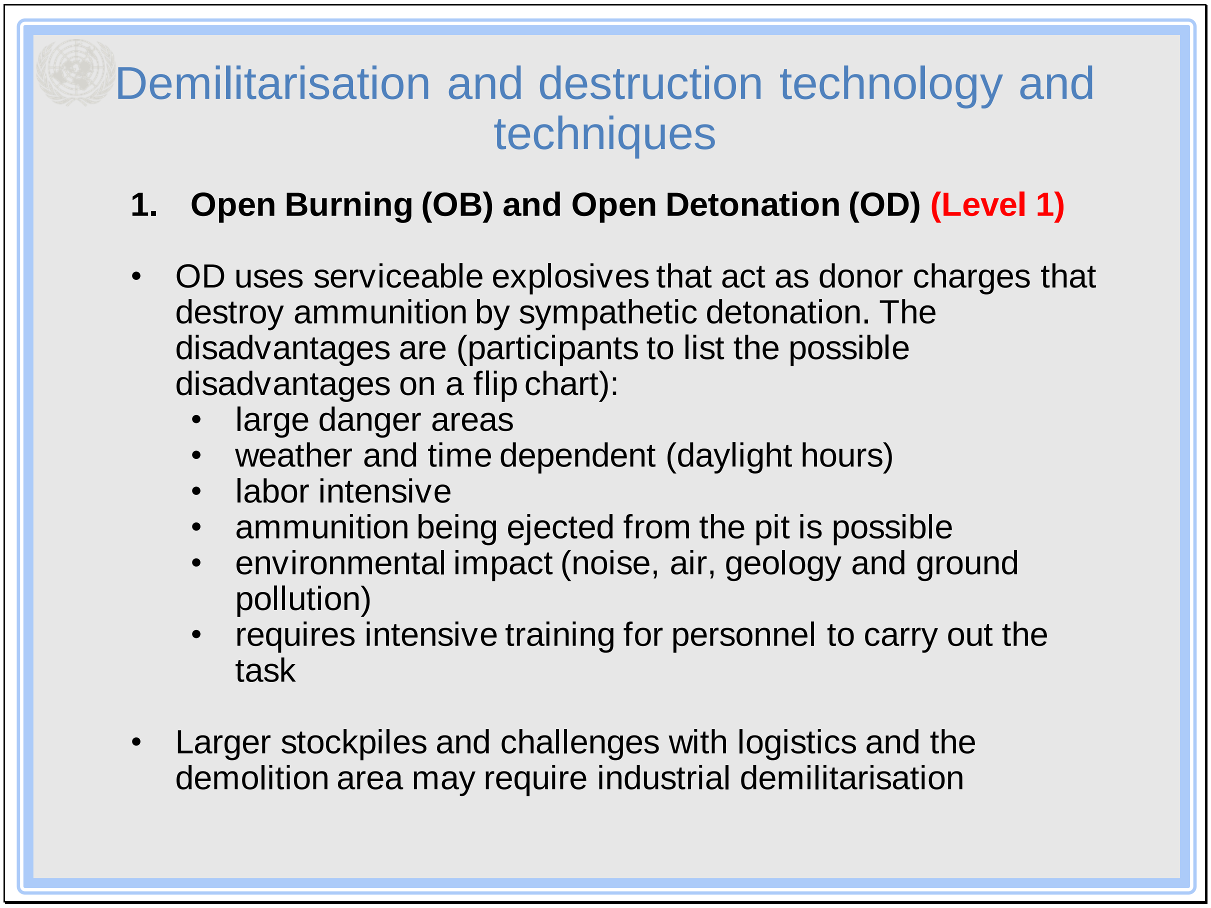
- OB is usually used for destruction of propellants and pyrotechnic compositions. Small quantities of unconfined high explosive may also be subjected to OB.
- If OB high explosives the danger area is calculated as per destruction by detonation.

- OB is done on concrete ground or burning trays to improve efficiency

**Main idea/objective for slide:**

- **Discuss the various mechanisms used for the destruction of time expired ammunition and explosives (Burning Tanks, Open Burning & Open Detonation) and describe how these range practices are conducted safely.**

Slide 22



## Demilitarisation and destruction technology and techniques

1. **Open Burning (OB) and Open Detonation (OD) (Level 1)**

- OD uses serviceable explosives that act as donor charges that destroy ammunition by sympathetic detonation. The disadvantages are (participants to list the possible disadvantages on a flip chart):
  - large danger areas
  - weather and time dependent (daylight hours)
  - labor intensive
  - ammunition being ejected from the pit is possible
  - environmental impact (noise, air, geology and ground pollution)
  - requires intensive training for personnel to carry out the task
- Larger stockpiles and challenges with logistics and the demolition area may require industrial demilitarisation

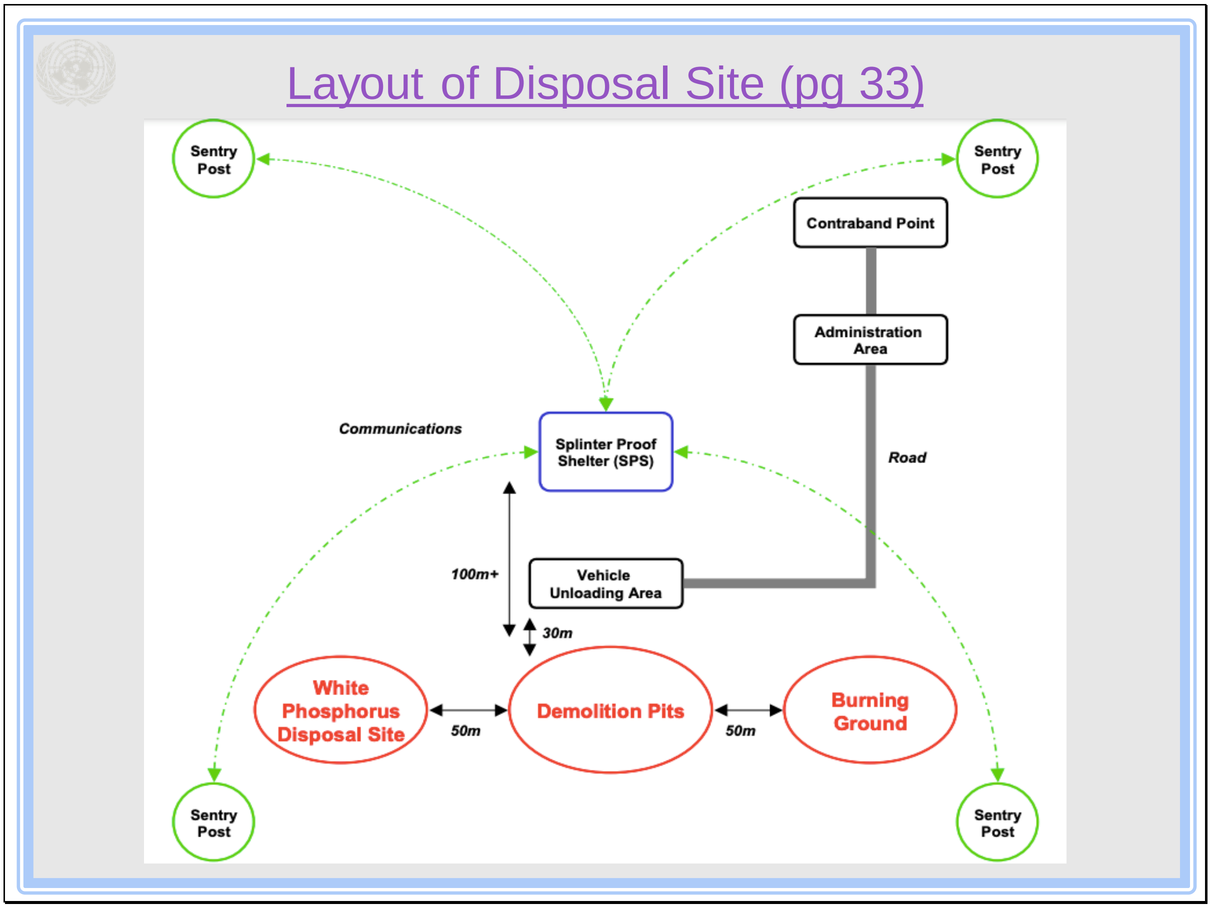
**Main idea/objective for slide:**

- **Discuss the various mechanisms used for the destruction of time expired ammunition and explosives (Burning Tanks, Open Burning & Open Detonation) and describe how these range practices are conducted safely.**

participant Activity

Before revealing the list of possible disadvantages, participants to list the possible disadvantages on a flip chart

Slide 23



## Layout of Disposal Site (pg 33)

Sentry Post

Sentry Post

Contraband Point

Administration Area

Communications

Splinter Proof Shelter (SPS)

Road

100m+

Vehicle Unloading Area

30m

White Phosphorus Disposal Site

50m

Demolition Pits

50m

Burning Ground

Sentry Post

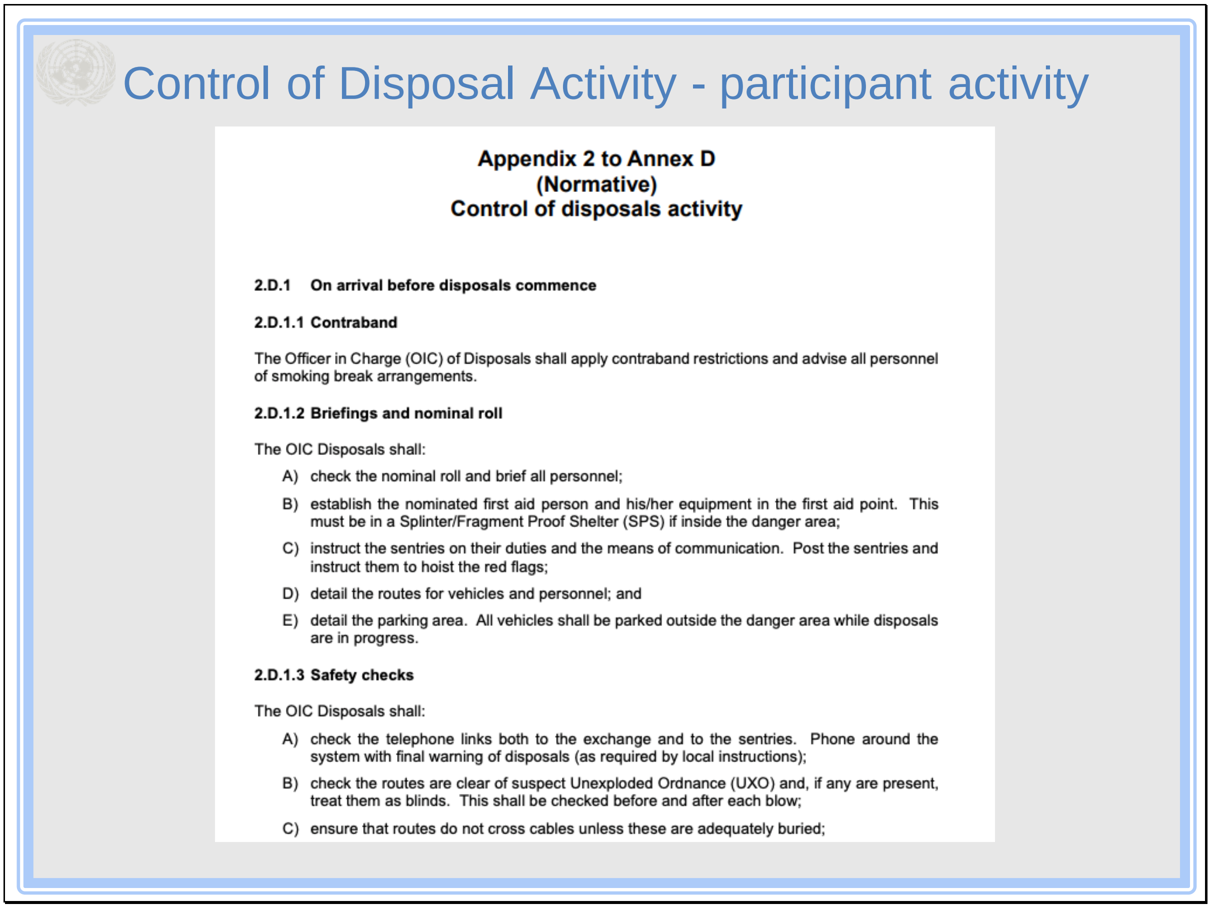
Sentry Post

**<u>Main idea/objective for slide:</u>**
**Discuss layout of disposal site**

<u>References/further reading</u>

Appendix 1 to Annex D of IATG 10.10.2021

Slide 24



## Control of Disposal Activity - participant activity

**Appendix 2 to Annex D**
**(Normative)**
**Control of disposals activity**

**2.D.1 On arrival before disposals commence**

**2.D.1.1 Contraband**

The Officer in Charge (OIC) of Disposals shall apply contraband restrictions and advise all personnel of smoking break arrangements.

**2.D.1.2 Briefings and nominal roll**

The OIC Disposals shall:

A) check the nominal roll and brief all personnel;

B) establish the nominated first aid person and his/her equipment in the first aid point. This must be in a Splinter/Fragment Proof Shelter (SPS) if inside the danger area;

C) instruct the sentries on their duties and the means of communication. Post the sentries and instruct them to hoist the red flags;

D) detail the routes for vehicles and personnel; and

E) detail the parking area. All vehicles shall be parked outside the danger area while disposals are in progress.

**2.D.1.3 Safety checks**

The OIC Disposals shall:

A) check the telephone links both to the exchange and to the sentries. Phone around the system with final warning of disposals (as required by local instructions);

B) check the routes are clear of suspect Unexploded Ordnance (UXO) and, if any are present, treat them as blinds. This shall be checked before and after each blow;

C) ensure that routes do not cross cables unless these are adequately buried;

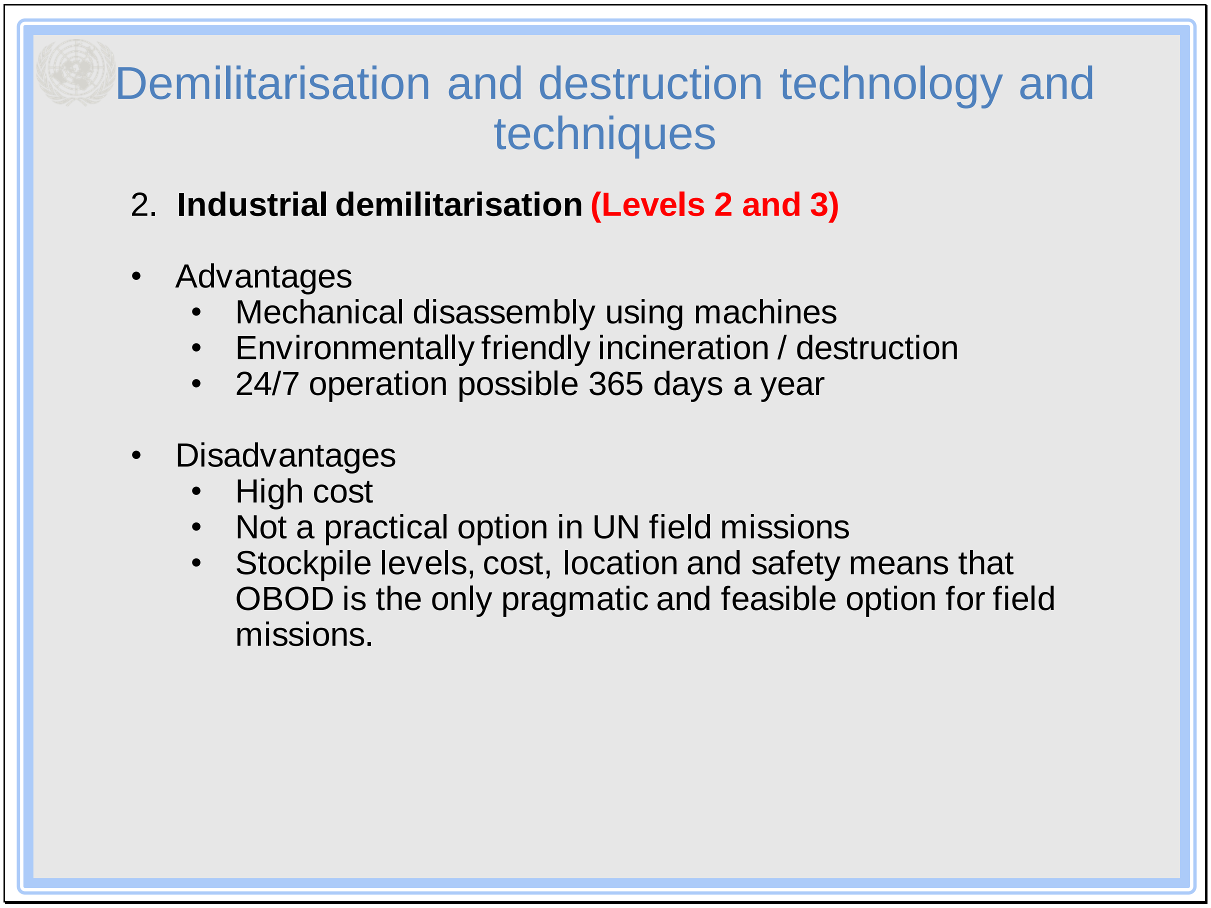
**<u>Main idea/objective for slide:</u>**
**participant exercise on control of disposal activity**

<u>participant Activity</u>
**participants are split into 3 groups:**

- Group 1 is tasked with briefing the class on “Arrival tasks” (before disposal commences)
- Group 2 is tasked with briefing the class on ‘During disposal” drills including supervision and control, paying particular attention to safety
- Group 3 is tasked with briefing the class on ”Misfire procedures”.

<u>References/further reading</u>
**(reference document Annex D to IATG 10.10.2021)**

Slide 25



## Demilitarisation and destruction technology and techniques

2. **Industrial demilitarisation** **(Levels 2 and 3)**

- Advantages
  - Mechanical disassembly using machines
  - Environmentally friendly incineration / destruction
  - 24/7 operation possible 365 days a year
- Disadvantages
  - High cost
  - Not a practical option in UN field missions
  - Stockpile levels, cost, location and safety means that OBOD is the only pragmatic and feasible option for field missions.

**Main idea/objective for slide:**

**Discuss the various mechanisms used for the destruction of time expired ammunition and explosives (Burning Tanks, Open Burning & Open Detonation) and describe how these range practices are conducted safely.**

Industrial demil

- Equipment being developed
- Costs are coming down
- More environmentally friendly

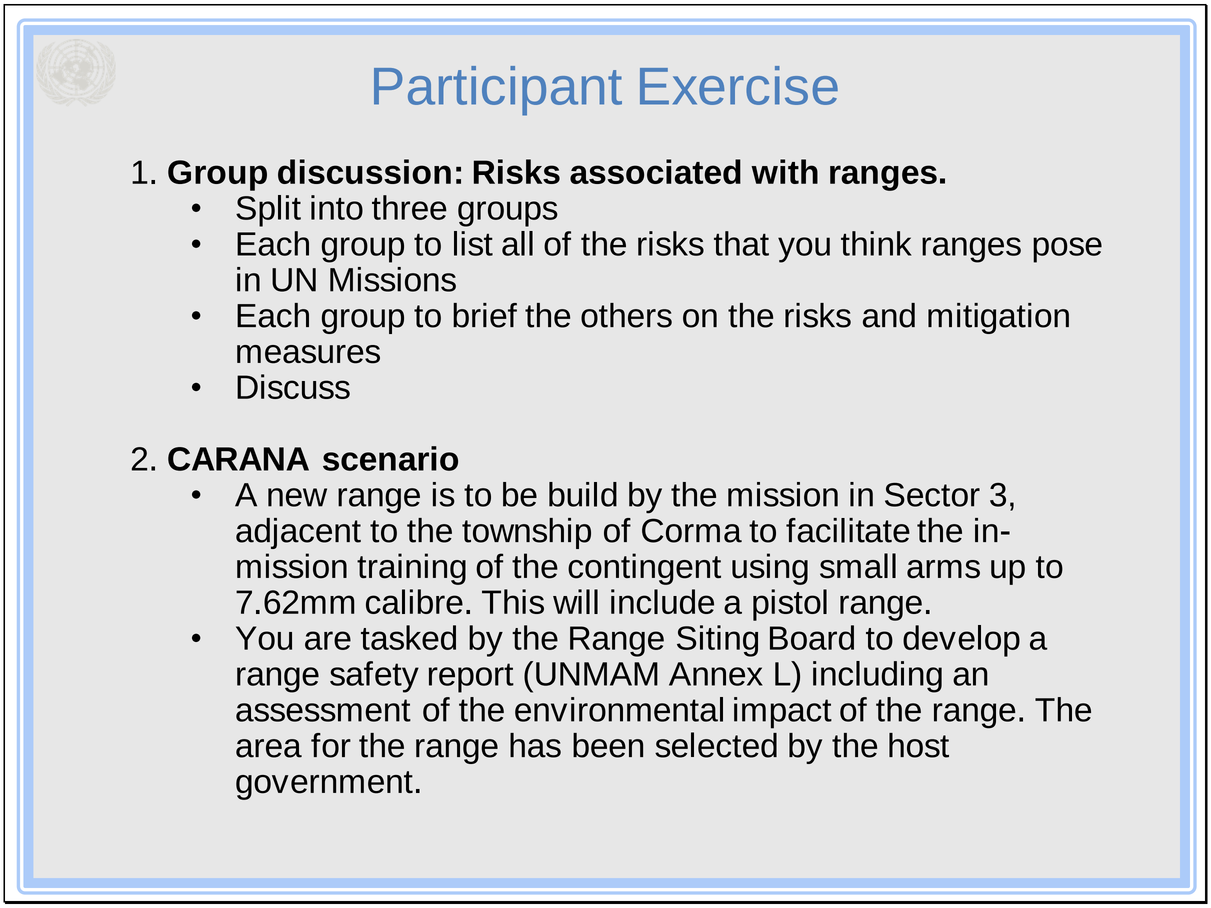
Slide 26

Participant Exercise

**Phase 2. Development (**Time allocation - 65 min**)**

Stage 3 (Time allocation 20 mins) – participant Exercise

Slide 27



## Participant Exercise

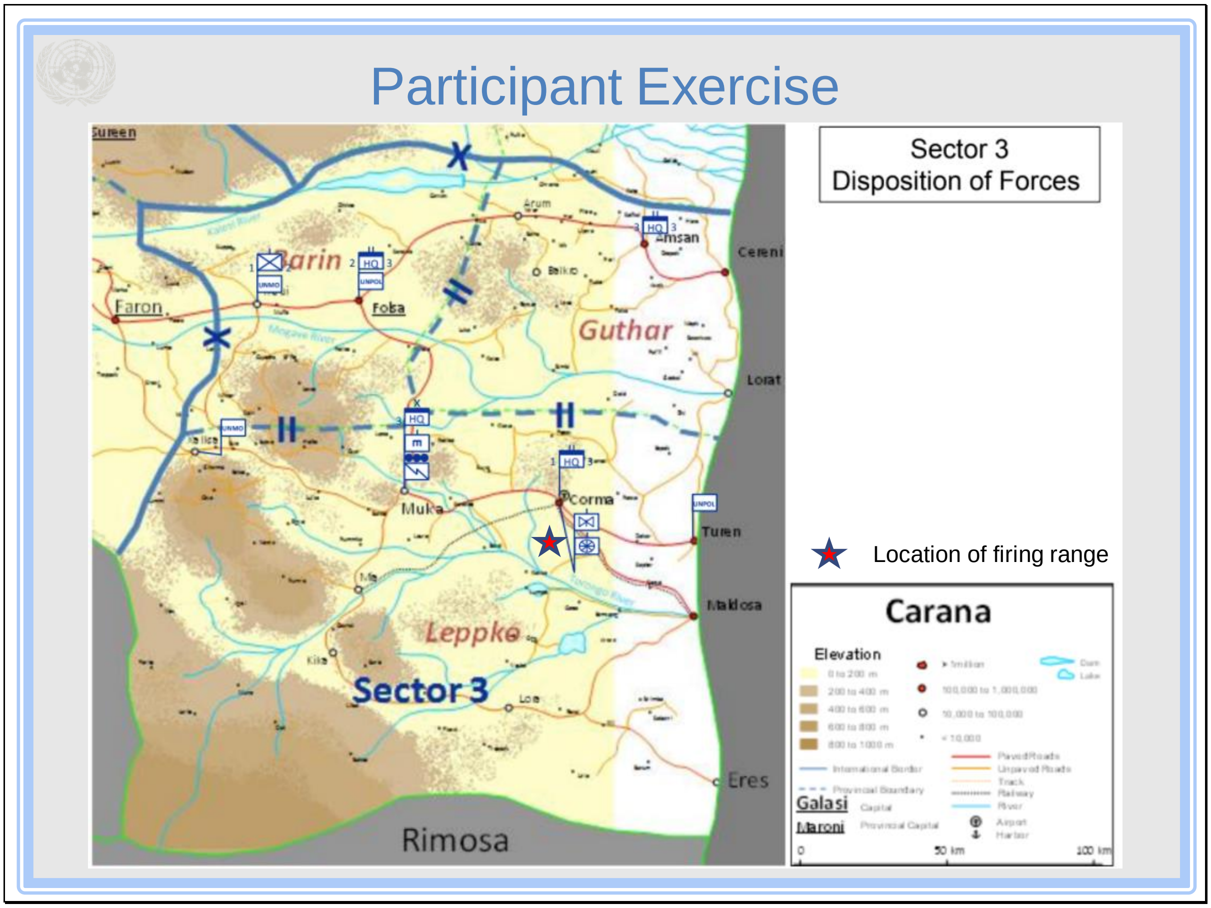
1. **Group discussion: Risks associated with ranges.**
    - Split into three groups
    - Each group to list all of the risks that you think ranges pose in UN Missions
    - Each group to brief the others on the risks and mitigation measures
    - Discuss

2. **CARANA scenario**
    - A new range is to be build by the mission in Sector 3, adjacent to the township of Corma to facilitate the in-mission training of the contingent using small arms up to 7.62mm calibre. This will include a pistol range.
    - You are tasked by the Range Siting Board to develop a range safety report (UNMAM Annex L) including an assessment of the environmental impact of the range. The area for the range has been selected by the host government.

**Main idea/objective for slide:**

- **Introduce participant exercise to identify risks and mitigations associated with ranges, and practice completing a range safety certificate**

- The next slides contain a map and some participant tips for these exercises.



Participant Exercise

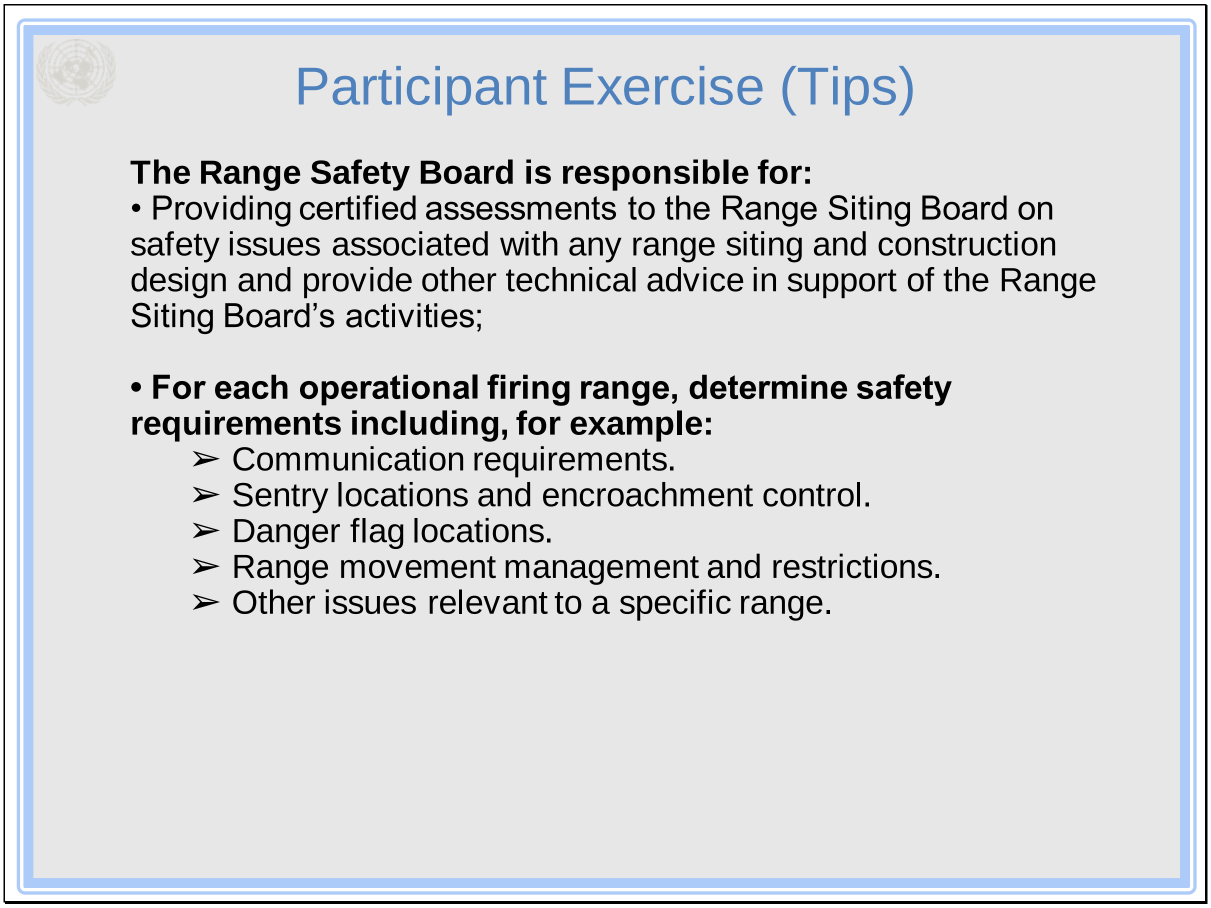
Sector 3
Disposition of Forces

Location of firing range

## Main idea/objective for slide:

- **Introduce UN CARANA scenario for exercise**

Slide 29



## Participant Exercise (Tips)

**The Range Safety Board is responsible for:**

- Providing certified assessments to the Range Siting Board on safety issues associated with any range siting and construction design and provide other technical advice in support of the Range Siting Board's activities;

- **For each operational firing range, determine safety requirements including, for example:**
  - ➢ Communication requirements.
  - ➢ Sentry locations and encroachment control.
  - ➢ Danger flag locations.
  - ➢ Range movement management and restrictions.
  - ➢ Other issues relevant to a specific range.

**Main idea/objective for slide:**

- **Provide tips to support participant exercise**

participant Activity

In groups, list all of the risks ranges pose in UN field operations
Review another group's list and develop mitigation measures for the risks, based on the UN Manual on Ammunition Management and associated documents
Develop a range safety report (pg 57 UN WAM) including an assessment of the environmental impact of the range.

What the instructor should cover (in addition to slide content)

When the groups have completed their groupwork, work through the answers with the class and ask questions.
The solution needs to consider the point listed here:

Permission to conduct range practice (SOP).

- Communication requirements.
- Sentry locations and encroachment control.
- Danger flag locations.
- Range movement management and restrictions.
- Range clearance certificate on completion of range practice.
- Range security on completion of range practice.
- Other issues relevant to a specific range.

# Lesson overview

- Discuss necessity, responsibility and planning for the disposal of unserviceable ammunition
- Discuss the provision of Ranges, Range Siting Boards and Safety Boards
- Discuss issuing a "Certificate of Disposal" for unserviceable ammunition
- Examine Ammunition Destruction - Burning Tanks, Open Burning & Open Detonation
- Examine the safe use, construction and closure of Ranges

## Summary

In this lesson, participants delved into range management procedures related to ammunition management on UN T/PCC operations. Key learning points included:

- Participants explored the importance of proper planning and responsibility for the disposal of unserviceable ammunition, ensuring compliance with safety standards and regulations.
- Engage in discussions about the establishment and management of ranges, including the role of range siting boards and safety boards in ensuring safe and effective operations.
- Participants learned about the process of issuing a "Certificate of Disposal" for unserviceable ammunition, emphasizing documentation and compliance requirements.
- Explore various methods of ammunition destruction, including burning tanks, open burning, and open detonation, highlighting safety protocols and environmental considerations.
- Participants examined best practices for the safe use, construction, and closure of ranges, ensuring adherence to safety standards and minimizing environmental impact.

Slide 31

**Ammunition Management**

UN policy into practice

Look Ahead: Safeguarding

**<u>Main idea/objective for slide:</u>**

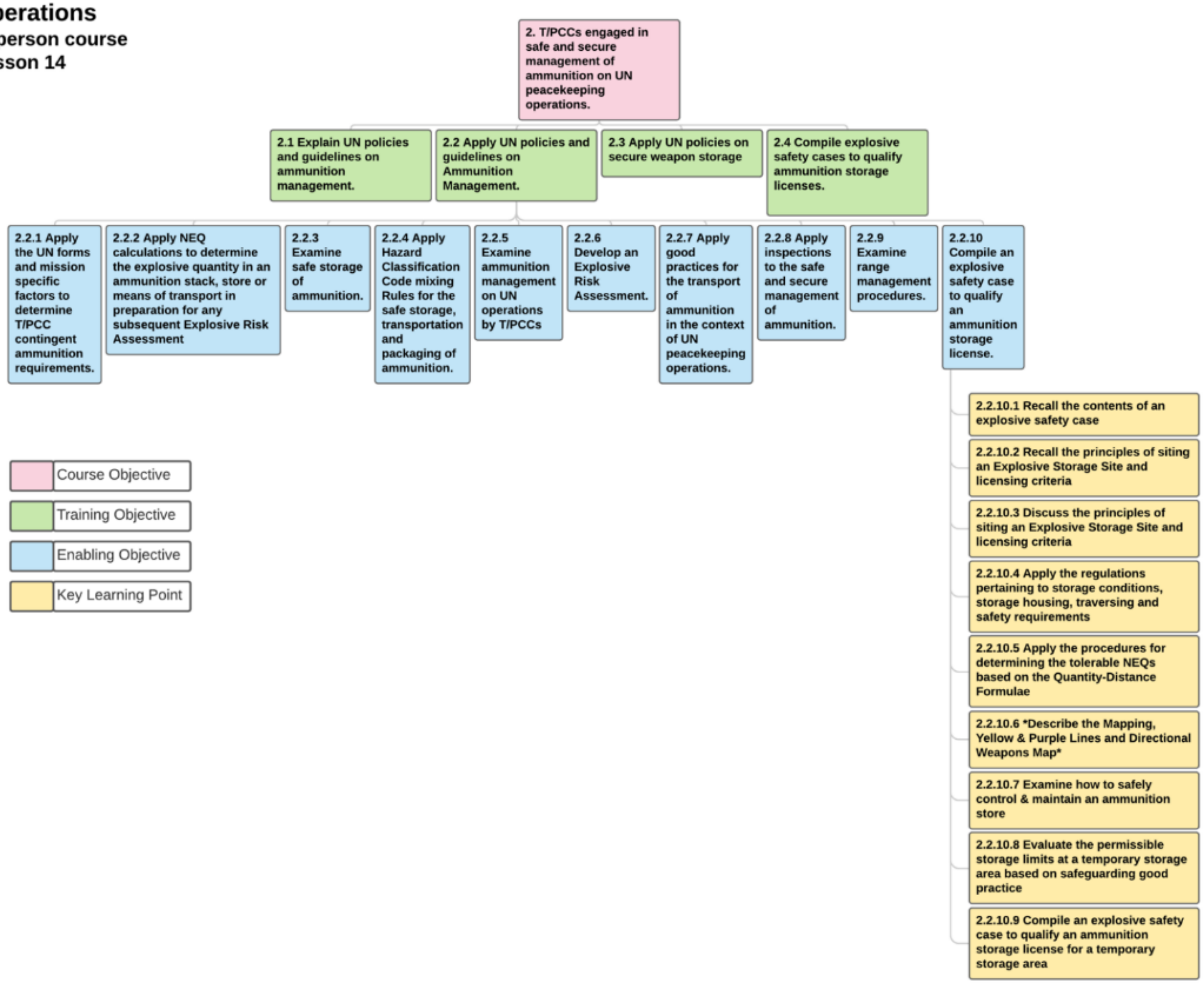
Look ahead to the next lesson of the course:

Safeguarding

# Lesson 2.10

## Lesson 2.10: Safeguarding

**Weapons and Ammunition Management in UN Peace Operations**
**In-person course**
**Lesson 14**



- 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations.
  - 2.1 Explain UN policies and guidelines on ammunition management.
  - 2.2 Apply UN policies and guidelines on Ammunition Management.
    - 2.2.1 Apply the UN forms and mission specific factors to determine T/PCC contingent ammunition requirements.
    - 2.2.2 Apply NEQ calculations to determine the explosive quantity in an ammunition stack, store or means of transport in preparation for any subsequent Explosive Risk Assessment
    - 2.2.3 Examine safe storage of ammunition.
    - 2.2.4 Apply Hazard Classification Code mixing Rules for the safe storage, transportation and packaging of ammunition.
    - 2.2.5 Examine ammunition management on UN operations by T/PCCs
    - 2.2.6 Develop an Explosive Risk Assessment.
    - 2.2.7 Apply good practices for the transport of ammunition in the context of UN peacekeeping operations.
    - 2.2.8 Apply inspections to the safe and secure management of ammunition.
    - 2.2.9 Examine range management procedures.
    - 2.2.10 Compile an explosive safety case to qualify an ammunition storage license.
      - 2.2.10.1 Recall the contents of an explosive safety case
      - 2.2.10.2 Recall the principles of siting an Explosive Storage Site and licensing criteria
      - 2.2.10.3 Discuss the principles of siting an Explosive Storage Site and licensing criteria
      - 2.2.10.4 Apply the regulations pertaining to storage conditions, storage housing, traversing and safety requirements
      - 2.2.10.5 Apply the procedures for determining the tolerable NEQs based on the Quantity-Distance Formulae
      - 2.2.10.6 *Describe the Mapping, Yellow & Purple Lines and Directional Weapons Map*
      - 2.2.10.7 Examine how to safely control & maintain an ammunition store
      - 2.2.10.8 Evaluate the permissible storage limits at a temporary storage area based on safeguarding good practice
      - 2.2.10.9 Compile an explosive safety case to qualify an ammunition storage license for a temporary storage area
  - 2.3 Apply UN policies on secure weapon storage
  - 2.4 Compile explosive safety cases to qualify ammunition storage licenses.

🟥 Course Objective
🟩 Training Objective
🟦 Enabling Objective
🟨 Key Learning Point

## Section 1. Lesson Specification

### Course Details:

| | |
|---|---|
| **Course Title:** | **Weapons and Ammunition Management in UN Peace Operations**<br>In-person training |
| **Course Objective** | 2. T/PCCs engaged in safe and secure management of ammunition on UN peacekeeping operations. |
| **Training Objective(s):** | 2.1 Explain UN policies and guidelines on ammunition management.<br>2.2 Apply UN policies and guidelines on Ammunition Management.<br>2.3 Apply UN policies on secure weapon storage<br>2.4 Compile explosive safety cases to qualify ammunition storage licenses |

### Lesson Details:

| | |
|---|---|
| **Lesson Number and Title:** | L14. Safeguarding |
| **Type of Lesson / Session:** | In-person, Participant Exercise |
| **Duration:** | 4.5 hours |

### Enabling Objectives, Key Learning Points & Training Outcomes:

| **Enabling Objectives:** | **Key learning Points:** |
|---|---|
| 2.2.10 Compile an explosive safety case to qualify an ammunition storage license. | 2.2.10.1 Recall the contents of an explosive safety case<br>2.2.10.2 Recall the principles of siting an Explosive Storage Site and licensing criteria<br>2.2.10.3 Discuss the principles of siting an Explosive Storage Site and licensing criteria<br>2.2.10.4 Apply the regulations pertaining to storage conditions, storage housing, traversing and safety requirements<br>2.2.10.5 Apply the procedures for determining the tolerable NEQs based on the Quantity-Distance Formulae<br>2.2.10.6 Describe the Mapping, Yellow & Purple Lines and Directional Weapons Map<br>2.2.10.7 Examine how to safely control & maintain an ammunition store<br>2.2.10.8 Evaluate the permissible storage limits at a temporary storage area based on safeguarding good practice<br>2.2.10.9 Compile an explosive safety case to qualify an ammunition storage license for a temporary storage area |

| | |
|---|---|
| **Performance Statement:** | *By the end of the lessons the participants will...*<br>Compile an explosive safety case to qualify an ammunition storage license. |
| **Assessment Criteria:** | There is no final assessment for this exercise, however, Instructors will use informal class discussion, questioning of participants and review the work by the participants to enable a positive feedback loop to be established to enhance the effectiveness of the learning. |

## Resource requirements:

| | |
|---|---|
| **Instructor to participant ratio:** | 1:6 in syndicates. Maximum class size 15. |
| **Interpreters:** | 1 per instructor |
| **Training Facilities & Equipment:** | Classroom, projector and screen, flipchart, whiteboard, |
| **Instructional tools & materials** | • Worked out examples of ELL Matrix<br>• Safeguarding Map<br>• Weapons Directional Map<br>• Imagery of explosive event(s) and impact on a camp and environs |
| **Participant Resources:** | • Lesson handout(s): WAMUNPOC L14 Exercise Handout<br>• CARANA Scenario & maps |
| **Training Safety Points:** | Trainer is to make participants aware of course risk assessment in relation to the specific training environment.<br>An example of Health and Safety checklist for classrooms is available here for reference here: [Health and safety checklist for classrooms (hse.gov.uk)](https://www.hse.gov.uk) |
| **Key Reference Documents:** | • UN Manual on Ammunition Management<br>• UN Weapons and Ammunition Management Policy (WAM)<br>• International Ammunition Technical Guidelines (IATG) |

## SECTION 2: LESSON PLAN

### Executive summary:

During this lesson participants will compile an explosive safety case to qualify an ammunition storage license. To do this they will recall and discuss the contents of an explosive safety case and the principles of siting an Explosive Storage Site and its licensing criteria. They will then apply the regulations pertaining to storage (housing, traversing and safety requirements) and the procedures for determining the tolerable NEQs based on the Quantity-Distance Formulae. They will describe the mapping of Yellow & Purple Lines and Directional Weapons Map and then examine how to safely control & maintain an ammunition store. They will evaluate the permissible storage limits at a temporary storage area based on safeguarding good practice, before finally compiling an explosive safety case to qualify an ammunition storage license for a temporary storage area.

### Setup:

Phase 1, Phase 2 (stages 1&2) and Phase 3 will be delivered to the class as a single collective.

Phase 3 (stage 3) will be conducted in small groups (6-8 participants) each with a dedicated instructor.

### Conduct:

**Phase 1. Introduction (Time allocation - 30 min)**

- Introduce the objectives of the lesson.
- Using Case Studies and relevant imagery, discuss with the participants the importance of not only maintaining safety from an explosive event within the camp but also the impact to buildings and civilians who live within the environs of the camp.
- Ask questions of the participants to determine the likely impacts and the hazards posed to external buildings and civilians. List these impacts on the flip chart and post onto the wall.

**Phase 2. Development**

Stage 1 (Time allocation 50 mins) – Quantity Distances

- Introduce the concept of Quantity Distances and provide the relevant definitions to the participants. Write these on a flipchart and post it to the wall.
- Ask the participants the methods by which they can measure quantity distances when on the UN mission.

- Discuss the concept of aggregation of Net Explosive Quantity, in particular with divisions HD1.4, HD1.5 and HD1.6. Ask the participants the benefits of this aggregation and why is it useful.
- Explain the term Inside Quantity Distance and discuss how it is calculated.
- Explain the term Outside Quantity Distance, discuss how it is calculated and the distinct types of Outside Quantity Distances that need to be considered.
- Discuss the Explosive Limit License matrix, its background, the various pictograms and emphasise the need for this matrix for each Potential Explosive Site.
- Complete a worked example of an Explosive Limit License matrix for the participants, discussing each step and asking questions to the class to confirm understanding.
- By the end of this stage participants should have effectively applied the regulations pertaining to storage conditions, storage housing, traversing and safety requirements

Stage 2 (Time allocation 50 mins) – Safeguarding of Temporary Storage Areas

- Introduce the concept of Safeguarding and provide the relevant definitions to the participants. Write these on a flipchart and post it to the wall.
- Outline the requirements of safeguarding systems, the responsibilities of key personnel in completing the documentation and the preparation of the Explosive Safety Case to include safeguarding maps.
- Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line.
- Complete a worked example of preparing a safeguarding map to include the yellow line and the purple line. Discuss each step and ask questions to the class to confirm understanding.
- Emphasise the importance of maintaining and inspecting safeguarded areas to ensure that the erection of new infrastructure or movement of people/civilians into hazardous areas does not impact on the safety of the Temporary Storage Area.
- By the end of this stage participants will be able to determine the NEQ limit.

Stage 3 (Time allocation 120 mins) – Participant Exercise

- Using the CARANA scenario, provide the participants with an exercise to compile an explosive safety case to qualify an ammunition storage license for a temporary storage area (see slides for exercise detail and instructions).
- Instructors are to work closely with the syndicate groups to ensure the knowledge is affectively applied and that the participants gain a full understanding of this risk management process.

- When complete, work through the answers with the class and ask questions.

### Phase 3. Consolidation (Time allocation - 20 min)

- Review Enabling objective and Key Learning Points (see Section 1), drawing out any common themes in the participant
- Look ahead to the next lesson of the course:
    - Secure weapon storage

Slide 1

Weapons and Ammunition Management in UN Peace Operations

Quantity Distances, Licensing and Safeguarding

**Key Reference Documents:**

UN Manual on Ammunition Management
UN Weapons and Ammunition Management Policy (WAM)
International Ammunition Technical Guidelines (IATG)

**All photographs in this lesson are © United Nations unless otherwise stated.**

Slide 2

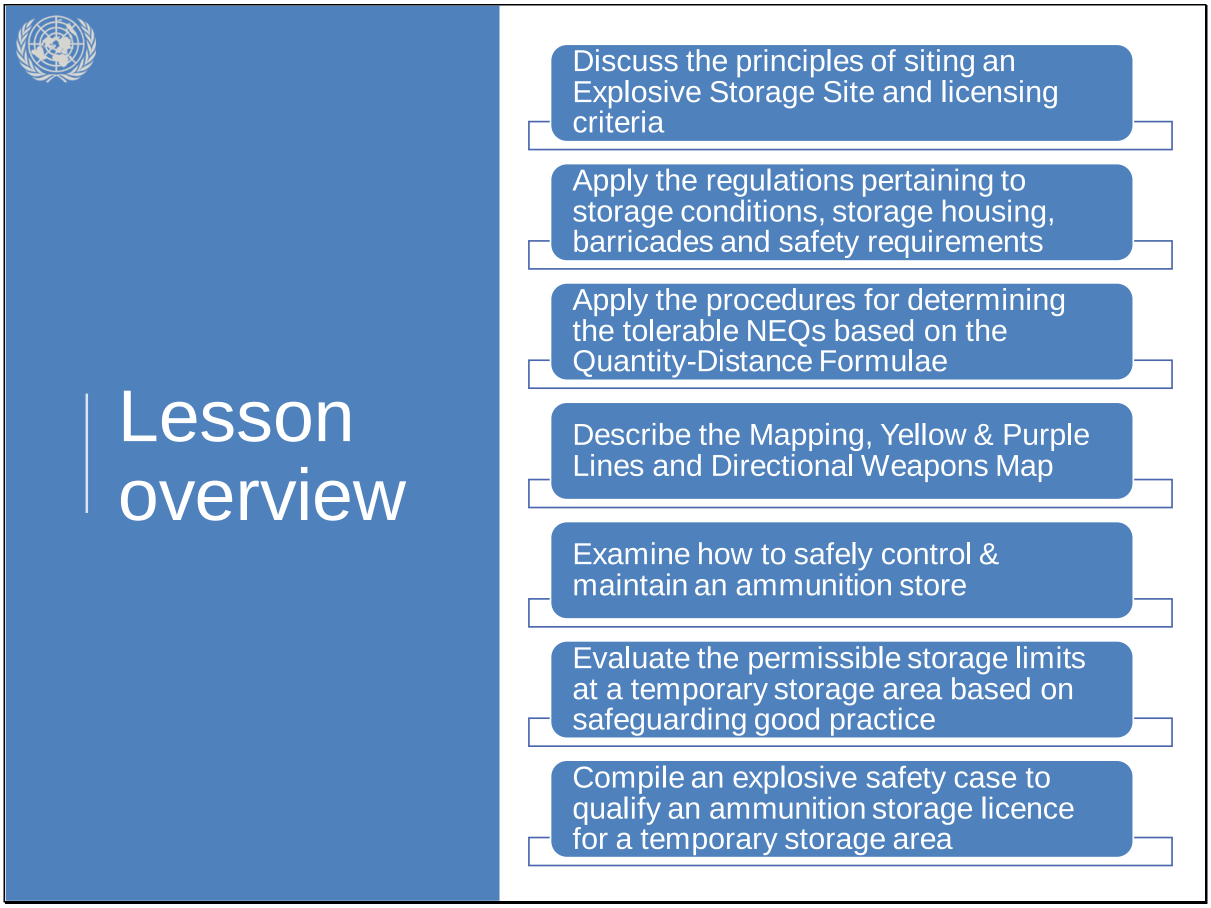
Objective

Compile an explosive safety case to qualify an ammunition storage licence.

**<u>Main idea/objective for slide:</u>**
**Phase 1. Introduction - Introduce the objectives of the lesson.**
(Enabling Objective: 2.2.10 Compile an explosive safety case to qualify an ammunition storage licence.)

<u>What the instructor should cover (in addition to slide content)</u>
By the end of this training session the participant will compile an explosive safety case to qualify an ammunition storage licence.

Slide 3



# Lesson overview

- Discuss the principles of siting an Explosive Storage Site and licensing criteria
- Apply the regulations pertaining to storage conditions, storage housing, barricades and safety requirements
- Apply the procedures for determining the tolerable NEQs based on the Quantity-Distance Formulae
- Describe the Mapping, Yellow & Purple Lines and Directional Weapons Map
- Examine how to safely control & maintain an ammunition store
- Evaluate the permissible storage limits at a temporary storage area based on safeguarding good practice
- Compile an explosive safety case to qualify an ammunition storage licence for a temporary storage area

**<u>Main idea/objective for slide:</u>**
**Introduce the Key Learning Points**

<u>What the instructor should cover (in addition to slide content)</u>

Key Learning Points
2.2.10.1 Recall the contents of an explosive safety case
2.2.10.2 Recall the principles of siting an Explosive Storage Site and licensing criteria
2.2.10.3 Discuss the principles of siting an Explosive Storage Site and licensing criteria
2.2.10.4 Apply the regulations pertaining to storage conditions, storage housing, traversing and safety requirements

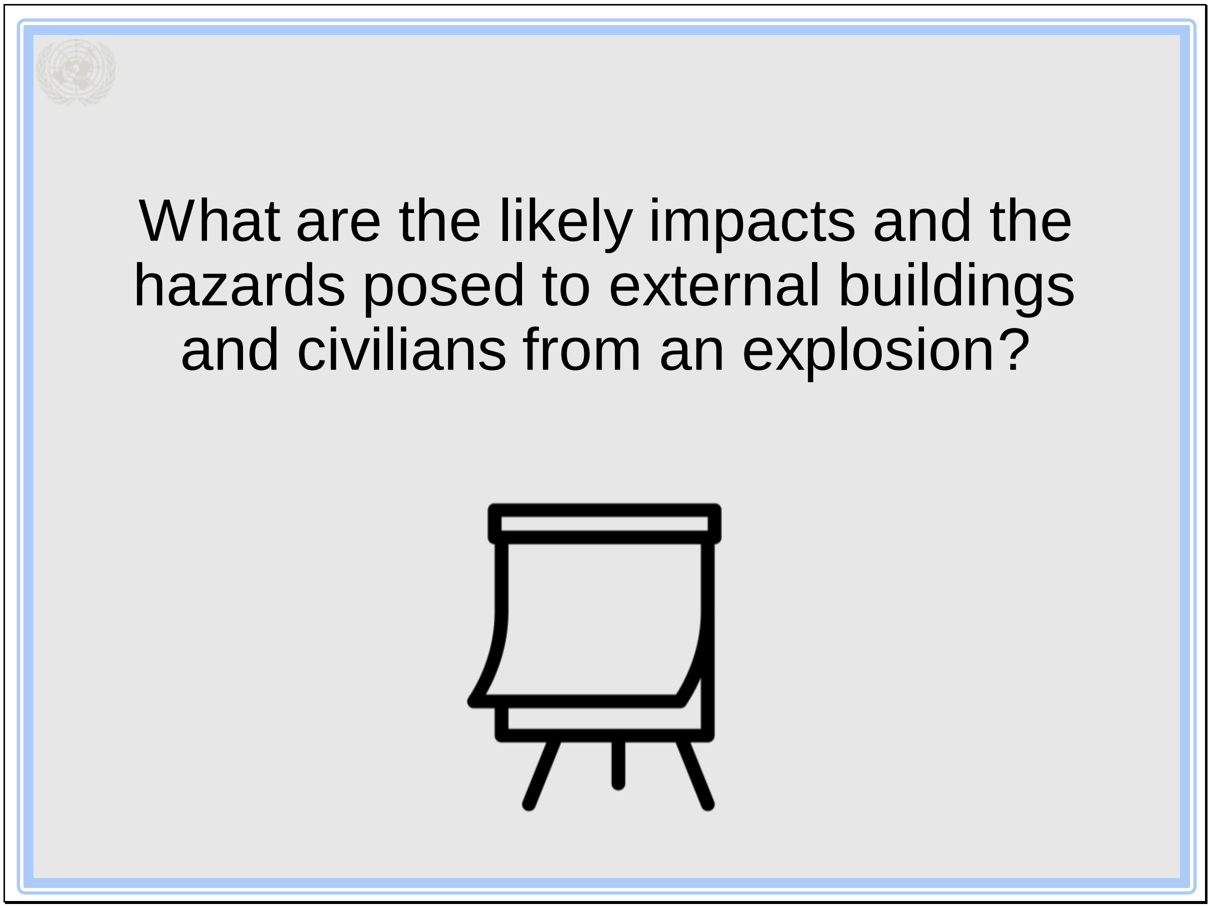
2.2.10.5 Apply the procedures for determining the tolerable NEQs based on the Quantity-Distance Formulae
2.2.10.6 Describe the Mapping, Yellow & Purple Lines and Directional Weapons Map
2.2.10.7 Examine how to safely control & maintain an ammunition store
2.2.10.8 Evaluate the permissible storage limits at a temporary storage area based on safeguarding good practice
2.2.10.9 Compile an explosive safety case to qualify an ammunition storage licence for a temporary storage area

Slide 4

Risks posed by living near stored Explosives and Ammunition

**Phase 1. Introduction (**Time allocation - 30 min**)**

Slide 5



What are the likely impacts and the hazards posed to external buildings and civilians from an explosion?

**Main idea/objective for slide:**
**Identify impacts and hazards posed to external buildings and civilians from an explosion**

participant Activity

- Ask questions of the participants to determine the likely impacts and the hazards posed to external buildings and civilians.
- List these impacts on the flip chart and post onto the wall.

## Protecting others

Before explosion

After explosion

**<u>Main idea/objective for slide:</u>**
**Identify impacts and hazards posed to external buildings and civilians from an explosion**

<u>What the instructor should cover (in addition to slide content)</u>

- Using relevant imagery, discuss with the participants the importance of not only maintaining safety from an explosive event within the camp but also the impact to buildings and civilians who live within the environs of the camp.

- Images are before and after the explosion in Bata, Equatorial Guinea, March 2021

- Facilitators can use examples that they are familiar with.

**Images from Google earth**

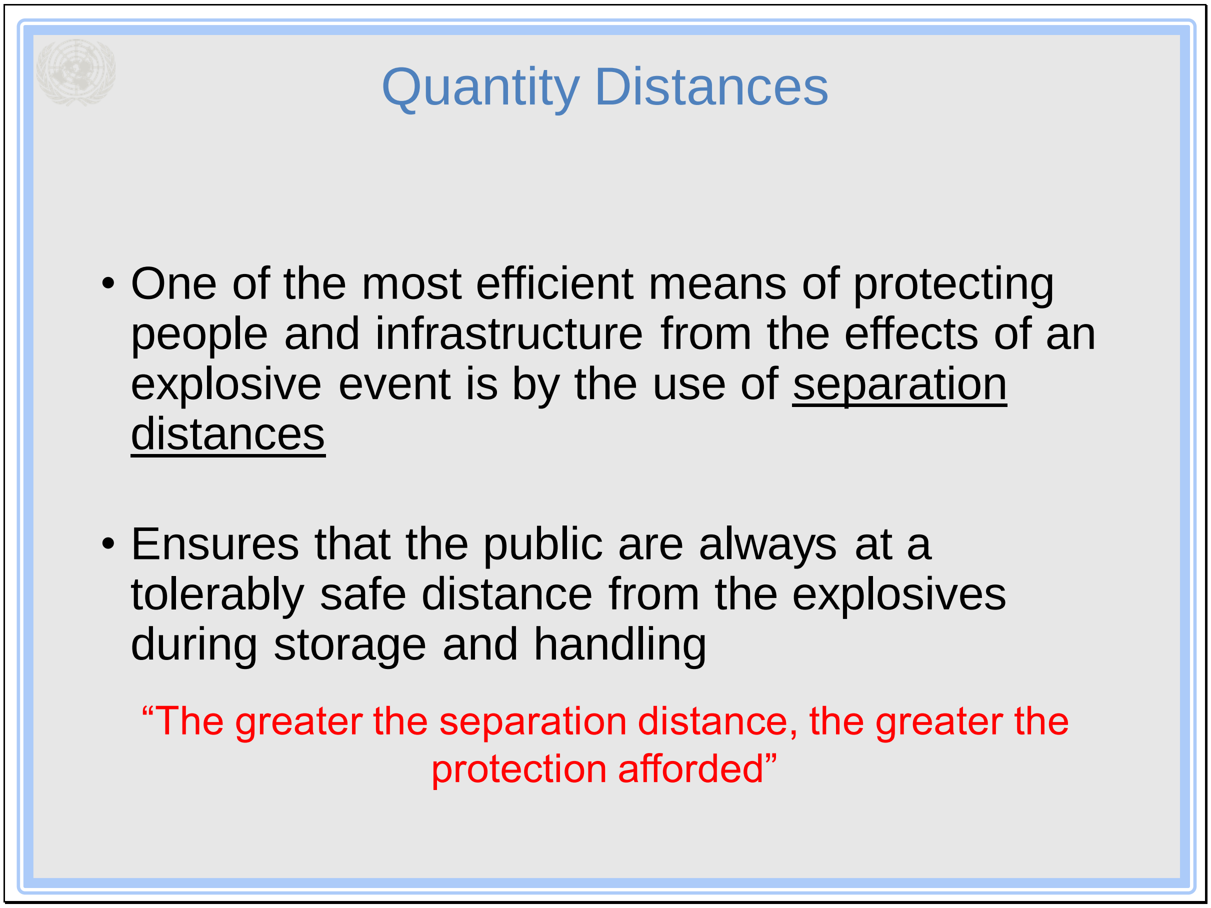
Slide 7

Quantity
Distances

**Phase 2. Development (**Time allocation - 220 min**)**

Stage 1 (Time allocation 50 mins) – Quantity Distances

Slide 8



## Quantity Distances

- One of the most efficient means of protecting people and infrastructure from the effects of an explosive event is by the use of separation distances
- Ensures that the public are always at a tolerably safe distance from the explosives during storage and handling

"The greater the separation distance, the greater the protection afforded"

**Main idea/objective for slide:**
**Introduce the concept of Quantity Distances**

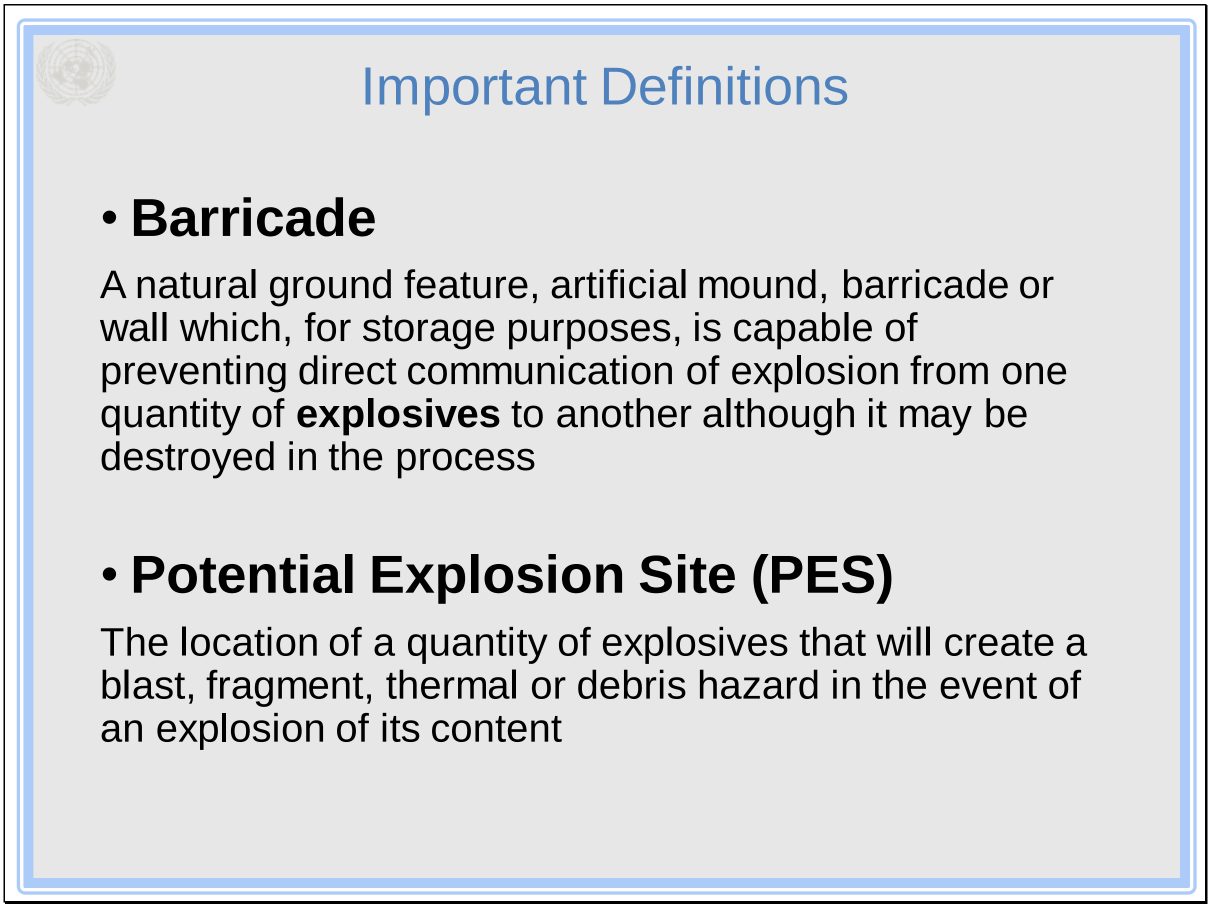
References/further reading
**IATG 02.20 – Quantity and Separation Distances**

- The storage and handling of ammunition and explosives within an ammunition storage area are operations that present inherent risks to persons and property.
- A national authority shall therefore have a legal responsibility to ensure, during any operation involving storage and/or handling of ammunition and explosives, that the risks associated with those operations are both tolerable and as low as reasonably practicable (ALARP)
- The use of QD is by necessity a compromise between 'an acceptable level of risk' and 'absolute protection', as it is generally impractical to procure/restrict

all the land around explosives locations such that all risk and explosion effects are eliminated.

- Glass breakage, some structural damage, and fragment impacts, in some cases capable of injury and possibly death, may be expected to occur outside these ‘safe’ separation distances.
- Where available, greater separation than those called for by the minimum

  QD should be applied whenever possible/practicable



## Important Definitions

- **Barricade**

A natural ground feature, artificial mound, barricade or wall which, for storage purposes, is capable of preventing direct communication of explosion from one quantity of **explosives** to another although it may be destroyed in the process

- **Potential Explosion Site (PES)**

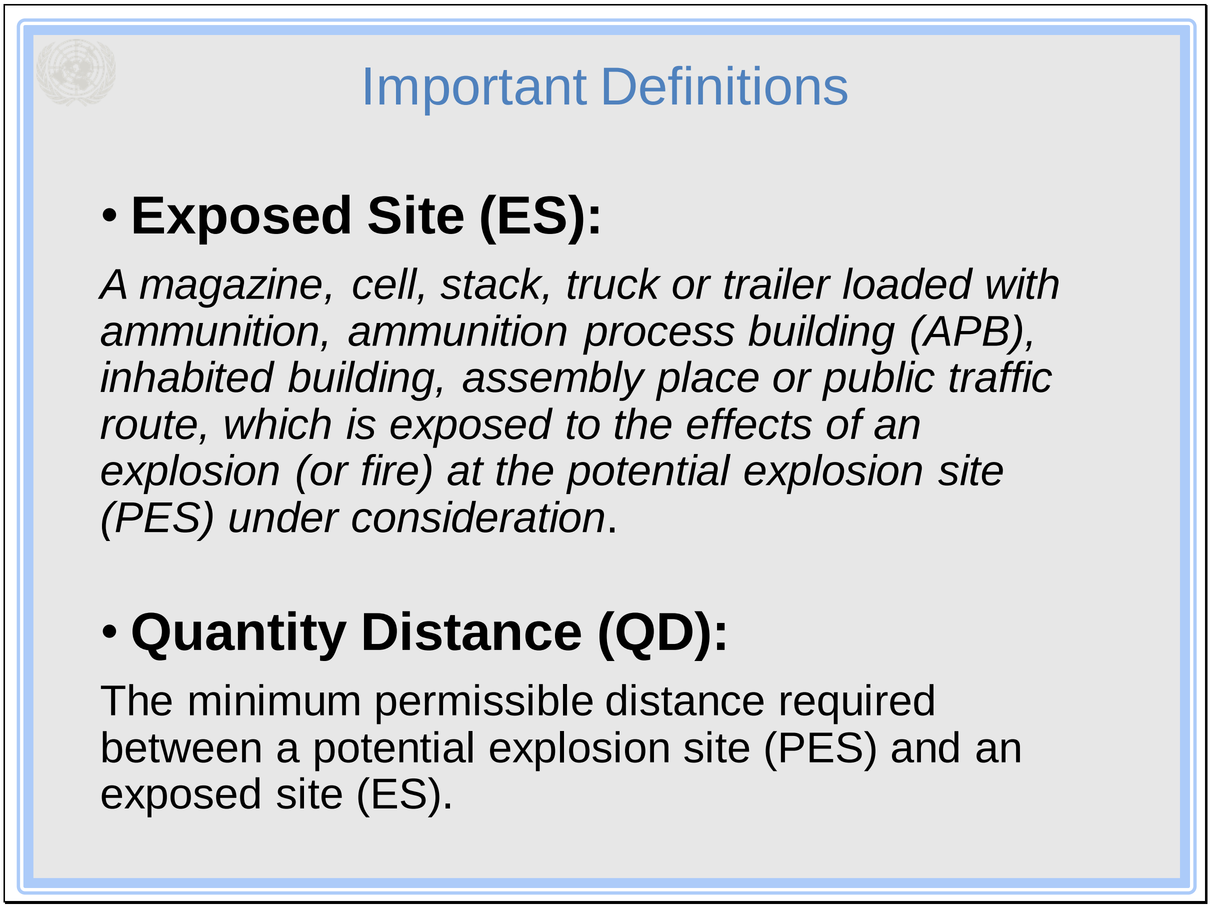
The location of a quantity of explosives that will create a blast, fragment, thermal or debris hazard in the event of an explosion of its content

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

References/further reading
**IATG 02.20 – Quantity and Separation Distances**

- A barricade *is capable of intercepting high velocity low angle projections from a potential explosion site and preventing initiation of explosives stocks stored nearby.*
- *The term 'traverse' is now been phased out and the alternate 'barricade' is now more frequently used.*
- *A barricade might be located at a PES or at an ES.*
- *If located at the PES, it may be destroyed by an explosion at that PES, but not until it has achieved its aim.*

Slide 10



## Important Definitions

- **Exposed Site (ES):**

*A magazine, cell, stack, truck or trailer loaded with ammunition, ammunition process building (APB), inhabited building, assembly place or public traffic route, which is exposed to the effects of an explosion (or fire) at the potential explosion site (PES) under consideration*.

- **Quantity Distance (QD):**

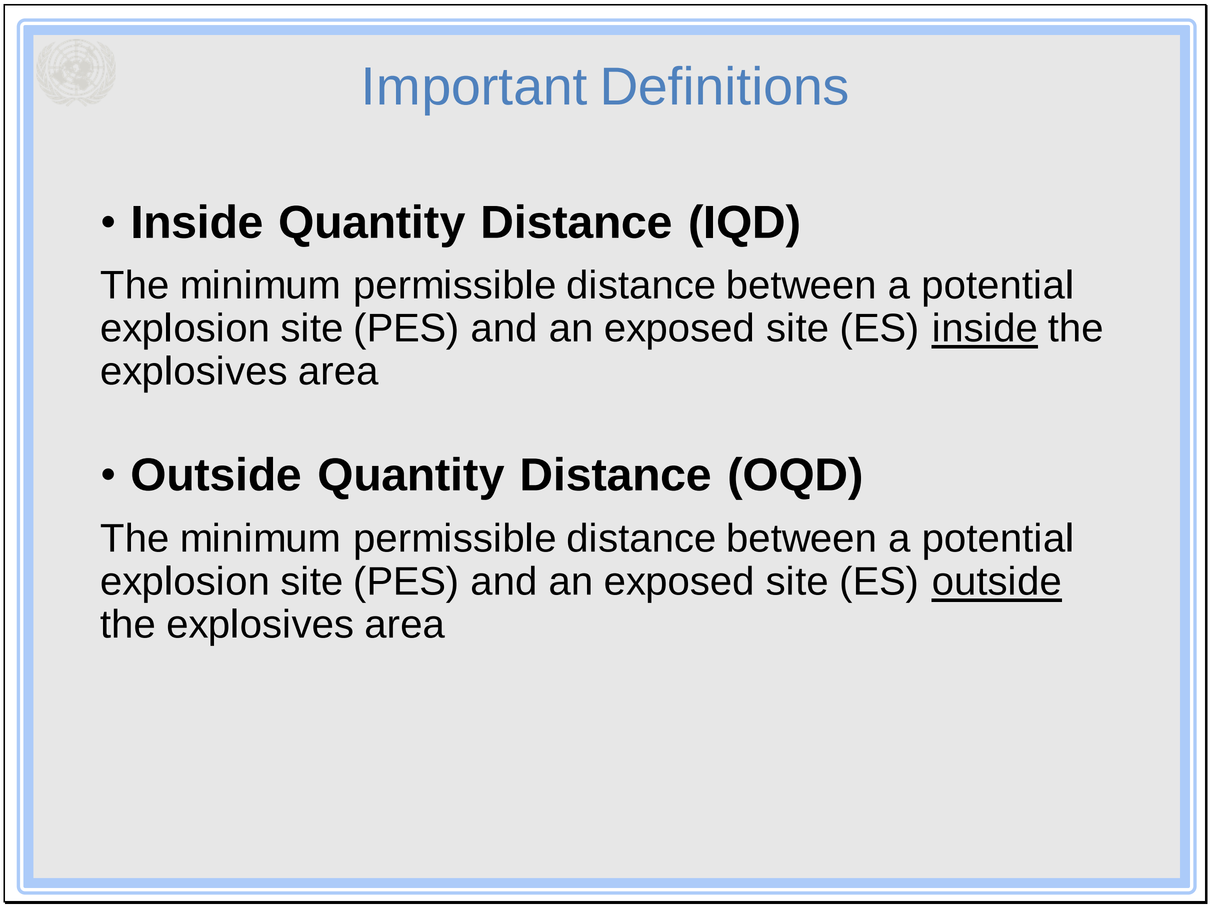
The minimum permissible distance required between a potential explosion site (PES) and an exposed site (ES).

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

References/further reading
**IATG 02.20 – Quantity and Separation Distances**

- The term ‘separation distance’ is often used ands refers to *a generic term for the minimum permissible distance between a potential explosion site (PES) and an exposed site (ES)*.

Slide 11



## Important Definitions

- **Inside Quantity Distance (IQD)**

The minimum permissible distance between a potential explosion site (PES) and an exposed site (ES) inside the explosives area

- **Outside Quantity Distance (OQD)**

The minimum permissible distance between a potential explosion site (PES) and an exposed site (ES) outside the explosives area

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

What the instructor should cover (in addition to slide content)
Highlight the difference between Inside and Outside Quantity Distance, emphasising that these play a crucial role in Safeguarding

References/further reading
**IATG 02.20 – Quantity and Separation Distances**

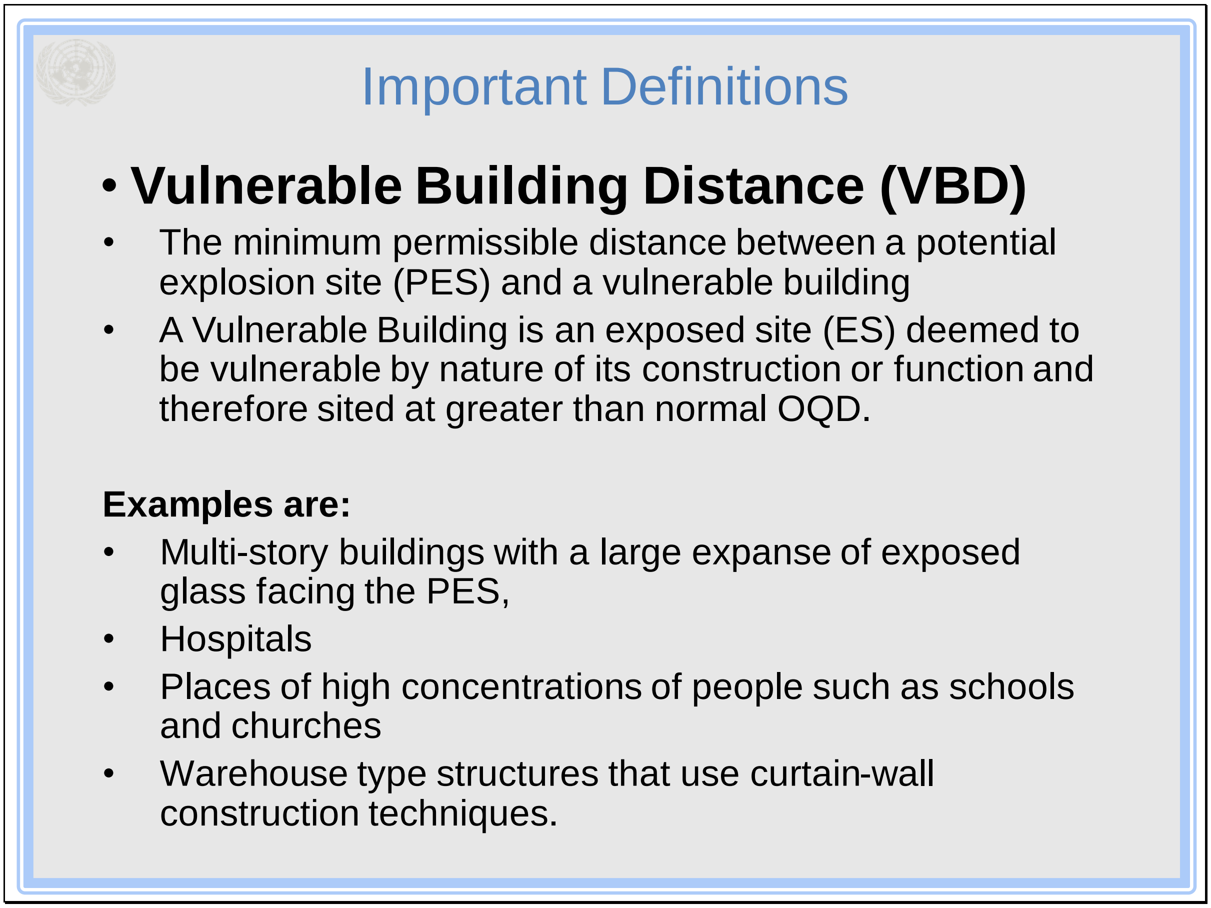
## Important Definitions

- **Inter-Magazine Distances (IMD)**
  - The minimum permissible distance between a building or stack containing explosives to other such buildings or stacks, which will prevent the immediate propagation of explosions or fire from one to the other by missile, flame or blast.
- **Inhabited Building Distance (IBD)**
  - The minimum permissible distance between potential explosive sites (PES) and non-associated exposed sites (ES) that requires a high degree of protection from an explosion
  - The ES is a building or structure occupied in whole or in part by people (usually civilian)

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

What the instructor should cover (in addition to slide content)
Spend some time explaining these definitions as they will be significant throughout the lesson

References/further reading
**IATG 02.20 – Quantity and Separation Distances**



## Important Definitions

- **Vulnerable Building Distance (VBD)**
  - The minimum permissible distance between a potential explosion site (PES) and a vulnerable building
  - A Vulnerable Building is an exposed site (ES) deemed to be vulnerable by nature of its construction or function and therefore sited at greater than normal OQD.

**Examples are:**

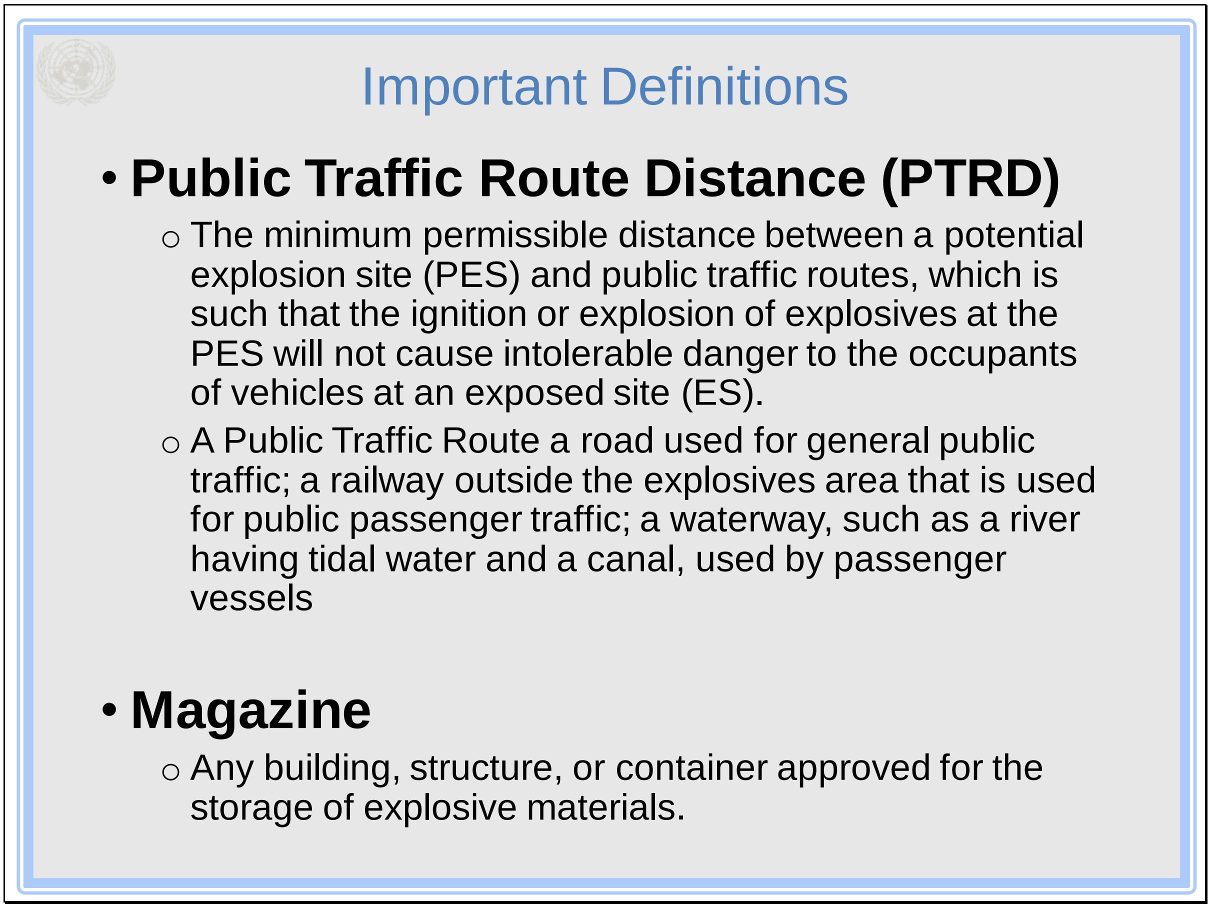
- Multi-story buildings with a large expanse of exposed glass facing the PES,
- Hospitals
- Places of high concentrations of people such as schools and churches
- Warehouse type structures that use curtain-wall construction techniques.

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

What the instructor should cover (in addition to slide content)
Spend some time explaining these definitions as they will be significant throughout the lesson

References/further reading
**IATG 02.20 – Quantity and Separation Distances**

Slide 14



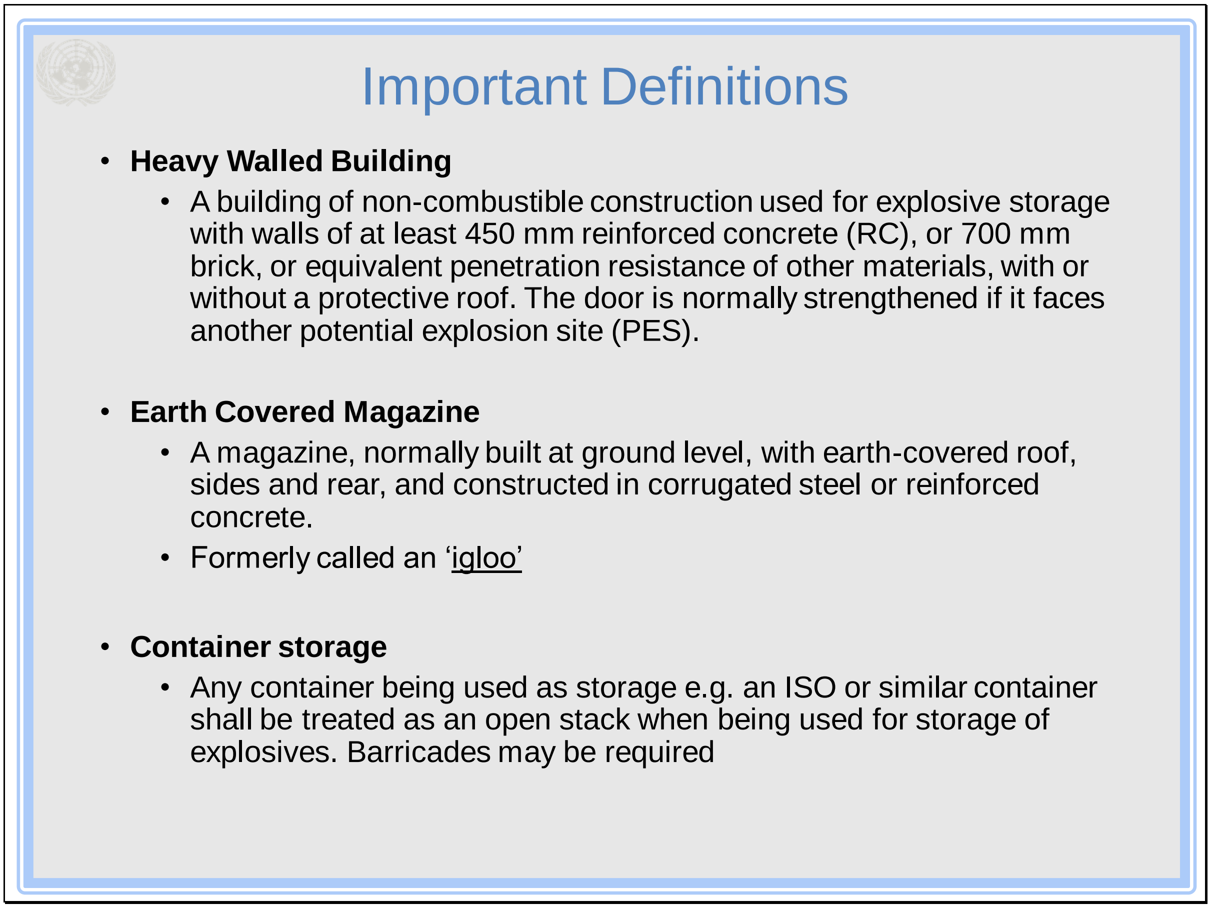
## Important Definitions

- **Public Traffic Route Distance (PTRD)**
  - The minimum permissible distance between a potential explosion site (PES) and public traffic routes, which is such that the ignition or explosion of explosives at the PES will not cause intolerable danger to the occupants of vehicles at an exposed site (ES).
  - A Public Traffic Route a road used for general public traffic; a railway outside the explosives area that is used for public passenger traffic; a waterway, such as a river having tidal water and a canal, used by passenger vessels
- **Magazine**
  - Any building, structure, or container approved for the storage of explosive materials.

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

What the instructor should cover (in addition to slide content)
Spend some time explaining these definitions as they will be significant throughout the lesson

References/further reading
**IATG 02.20 – Quantity and Separation Distances**



## Important Definitions

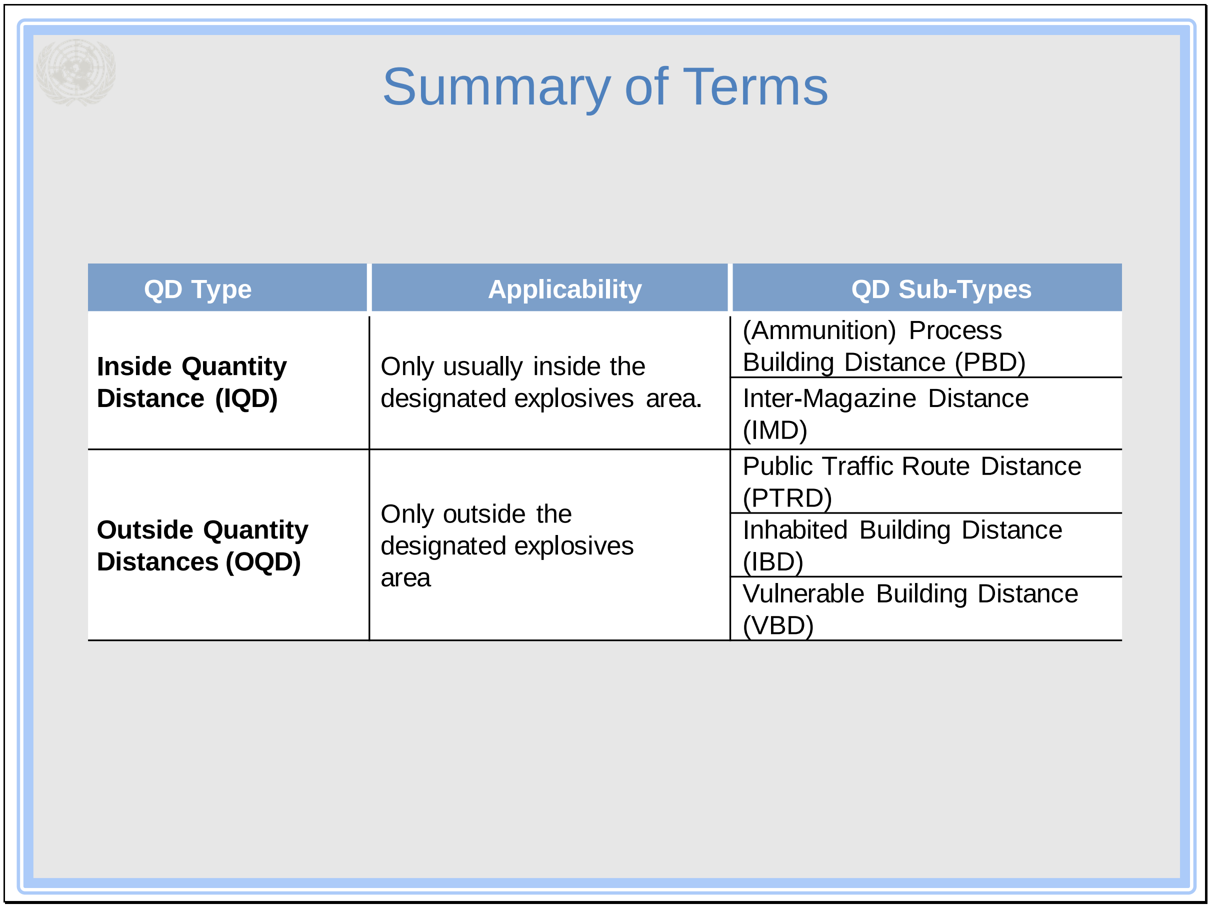
- **Heavy Walled Building**
  - A building of non-combustible construction used for explosive storage with walls of at least 450 mm reinforced concrete (RC), or 700 mm brick, or equivalent penetration resistance of other materials, with or without a protective roof. The door is normally strengthened if it faces another potential explosion site (PES).
- **Earth Covered Magazine**
  - A magazine, normally built at ground level, with earth-covered roof, sides and rear, and constructed in corrugated steel or reinforced concrete.
  - Formerly called an ‘igloo’
- **Container storage**
  - Any container being used as storage e.g. an ISO or similar container shall be treated as an open stack when being used for storage of explosives. Barricades may be required

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

What the instructor should cover (in addition to slide content)
Spend some time explaining these definitions as they will be significant throughout the lesson

References/further reading
**IATG 02.20 – Quantity and Separation Distances**

Slide 16



## Summary of Terms

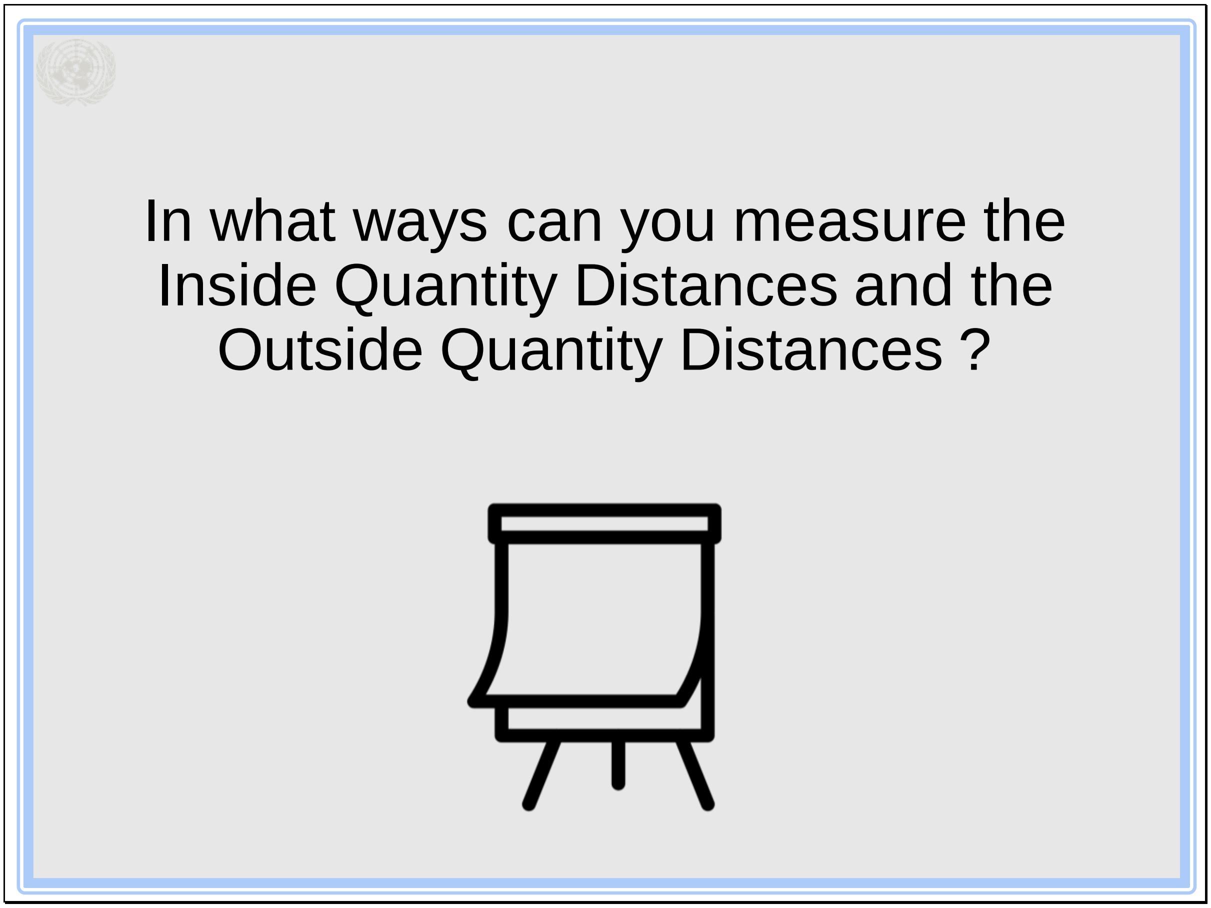
| QD Type | Applicability | QD Sub-Types |
|---|---|---|
| **Inside Quantity Distance (IQD)** | Only usually inside the designated explosives area. | (Ammunition) Process Building Distance (PBD)<br>Inter-Magazine Distance (IMD) |
| **Outside Quantity Distances (OQD)** | Only outside the designated explosives area | Public Traffic Route Distance (PTRD)<br>Inhabited Building Distance (IBD)<br>Vulnerable Building Distance (VBD) |

**Main idea/objective for slide:**
**Provide relevant definitions related to Quantity Distances**

What the instructor should cover (in addition to slide content)
Provide this table as a Handout for future reference for participants. http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 5

References/further reading
**IATG 02.20 – Quantity and Separation Distances**

Slide 17



In what ways can you measure the Inside Quantity Distances and the Outside Quantity Distances ?

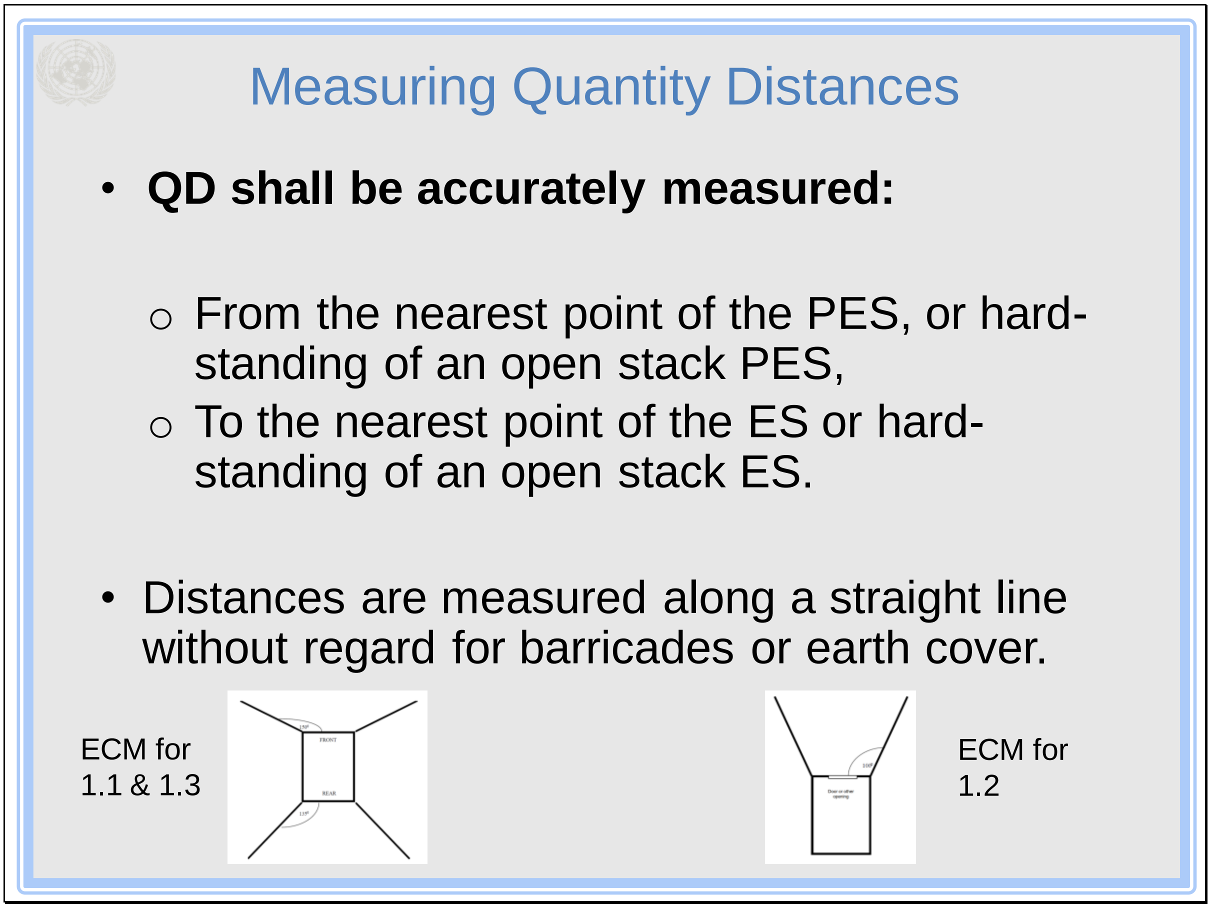
**<u>Main idea/objective for slide:</u>**

- **methods to measure quantity distances**

<u>What the instructor should cover (in addition to slide content)</u>
Ask the participants the methods by which you can measure quantity distances
Ask the participants what methods they have used/would expect to use when on the UN mission.

Tape measure, laser range-finder, google earth etc.

Slide 18



## Measuring Quantity Distances

- **QD shall be accurately measured:**
    - From the nearest point of the PES, or hard-standing of an open stack PES,
    - To the nearest point of the ES or hard-standing of an open stack ES.
- Distances are measured along a straight line without regard for barricades or earth cover.

ECM for
1.1 & 1.3

ECM for
1.2

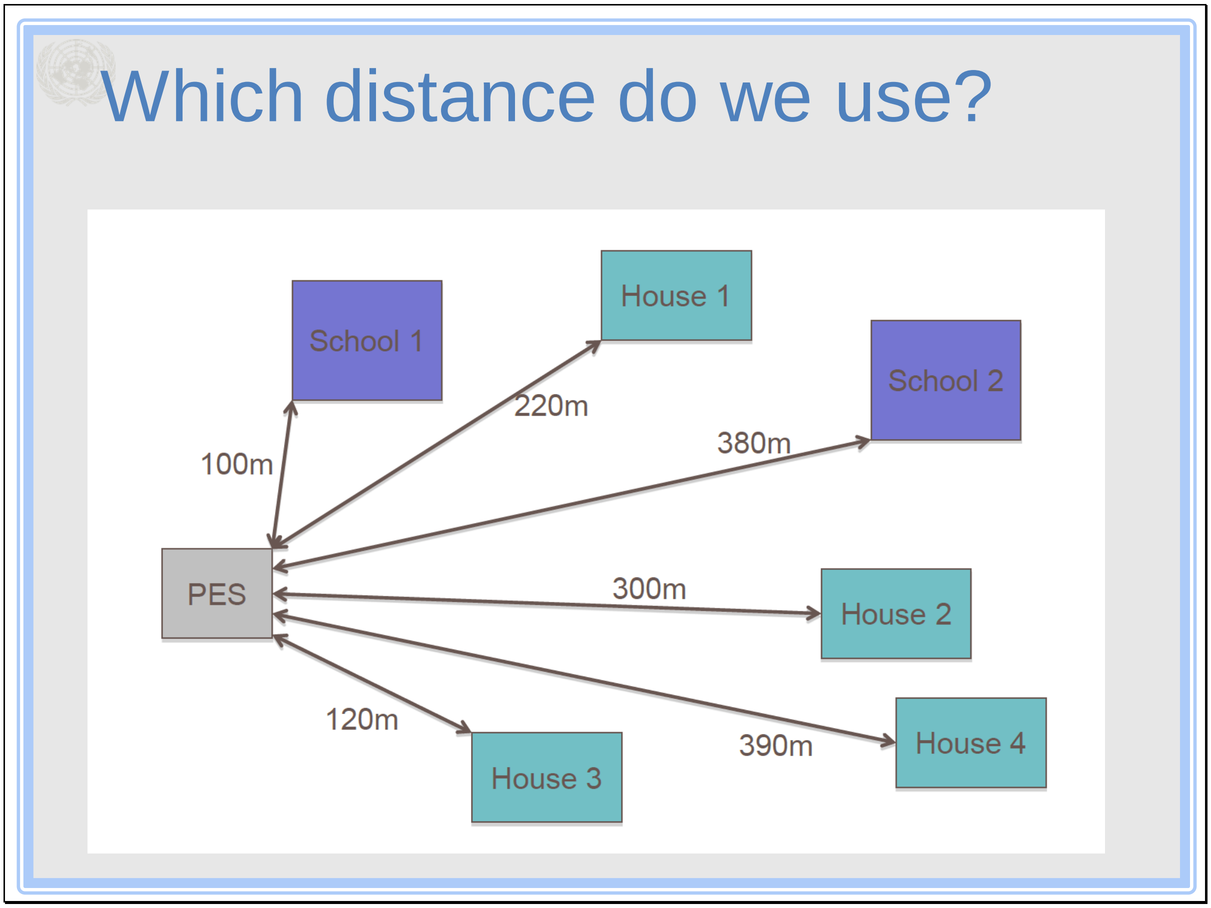
**Main idea/objective for slide:**

- **methods to measure quantity distances**

What the instructor should cover (in addition to slide content)

Different measuring criteria depending on construction and contents.

Slide 19

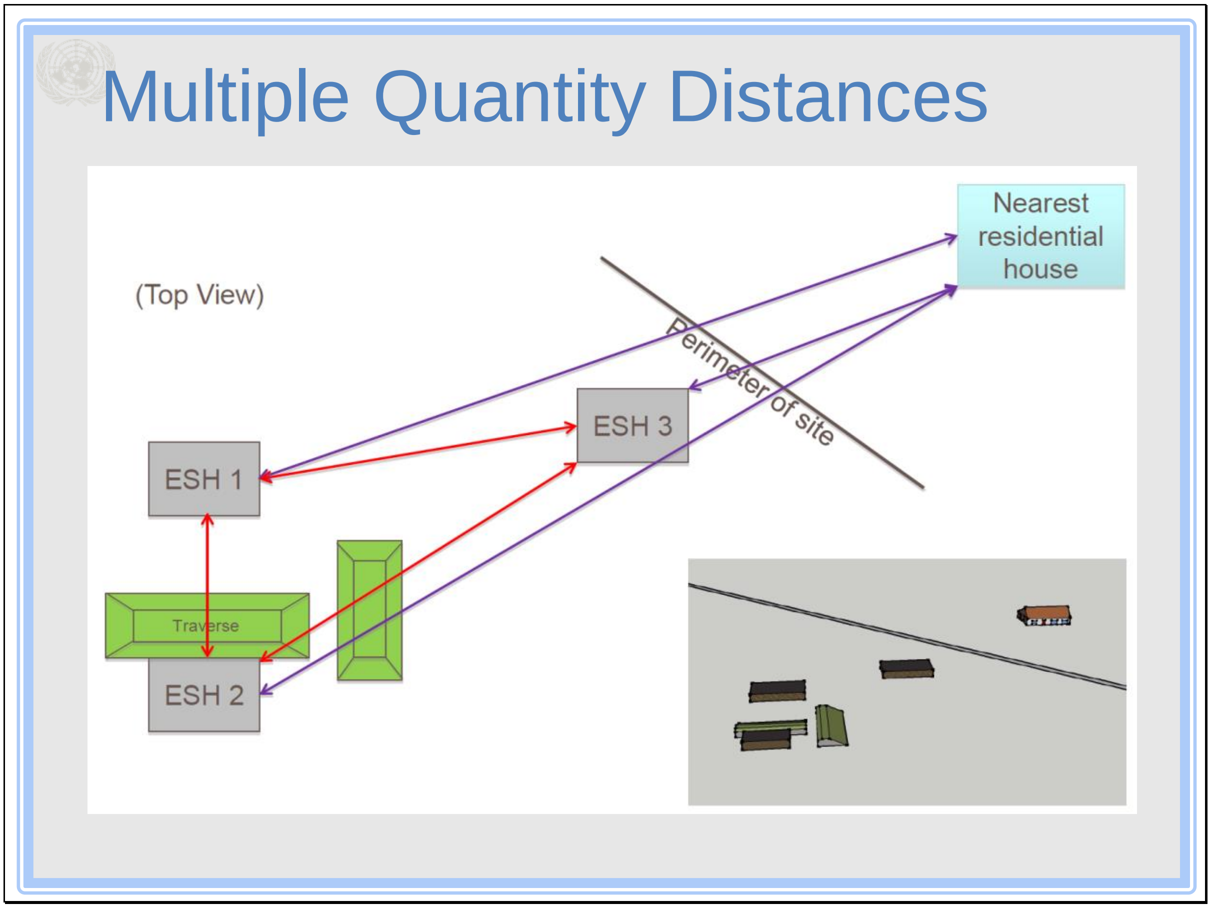


# Which distance do we use?

**<u>Main idea/objective for slide:</u>**

- **Define the important distance**

Slide 20

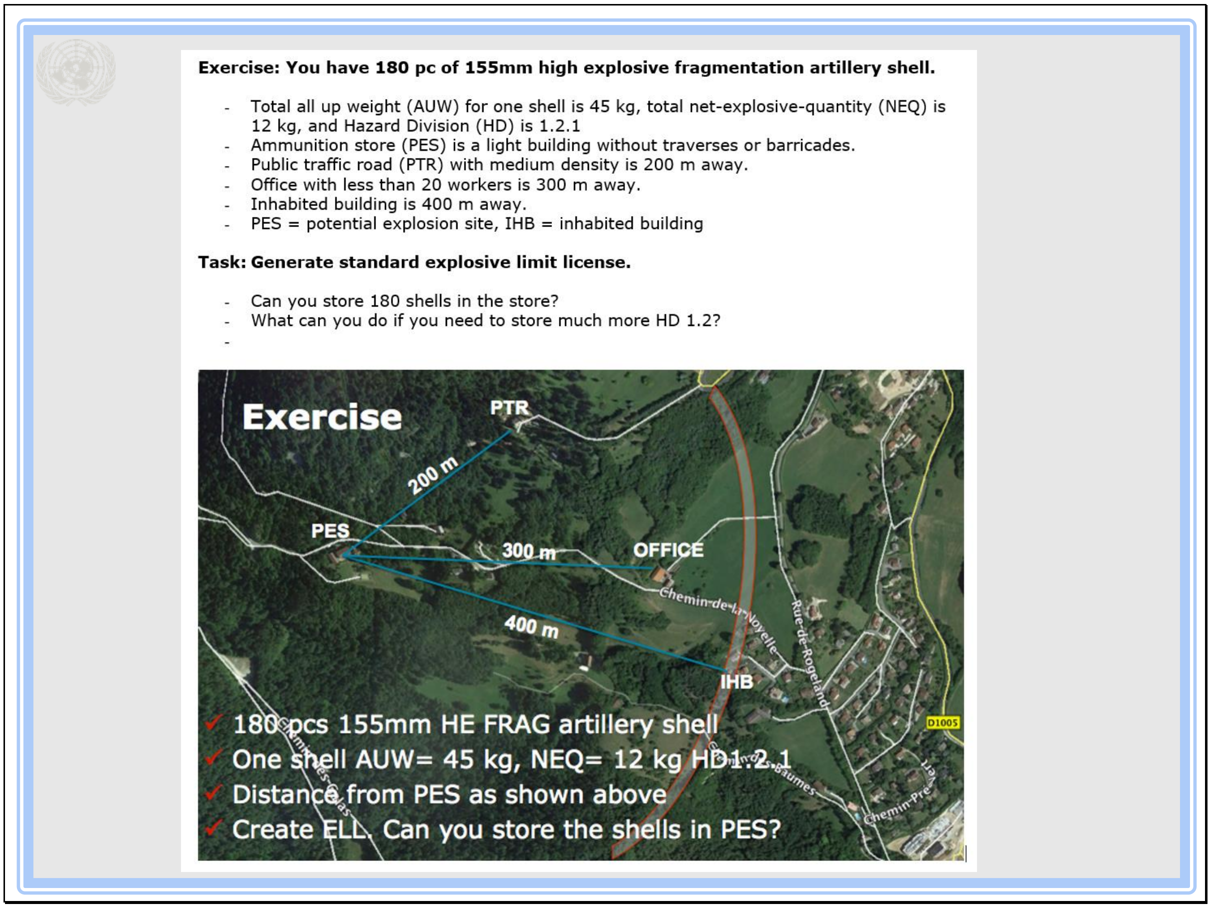


# Multiple Quantity Distances

**Main idea/objective for slide:**

- **Define the important distance**

Slide 21



**Exercise: You have 180 pc of 155mm high explosive fragmentation artillery shell.**

- Total all up weight (AUW) for one shell is 45 kg, total net-explosive-quantity (NEQ) is 12 kg, and Hazard Division (HD) is 1.2.1
- Ammunition store (PES) is a light building without traverses or barricades.
- Public traffic road (PTR) with medium density is 200 m away.
- Office with less than 20 workers is 300 m away.
- Inhabited building is 400 m away.
- PES = potential explosion site, IHB = inhabited building

**Task: Generate standard explosive limit license.**

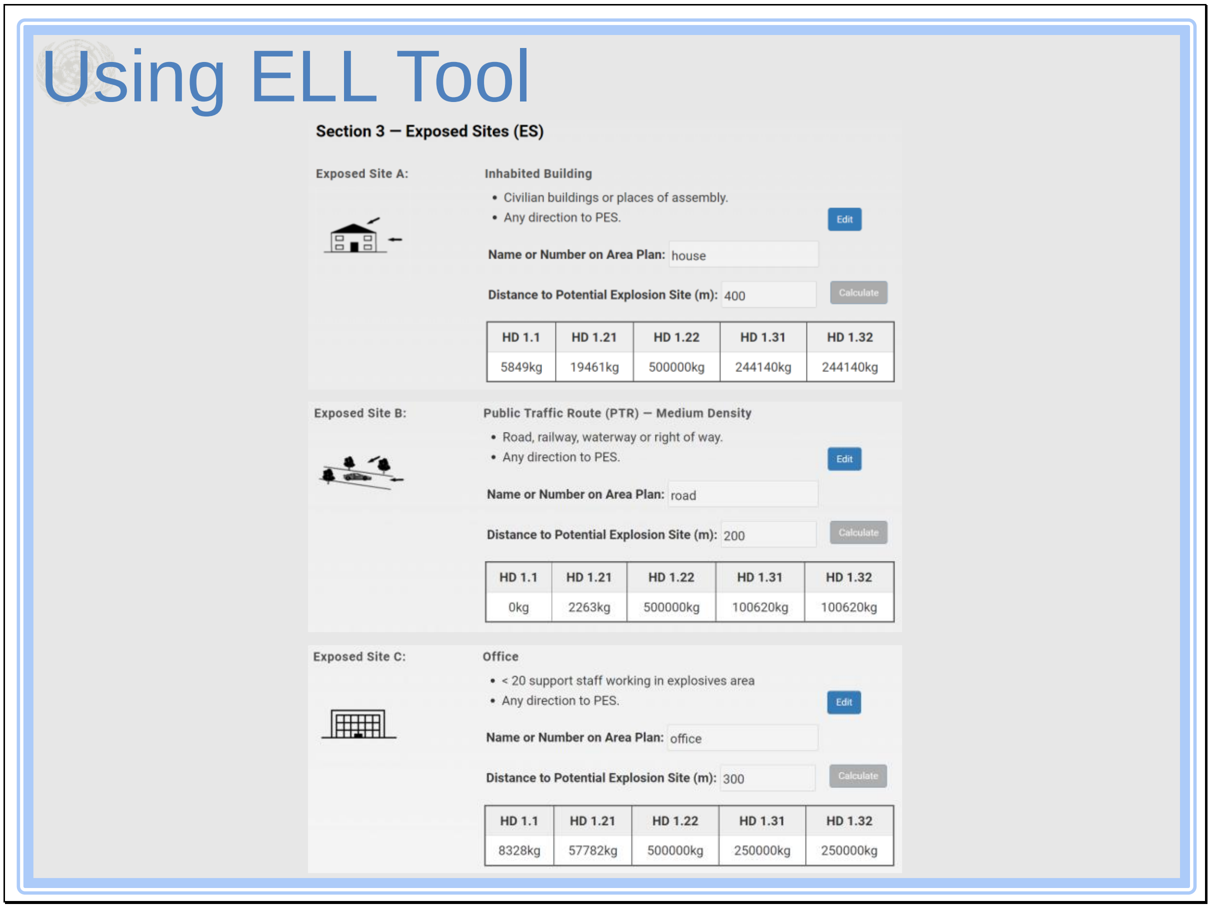
- Can you store 180 shells in the store?
- What can you do if you need to store much more HD 1.2?
-

**Exercise**

- ✓ 180 pcs 155mm HE FRAG artillery shell
- ✓ One shell AUW= 45 kg, NEQ= 12 kg HD1.2.1
- ✓ Distance from PES as shown above
- ✓ Create ELL. Can you store the shells in PES?

Total NEQ 2160kg

Slide 22



# Using ELL Tool

**Section 3 — Exposed Sites (ES)**

**Exposed Site A:**

**Inhabited Building**

- Civilian buildings or places of assembly.
- Any direction to PES.

**Name or Number on Area Plan:** house

**Distance to Potential Explosion Site (m):** 400

| HD 1.1 | HD 1.21 | HD 1.22 | HD 1.31 | HD 1.32 |
|---|---|---|---|---|
| 5849kg | 19461kg | 500000kg | 244140kg | 244140kg |

**Exposed Site B:**

**Public Traffic Route (PTR) — Medium Density**

- Road, railway, waterway or right of way.
- Any direction to PES.

**Name or Number on Area Plan:** road

**Distance to Potential Explosion Site (m):** 200

| HD 1.1 | HD 1.21 | HD 1.22 | HD 1.31 | HD 1.32 |
|---|---|---|---|---|
| 0kg | 2263kg | 500000kg | 100620kg | 100620kg |

**Exposed Site C:**

**Office**

- < 20 support staff working in explosives area
- Any direction to PES.

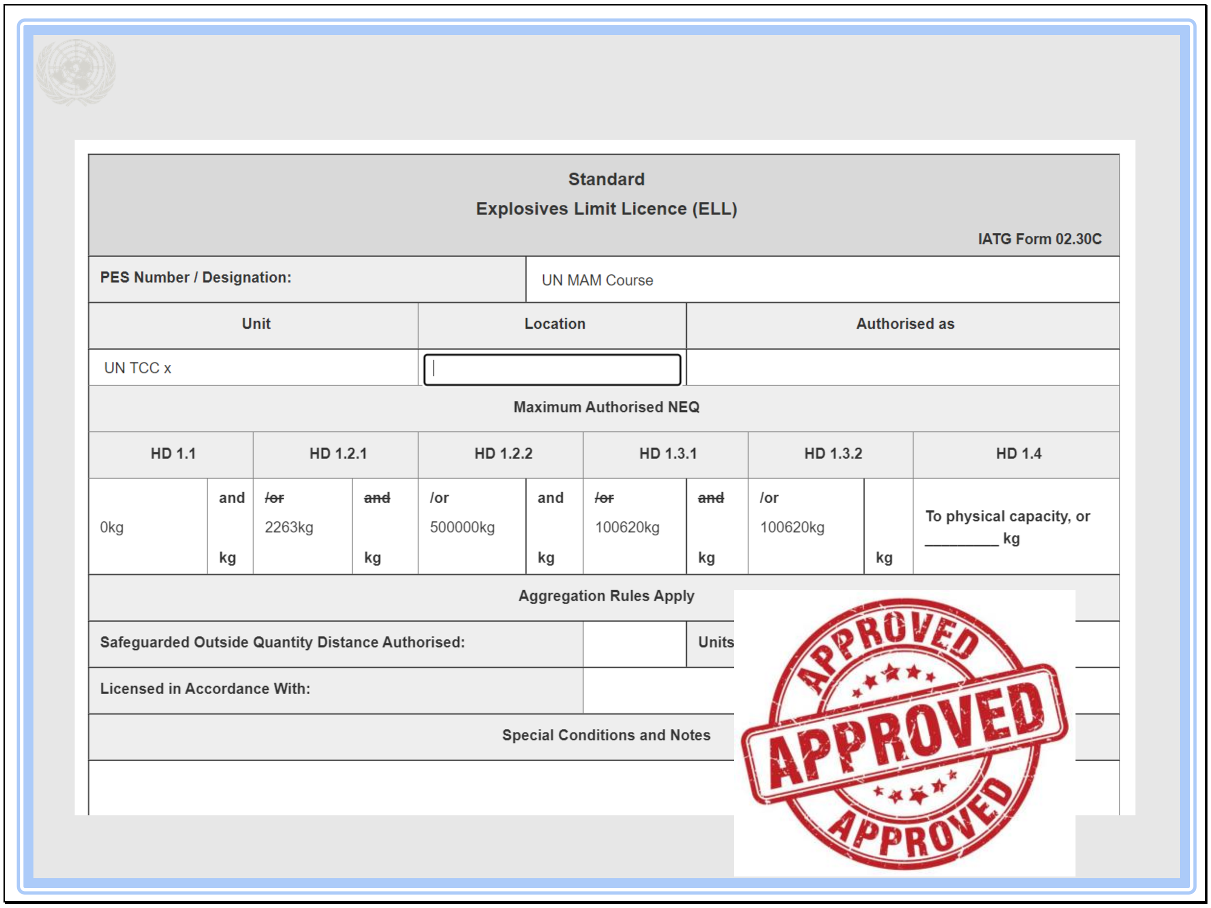
**Name or Number on Area Plan:** office

**Distance to Potential Explosion Site (m):** 300

| HD 1.1 | HD 1.21 | HD 1.22 | HD 1.31 | HD 1.32 |
|---|---|---|---|---|
| 8328kg | 57782kg | 500000kg | 250000kg | 250000kg |

## Main idea/objective for slide:

- **Demonstration of the procedure with ELL Tool**



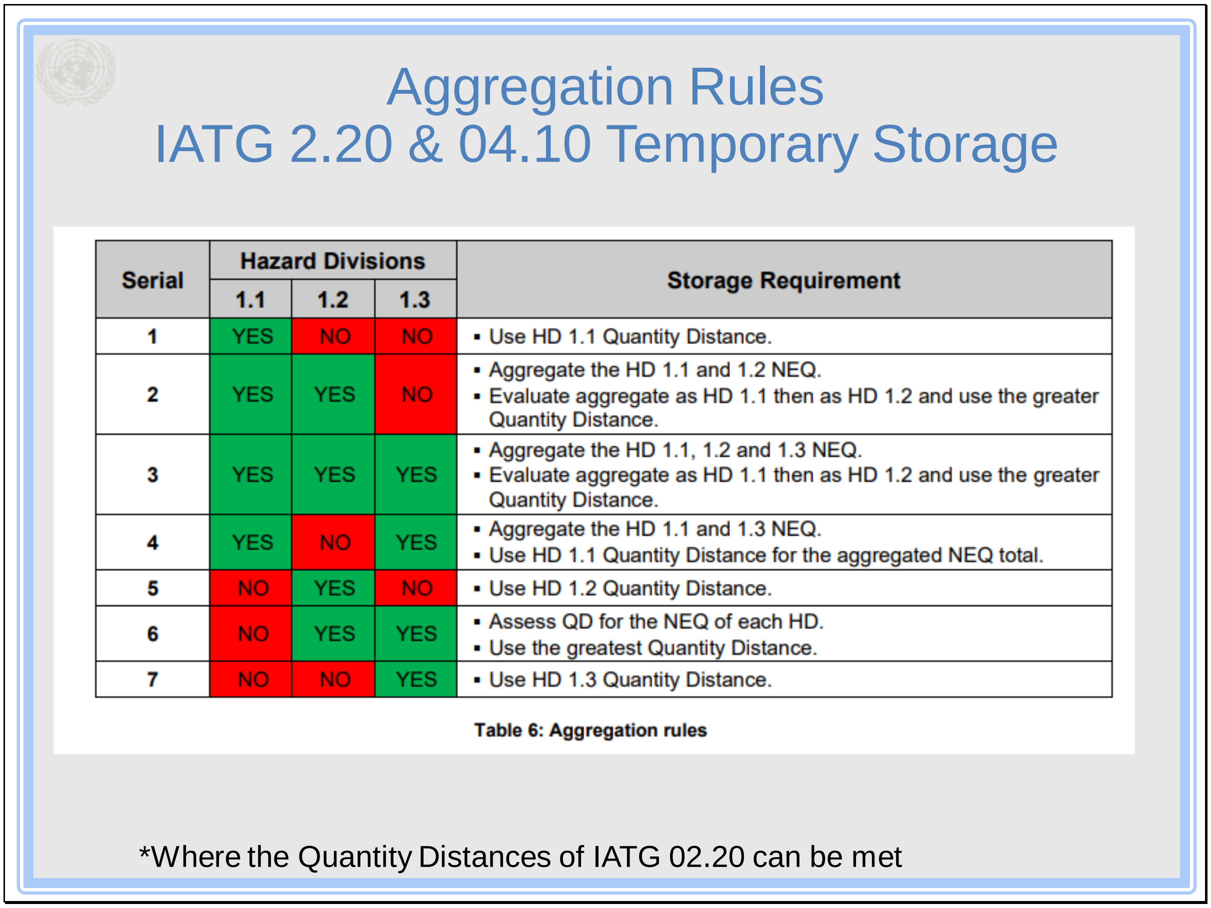
**Standard**
**Explosives Limit Licence (ELL)**
**IATG Form 02.30C**

| | | | | | |
|---|---|---|---|---|---|
| **PES Number / Designation:** | | | UN MAM Course | | |
| **Unit** | | **Location** | | **Authorised as** | |
| UN TCC x | | | | | |
| **Maximum Authorised NEQ** | | | | | |
| **HD 1.1** | **HD 1.2.1** | **HD 1.2.2** | **HD 1.3.1** | **HD 1.3.2** | **HD 1.4** |
| 0kg **and** **kg** | ~~/or~~ 2263kg ~~and~~ **kg** | /or 500000kg **and** **kg** | ~~/or~~ 100620kg ~~and~~ **kg** | /or 100620kg **kg** | **To physical capacity, or _________ kg** |
| **Aggregation Rules Apply** | | | | | |
| **Safeguarded Outside Quantity Distance Authorised:** | | | | **Units** | |
| **Licensed in Accordance With:** | | | | | |
| **Special Conditions and Notes** | | | | | |

APPROVED

## Main idea/objective for slide:

- **Demonstration of the procedure with ELL Tool**



## Aggregation Rules
## IATG 2.20 & 04.10 Temporary Storage

| Serial | Hazard Divisions | | | Storage Requirement |
|---|---|---|---|---|
| | 1.1 | 1.2 | 1.3 | |
| 1 | YES | NO | NO | ▪ Use HD 1.1 Quantity Distance. |
| 2 | YES | YES | NO | ▪ Aggregate the HD 1.1 and 1.2 NEQ.<br>▪ Evaluate aggregate as HD 1.1 then as HD 1.2 and use the greater Quantity Distance. |
| 3 | YES | YES | YES | ▪ Aggregate the HD 1.1, 1.2 and 1.3 NEQ.<br>▪ Evaluate aggregate as HD 1.1 then as HD 1.2 and use the greater Quantity Distance. |
| 4 | YES | NO | YES | ▪ Aggregate the HD 1.1 and 1.3 NEQ.<br>▪ Use HD 1.1 Quantity Distance for the aggregated NEQ total. |
| 5 | NO | YES | NO | ▪ Use HD 1.2 Quantity Distance. |
| 6 | NO | YES | YES | ▪ Assess QD for the NEQ of each HD.<br>▪ Use the greatest Quantity Distance. |
| 7 | NO | NO | YES | ▪ Use HD 1.3 Quantity Distance. |

**Table 6: Aggregation rules**

*Where the Quantity Distances of IATG 02.20 can be met

**<u>Main idea/objective for slide:</u>**

- **Discuss the concept of aggregation of Net Explosive Quantity and temporary storage**

<u>What the instructor should cover (in addition to slide content)</u>

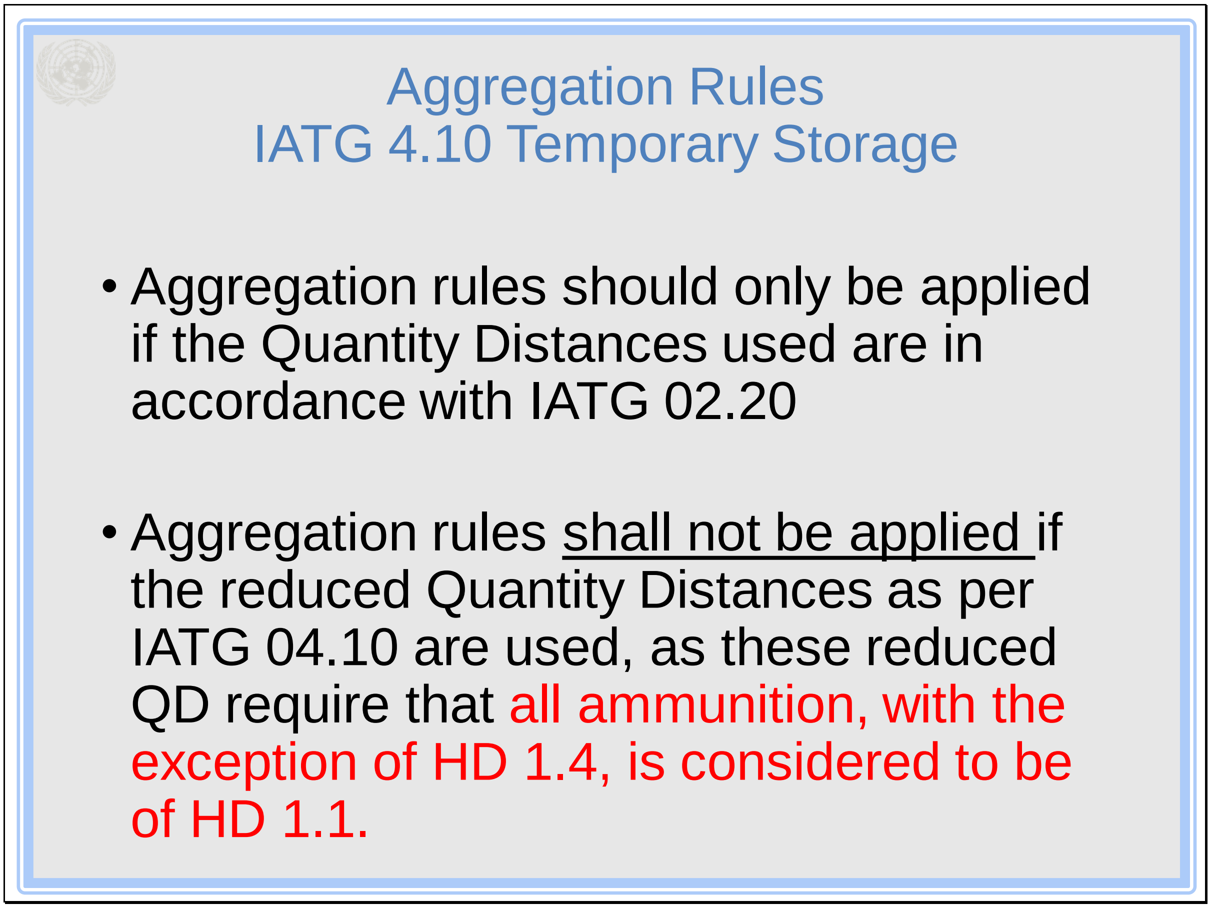
Discuss each serial in this table

Give this table as a handout

<u>http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf.</u> page 8

<u>References/further reading</u>

**IATG 02.20 – Quantity Separation Distances**



## Aggregation Rules
## IATG 4.10 Temporary Storage

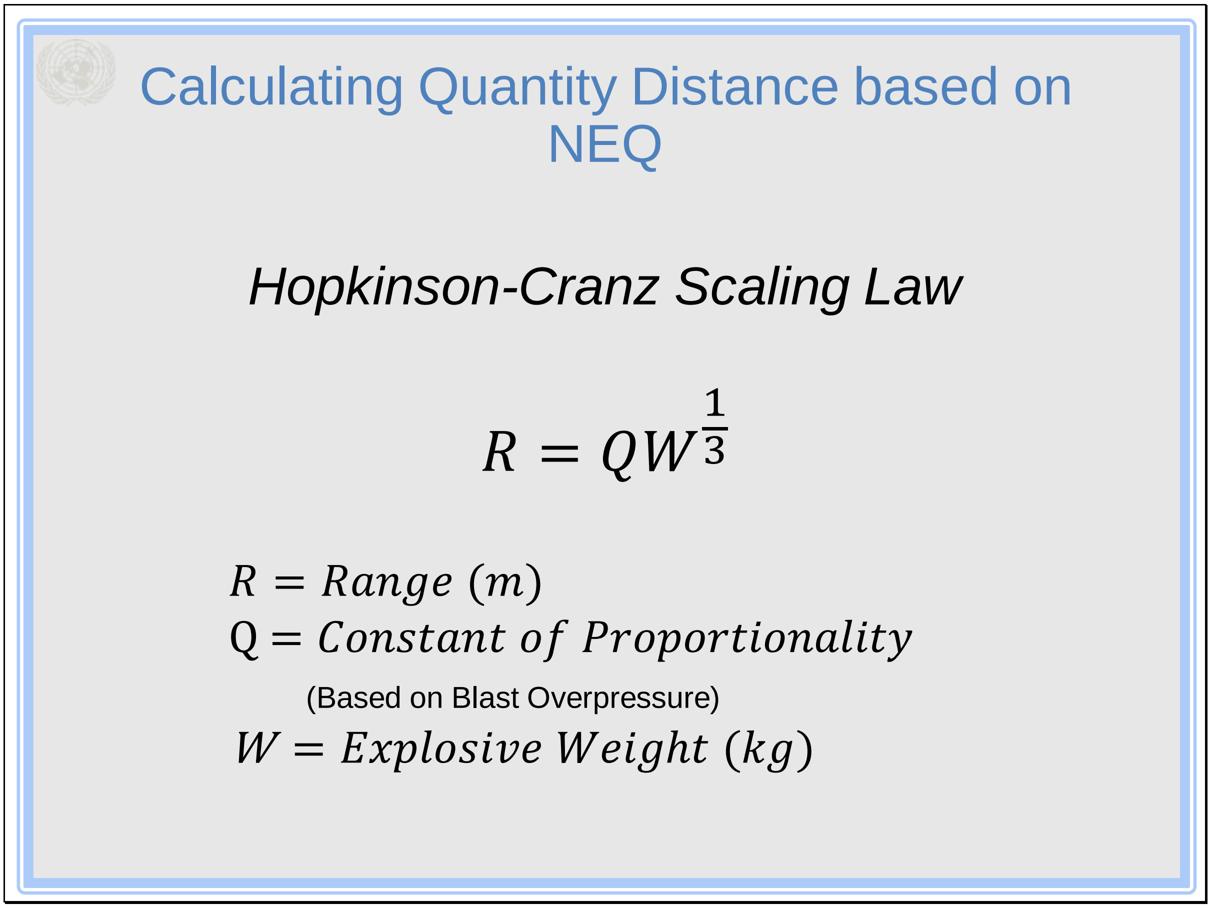
- Aggregation rules should only be applied if the Quantity Distances used are in accordance with IATG 02.20
- Aggregation rules shall not be applied if the reduced Quantity Distances as per IATG 04.10 are used, as these reduced QD require that all ammunition, with the exception of HD 1.4, is considered to be of HD 1.1.

**Main idea/objective for slide:**

- **Discuss the concept of aggregation of Net Explosive Quantity and temporary storage**

What the instructor should cover (in addition to slide content)
Ensure participants understand that all ammunition is classed as HD1.1 under temporary storage , unless it is HD1.4

References/further reading
**IATG 04.10 – Temporary Storage**



## Calculating Quantity Distance based on NEQ

*Hopkinson-Cranz Scaling Law*

$$R = QW^{\frac{1}{3}}$$

$R = Range\ (m)$

$\mathrm{Q} = Constant\ of\ Proportionality$

(Based on Blast Overpressure)

$W = Explosive\ Weight\ (kg)$

**Main idea/objective for slide:**

- **Calculating Quantity Distance based on NEQ**

What the instructor should cover (in addition to slide content)

- Explain each term in this formula

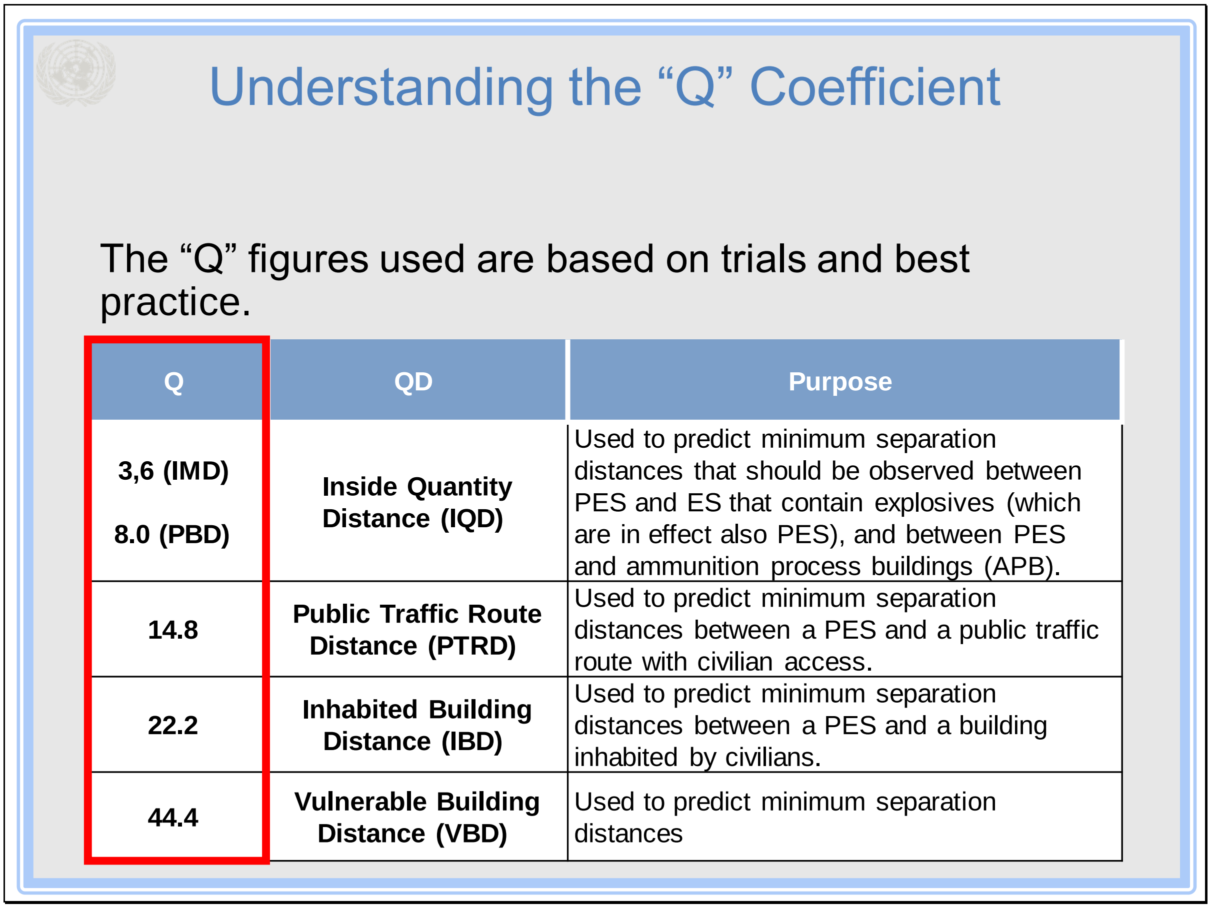
References/further reading

**IATG 02.20 – Quantity and Separation Distances**

- Many States use rules based upon the explosives, their quantity, and the distance from the explosive to where people and, in some cases, critical facilities/equipment are at risk.

- These rules are known as Quantity-Distance (Q-D) criteria and are based on the approach derived from the *Hopkinson-Cranz Scaling Law*, which is further amended by a range of coefficients.
- It is the basis of much of the work on the estimation of appropriate quantity and separation distances.
- The *Hopkinson-Cranz Scaling Law* is also referred to as the *Cube Root Scaling Law*

Slide 27



## Understanding the "Q" Coefficient

The "Q" figures used are based on trials and best practice.

| Q | QD | Purpose |
|---|---|---|
| **3,6 (IMD)**<br>**8.0 (PBD)** | **Inside Quantity Distance (IQD)** | Used to predict minimum separation distances that should be observed between PES and ES that contain explosives (which are in effect also PES), and between PES and ammunition process buildings (APB). |
| **14.8** | **Public Traffic Route Distance (PTRD)** | Used to predict minimum separation distances between a PES and a public traffic route with civilian access. |
| **22.2** | **Inhabited Building Distance (IBD)** | Used to predict minimum separation distances between a PES and a building inhabited by civilians. |
| **44.4** | **Vulnerable Building Distance (VBD)** | Used to predict minimum separation distances |

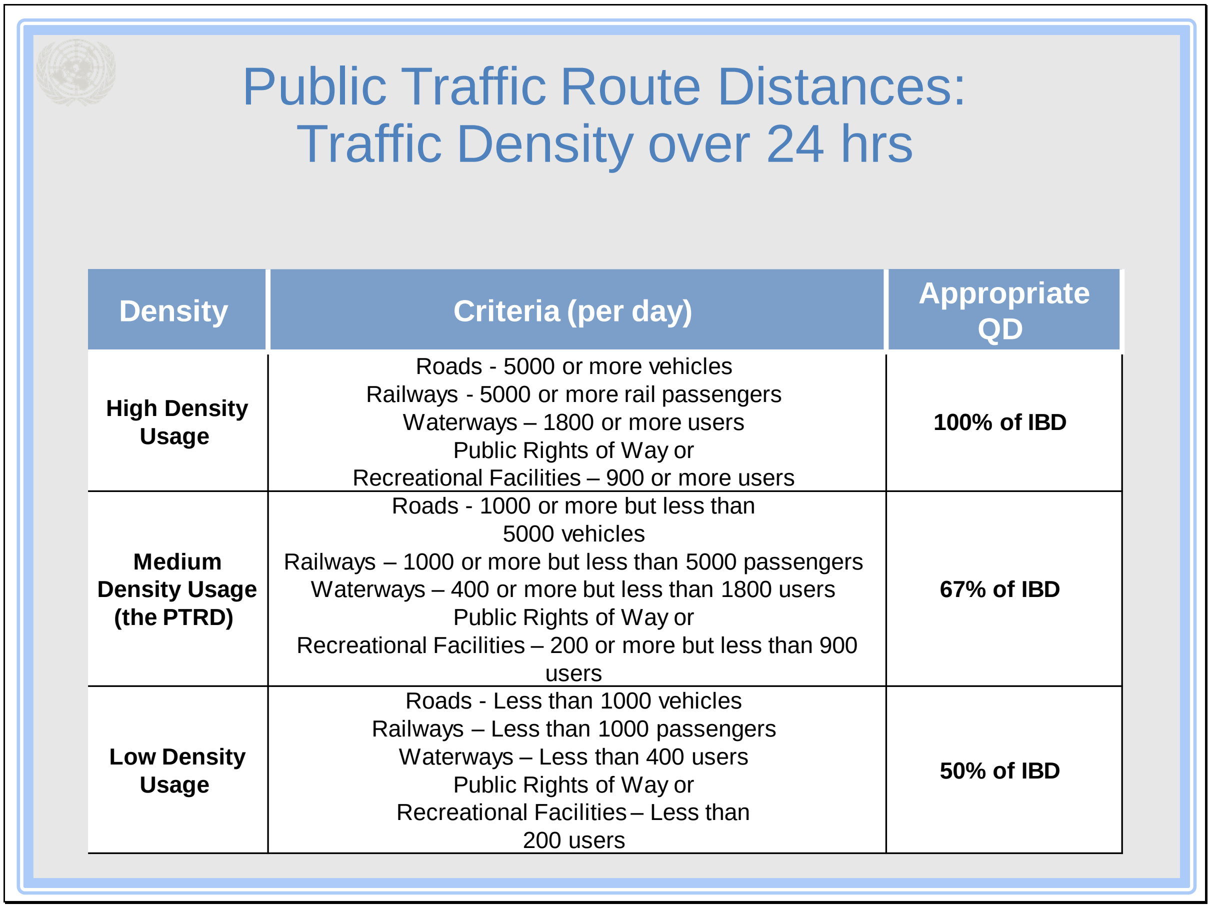
**Main idea/objective for slide:**
- **Calculating Quantity Distance based on NEQ – understanding the Q coefficient**

What the instructor should cover (in addition to slide content)
- Give this table as a handout http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 4

References/further reading

**IATG 02.20 – Quantity and Separation Distances**
- The particular QD coefficients 'Q' shown at Table 2 are based on trials and other data, but are susceptible to uncertainty owing to the variability of the nature of explosions and the incompleteness of the trials data.
- Because of this, QD should be subject to continuing refinement, as further data becomes available.

Slide 28



## Public Traffic Route Distances: Traffic Density over 24 hrs

| Density | Criteria (per day) | Appropriate QD |
|---|---|---|
| **High Density Usage** | Roads - 5000 or more vehicles<br>Railways - 5000 or more rail passengers<br>Waterways – 1800 or more users<br>Public Rights of Way or<br>Recreational Facilities – 900 or more users | **100% of IBD** |
| **Medium Density Usage (the PTRD)** | Roads - 1000 or more but less than 5000 vehicles<br>Railways – 1000 or more but less than 5000 passengers<br>Waterways – 400 or more but less than 1800 users<br>Public Rights of Way or<br>Recreational Facilities – 200 or more but less than 900 users | **67% of IBD** |
| **Low Density Usage** | Roads - Less than 1000 vehicles<br>Railways – Less than 1000 passengers<br>Waterways – Less than 400 users<br>Public Rights of Way or<br>Recreational Facilities – Less than 200 users | **50% of IBD** |

**Main idea/objective for slide:**

- **Calculating Quantity Distance – Public traffic route distances**

What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 6

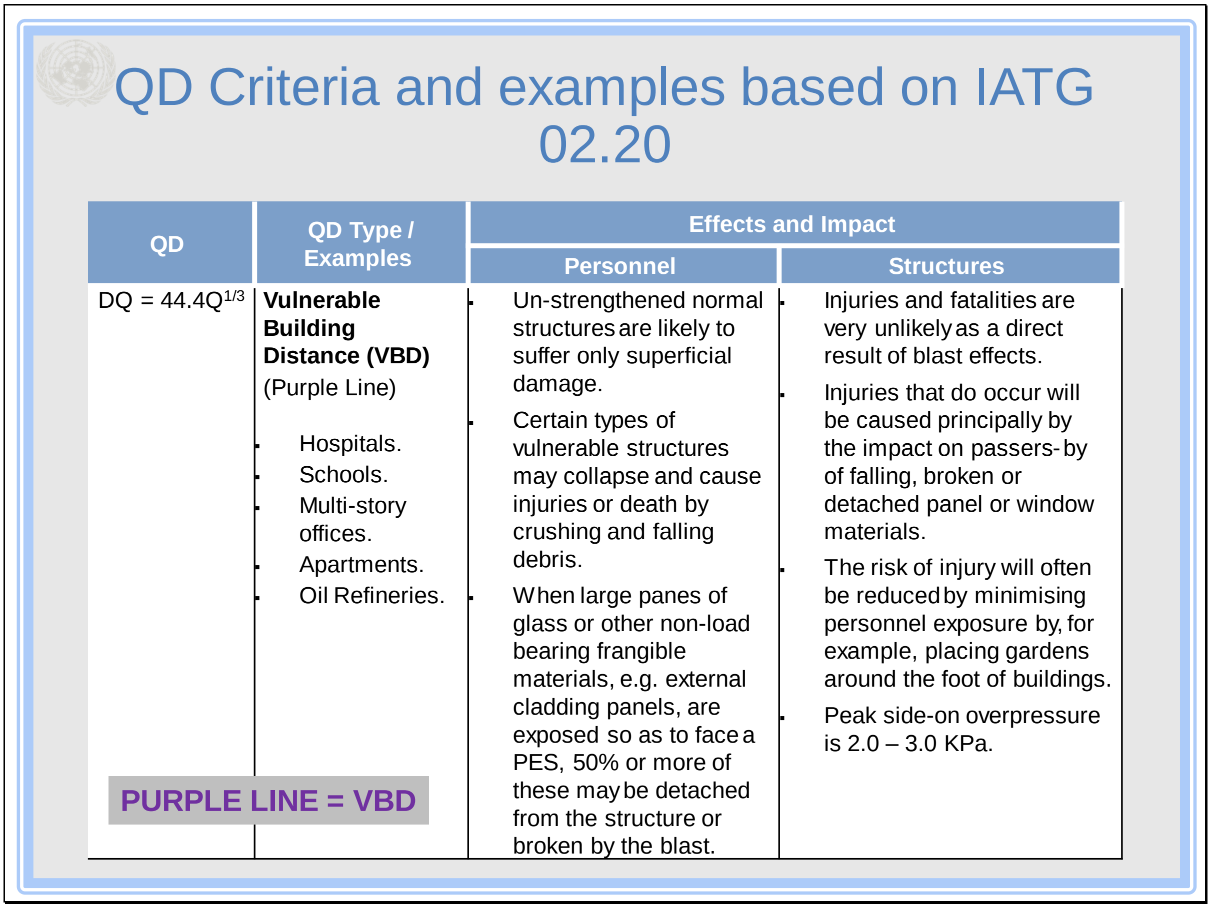
References/further reading

**IATG 02.20 – Quantity and Separation Distances**

- PTRD should be the distances to be observed between PES and routes used by the general public, which are generically referred to as Public Traffic Routes.
- These include:

  - roads;
  - railways;
  - waterways, including rivers, canals and lakes;
  - runways, taxi ways and aircraft parking areas; and
  - public rights of way (e.g. footpaths).
- The distance required is based on the amount of usage of the route by vehicles, people, etc., also known as traffic density.
- The numbers of people exposed to the hazard and their relative times of exposure should be determined by the average of the traffic or people counted, as appropriate, over a number of 24 hour periods.
- Similar QD to those suggested for public rights of way should be applied to playing fields, golf courses and similar recreational facilities.
- These should be subject to the same minimum QD requirements

Slide 29



## QD Criteria and examples based on IATG 02.20

| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| DQ = $44.4Q^{1/3}$ | **Vulnerable Building Distance (VBD)**<br>(Purple Line)<br>- Hospitals.<br>- Schools.<br>- Multi-story offices.<br>- Apartments.<br>- Oil Refineries. | - Un-strengthened normal structures are likely to suffer only superficial damage.<br>- Certain types of vulnerable structures may collapse and cause injuries or death by crushing and falling debris.<br>- When large panes of glass or other non-load bearing frangible materials, e.g. external cladding panels, are exposed so as to face a PES, 50% or more of these may be detached from the structure or broken by the blast. | - Injuries and fatalities are very unlikely as a direct result of blast effects.<br>- Injuries that do occur will be caused principally by the impact on passers-by of falling, broken or detached panel or window materials.<br>- The risk of injury will often be reduced by minimising personnel exposure by, for example, placing gardens around the foot of buildings.<br>- Peak side-on overpressure is 2.0 – 3.0 KPa. |

PURPLE LINE = VBD

**Main idea/objective for slide:**

- **QD criteria and examples – vulnerable building**

What the instructor should cover (in addition to slide content)

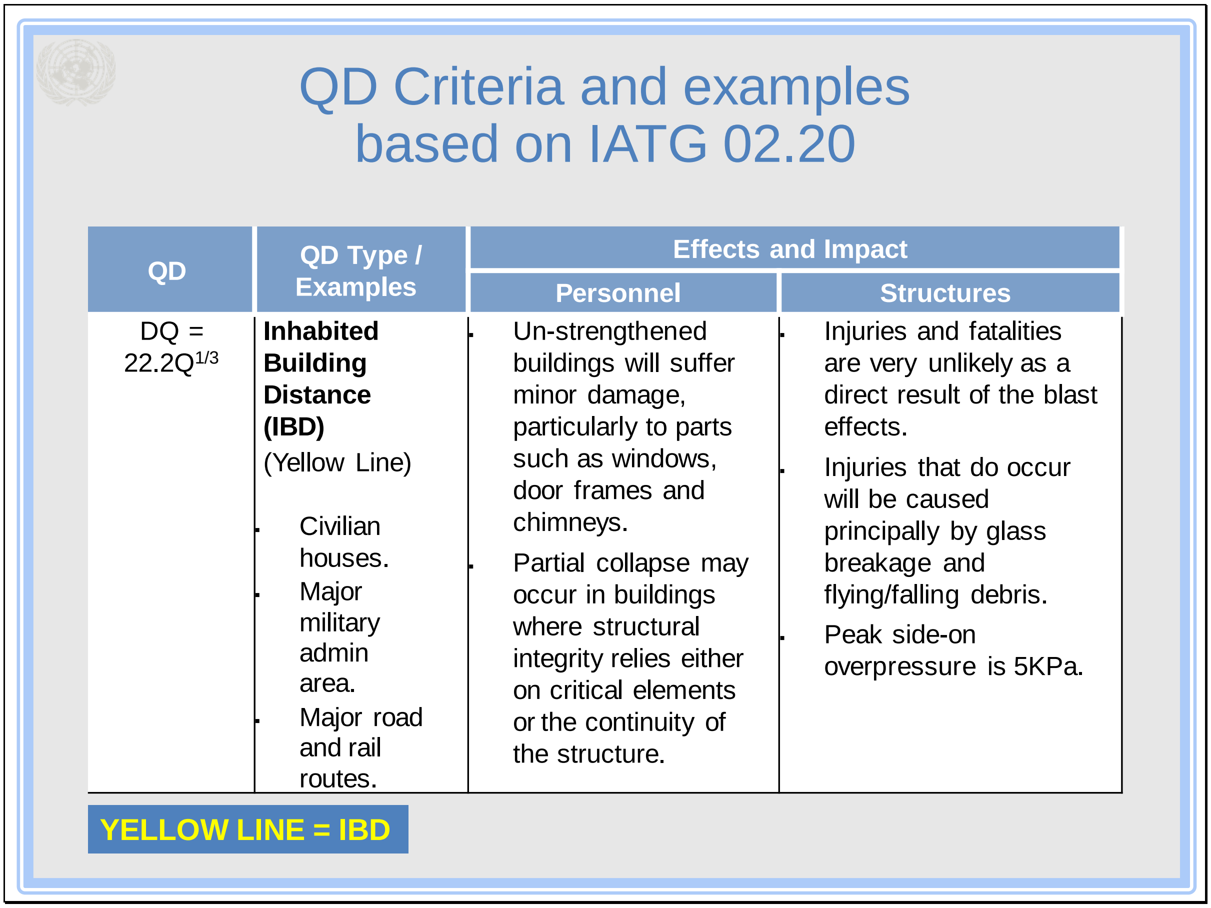
- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12
- Emphasise the importance of the Purple Line

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

- Where an inhabited building is of vulnerable construction (e.g. glass facade) or is a large facility of special importance (e.g. a school), larger distances (normally 44.4Q1/3) shall be applied from PES containing HD 1.1 to afford a higher degree of protection

Slide 30



## QD Criteria and examples based on IATG 02.20

| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| DQ = $22.2Q^{1/3}$ | **Inhabited Building Distance (IBD)**<br>(Yellow Line)<br>- Civilian houses.<br>- Major military admin area.<br>- Major road and rail routes. | - Un-strengthened buildings will suffer minor damage, particularly to parts such as windows, door frames and chimneys.<br>- Partial collapse may occur in buildings where structural integrity relies either on critical elements or the continuity of the structure. | - Injuries and fatalities are very unlikely as a direct result of the blast effects.<br>- Injuries that do occur will be caused principally by glass breakage and flying/falling debris.<br>- Peak side-on overpressure is 5KPa. |

YELLOW LINE = IBD

**Main idea/objective for slide:**

- **QD criteria and examples – inhabited building**

What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12
- Emphasise the importance of the Yellow Line

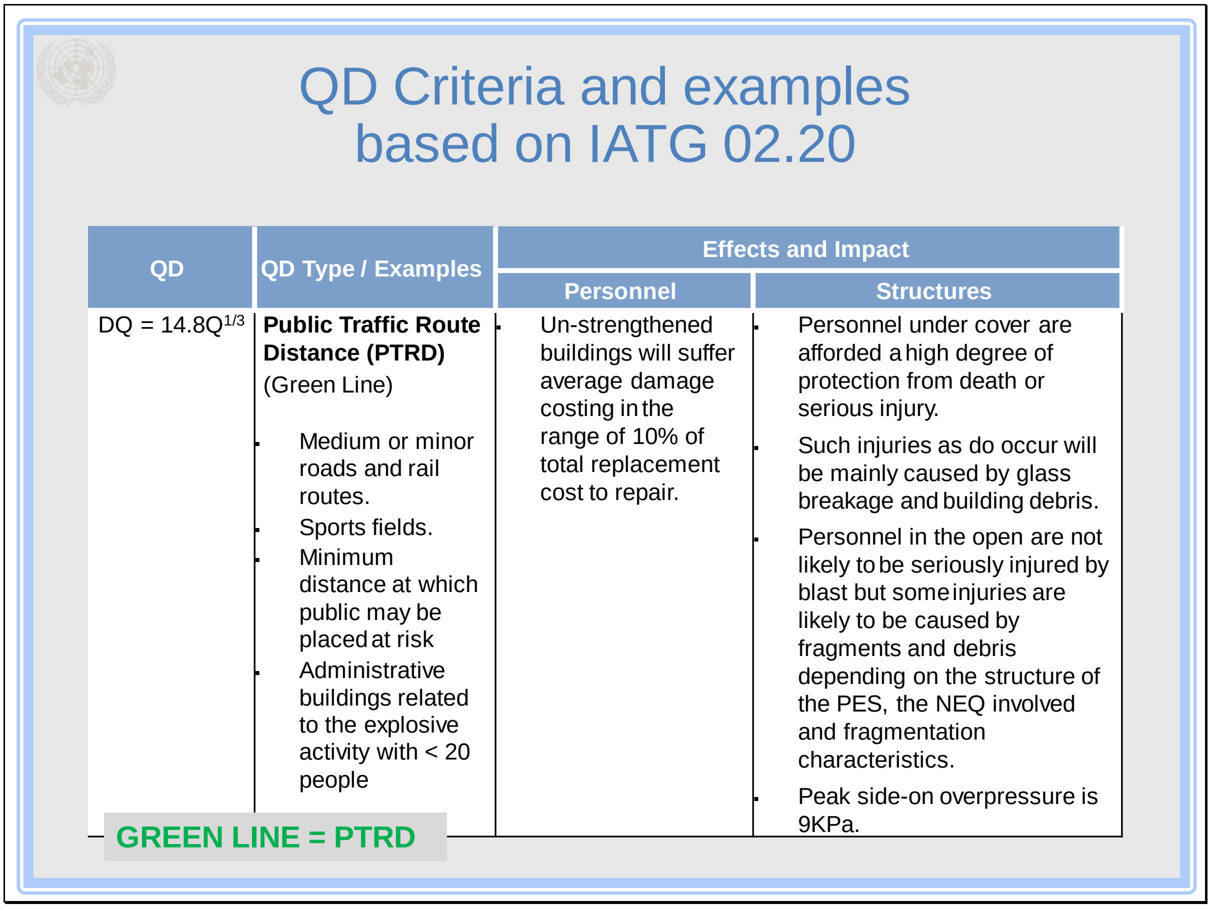
References/further reading

**IATG 02.20 – Quantity and Separation Distances**

- IBD should be the minimum distances to be observed between PES and buildings or sites where members of the general public, or personnel not involved in explosives-related operations, either work, live or congregate.

- The distances are intended to prevent serious structural damage to traditional types of inhabited buildings or caravans, and any consequential death or serious injury to their occupants.
- Persons in the open would not suffer direct injury from the effects of blast and radiant heat at these distances.
- Fragments and debris may cause some injuries.
- The extent of injuries will depend upon the PES structure and the NEQ and fragmentation characteristics of the ammunition and explosives involved.
- At this distance, the fragment threat is defined as one hazardous fragment of 80 joules/56m2.
- The fragment threat will decrease as the distance from the PES increases.
- The distances do not, however, exclude the risk to the public from projections falling from structures, broken glass, displaced tiles etc., or the risk of some minor injury to occupants.
- Glazing is an important factor in building occupant protection and protective features are relatively easy to provide.
- IBD are normally subject to fixed minimum distances to give protection against fragments and debris emanating from a PES.

Slide 31



## QD Criteria and examples based on IATG 02.20

| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| DQ = $14.8Q^{1/3}$ | **Public Traffic Route Distance (PTRD)**<br>(Green Line)<br>- Medium or minor roads and rail routes.<br>- Sports fields.<br>- Minimum distance at which public may be placed at risk<br>- Administrative buildings related to the explosive activity with < 20 people | - Un-strengthened buildings will suffer average damage costing in the range of 10% of total replacement cost to repair. | - Personnel under cover are afforded a high degree of protection from death or serious injury.<br>- Such injuries as do occur will be mainly caused by glass breakage and building debris.<br>- Personnel in the open are not likely to be seriously injured by blast but some injuries are likely to be caused by fragments and debris depending on the structure of the PES, the NEQ involved and fragmentation characteristics.<br>- Peak side-on overpressure is 9KPa. |

GREEN LINE = PTRD

**Main idea/objective for slide:**

- **QD criteria and examples – Public traffic route distance**

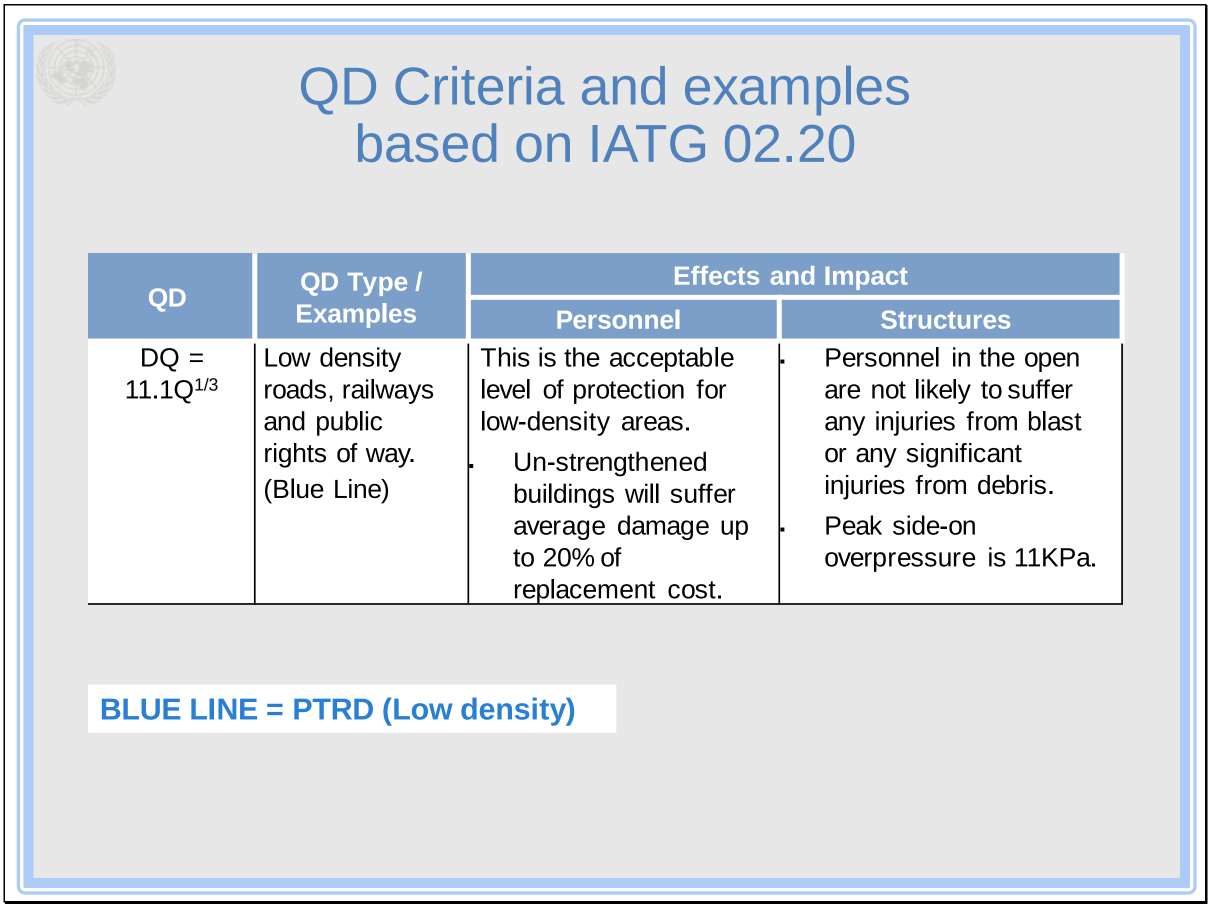
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12
- Emphasise the importance of the Green Line

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 32



## QD Criteria and examples based on IATG 02.20

| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| $DQ = 11.1Q^{1/3}$ | Low density roads, railways and public rights of way. (Blue Line) | This is the acceptable level of protection for low-density areas.<br>Un-strengthened buildings will suffer average damage up to 20% of replacement cost. | Personnel in the open are not likely to suffer any injuries from blast or any significant injuries from debris.<br>Peak side-on overpressure is 11KPa. |

**BLUE LINE = PTRD (Low density)**

**Main idea/objective for slide:**

- **QD criteria and examples – Public traffic route distance, low density**

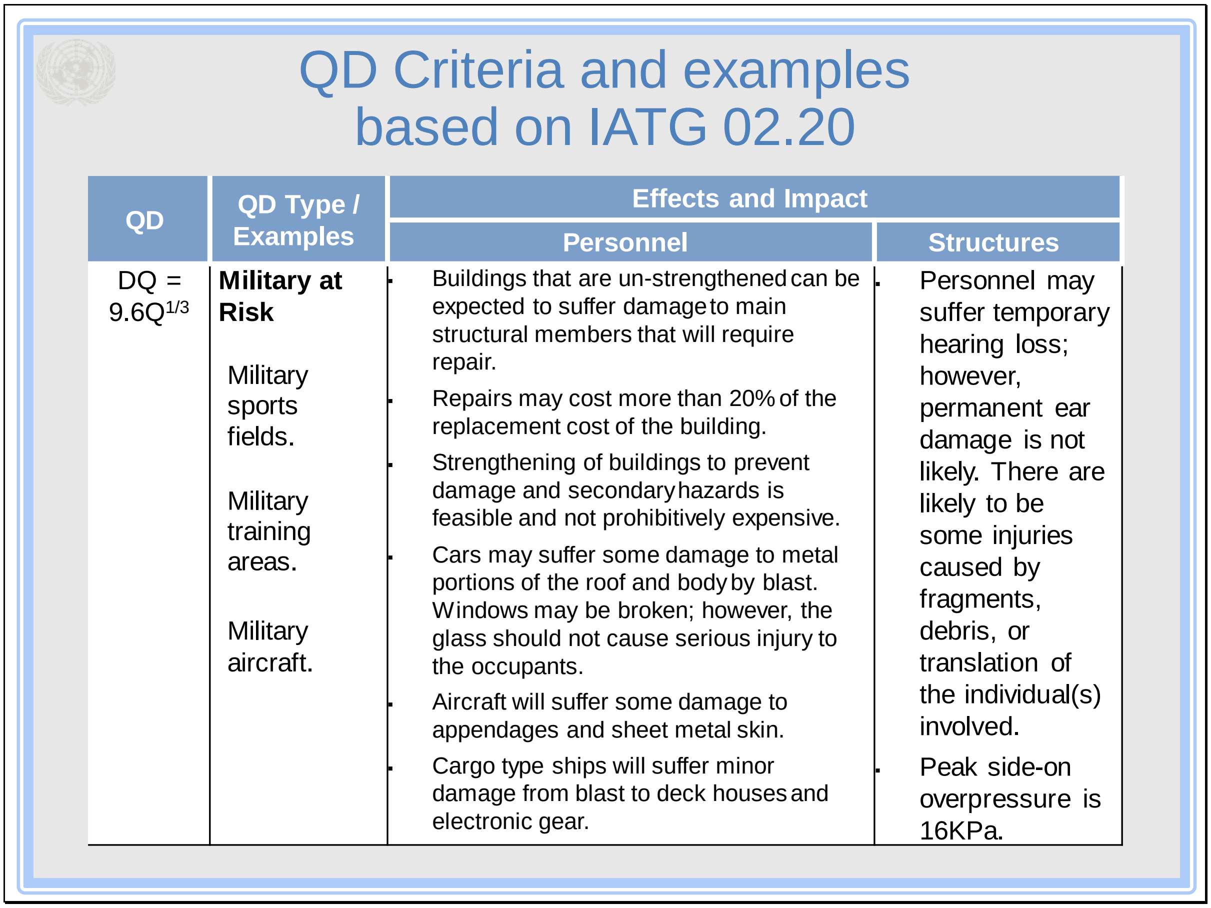
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12
- Emphasise the importance of the Blue Line

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 33



# QD Criteria and examples based on IATG 02.20

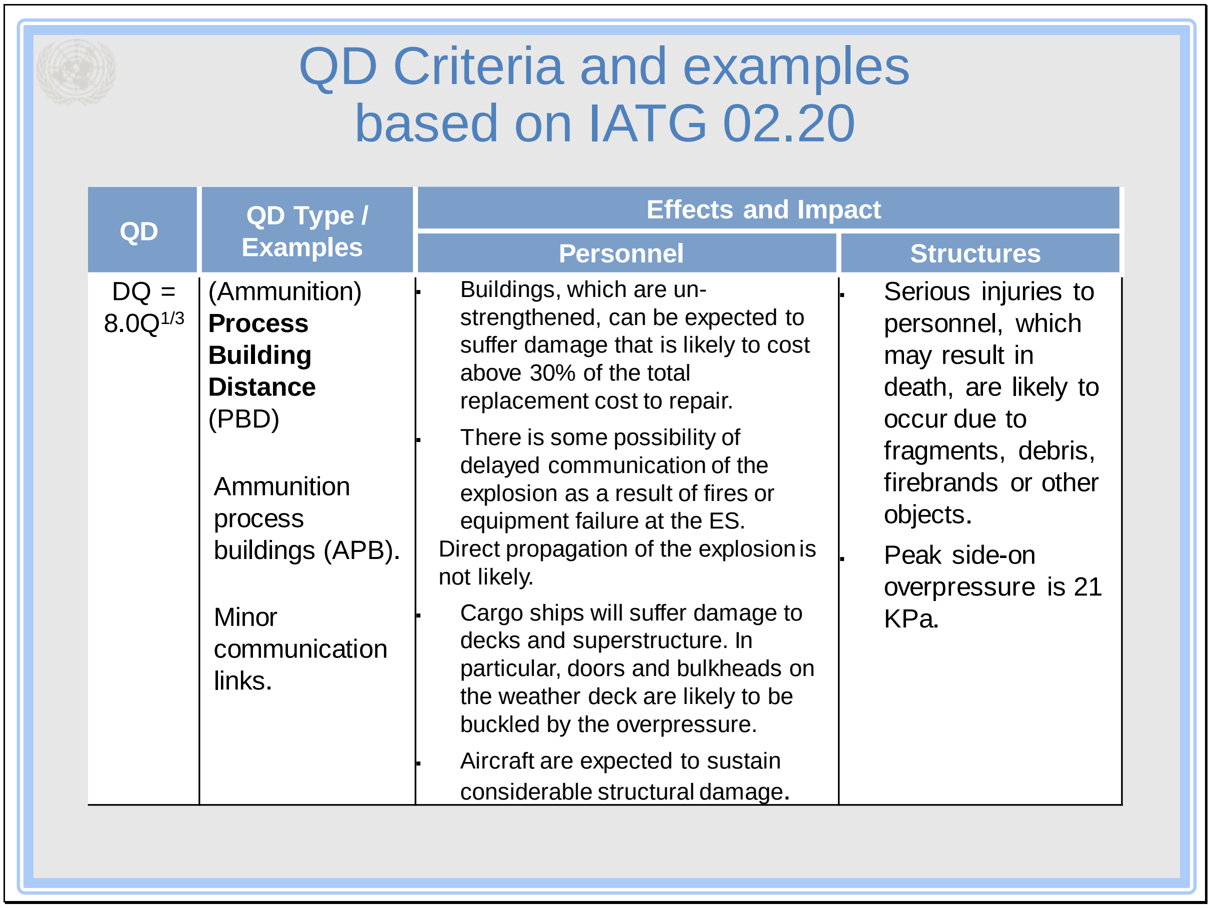
| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| DQ = $9.6Q^{1/3}$ | **Military at Risk**<br>Military sports fields.<br>Military training areas.<br>Military aircraft. | Buildings that are un-strengthened can be expected to suffer damage to main structural members that will require repair.<br>Repairs may cost more than 20% of the replacement cost of the building.<br>Strengthening of buildings to prevent damage and secondary hazards is feasible and not prohibitively expensive.<br>Cars may suffer some damage to metal portions of the roof and body by blast. Windows may be broken; however, the glass should not cause serious injury to the occupants.<br>Aircraft will suffer some damage to appendages and sheet metal skin.<br>Cargo type ships will suffer minor damage from blast to deck houses and electronic gear. | Personnel may suffer temporary hearing loss; however, permanent ear damage is not likely. There are likely to be some injuries caused by fragments, debris, or translation of the individual(s) involved.<br>Peak side-on overpressure is 16KPa. |

**Main idea/objective for slide:**
- **QD criteria and examples – Military at risk**

What the instructor should cover (in addition to slide content)
- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12

References/further reading

**IATG 02.20 – Quantity and Separation Distances**



# QD Criteria and examples based on IATG 02.20

| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| DQ = 8.0Q$^{1/3}$ | (Ammunition) **Process Building Distance** (PBD)<br>Ammunition process buildings (APB).<br>Minor communication links. | Buildings, which are un-strengthened, can be expected to suffer damage that is likely to cost above 30% of the total replacement cost to repair.<br>There is some possibility of delayed communication of the explosion as a result of fires or equipment failure at the ES. Direct propagation of the explosion is not likely.<br>Cargo ships will suffer damage to decks and superstructure. In particular, doors and bulkheads on the weather deck are likely to be buckled by the overpressure.<br>Aircraft are expected to sustain considerable structural damage. | Serious injuries to personnel, which may result in death, are likely to occur due to fragments, debris, firebrands or other objects.<br>Peak side-on overpressure is 21 KPa. |

**Main idea/objective for slide:**

- **QD criteria and examples – (Ammunition) Process building distance**

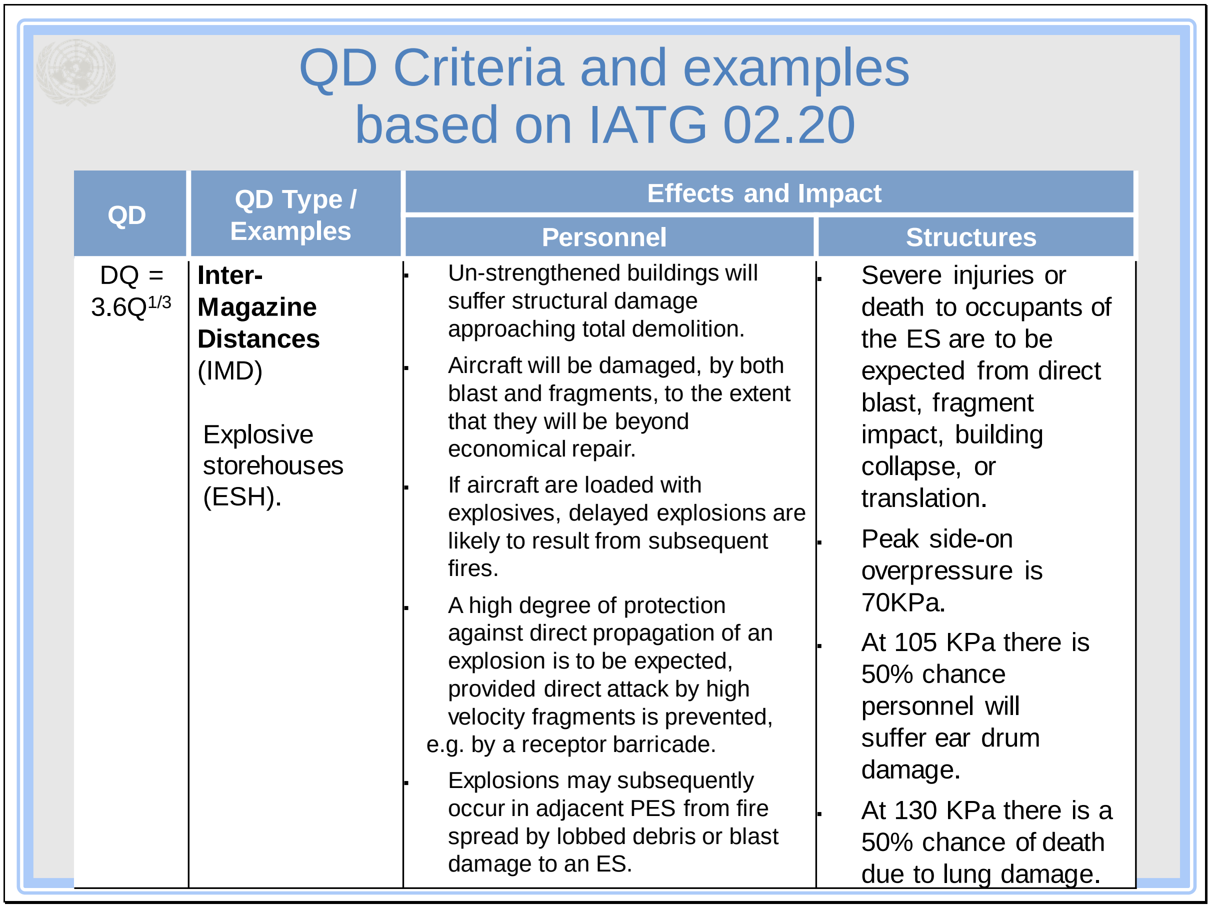
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 35



# QD Criteria and examples based on IATG 02.20

| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| DQ = $3.6Q^{1/3}$ | **Inter-Magazine Distances** (IMD)<br>Explosive storehouses (ESH). | - Un-strengthened buildings will suffer structural damage approaching total demolition.<br>- Aircraft will be damaged, by both blast and fragments, to the extent that they will be beyond economical repair.<br>- If aircraft are loaded with explosives, delayed explosions are likely to result from subsequent fires.<br>- A high degree of protection against direct propagation of an explosion is to be expected, provided direct attack by high velocity fragments is prevented, e.g. by a receptor barricade.<br>- Explosions may subsequently occur in adjacent PES from fire spread by lobbed debris or blast damage to an ES. | - Severe injuries or death to occupants of the ES are to be expected from direct blast, fragment impact, building collapse, or translation.<br>- Peak side-on overpressure is 70KPa.<br>- At 105 KPa there is 50% chance personnel will suffer ear drum damage.<br>- At 130 KPa there is a 50% chance of death due to lung damage. |

**Main idea/objective for slide:**

- **QD criteria and examples – Inter-magazine distances**

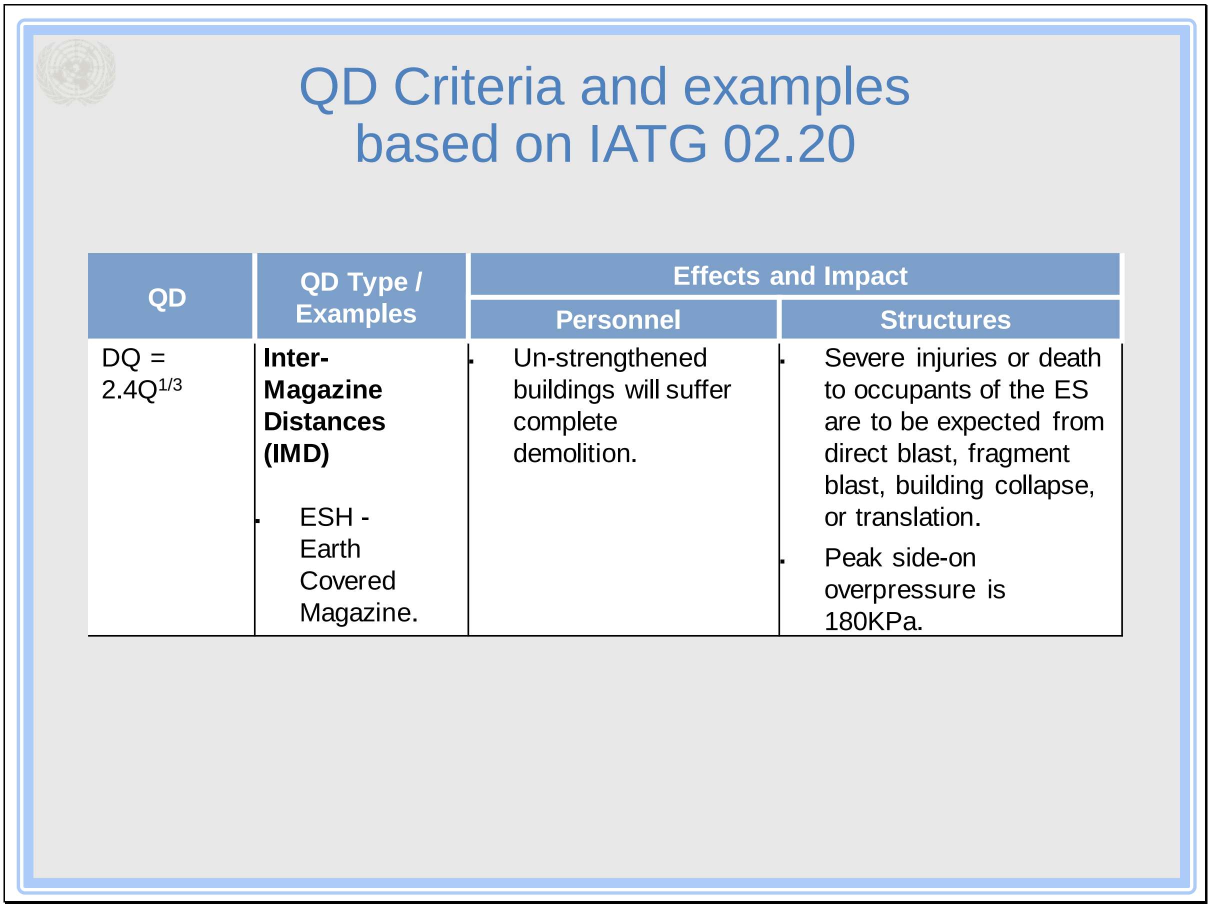
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 36



## QD Criteria and examples based on IATG 02.20

| QD | QD Type / Examples | Effects and Impact | |
|---|---|---|---|
| | | Personnel | Structures |
| DQ = 2.4$Q^{1/3}$ | **Inter-Magazine Distances (IMD)**<br>- ESH - Earth Covered Magazine. | - Un-strengthened buildings will suffer complete demolition. | - Severe injuries or death to occupants of the ES are to be expected from direct blast, fragment blast, building collapse, or translation.<br>- Peak side-on overpressure is 180KPa. |

**Main idea/objective for slide:**

- **QD criteria and examples – Inter-magazine distances**

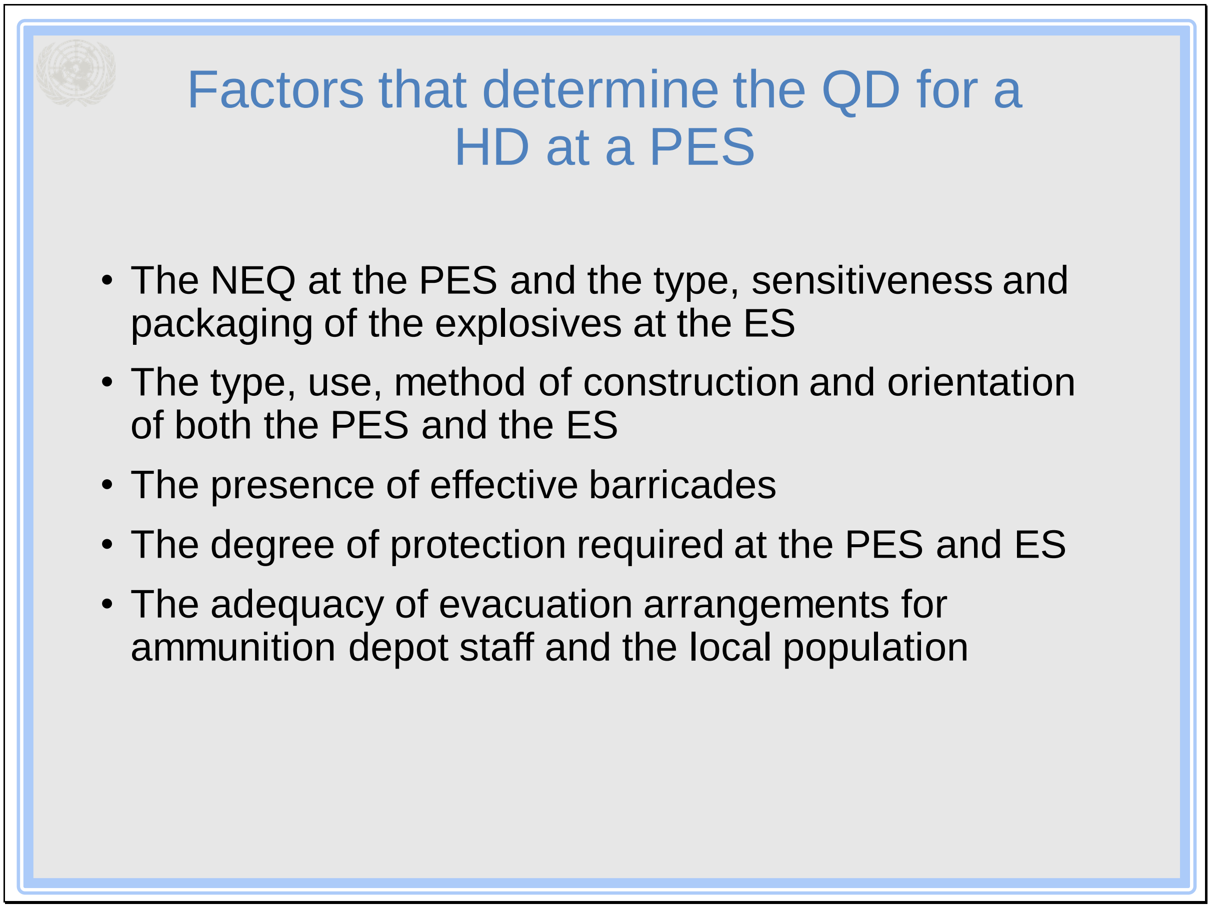
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf page 10-12

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 37



## Factors that determine the QD for a HD at a PES

- The NEQ at the PES and the type, sensitiveness and packaging of the explosives at the ES
- The type, use, method of construction and orientation of both the PES and the ES
- The presence of effective barricades
- The degree of protection required at the PES and ES
- The adequacy of evacuation arrangements for ammunition depot staff and the local population

**Main idea/objective for slide:**
**Factors that determine the QD for a HD at a PES**

What the instructor should cover (in addition to slide content)

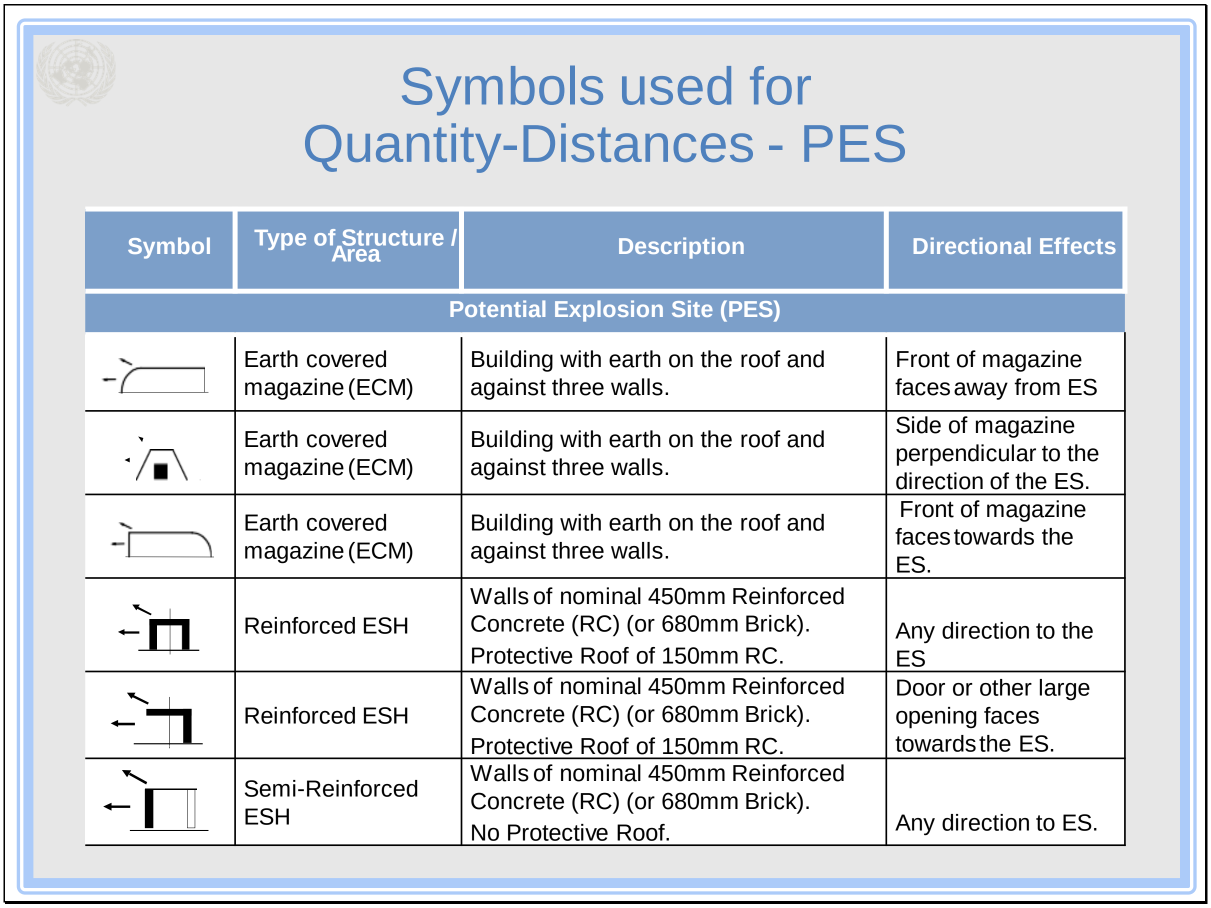
- Explain to the participants the various factors that can affect the quantity distance, depending on the scenario that they are faced with.

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

- The provision of stronger and more robust ESH allows for the use of smaller QD for a given degree of protection or achieves a higher standard of protection at a given distance, especially in the case of an ES near a PES containing explosives of HD 1.1.
- Yet some stronger and more robust ESH may also increase OQDs as their heavier structure can produce large, long-range fragments in the event of an explosion within.

Slide 38



## Symbols used for Quantity-Distances - PES

| Symbol | Type of Structure / Area | Description | Directional Effects |
|---|---|---|---|
| **Potential Explosion Site (PES)** | | | |
| | Earth covered magazine (ECM) | Building with earth on the roof and against three walls. | Front of magazine faces away from ES |
| | Earth covered magazine (ECM) | Building with earth on the roof and against three walls. | Side of magazine perpendicular to the direction of the ES. |
| | Earth covered magazine (ECM) | Building with earth on the roof and against three walls. | Front of magazine faces towards the ES. |
| | Reinforced ESH | Walls of nominal 450mm Reinforced Concrete (RC) (or 680mm Brick).<br>Protective Roof of 150mm RC. | Any direction to the ES |
| | Reinforced ESH | Walls of nominal 450mm Reinforced Concrete (RC) (or 680mm Brick).<br>Protective Roof of 150mm RC. | Door or other large opening faces towards the ES. |
| | Semi-Reinforced ESH | Walls of nominal 450mm Reinforced Concrete (RC) (or 680mm Brick).<br>No Protective Roof. | Any direction to ES. |

**Main idea/objective for slide:**
**Symbols for QDs - PES**

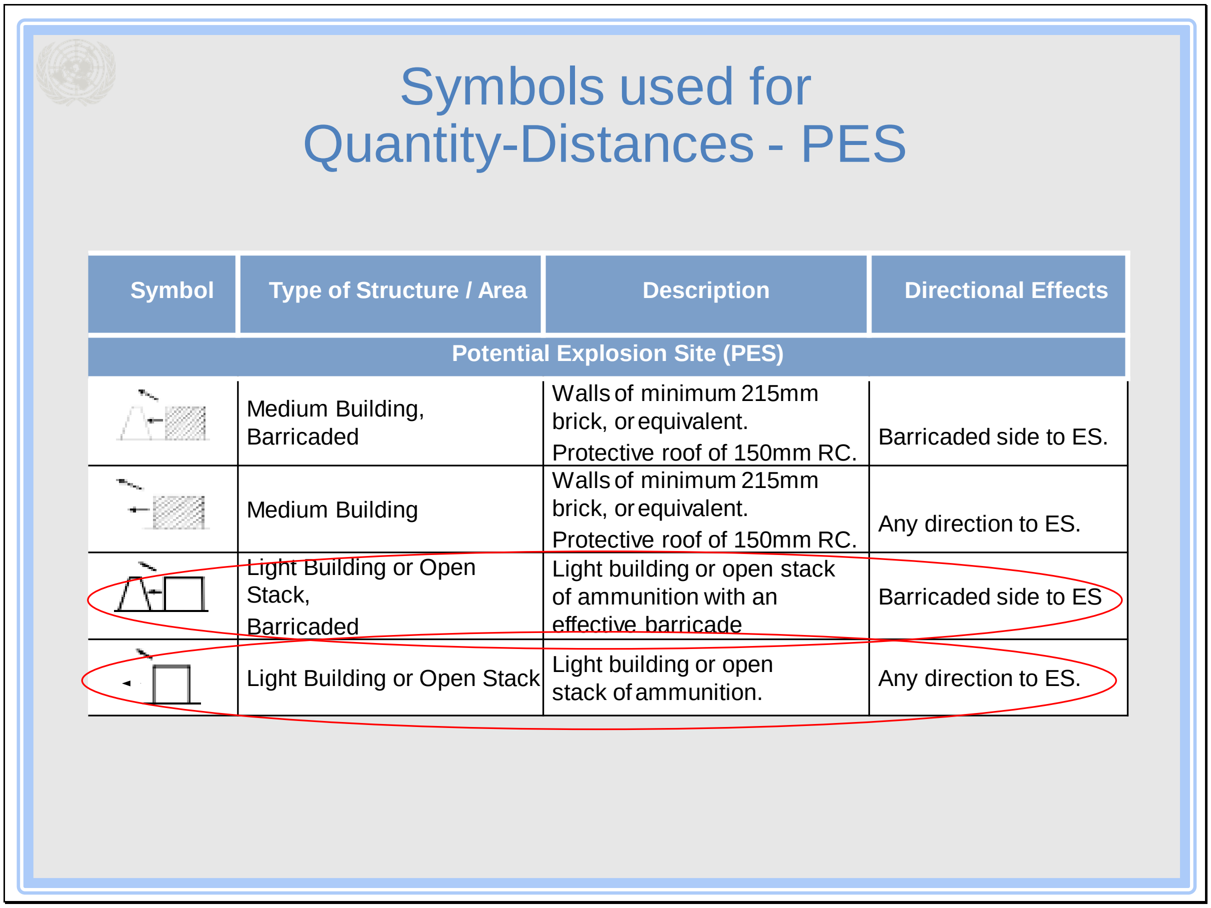
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex C
- Explain each Pictogram and outline what that might look like in real life.

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 39



# Symbols used for Quantity-Distances - PES

| Symbol | Type of Structure / Area | Description | Directional Effects |
|---|---|---|---|
| Potential Explosion Site (PES) | | | |
| | Medium Building,<br>Barricaded | Walls of minimum 215mm brick, or equivalent.<br>Protective roof of 150mm RC. | Barricaded side to ES. |
| | Medium Building | Walls of minimum 215mm brick, or equivalent.<br>Protective roof of 150mm RC. | Any direction to ES. |
| | Light Building or Open Stack,<br>Barricaded | Light building or open stack of ammunition with an effective barricade | Barricaded side to ES |
| | Light Building or Open Stack | Light building or open stack of ammunition. | Any direction to ES. |

**Main idea/objective for slide:**

**Symbols for QDs - PES**

What the instructor should cover (in addition to slide content)

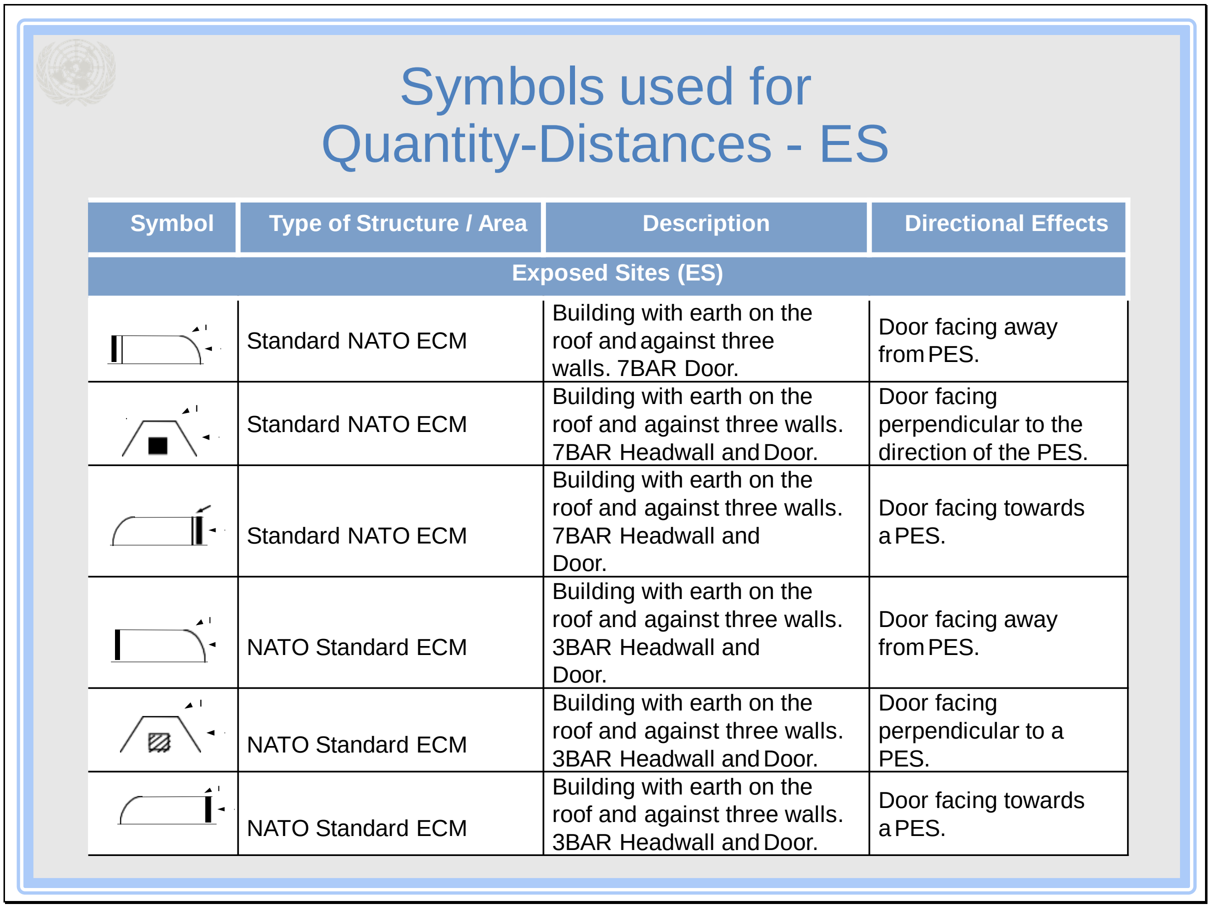
- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex C
- Explain each Pictogram and outline what that might look like in real life.

Explain that using a shipping container (common on UN Missions) is considered an open stack. If the container is barricaded then it is Open Stack, Barricaded. Highlight the relevant pictogram

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 40



# Symbols used for Quantity-Distances - ES

| Symbol | Type of Structure / Area | Description | Directional Effects |
|---|---|---|---|
| Exposed Sites (ES) | | | |
| | Standard NATO ECM | Building with earth on the roof and against three walls. 7BAR Door. | Door facing away from PES. |
| | Standard NATO ECM | Building with earth on the roof and against three walls. 7BAR Headwall and Door. | Door facing perpendicular to the direction of the PES. |
| | Standard NATO ECM | Building with earth on the roof and against three walls. 7BAR Headwall and Door. | Door facing towards a PES. |
| | NATO Standard ECM | Building with earth on the roof and against three walls. 3BAR Headwall and Door. | Door facing away from PES. |
| | NATO Standard ECM | Building with earth on the roof and against three walls. 3BAR Headwall and Door. | Door facing perpendicular to a PES. |
| | NATO Standard ECM | Building with earth on the roof and against three walls. 3BAR Headwall and Door. | Door facing towards a PES. |

**Main idea/objective for slide:**
**Symbols for QDs - ES**

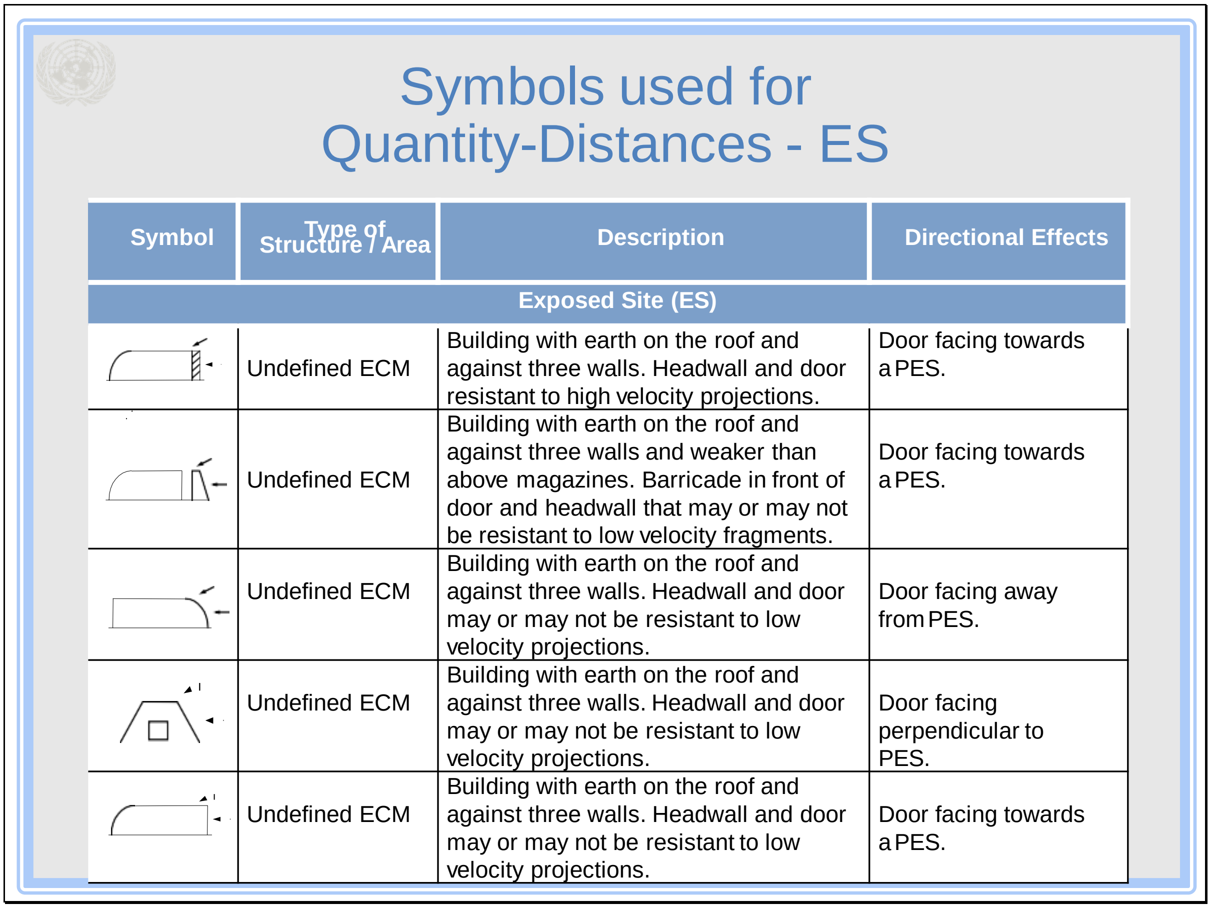
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex C
- Explain each Pictogram and outline what that might look like in real life.

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 41



# Symbols used for Quantity-Distances - ES

| Symbol | Type of Structure / Area | Description | Directional Effects |
|---|---|---|---|
| Exposed Site (ES) | | | |
| | Undefined ECM | Building with earth on the roof and against three walls. Headwall and door resistant to high velocity projections. | Door facing towards a PES. |
| | Undefined ECM | Building with earth on the roof and against three walls and weaker than above magazines. Barricade in front of door and headwall that may or may not be resistant to low velocity fragments. | Door facing towards a PES. |
| | Undefined ECM | Building with earth on the roof and against three walls. Headwall and door may or may not be resistant to low velocity projections. | Door facing away from PES. |
| | Undefined ECM | Building with earth on the roof and against three walls. Headwall and door may or may not be resistant to low velocity projections. | Door facing perpendicular to PES. |
| | Undefined ECM | Building with earth on the roof and against three walls. Headwall and door may or may not be resistant to low velocity projections. | Door facing towards a PES. |

**Main idea/objective for slide:**
**Symbols for QDs - ES**

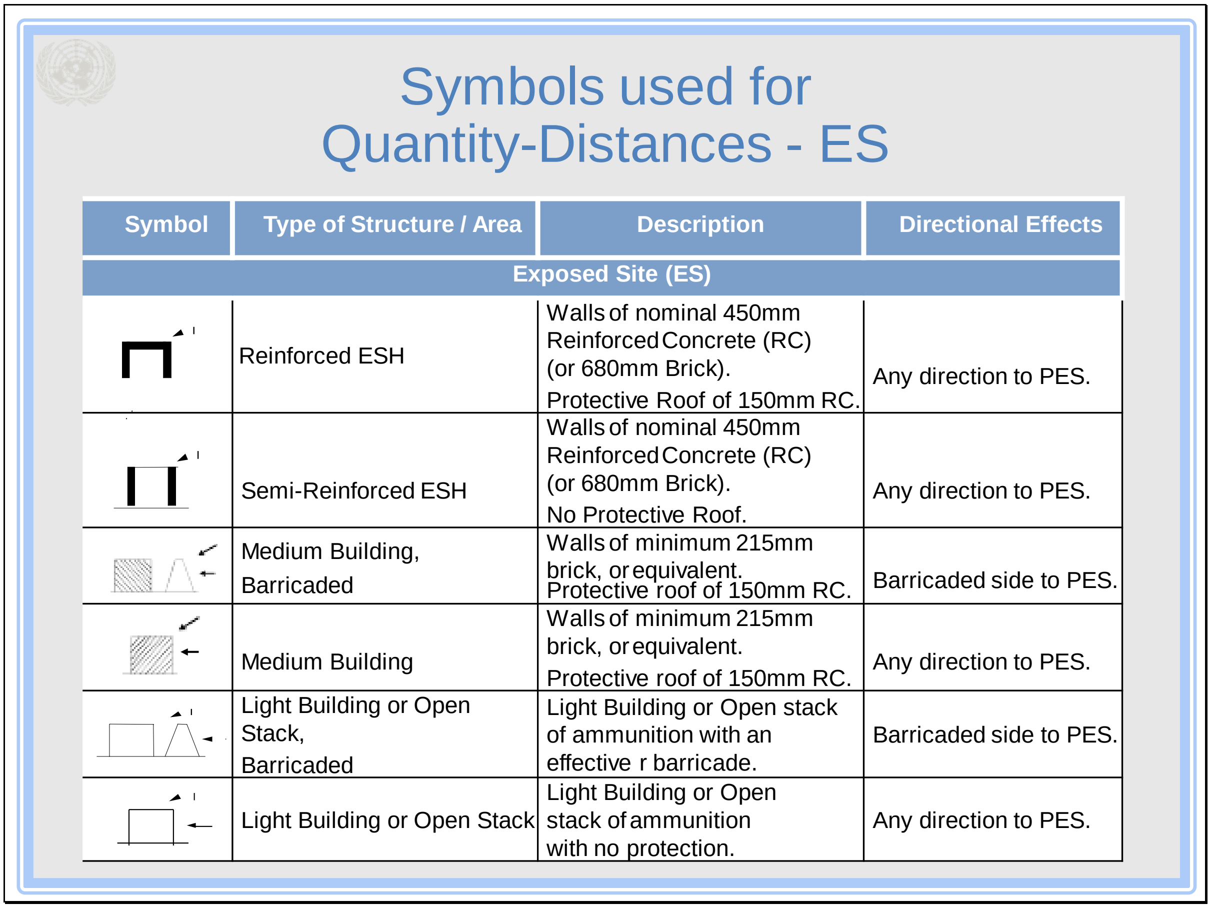
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex C
- Explain each Pictogram and outline what that might look like in real life.

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 42



## Symbols used for Quantity-Distances - ES

| Symbol | Type of Structure / Area | Description | Directional Effects |
|---|---|---|---|
| **Exposed Site (ES)** | | | |
| | Reinforced ESH | Walls of nominal 450mm Reinforced Concrete (RC) (or 680mm Brick).<br>Protective Roof of 150mm RC. | Any direction to PES. |
| | Semi-Reinforced ESH | Walls of nominal 450mm Reinforced Concrete (RC) (or 680mm Brick).<br>No Protective Roof. | Any direction to PES. |
| | Medium Building, Barricaded | Walls of minimum 215mm brick, or equivalent.<br>Protective roof of 150mm RC. | Barricaded side to PES. |
| | Medium Building | Walls of minimum 215mm brick, or equivalent.<br>Protective roof of 150mm RC. | Any direction to PES. |
| | Light Building or Open Stack, Barricaded | Light Building or Open stack of ammunition with an effective r barricade. | Barricaded side to PES. |
| | Light Building or Open Stack | Light Building or Open stack of ammunition with no protection. | Any direction to PES. |

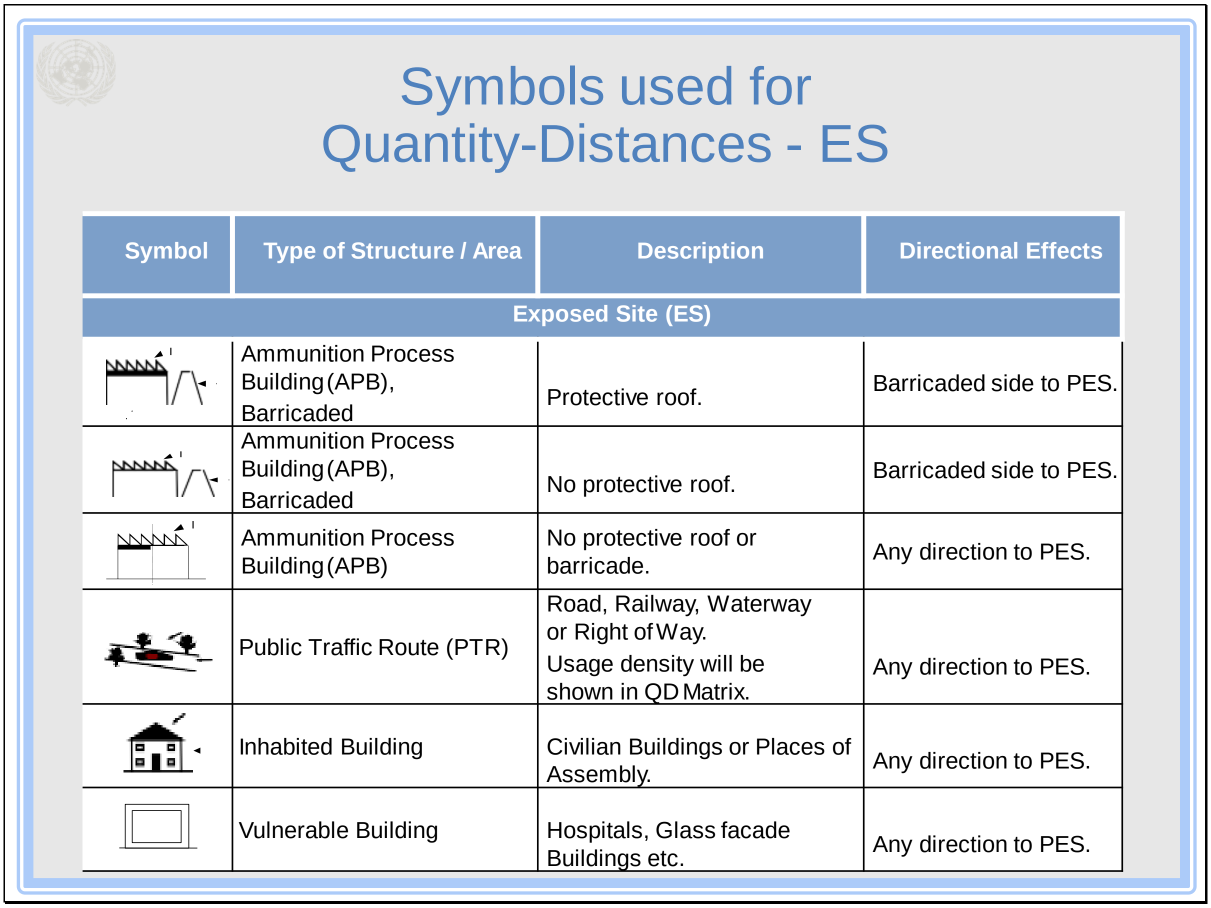
**<u>Main idea/objective for slide:</u>**
**Symbols for QDs - ES**

<u>What the instructor should cover (in addition to slide content)</u>

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex C
- Explain each Pictogram and outline what that might look like in real life.

<u>References/further reading</u>
**IATG 02.20 – Quantity and Separation Distances**

Slide 43



# Symbols used for Quantity-Distances - ES

| Symbol | Type of Structure / Area | Description | Directional Effects |
|---|---|---|---|
| Exposed Site (ES) | | | |
| | Ammunition Process Building (APB), Barricaded | Protective roof. | Barricaded side to PES. |
| | Ammunition Process Building (APB), Barricaded | No protective roof. | Barricaded side to PES. |
| | Ammunition Process Building (APB) | No protective roof or barricade. | Any direction to PES. |
| | Public Traffic Route (PTR) | Road, Railway, Waterway or Right of Way.<br>Usage density will be shown in QD Matrix. | Any direction to PES. |
| | Inhabited Building | Civilian Buildings or Places of Assembly. | Any direction to PES. |
| | Vulnerable Building | Hospitals, Glass facade Buildings etc. | Any direction to PES. |

**Main idea/objective for slide:**
**Symbols for QDs - ES**

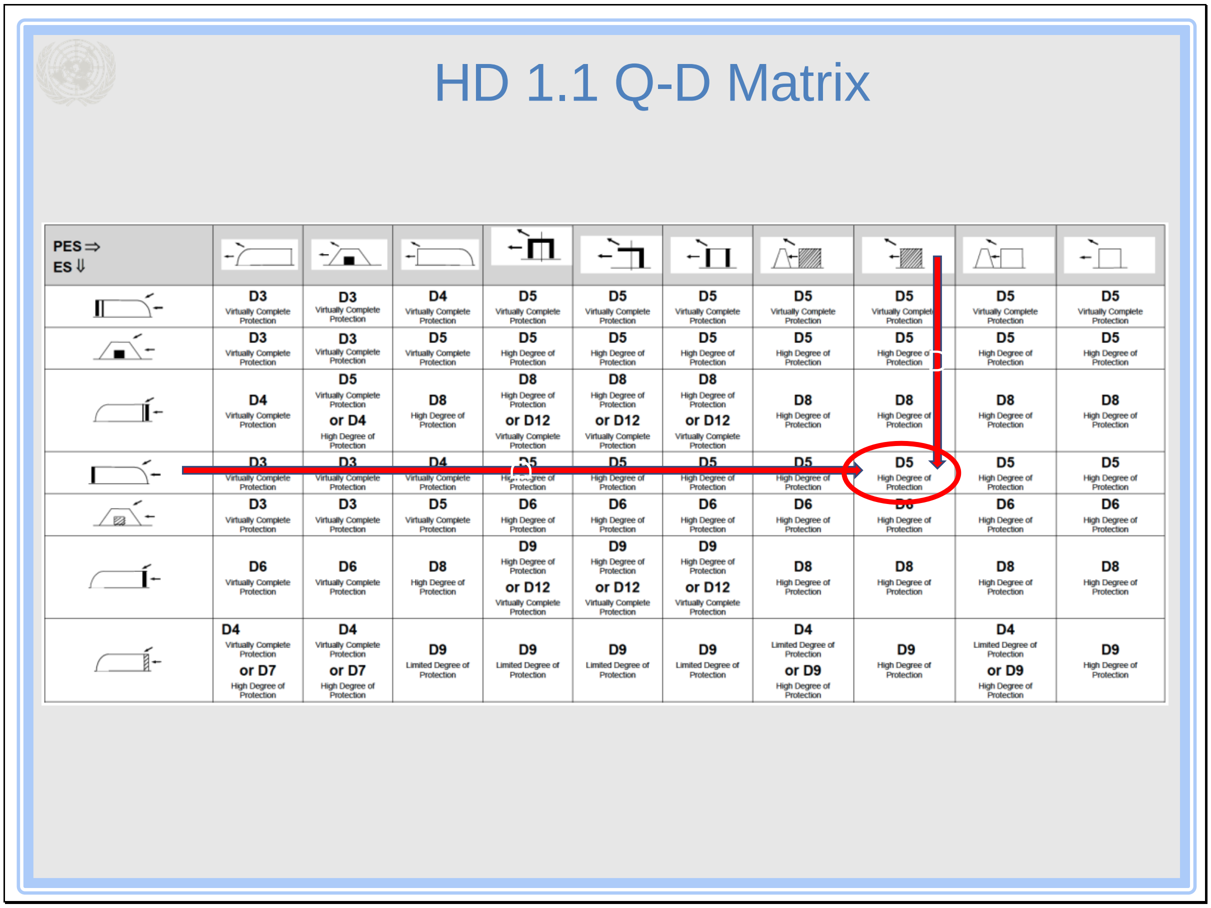
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex C
- Explain each Pictogram and outline what that might look like in real life.

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

Slide 44



## HD 1.1 Q-D Matrix

| PES ⇒<br>ES ⇓ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **D3**<br>Virtually Complete Protection | **D3**<br>Virtually Complete Protection | **D4**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection |
| | **D3**<br>Virtually Complete Protection | **D3**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection |
| | **D4**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection<br>**or D4**<br>High Degree of Protection | **D8**<br>High Degree of Protection | **D8**<br>High Degree of Protection<br>**or D12**<br>Virtually Complete Protection | **D8**<br>High Degree of Protection<br>**or D12**<br>Virtually Complete Protection | **D8**<br>High Degree of Protection<br>**or D12**<br>Virtually Complete Protection | **D8**<br>High Degree of Protection | **D8**<br>High Degree of Protection | **D8**<br>High Degree of Protection | **D8**<br>High Degree of Protection |
| | **D3**<br>Virtually Complete Protection | **D3**<br>Virtually Complete Protection | **D4**<br>Virtually Complete Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection | **D5**<br>High Degree of Protection |
| | **D3**<br>Virtually Complete Protection | **D3**<br>Virtually Complete Protection | **D5**<br>Virtually Complete Protection | **D6**<br>High Degree of Protection | **D6**<br>High Degree of Protection | **D6**<br>High Degree of Protection | **D6**<br>High Degree of Protection | **D6**<br>High Degree of Protection | **D6**<br>High Degree of Protection | **D6**<br>High Degree of Protection |
| | **D6**<br>Virtually Complete Protection | **D6**<br>Virtually Complete Protection | **D8**<br>High Degree of Protection | **D9**<br>High Degree of Protection<br>**or D12**<br>Virtually Complete Protection | **D9**<br>High Degree of Protection<br>**or D12**<br>Virtually Complete Protection | **D9**<br>High Degree of Protection<br>**or D12**<br>Virtually Complete Protection | **D8**<br>High Degree of Protection | **D8**<br>High Degree of Protection | **D8**<br>High Degree of Protection | **D8**<br>High Degree of Protection |
| | **D4**<br>Virtually Complete Protection<br>**or D7**<br>High Degree of Protection | **D4**<br>Virtually Complete Protection<br>**or D7**<br>High Degree of Protection | **D9**<br>Limited Degree of Protection | **D9**<br>Limited Degree of Protection | **D9**<br>Limited Degree of Protection | **D9**<br>Limited Degree of Protection | **D4**<br>Limited Degree of Protection<br>**or D9**<br>High Degree of Protection | **D9**<br>High Degree of Protection | **D4**<br>Limited Degree of Protection<br>**or D9**<br>High Degree of Protection | **D9**<br>High Degree of Protection |

**Main idea/objective for slide:**
**HD 1.1 QD matrix**

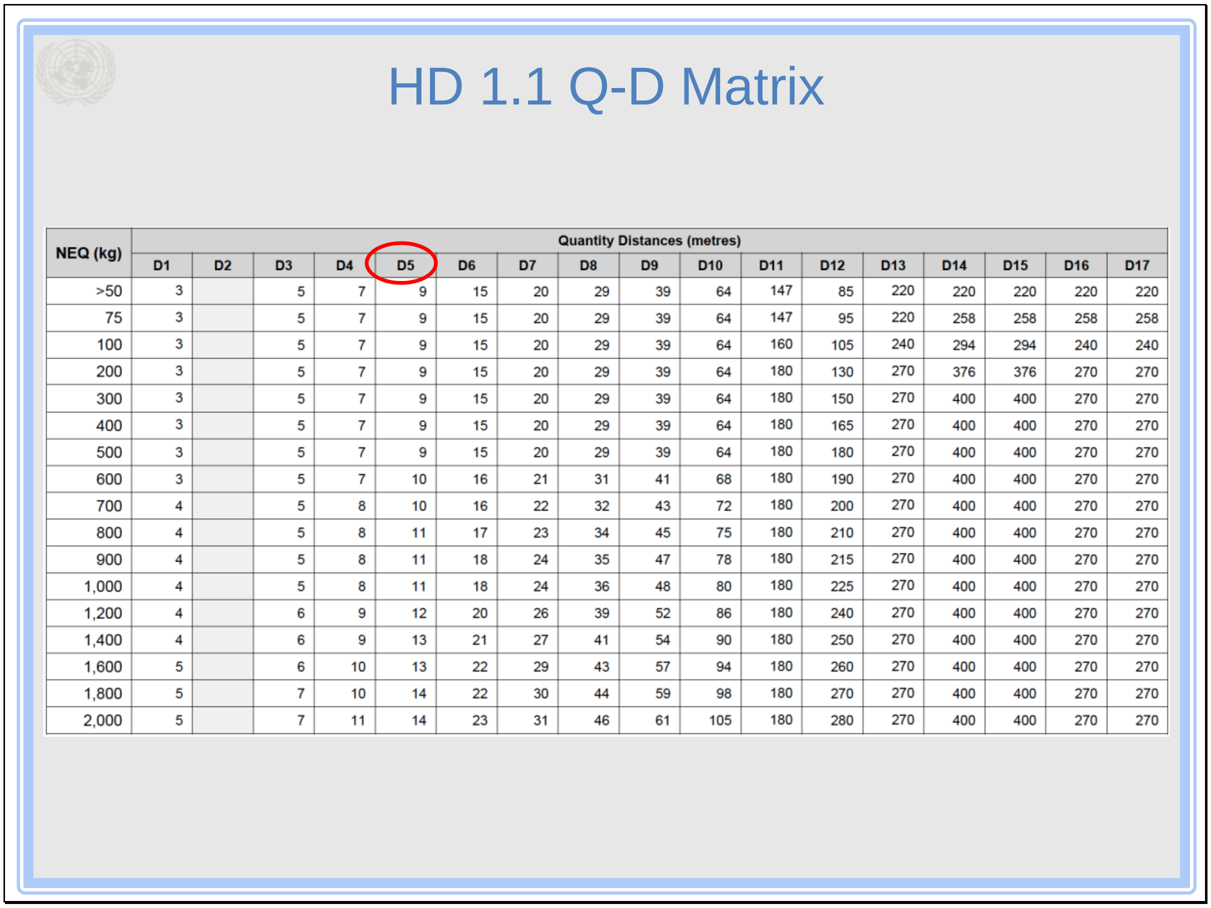
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex D
- Explain each Pictogram and how to use the Matrix.
- Explain the importance of the D figure

References/further reading

- http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex D

Slide 45



## HD 1.1 Q-D Matrix

| NEQ (kg) | Quantity Distances (metres) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | D13 | D14 | D15 | D16 | D17 |
| >50 | 3 | | 5 | 7 | 9 | 15 | 20 | 29 | 39 | 64 | 147 | 85 | 220 | 220 | 220 | 220 | 220 |
| 75 | 3 | | 5 | 7 | 9 | 15 | 20 | 29 | 39 | 64 | 147 | 95 | 220 | 258 | 258 | 258 | 258 |
| 100 | 3 | | 5 | 7 | 9 | 15 | 20 | 29 | 39 | 64 | 160 | 105 | 240 | 294 | 294 | 240 | 240 |
| 200 | 3 | | 5 | 7 | 9 | 15 | 20 | 29 | 39 | 64 | 180 | 130 | 270 | 376 | 376 | 270 | 270 |
| 300 | 3 | | 5 | 7 | 9 | 15 | 20 | 29 | 39 | 64 | 180 | 150 | 270 | 400 | 400 | 270 | 270 |
| 400 | 3 | | 5 | 7 | 9 | 15 | 20 | 29 | 39 | 64 | 180 | 165 | 270 | 400 | 400 | 270 | 270 |
| 500 | 3 | | 5 | 7 | 9 | 15 | 20 | 29 | 39 | 64 | 180 | 180 | 270 | 400 | 400 | 270 | 270 |
| 600 | 3 | | 5 | 7 | 10 | 16 | 21 | 31 | 41 | 68 | 180 | 190 | 270 | 400 | 400 | 270 | 270 |
| 700 | 4 | | 5 | 8 | 10 | 16 | 22 | 32 | 43 | 72 | 180 | 200 | 270 | 400 | 400 | 270 | 270 |
| 800 | 4 | | 5 | 8 | 11 | 17 | 23 | 34 | 45 | 75 | 180 | 210 | 270 | 400 | 400 | 270 | 270 |
| 900 | 4 | | 5 | 8 | 11 | 18 | 24 | 35 | 47 | 78 | 180 | 215 | 270 | 400 | 400 | 270 | 270 |
| 1,000 | 4 | | 5 | 8 | 11 | 18 | 24 | 36 | 48 | 80 | 180 | 225 | 270 | 400 | 400 | 270 | 270 |
| 1,200 | 4 | | 6 | 9 | 12 | 20 | 26 | 39 | 52 | 86 | 180 | 240 | 270 | 400 | 400 | 270 | 270 |
| 1,400 | 4 | | 6 | 9 | 13 | 21 | 27 | 41 | 54 | 90 | 180 | 250 | 270 | 400 | 400 | 270 | 270 |
| 1,600 | 5 | | 6 | 10 | 13 | 22 | 29 | 43 | 57 | 94 | 180 | 260 | 270 | 400 | 400 | 270 | 270 |
| 1,800 | 5 | | 7 | 10 | 14 | 22 | 30 | 44 | 59 | 98 | 180 | 270 | 270 | 400 | 400 | 270 | 270 |
| 2,000 | 5 | | 7 | 11 | 14 | 23 | 31 | 46 | 61 | 105 | 180 | 280 | 270 | 400 | 400 | 270 | 270 |

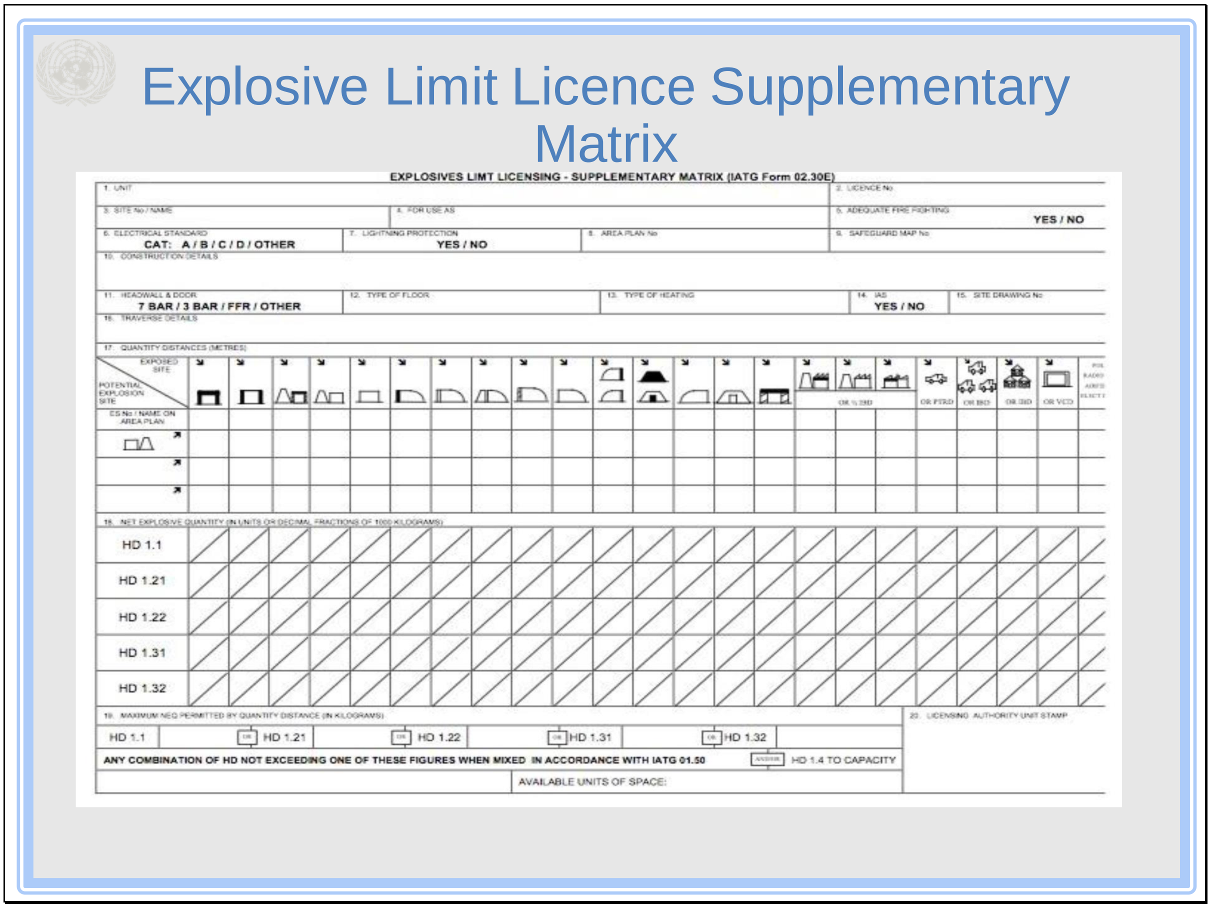
**Main idea/objective for slide:**
**HD 1.1 QD matrix – NEQ and QD**

What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex E
- Explain how to use the Matrix and highlight where the D figure is now useful.

References/further reading
http://data.unsaferguard.org/iatg/en/IATG-02.20-Quantity-separation-distances-IATG-V.3.pdf Annex E

Slide 46



## Explosive Limit Licence Supplementary Matrix

EXPLOSIVES LIMT LICENSING - SUPPLEMENTARY MATRIX (IATG Form 02.30E)

1. UNIT
2. LICENCE No
3. SITE No / NAME
4. FOR USE AS
5. ADEQUATE FIRE FIGHTING YES / NO
6. ELECTRICAL STANDARD CAT: A / B / C / D / OTHER
7. LIGHTNING PROTECTION YES / NO
8. AREA PLAN No
9. SAFEGUARD MAP No
10. CONSTRUCTION DETAILS
11. HEADWALL & DOOR 7 BAR / 3 BAR / FFR / OTHER
12. TYPE OF FLOOR
13. TYPE OF HEATING
14. IAS YES / NO
15. SITE DRAWING No
16. TRAVERSE DETAILS
17. QUANTITY DISTANCES (METRES)

EXPOSED SITE

POTENTIAL EXPLOSION SITE

ES No / NAME ON AREA PLAN

OR ½ IBD

OR PTRD

OR IBD

OR IBD

OR VCD

POL RADIO ADITS ELECT I

18. NET EXPLOSIVE QUANTITY (IN UNITS OR DECIMAL FRACTIONS OF 1000 KILOGRAMS)

HD 1.1

HD 1.21

HD 1.22

HD 1.31

HD 1.32

19. MAXIMUM NEQ PERMITTED BY QUANTITY DISTANCE (IN KILOGRAMS)

HD 1.1 OR HD 1.21 OR HD 1.22 OR HD 1.31 OR HD 1.32

ANY COMBINATION OF HD NOT EXCEEDING ONE OF THESE FIGURES WHEN MIXED IN ACCORDANCE WITH IATG 01.50 AND/OR HD 1.4 TO CAPACITY

AVAILABLE UNITS OF SPACE:

20. LICENSING AUTHORITY UNIT STAMP

**Main idea/objective for slide:**

- **Discuss the Explosive Limit licence matrix, its background, the various pictograms and emphasise the need for this matrix for each Potential Explosive Site.**

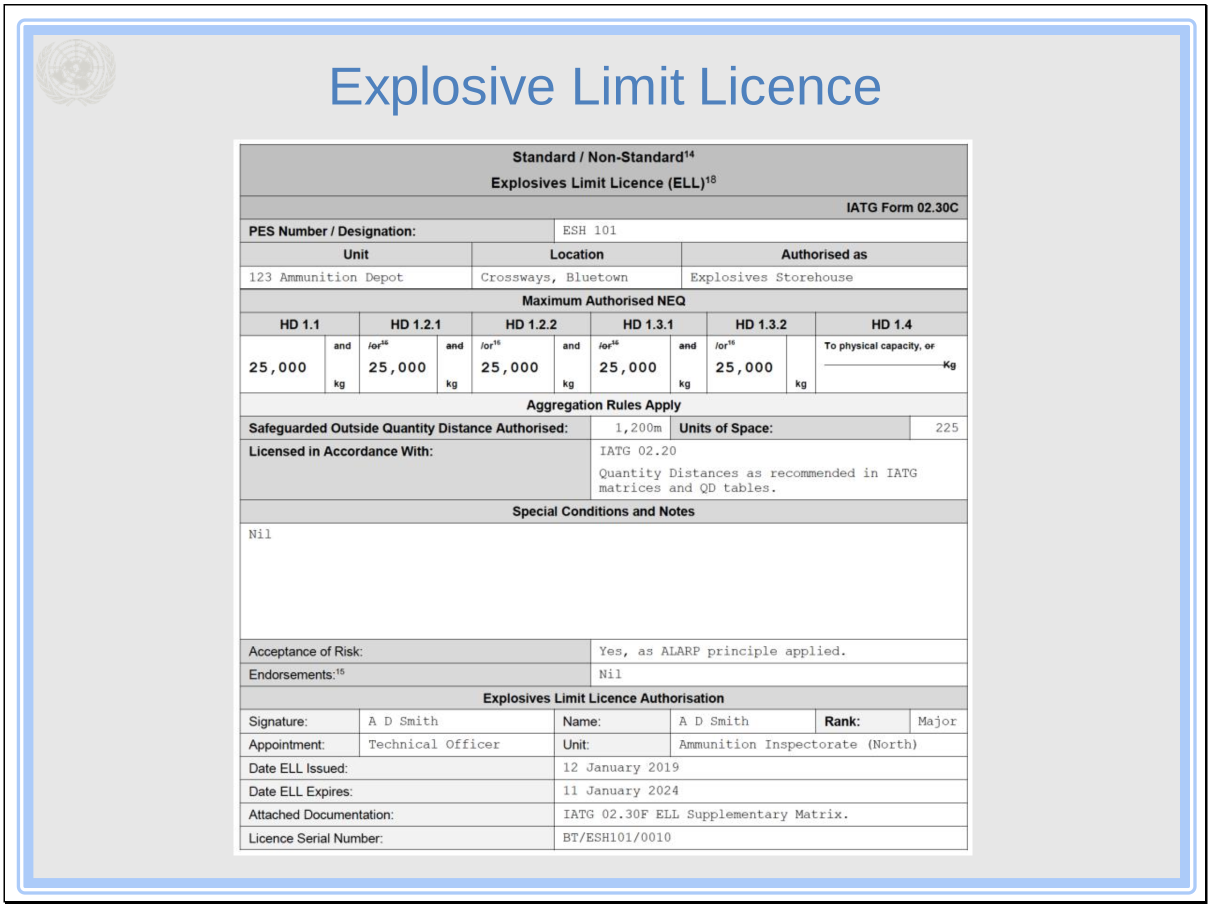
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf Annex E
- Provide a handout of the Guidance document also
  - **Guide to ELL Supplementary Matrix.** http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf. Appendix 1 to Annex E
- Working with the participants, explain how to complete the Matrix, using the QD tables

References/further reading

- http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf

Slide 47



## Explosive Limit Licence

**Standard / Non-Standard[14]**

**Explosives Limit Licence (ELL)[18]**

**IATG Form 02.30C**

| | |
|---|---|
| **PES Number / Designation:** | ESH 101 |

| **Unit** | **Location** | **Authorised as** |
|---|---|---|
| 123 Ammunition Depot | Crossways, Bluetown | Explosives Storehouse |

**Maximum Authorised NEQ**

| **HD 1.1** | | **HD 1.2.1** | | **HD 1.2.2** | | **HD 1.3.1** | | **HD 1.3.2** | | **HD 1.4** |
|---|---|---|---|---|---|---|---|---|---|---|
| 25,000 | and<br>kg | ~~/or~~[16]<br>25,000 | ~~and~~<br>kg | /or[16]<br>25,000 | and<br>kg | ~~/or~~[16]<br>25,000 | ~~and~~<br>kg | /or[16]<br>25,000 | kg | To physical capacity, ~~or~~<br>Kg |

**Aggregation Rules Apply**

| | | | |
|---|---|---|---|
| **Safeguarded Outside Quantity Distance Authorised:** | 1,200m | **Units of Space:** | 225 |
| **Licensed in Accordance With:** | IATG 02.20<br>Quantity Distances as recommended in IATG matrices and QD tables. | | |

**Special Conditions and Notes**

Nil

| | |
|---|---|
| Acceptance of Risk: | Yes, as ALARP principle applied. |
| Endorsements:[15] | Nil |

**Explosives Limit Licence Authorisation**

| | | | | | |
|---|---|---|---|---|---|
| Signature: | A D Smith | Name: | A D Smith | **Rank:** | Major |
| Appointment: | Technical Officer | Unit: | Ammunition Inspectorate (North) | | |
| Date ELL Issued: | | 12 January 2019 | | | |
| Date ELL Expires: | | 11 January 2024 | | | |
| Attached Documentation: | | IATG 02.30F ELL Supplementary Matrix. | | | |
| Licence Serial Number: | | BT/ESH101/0010 | | | |

**Main idea/objective for slide:**

- **worked example of an Explosive Limit licence**

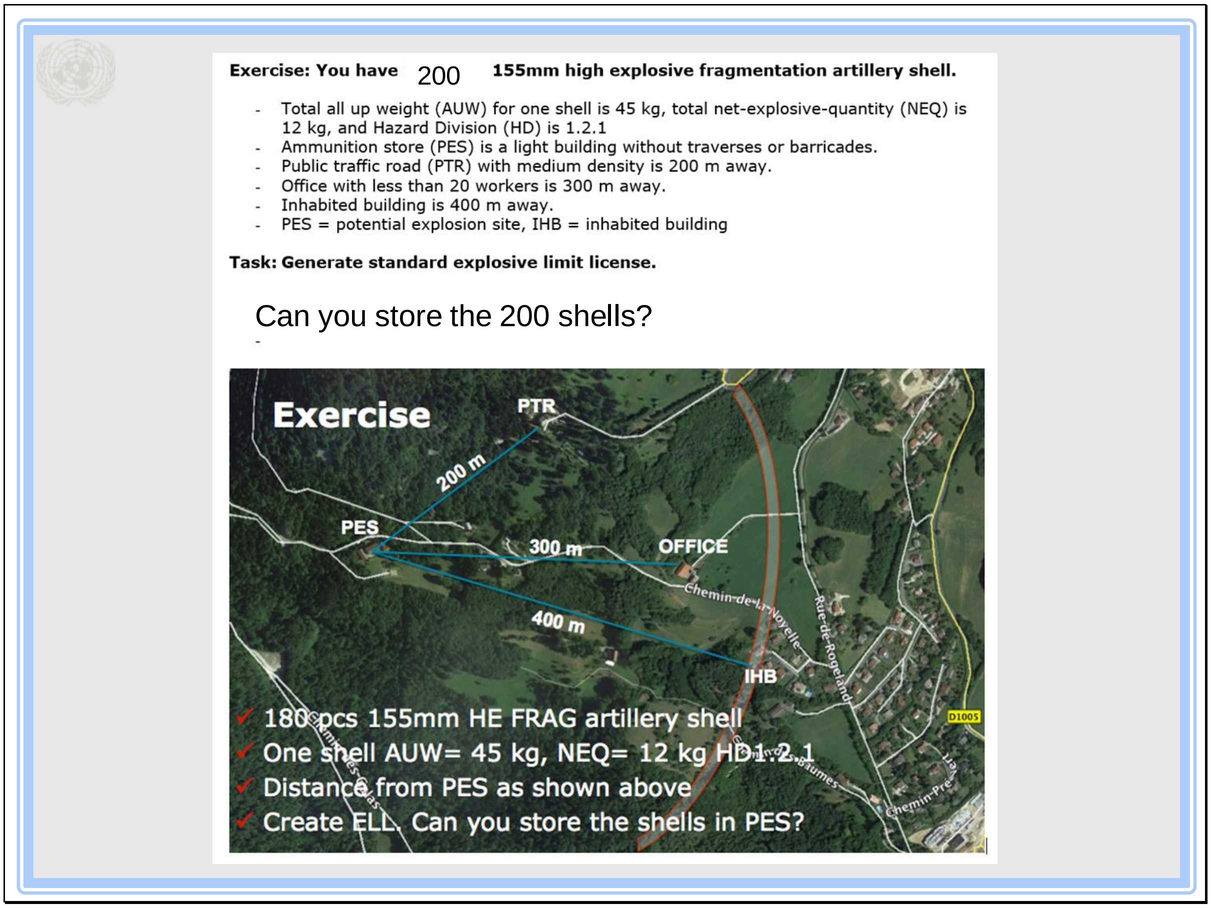
What the instructor should cover (in addition to slide content)

- Provide a hand out http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf Annex C
- Revise the Explosive Licence, which is defined by the ELL Matrix

References/further reading

http://data.unsaferguard.org/iatg/en/IATG-02.30-Licensing-explosive-facilities-IATG-V.3.pdf

Slide 48



**Exercise: You have** 200 **155mm high explosive fragmentation artillery shell.**

- Total all up weight (AUW) for one shell is 45 kg, total net-explosive-quantity (NEQ) is 12 kg, and Hazard Division (HD) is 1.2.1
- Ammunition store (PES) is a light building without traverses or barricades.
- Public traffic road (PTR) with medium density is 200 m away.
- Office with less than 20 workers is 300 m away.
- Inhabited building is 400 m away.
- PES = potential explosion site, IHB = inhabited building

**Task: Generate standard explosive limit license.**

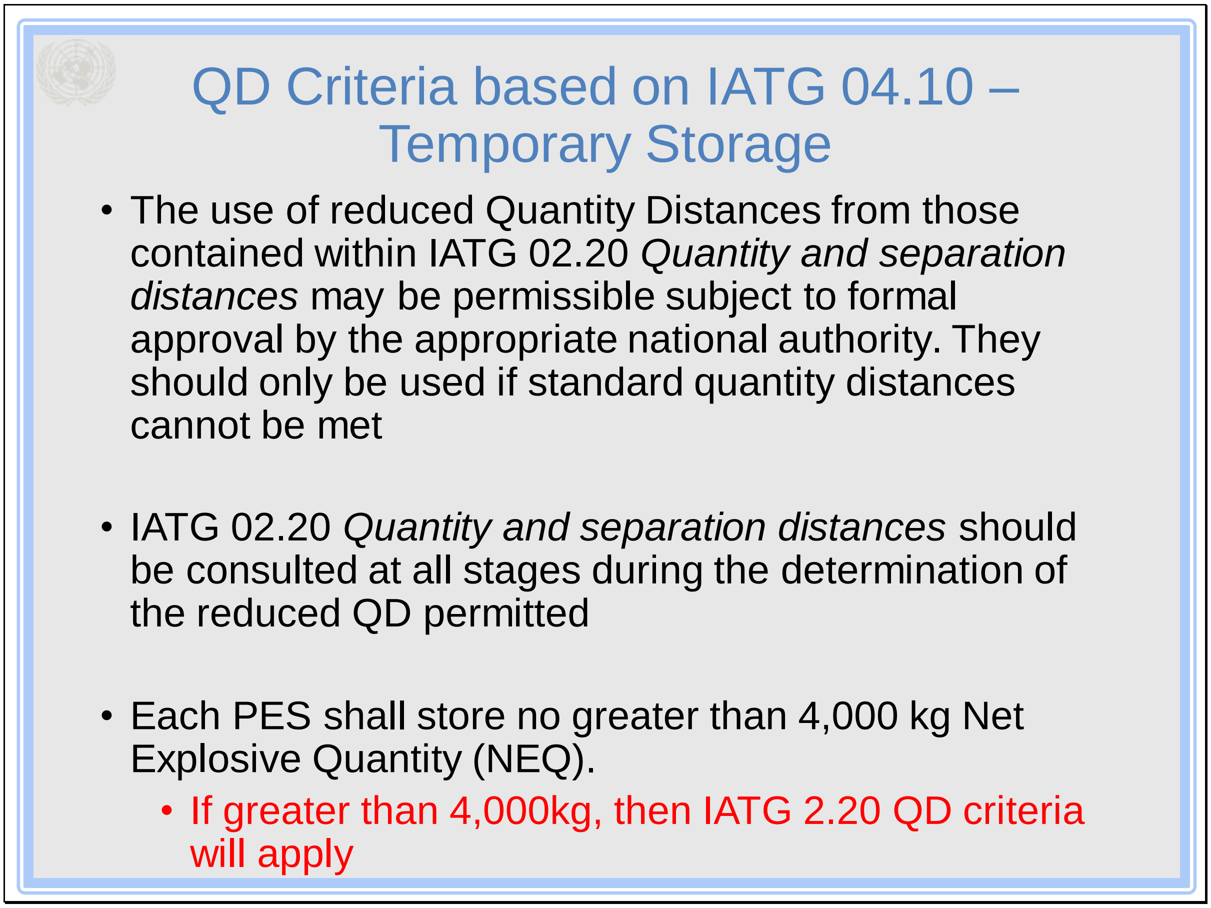
Can you store the 200 shells?

**Exercise**

- ✓ 180 pcs 155mm HE FRAG artillery shell
- ✓ One shell AUW= 45 kg, NEQ= 12 kg HD1.2.1
- ✓ Distance from PES as shown above
- ✓ Create ELL. Can you store the shells in PES?

# NEQ = 2400kg of 1.2.1

- IBD = D2 18000kg
- Office = D6 50000kg
- PTRD medium = D6 2000kg



## QD Criteria based on IATG 04.10 – Temporary Storage

- The use of reduced Quantity Distances from those contained within IATG 02.20 *Quantity and separation distances* may be permissible subject to formal approval by the appropriate national authority. They should only be used if standard quantity distances cannot be met
- IATG 02.20 *Quantity and separation distances* should be consulted at all stages during the determination of the reduced QD permitted
- Each PES shall store no greater than 4,000 kg Net Explosive Quantity (NEQ).
  - If greater than 4,000kg, then IATG 2.20 QD criteria will apply

**<u>Main idea/objective for slide:</u>**

- **QD Criteria based on IATG 04.10 – Temporary Storage**

<u>What the instructor should cover (in addition to slide content)</u>

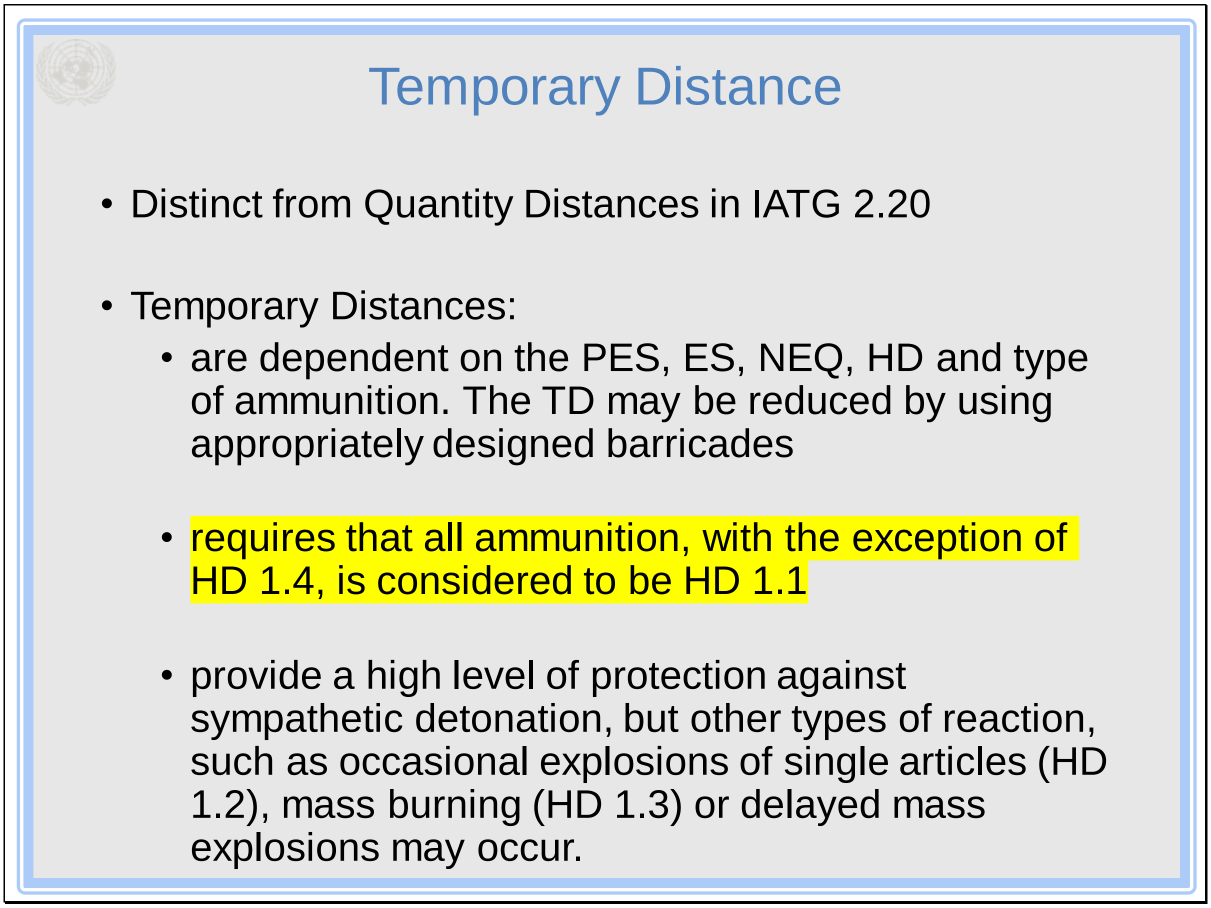
- Emphasise that there is a distinct difference when considering Temporary storage but you must apply normal QD distances and regulations where possible.
- Highlight that an ammunition container cannot hold more than 4,000kg NEQ
- An Explosive Safety Case is required if TDs are used.

<u>References/further reading</u>

**IATG 04.10 – Temporary Storage**

- Ammunition in Temporary Storage Areas is particularly vulnerable to fire.

- adequate separation from site to site may cause large losses through secondary effects such as explosions initiated by the fire.
- It is therefore important that consideration be given to applying adequate Quantity Distances between sites and ensuring that natural traverses and overhead cover are used wherever possible.
- Reduced QDs may be authorised for the storage of ammunition in Temporary Storage Areas.
- In all cases, QDs shall be measured from the nearest point of the Potential Explosion Site (PES) to the nearest point of the Exposed Site (ES).
- Each PES shall store no greater than 4,000 kg Net Explosive Quantity (NEQ).
- This is to ensure that the Maximum Credible Event (MCE) should avoid or reduce the loss of personnel and material, minimize the effects of unintended detonations/reactions during storage,



## Temporary Distance

- Distinct from Quantity Distances in IATG 2.20
- Temporary Distances:
  - are dependent on the PES, ES, NEQ, HD and type of ammunition. The TD may be reduced by using appropriately designed barricades
  - requires that all ammunition, with the exception of HD 1.4, is considered to be HD 1.1
  - provide a high level of protection against sympathetic detonation, but other types of reaction, such as occasional explosions of single articles (HD 1.2), mass burning (HD 1.3) or delayed mass explosions may occur.

**Main idea/objective for slide:**

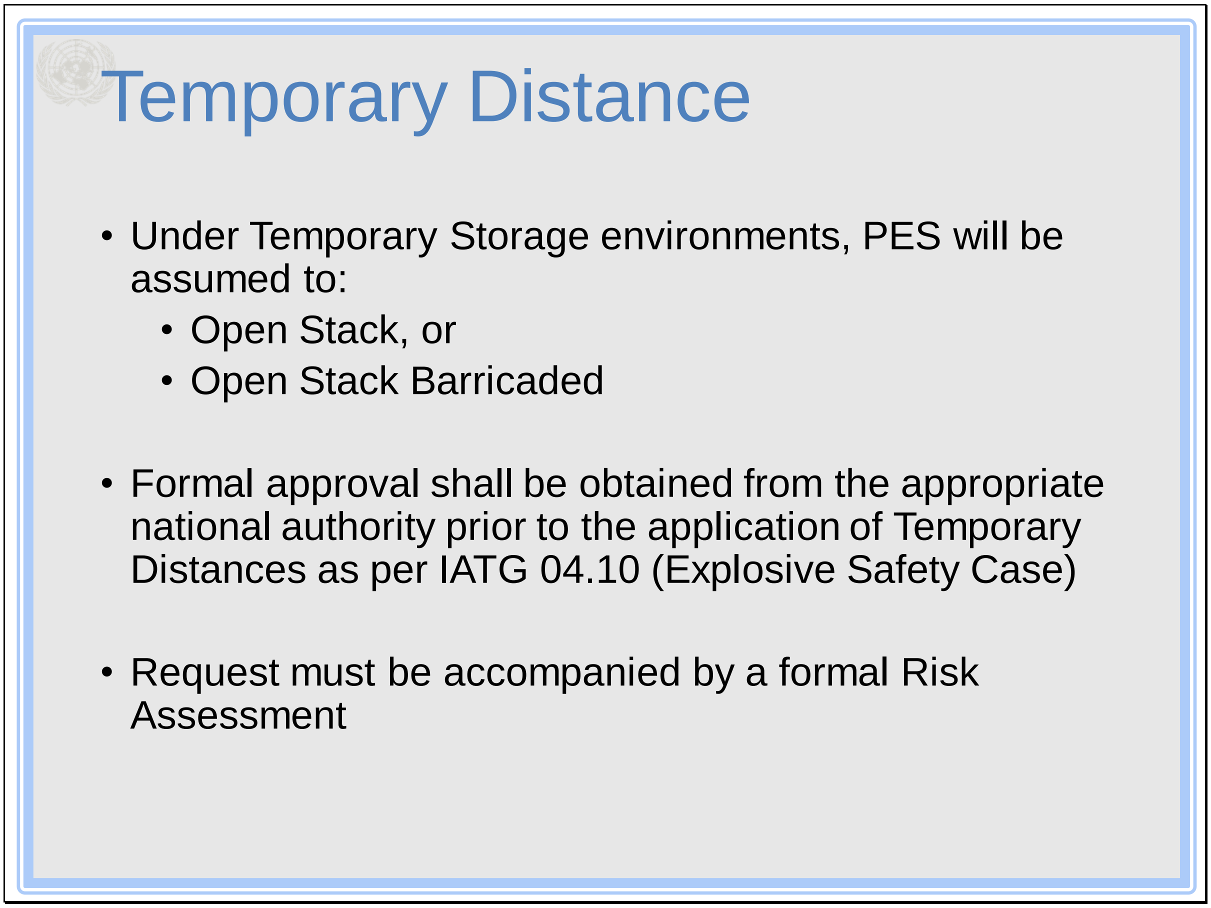
- **Temporary Distances vs Quantity Distances**

References/further reading

**IATG 04.10 – Temporary Storage**

- Ammunition in Temporary Storage Areas is particularly vulnerable to fire.
- adequate separation from site to site may cause large losses through secondary effects such as explosions initiated by the fire.
- It is therefore important that consideration be given to applying adequate Quantity Distances between sites and ensuring that natural traverses and overhead cover are used wherever possible.
- Reduced QDs may be authorised for the storage of ammunition in Temporary Storage Areas.

- In all cases, QDs shall be measured from the nearest point of the Potential Explosion Site (PES) to the nearest point of the Exposed Site (ES).
- Each Exposed Site (ES) shall store no greater than 4,000 kg Net Explosive Quantity (NEQ).
- This is to ensure that the Maximum Credible Event (MCE) should avoid or reduce the loss of personnel and material, minimize the effects of unintended detonations/reactions during storage, transportation and handling or as a result of enemy action



# Temporary Distance

- Under Temporary Storage environments, PES will be assumed to:
  - Open Stack, or
  - Open Stack Barricaded
- Formal approval shall be obtained from the appropriate national authority prior to the application of Temporary Distances as per IATG 04.10 (Explosive Safety Case)
- Request must be accompanied by a formal Risk Assessment

**<u>Main idea/objective for slide:</u>**

- **Temporary Distances vs Quantity Distances**

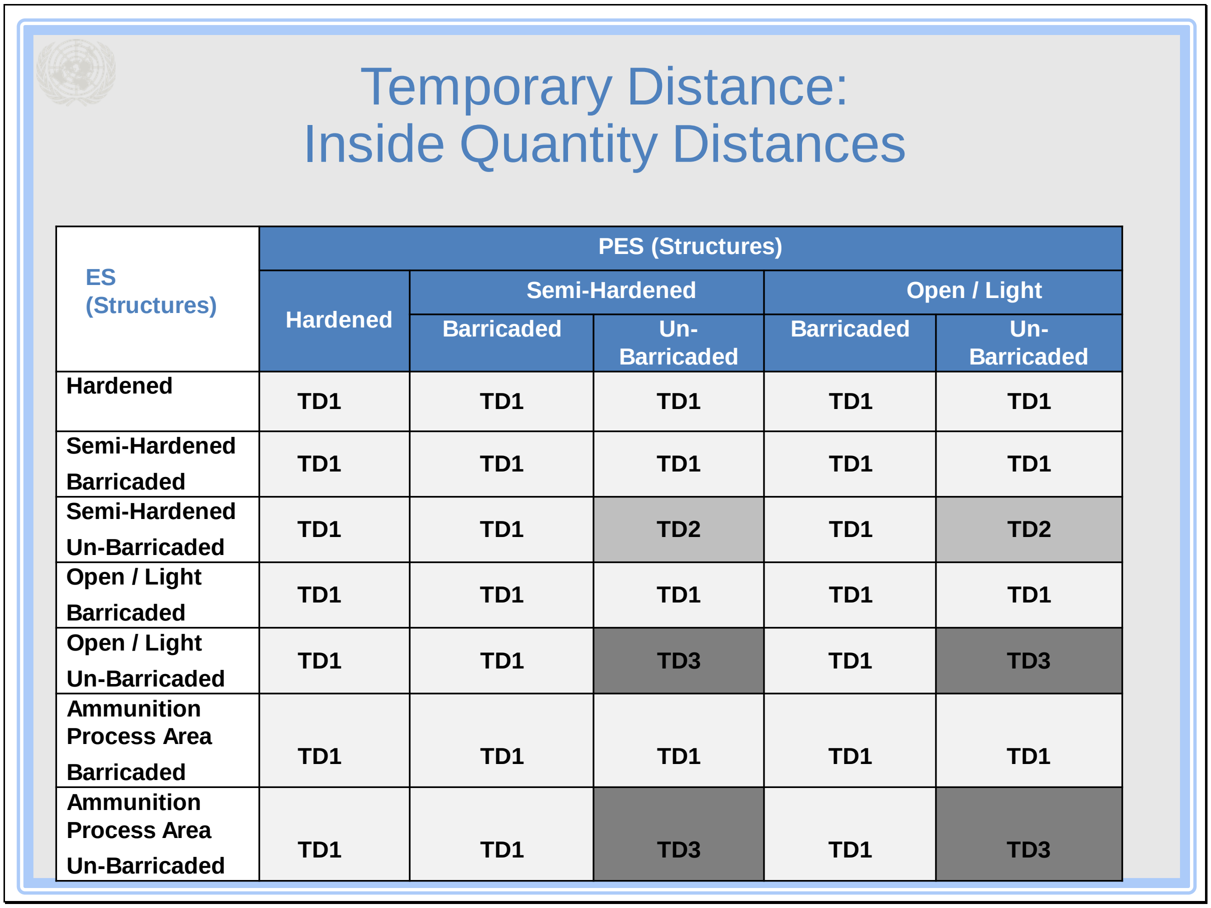
<u>References/further reading</u>

**IATG 04.10 – Temporary Storage**

- Ammunition in Temporary Storage Areas is particularly vulnerable to fire.
- adequate separation from site to site may cause large losses through secondary effects such as explosions initiated by the fire.
- It is therefore important that consideration be given to applying adequate Quantity Distances between sites and ensuring that natural traverses and overhead cover are used wherever possible.
- Reduced QDs may be authorised for the storage of ammunition in Temporary Storage Areas.

- In all cases, QDs shall be measured from the nearest point of the Potential Explosion Site (PES) to the nearest point of the Exposed Site (ES).
- Each Exposed Site (ES) shall store no greater than 4,000 kg Net Explosive Quantity (NEQ).
- This is to ensure that the Maximum Credible Event (MCE) should avoid or reduce the loss of personnel and material, minimize the effects of unintended detonations/reactions during storage, transportation and handling or as a result of enemy action

Slide 53



# Temporary Distance:
# Inside Quantity Distances

| ES (Structures) | PES (Structures) | | | | |
|---|---|---|---|---|---|
| | Hardened | Semi-Hardened | | Open / Light | |
| | | Barricaded | Un-Barricaded | Barricaded | Un-Barricaded |
| Hardened | TD1 | TD1 | TD1 | TD1 | TD1 |
| Semi-Hardened Barricaded | TD1 | TD1 | TD1 | TD1 | TD1 |
| Semi-Hardened Un-Barricaded | TD1 | TD1 | TD2 | TD1 | TD2 |
| Open / Light Barricaded | TD1 | TD1 | TD1 | TD1 | TD1 |
| Open / Light Un-Barricaded | TD1 | TD1 | TD3 | TD1 | TD3 |
| Ammunition Process Area Barricaded | TD1 | TD1 | TD1 | TD1 | TD1 |
| Ammunition Process Area Un-Barricaded | TD1 | TD1 | TD3 | TD1 | TD3 |

**Main idea/objective for slide:**

- **Temporary Distances: Internal Quantity Distances**

What the instructor should cover (in addition to slide content)

- Provide a hand out **IATG 04.10 – Temporary Storage, page 11-12**
- Explain the use of this matrix and highlight the distinct differences to the normal QD tables
- Emphasise that this matrix is for Inside Quantity Distances ONLY

References/further reading

**IATG 04.10 – Temporary Storage**

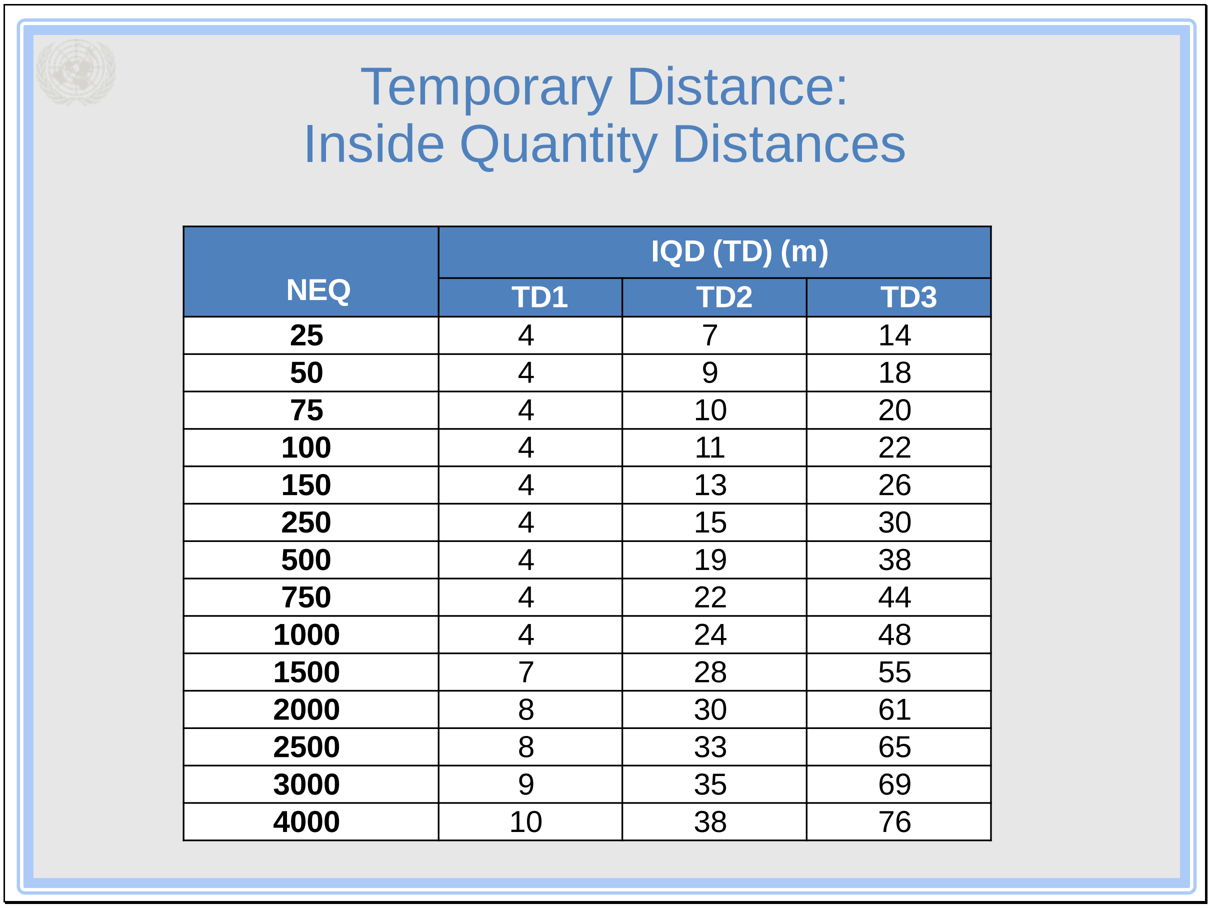
NOTE 1 Non-earth covered buildings that can generate debris like structures of concrete or bricks shall NOT be used as PES, unless constructed in accordance with Clause 7.5 (Barricades)

NOTE 2 Reduced distances may be implemented if authorised by the national authority.

NOTE 3 Hardened structures are by definition barricaded.

NOTE 4 Only for ammunition related personnel. For an ammunition process area as a PES use the appropriate PES structure type column.

Slide 54



## Temporary Distance:
## Inside Quantity Distances

| NEQ | IQD (TD) (m) | | |
|---|---|---|---|
| | TD1 | TD2 | TD3 |
| **25** | 4 | 7 | 14 |
| **50** | 4 | 9 | 18 |
| **75** | 4 | 10 | 20 |
| **100** | 4 | 11 | 22 |
| **150** | 4 | 13 | 26 |
| **250** | 4 | 15 | 30 |
| **500** | 4 | 19 | 38 |
| **750** | 4 | 22 | 44 |
| **1000** | 4 | 24 | 48 |
| **1500** | 7 | 28 | 55 |
| **2000** | 8 | 30 | 61 |
| **2500** | 8 | 33 | 65 |
| **3000** | 9 | 35 | 69 |
| **4000** | 10 | 38 | 76 |

**Main idea/objective for slide:**
- **Temporary Distances: Internal Quantity Distances**

What the instructor should cover (in addition to slide content)
- Provide a hand out **IATG 04.10 – Temporary Storage, page 12**
- Explain the use of this matrix and highlight the distinct differences to the normal NEQ tables
- Emphasise that this matrix is for Inside Quantity Distances ONLY

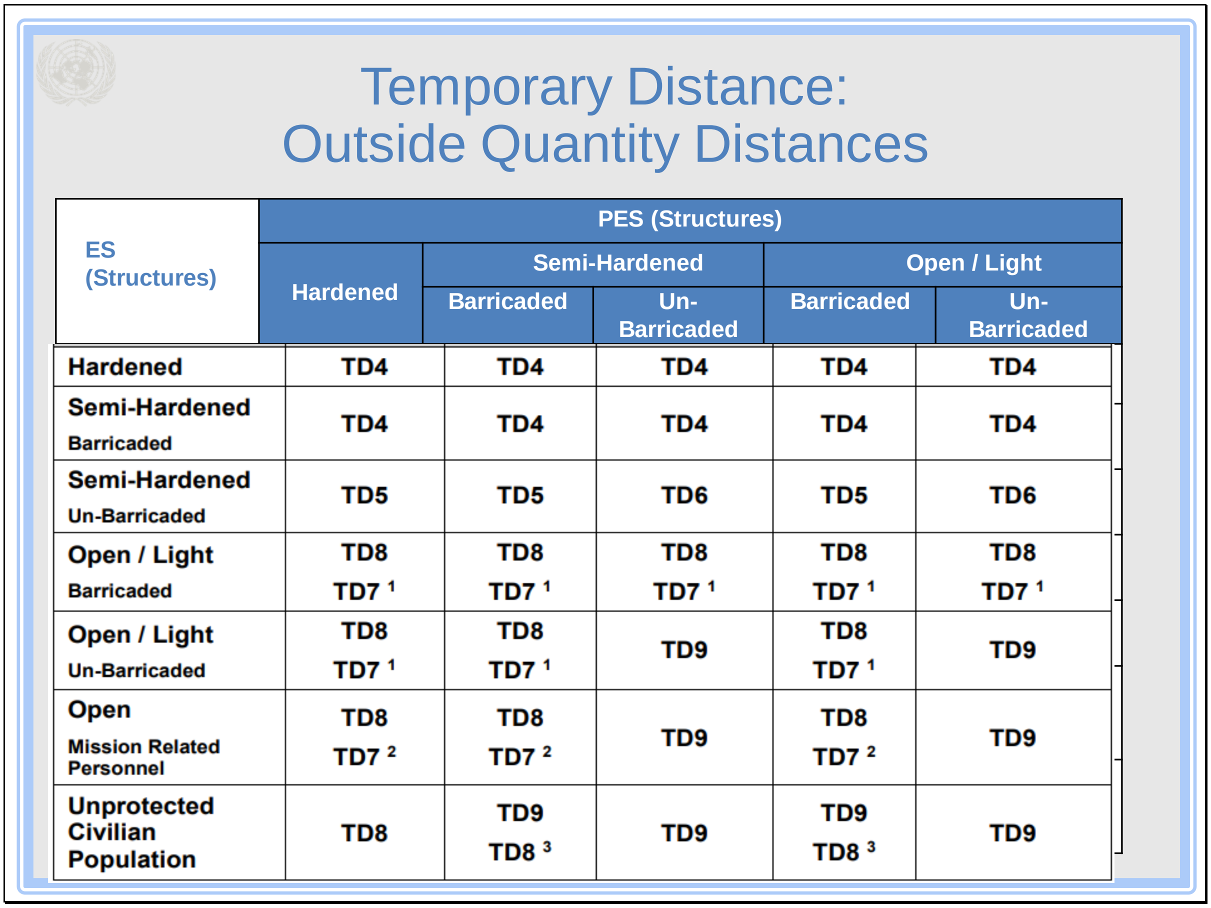
References/further reading

**IATG 04.10 – Temporary Storage**

NOTE 1 Non-earth covered buildings that can generate debris like structures of concrete or bricks shall NOT be used as PES, unless constructed in accordance with Clause 7.5 (Barricades)

NOTE 2 Reduced distances may be implemented if authorised by the national authority.
NOTE 3 Hardened structures are by definition barricaded.
NOTE 4 Only for ammunition related personnel. For an ammunition process area as a PES use the appropriate PES structure type column.

Slide 55



## Temporary Distance: Outside Quantity Distances

| ES (Structures) | PES (Structures) | | | | |
|---|---|---|---|---|---|
| | Hardened | Semi-Hardened | | Open / Light | |
| | | Barricaded | Un-Barricaded | Barricaded | Un-Barricaded |
| Hardened | TD4 | TD4 | TD4 | TD4 | TD4 |
| Semi-Hardened<br>Barricaded | TD4 | TD4 | TD4 | TD4 | TD4 |
| Semi-Hardened<br>Un-Barricaded | TD5 | TD5 | TD6 | TD5 | TD6 |
| Open / Light<br>Barricaded | TD8<br>TD7 [1] | TD8<br>TD7 [1] | TD8<br>TD7 [1] | TD8<br>TD7 [1] | TD8<br>TD7 [1] |
| Open / Light<br>Un-Barricaded | TD8<br>TD7 [1] | TD8<br>TD7 [1] | TD9 | TD8<br>TD7 [1] | TD9 |
| Open<br>Mission Related Personnel | TD8<br>TD7 [2] | TD8<br>TD7 [2] | TD9 | TD8<br>TD7 [2] | TD9 |
| Unprotected Civilian Population | TD8 | TD9<br>TD8 [3] | TD9 | TD9<br>TD8 [3] | TD9 |

**Main idea/objective for slide:**

- **Temporary Distances: Outside Quantity Distances**

What the instructor should cover (in addition to slide content)

- Provide a hand out **IATG 04.10 – Temporary Storage, page 13**
- Explain the use of this matrix and highlight the distinct differences to the normal NEQ tables
- Emphasise that this matrix is for Outside Quantity Distances ONLY

References/further reading

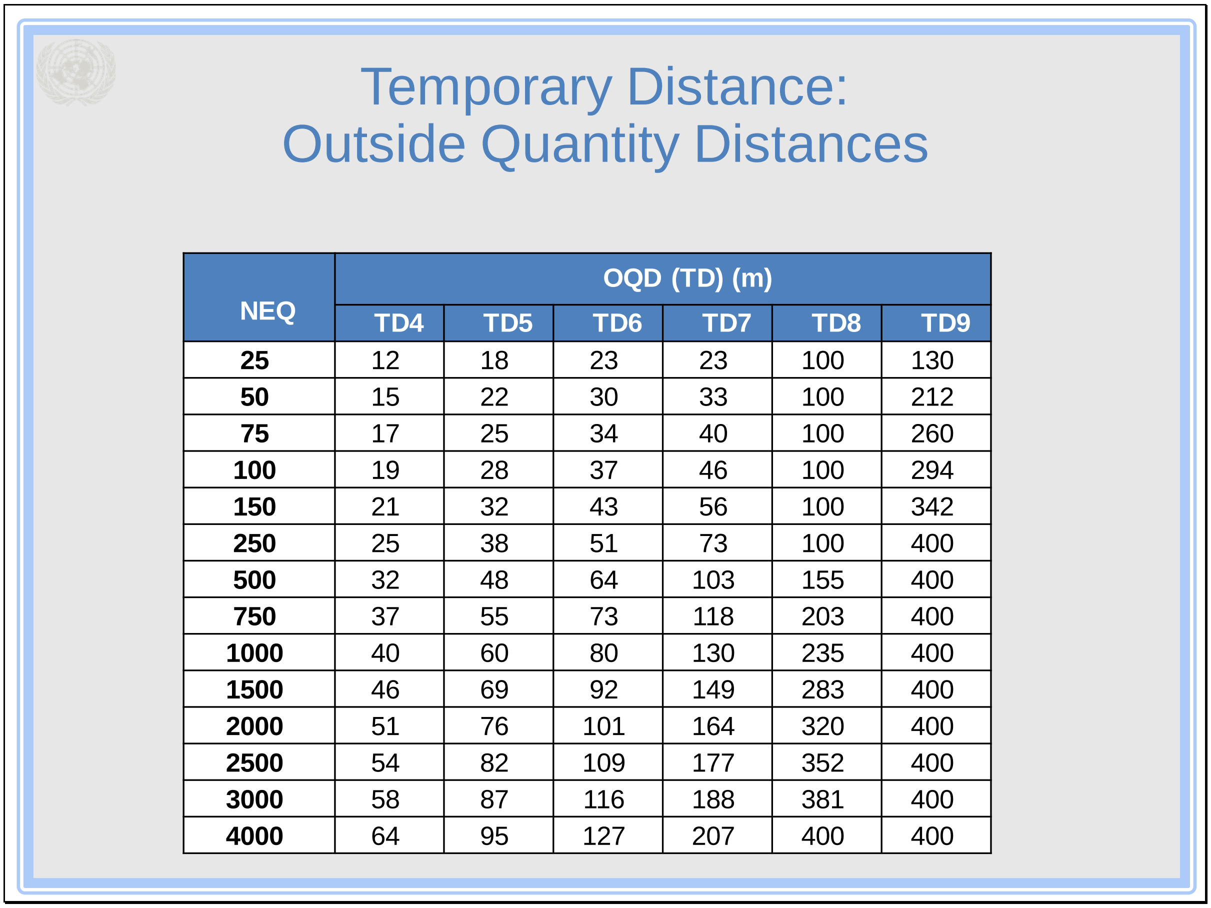
**IATG 04.10 – Temporary Storage**

NOTE 1 If an Overhead Protection protects against falling fragments then FD7 may be applied.

NOTE 2 Reduced distances may be implemented if the national authority has approved the storage structures.

NOTE 3 TD9 shall be applied except for heavy calibre artillery shells stored in a vertical position where TD8 may be applied.

Slide 56



## Temporary Distance:
## Outside Quantity Distances

| NEQ | OQD (TD) (m) | | | | | |
|---|---|---|---|---|---|---|
| | TD4 | TD5 | TD6 | TD7 | TD8 | TD9 |
| **25** | 12 | 18 | 23 | 23 | 100 | 130 |
| **50** | 15 | 22 | 30 | 33 | 100 | 212 |
| **75** | 17 | 25 | 34 | 40 | 100 | 260 |
| **100** | 19 | 28 | 37 | 46 | 100 | 294 |
| **150** | 21 | 32 | 43 | 56 | 100 | 342 |
| **250** | 25 | 38 | 51 | 73 | 100 | 400 |
| **500** | 32 | 48 | 64 | 103 | 155 | 400 |
| **750** | 37 | 55 | 73 | 118 | 203 | 400 |
| **1000** | 40 | 60 | 80 | 130 | 235 | 400 |
| **1500** | 46 | 69 | 92 | 149 | 283 | 400 |
| **2000** | 51 | 76 | 101 | 164 | 320 | 400 |
| **2500** | 54 | 82 | 109 | 177 | 352 | 400 |
| **3000** | 58 | 87 | 116 | 188 | 381 | 400 |
| **4000** | 64 | 95 | 127 | 207 | 400 | 400 |

**Main idea/objective for slide:**

- **Temporary Distances: Outside Quantity Distances**

What the instructor should cover (in addition to slide content)

- Provide a hand out **IATG 04.10 – Temporary Storage, page 13**
- Explain the use of this matrix and highlight the distinct differences to the normal NEQ tables
- Emphasise that this matrix is for Outside Quantity Distances ONLY

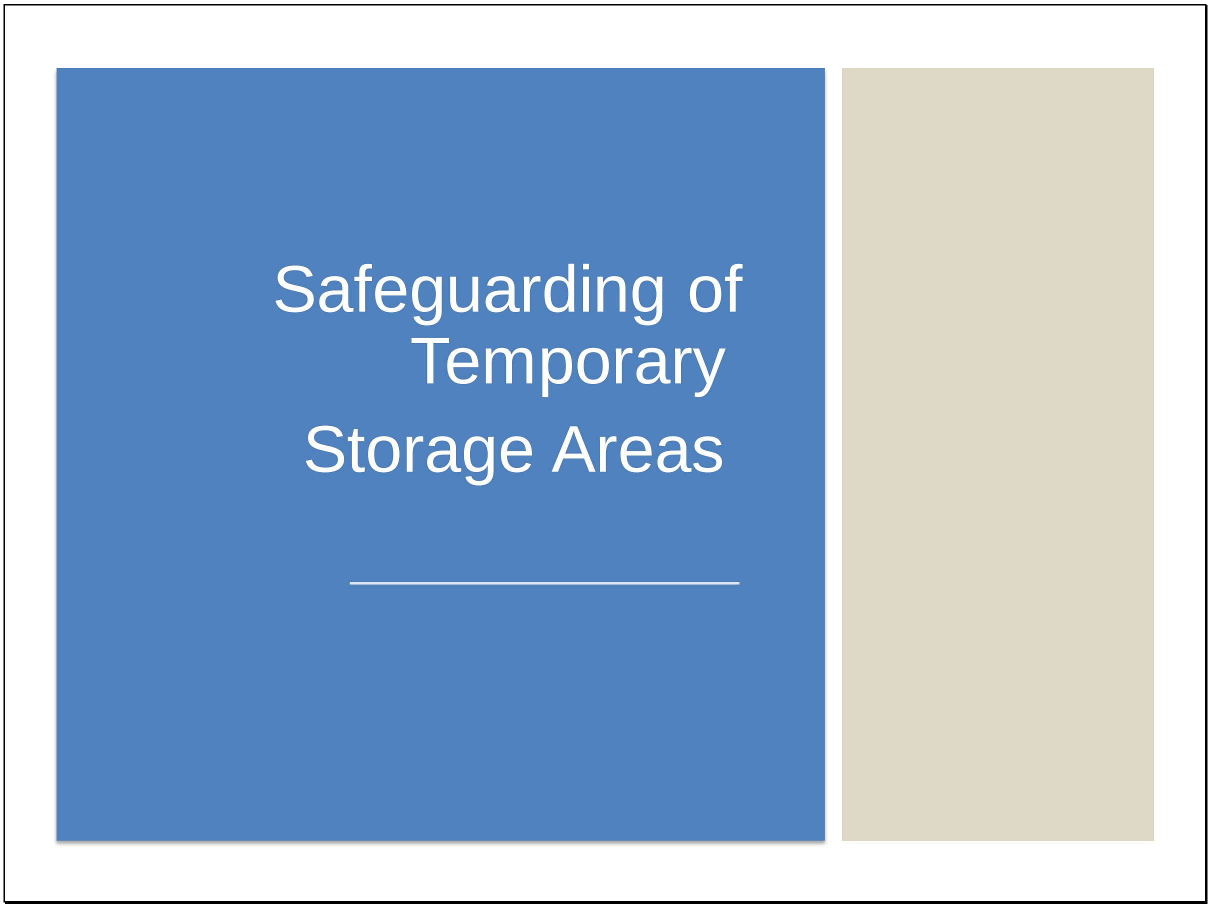
References/further reading

**IATG 04.10 – Temporary Storage**

NOTE 1 If an Overhead Protection protects against falling fragments then FD7 may be applied.

NOTE 2 Reduced distances may be implemented if the national authority has approved the storage structures.
NOTE 3 TD9 shall be applied except for heavy calibre artillery shells stored in a vertical position where TD8 may be applied.

Slide 57

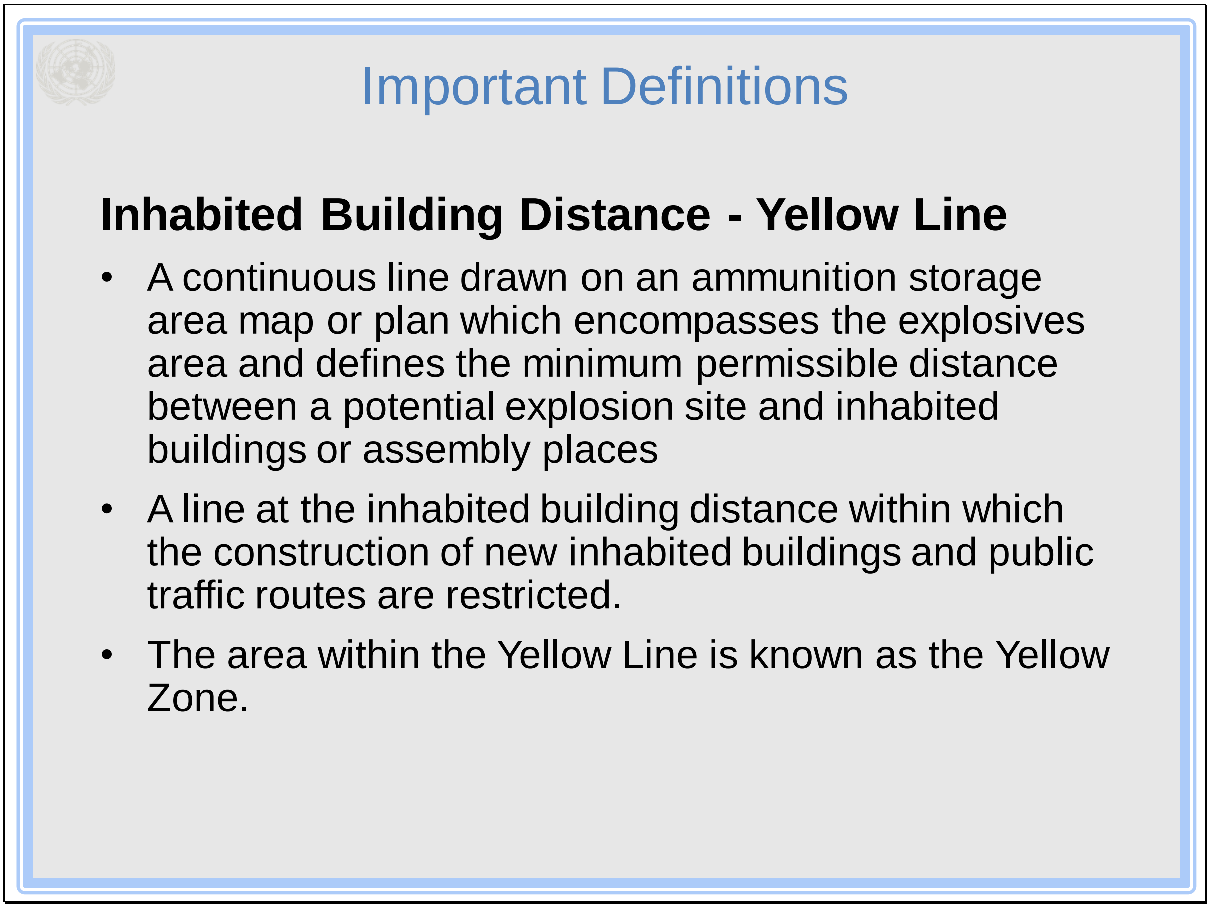


Safeguarding of Temporary Storage Areas

**Phase 2. Development (**Time allocation - 220 min**)**

Stage 2 (Time allocation 50 mins) – Safeguarding of Field Storage Areas

Slide 58



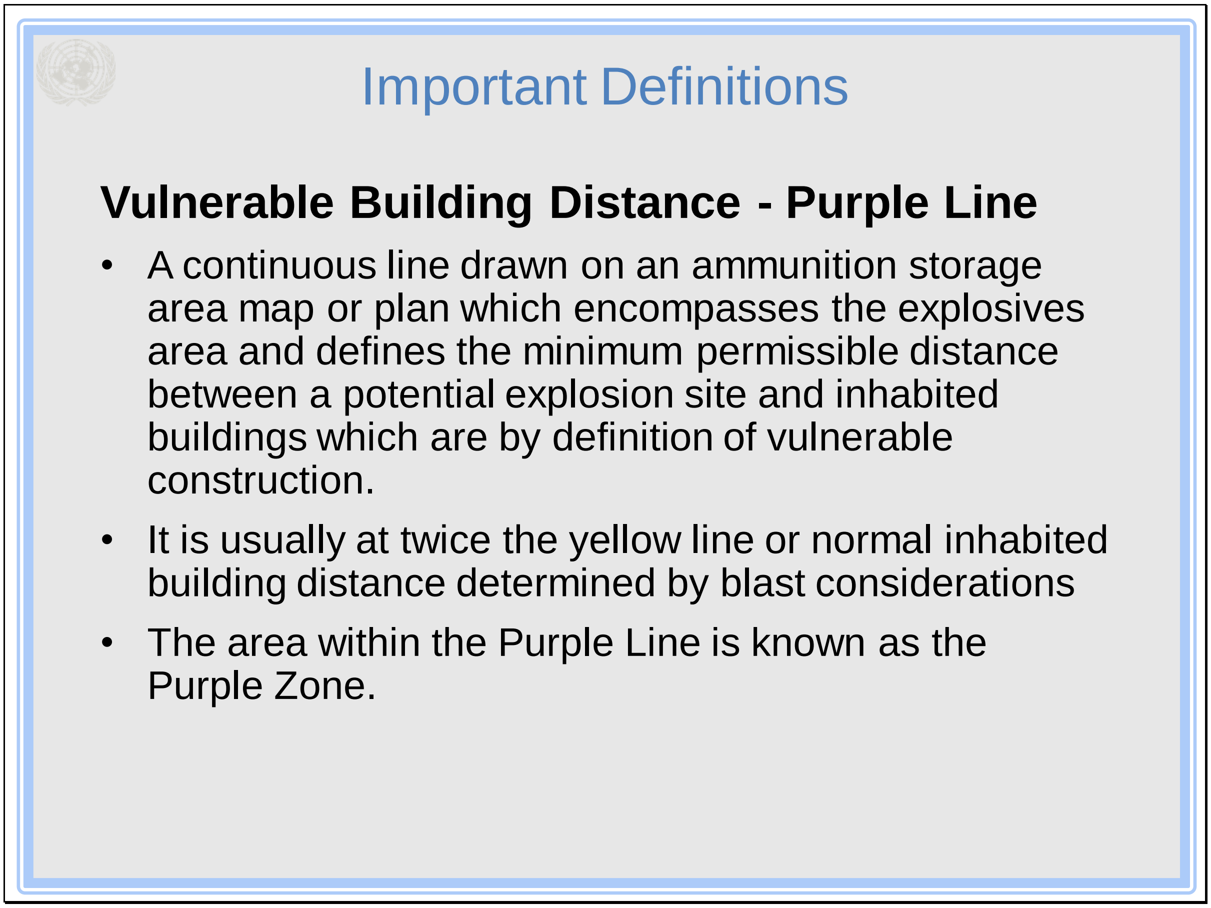
## Important Definitions

**Inhabited Building Distance - Yellow Line**

- A continuous line drawn on an ammunition storage area map or plan which encompasses the explosives area and defines the minimum permissible distance between a potential explosion site and inhabited buildings or assembly places
- A line at the inhabited building distance within which the construction of new inhabited buildings and public traffic routes are restricted.
- The area within the Yellow Line is known as the Yellow Zone.

**Main idea/objective for slide:**

- **Introduce the concept of Safeguarding and provide the relevant definitions to the participants.**



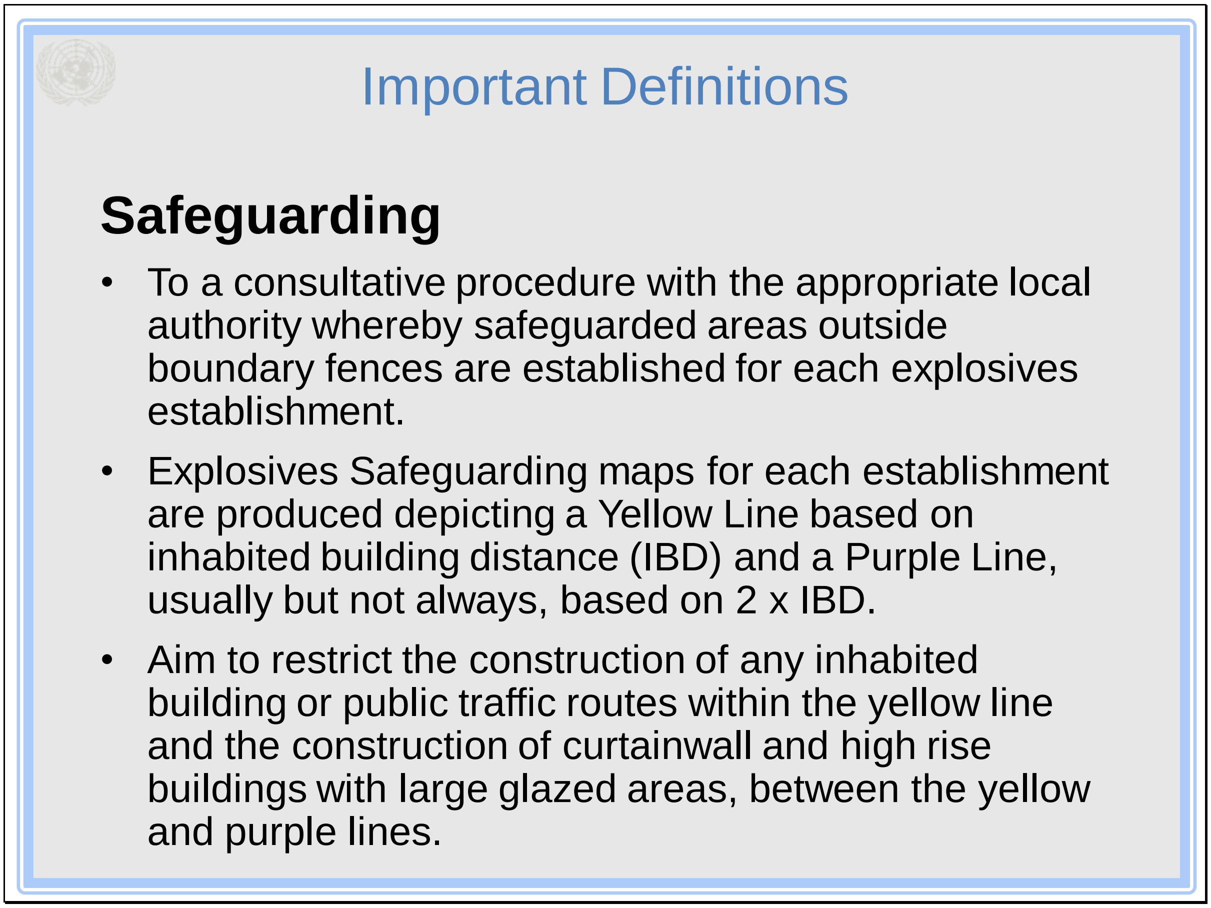
## Important Definitions

**Vulnerable Building Distance - Purple Line**

- A continuous line drawn on an ammunition storage area map or plan which encompasses the explosives area and defines the minimum permissible distance between a potential explosion site and inhabited buildings which are by definition of vulnerable construction.
- It is usually at twice the yellow line or normal inhabited building distance determined by blast considerations
- The area within the Purple Line is known as the Purple Zone.

**Main idea/objective for slide:**

- **Introduce the concept of Safeguarding and provide the relevant definitions to the participants.**



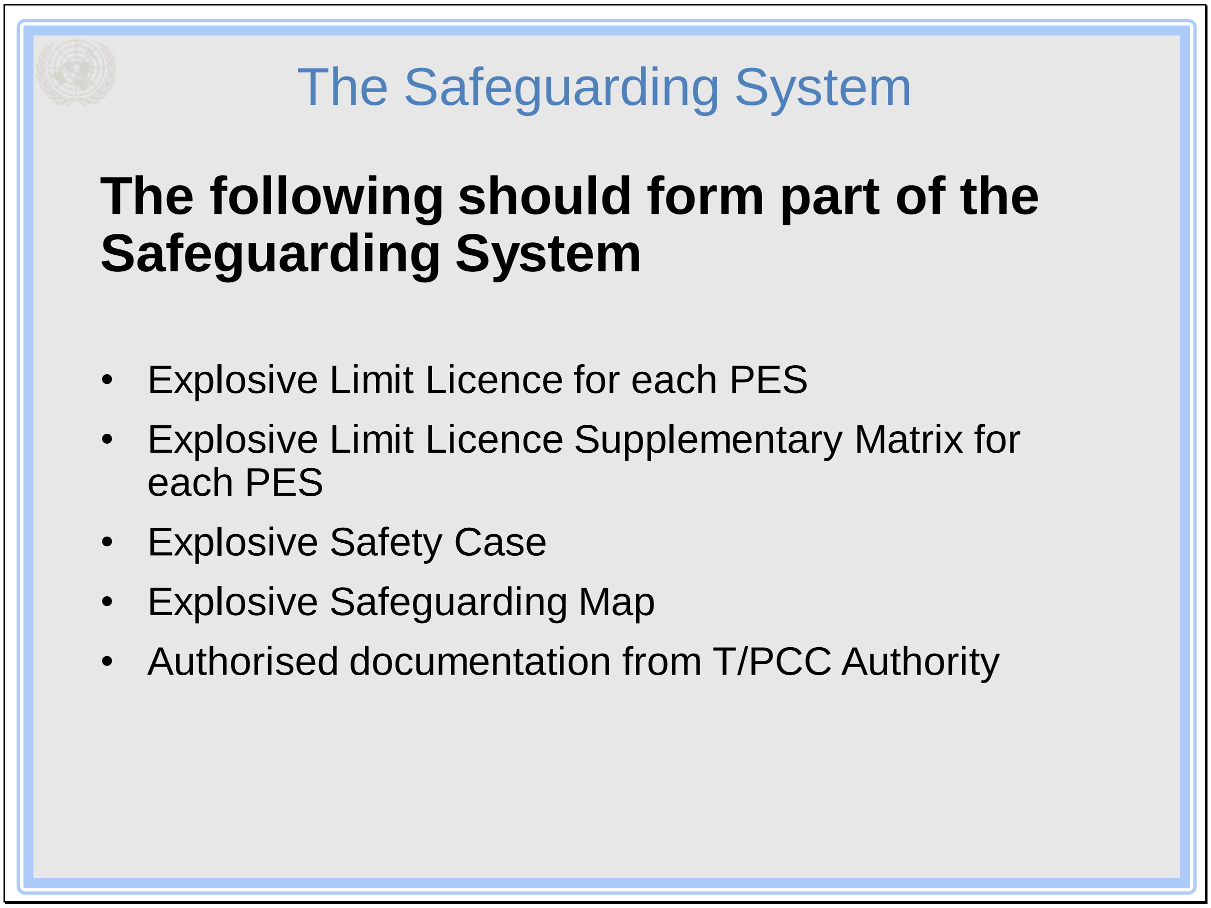
## Important Definitions

### Safeguarding

- To a consultative procedure with the appropriate local authority whereby safeguarded areas outside boundary fences are established for each explosives establishment.
- Explosives Safeguarding maps for each establishment are produced depicting a Yellow Line based on inhabited building distance (IBD) and a Purple Line, usually but not always, based on 2 x IBD.
- Aim to restrict the construction of any inhabited building or public traffic routes within the yellow line and the construction of curtainwall and high rise buildings with large glazed areas, between the yellow and purple lines.

**Main idea/objective for slide:**

- **Introduce the concept of Safeguarding and provide the relevant definitions to the participants.**



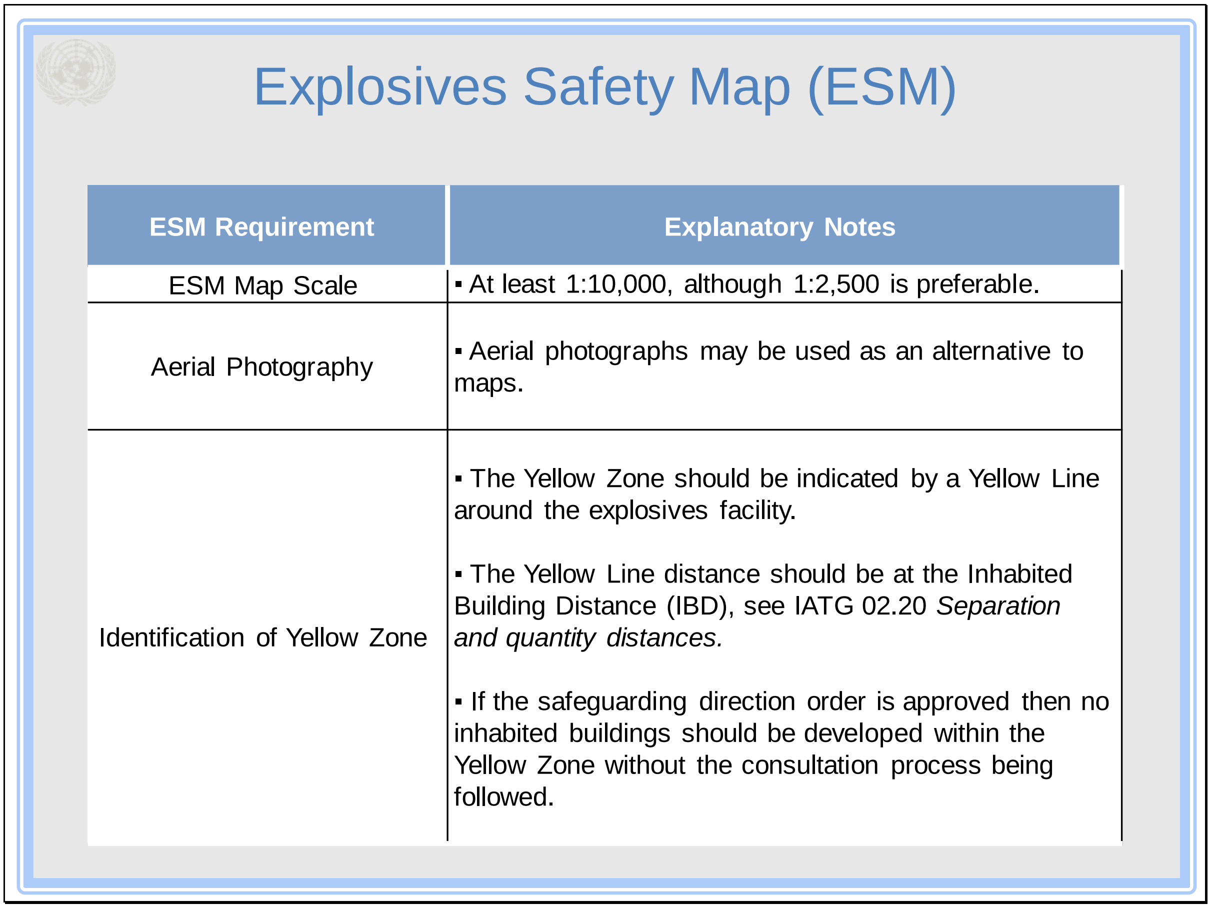
## The Safeguarding System

**The following should form part of the Safeguarding System**

- Explosive Limit Licence for each PES
- Explosive Limit Licence Supplementary Matrix for each PES
- Explosive Safety Case
- Explosive Safeguarding Map
- Authorised documentation from T/PCC Authority

**Main idea/objective for slide:**

- **Outline the requirements of safeguarding systems, the responsibilities of key personnel in completing the documentation and the preparation of the Explosive Safety Case to include safeguarding maps.**



## Explosives Safety Map (ESM)

| ESM Requirement | Explanatory Notes |
|---|---|
| ESM Map Scale | ▪ At least 1:10,000, although 1:2,500 is preferable. |
| Aerial Photography | ▪ Aerial photographs may be used as an alternative to maps. |
| Identification of Yellow Zone | ▪ The Yellow Zone should be indicated by a Yellow Line around the explosives facility.<br>▪ The Yellow Line distance should be at the Inhabited Building Distance (IBD), see IATG 02.20 *Separation and quantity distances.*<br>▪ If the safeguarding direction order is approved then no inhabited buildings should be developed within the Yellow Zone without the consultation process being followed. |

**Main idea/objective for slide:**

- **Outline the requirements of safeguarding systems, the responsibilities of key personnel in completing the documentation and the preparation of the Explosive Safety Case to include safeguarding maps.**

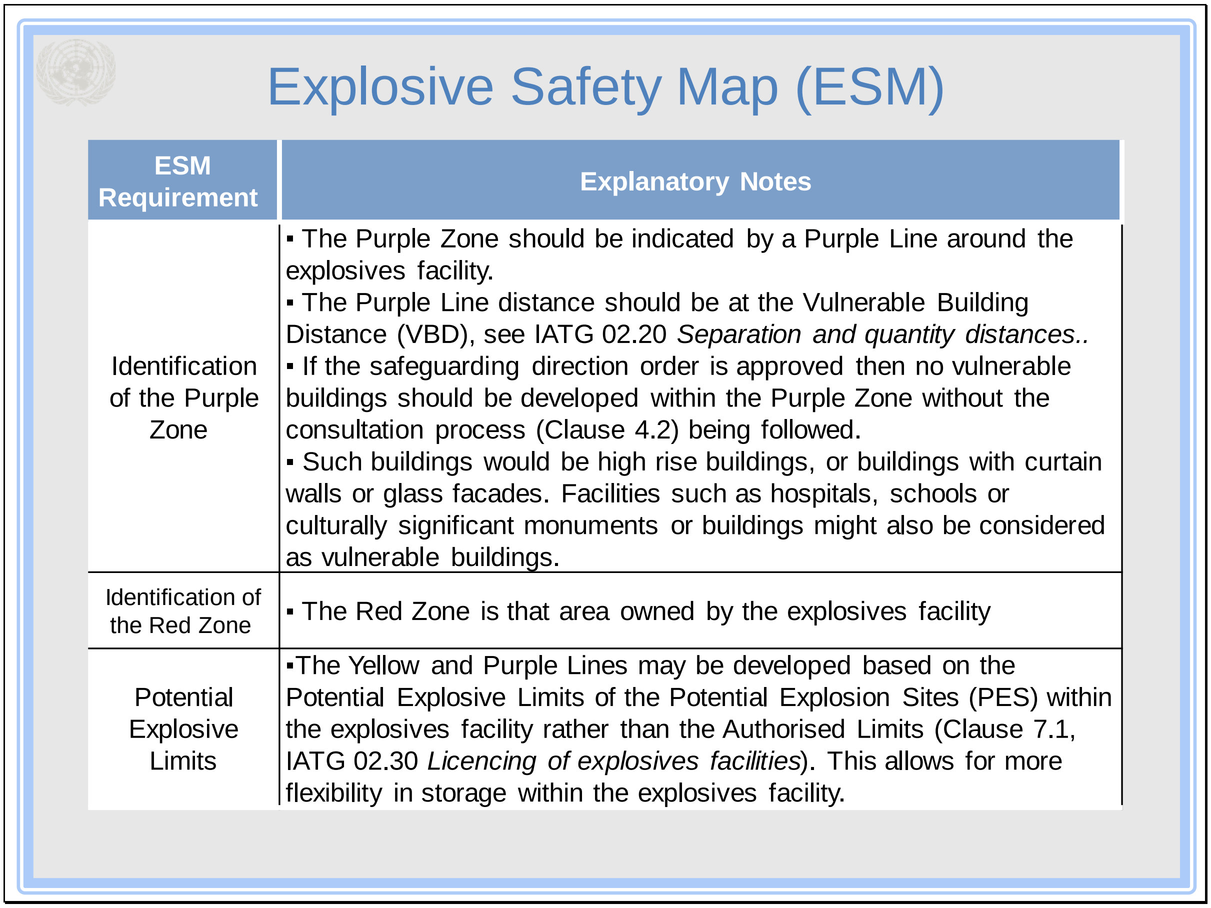
What the instructor should cover (in addition to slide content)

- Provide a hand out **IATG 02.40 – Safeguarding Explosives Facilities, page 3-4**
- Explain how to use this table to build up an Explosive Safety Map

References/further reading

http://data.unsaferguard.org/iatg/en/IATG-02.40-Safeguarding-explosives-facilities-IATG-V.3.pdf

Slide 63



## Explosive Safety Map (ESM)

| ESM Requirement | Explanatory Notes |
|---|---|
| Identification of the Purple Zone | ▪ The Purple Zone should be indicated by a Purple Line around the explosives facility.<br>▪ The Purple Line distance should be at the Vulnerable Building Distance (VBD), see IATG 02.20 *Separation and quantity distances..*<br>▪ If the safeguarding direction order is approved then no vulnerable buildings should be developed within the Purple Zone without the consultation process (Clause 4.2) being followed.<br>▪ Such buildings would be high rise buildings, or buildings with curtain walls or glass facades. Facilities such as hospitals, schools or culturally significant monuments or buildings might also be considered as vulnerable buildings. |
| Identification of the Red Zone | ▪ The Red Zone is that area owned by the explosives facility |
| Potential Explosive Limits | ▪The Yellow and Purple Lines may be developed based on the Potential Explosive Limits of the Potential Explosion Sites (PES) within the explosives facility rather than the Authorised Limits (Clause 7.1, IATG 02.30 *Licencing of explosives facilities*). This allows for more flexibility in storage within the explosives facility. |

**Main idea/objective for slide:**

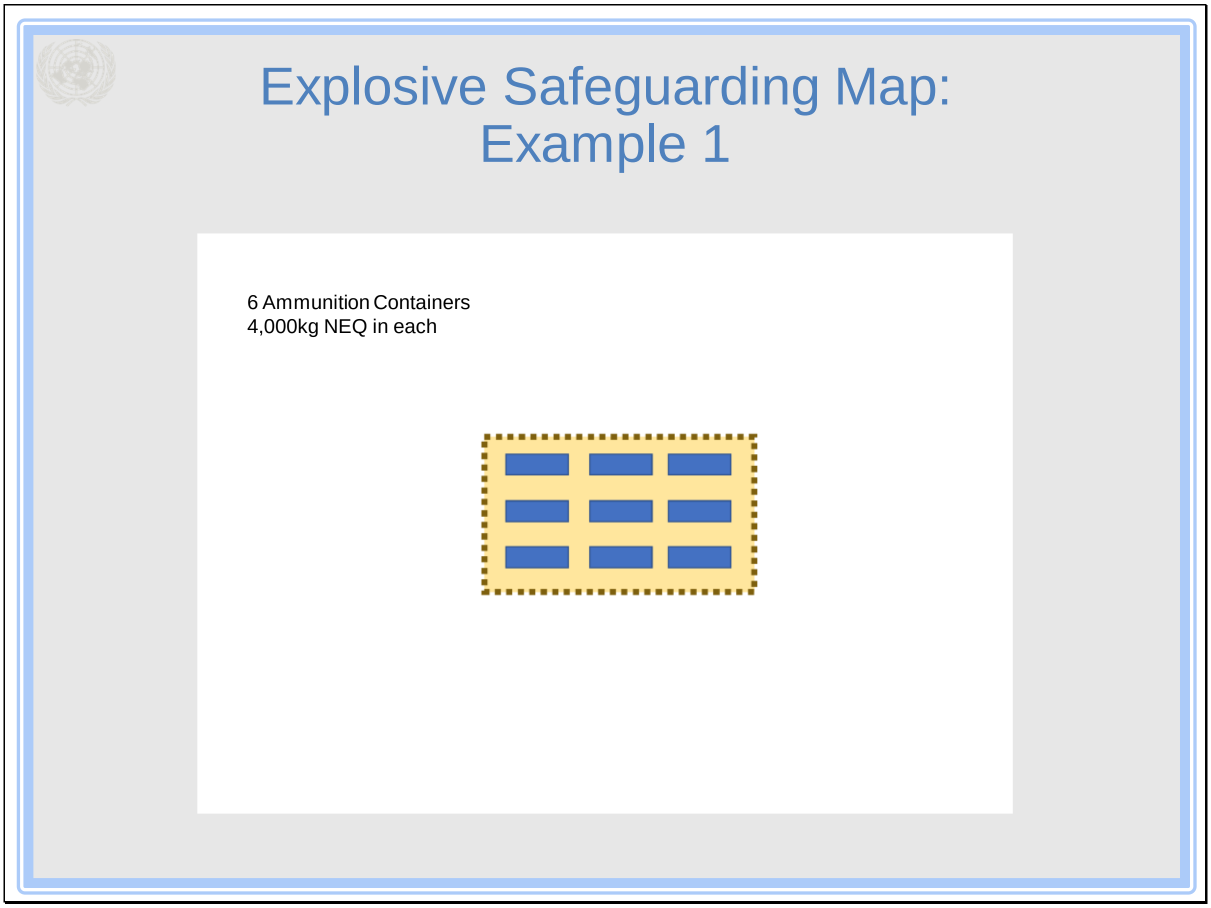
- **Outline the requirements of safeguarding systems, the responsibilities of key personnel in completing the documentation and the preparation of the Explosive Safety Case to include safeguarding maps.**

What the instructor should cover (in addition to slide content)

- Provide a hand out **IATG 02.40 – Safeguarding Explosives Facilities, page 3-4**
- Explain how to use this table to build up an Explosive Safety Map

References/further reading

http://data.unsaferguard.org/iatg/en/IATG-02.40-Safeguarding-explosives-facilities-IATG-V.3.pdf



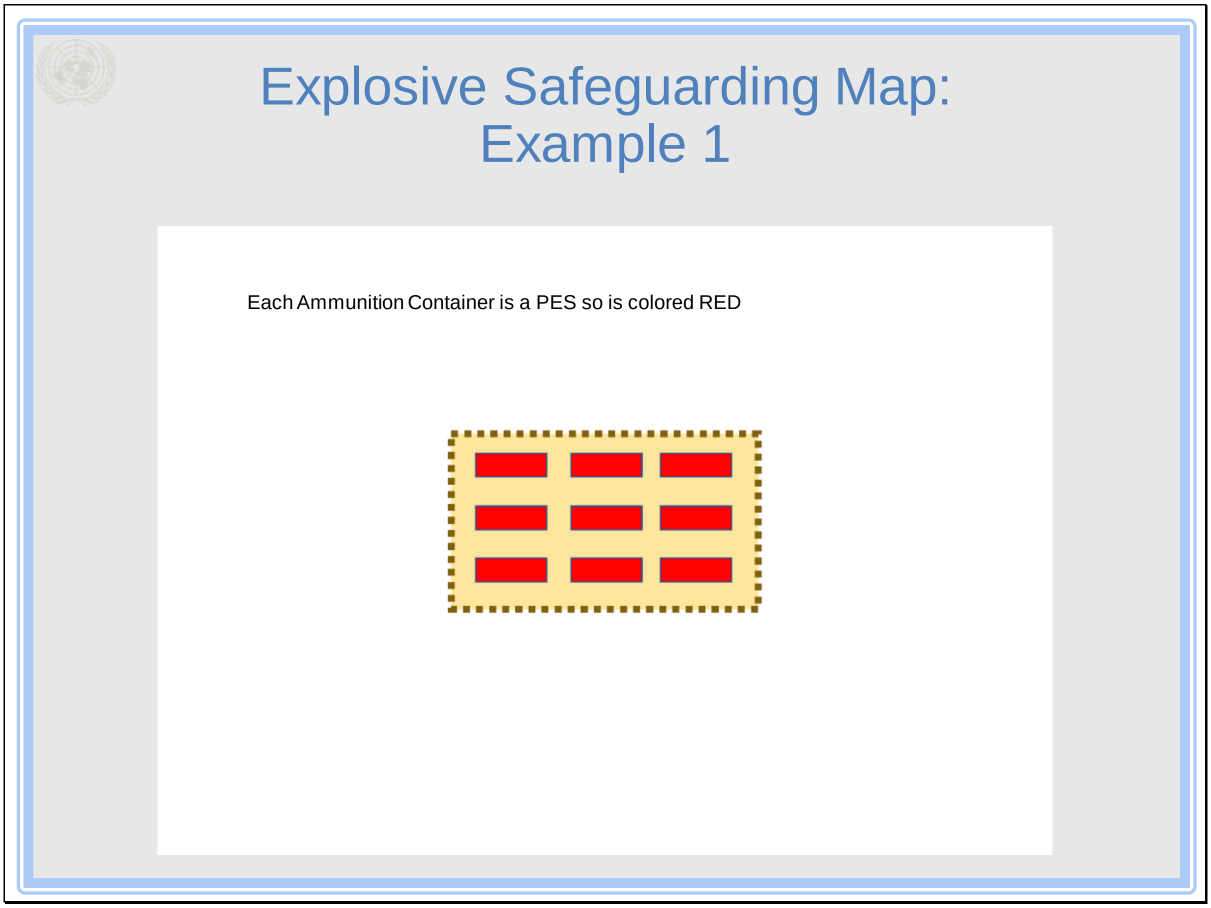
## Explosive Safeguarding Map: Example 1

6 Ammunition Containers
4,000kg NEQ in each

**<u>Main idea/objective for slide:</u>**

- **Introduce the participant to building a 'Yellow' and Purple' Line in a Green Field Setting, with maximum allowable NEQ being stored.**

<u>What the instructor should cover (in addition to slide content)</u>
Explain that each container is a Potential Explosion Site and so must be individually measured
Each container is holding the maximum allowable NEQ for Temporary Storage – 4,000kg
Use the Temporary Storage Reduced Quantity Distances



## Explosive Safeguarding Map: Example 1

Each Ammunition Container is a PES so is colored RED

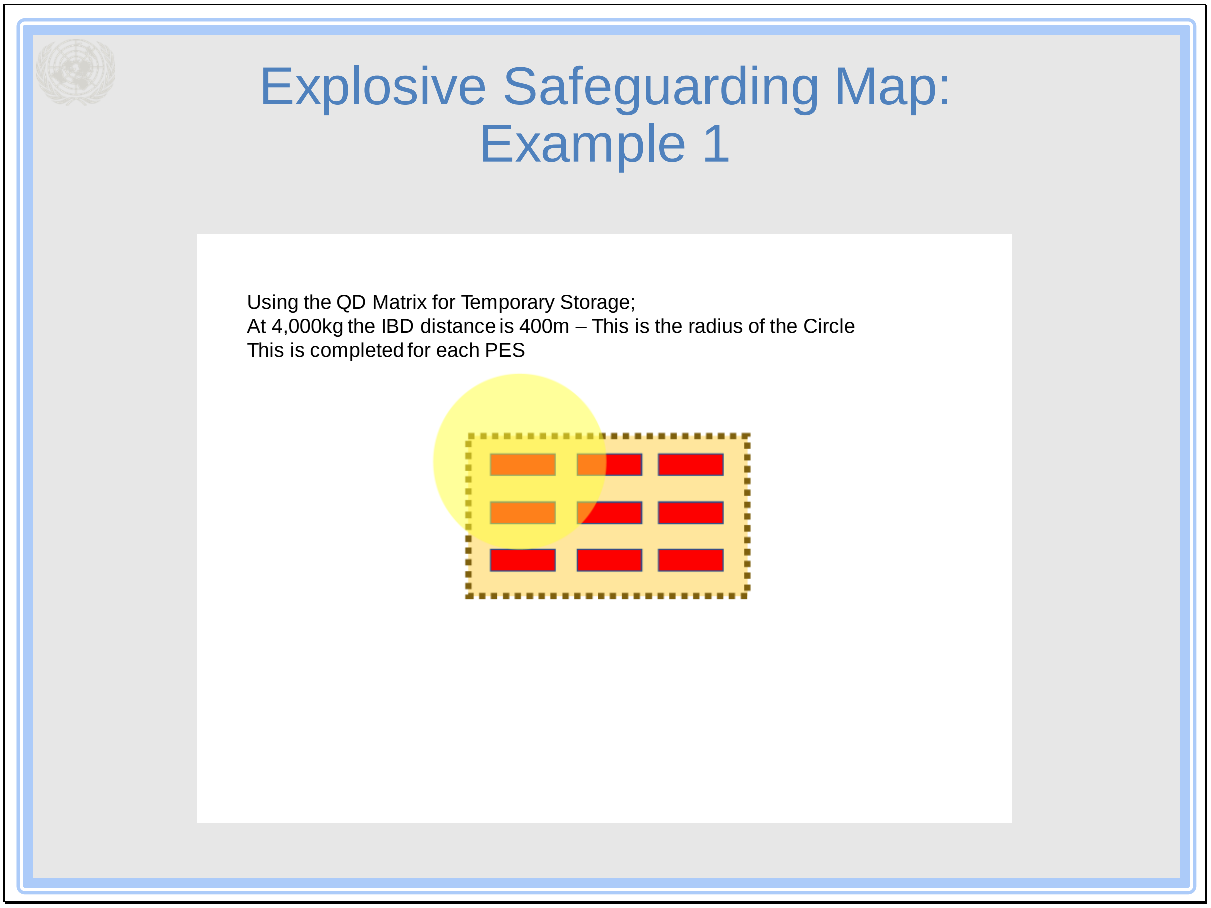
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be coloured RED

Slide 66



# Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

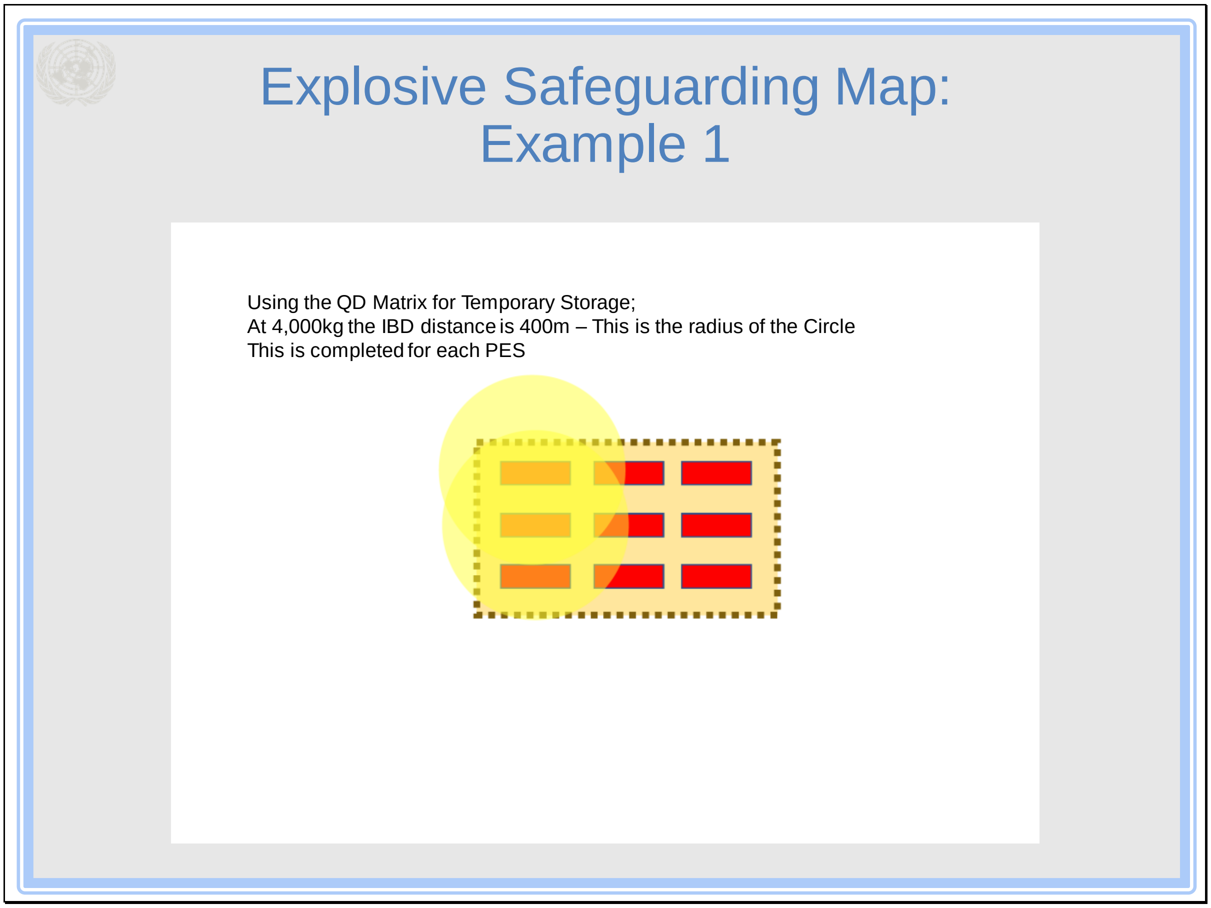
What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be individually measured

Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m

Slide 67



## Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

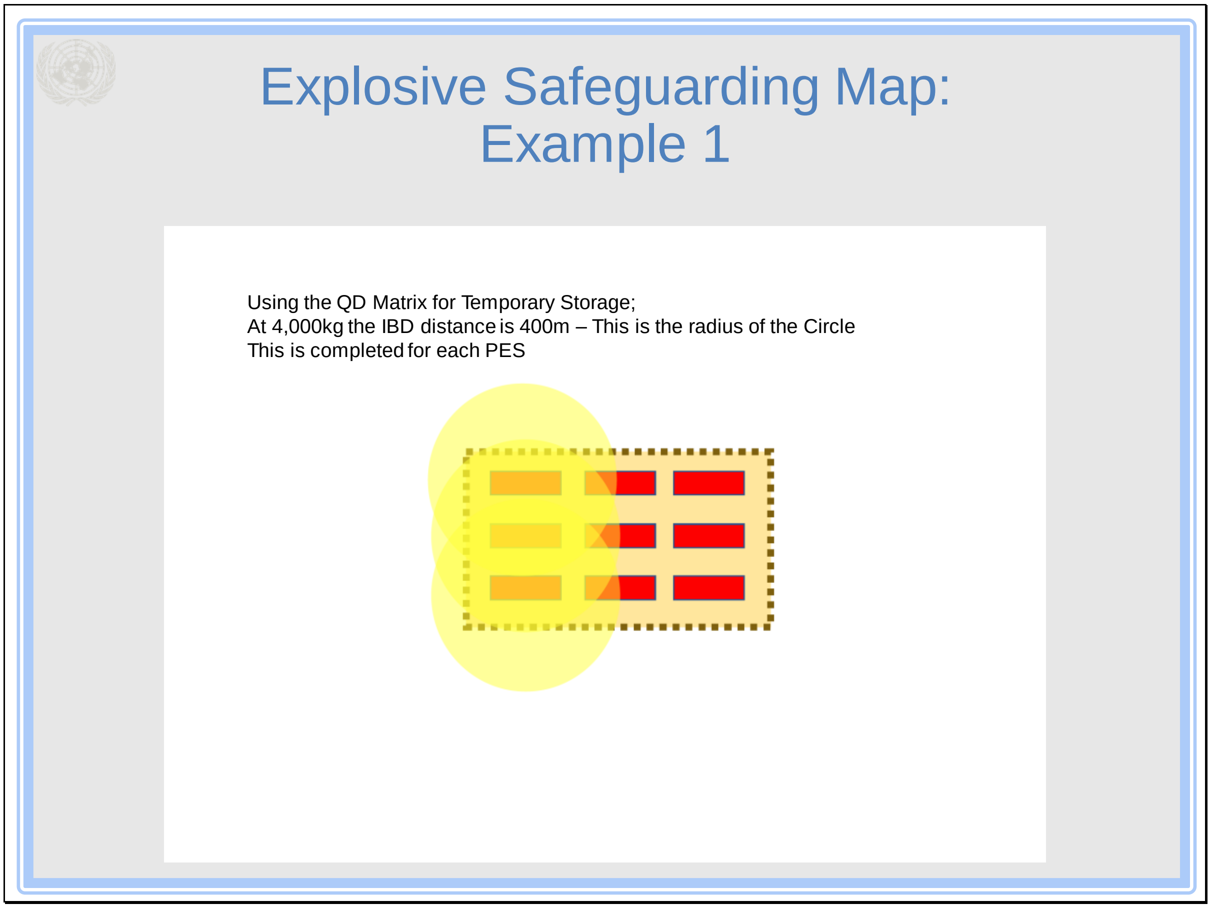
What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be individually measured

Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m

Slide 68



## Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

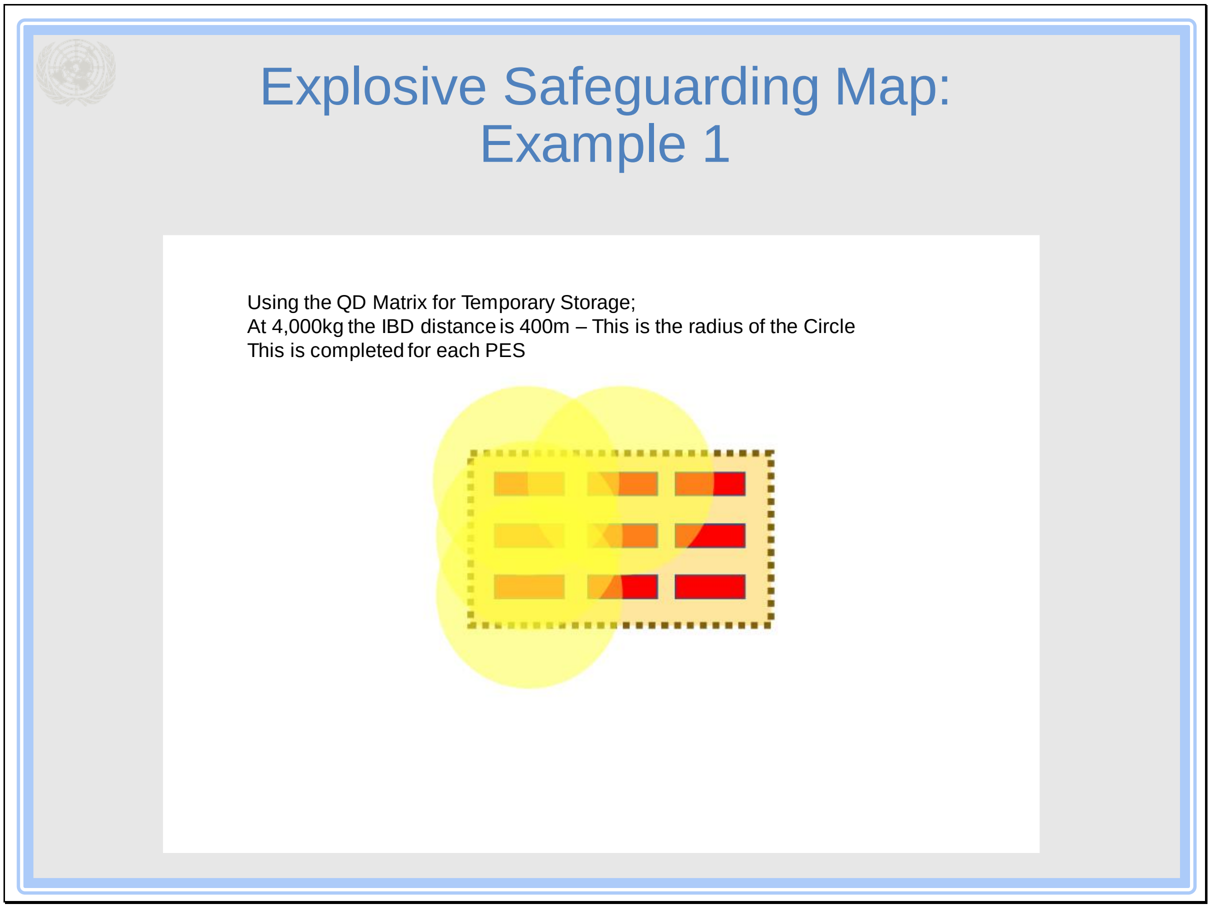
What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be individually measured

Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m

Slide 69



## Explosive Safeguarding Map: Example 1

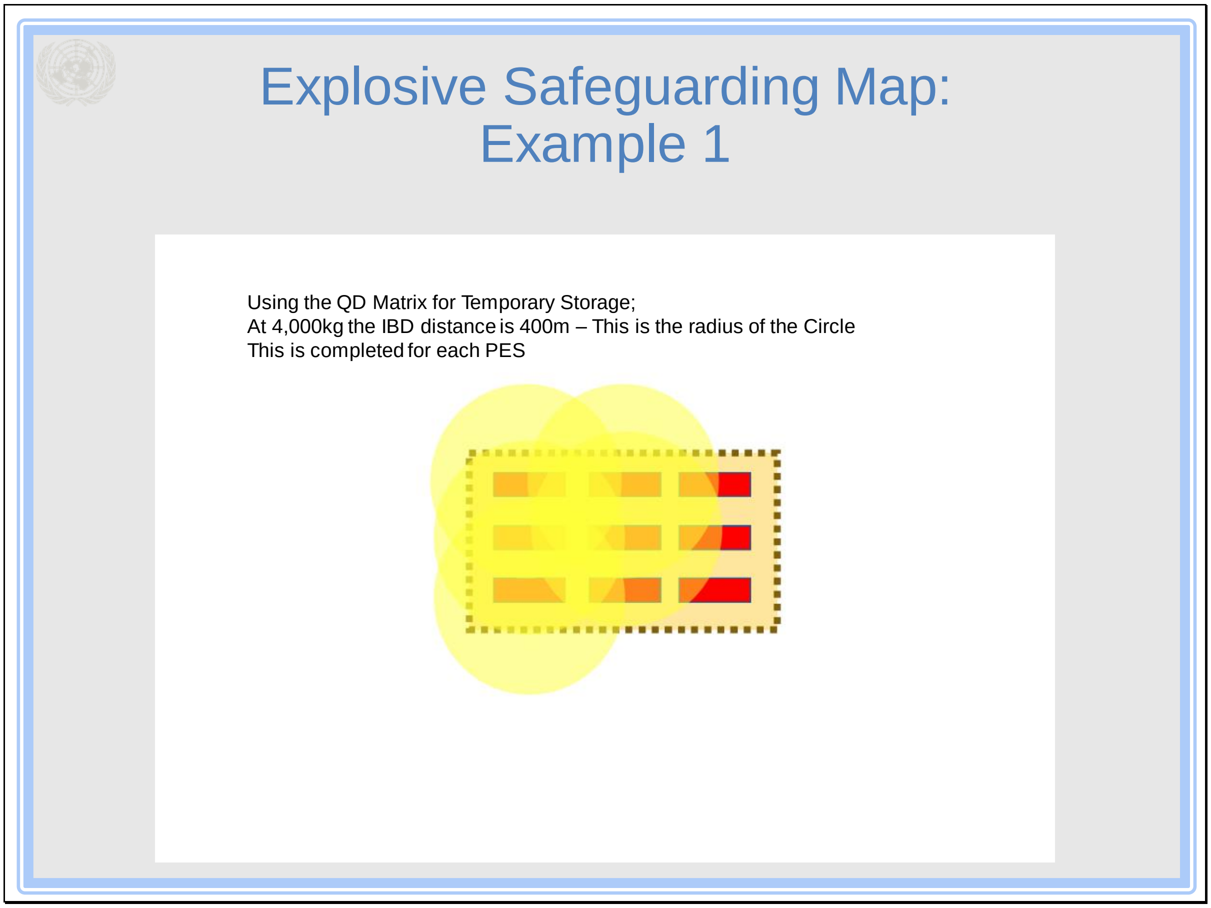
Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
Using the ESM model, build out the example map here

Slide 70



## Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**Main idea/objective for slide:**

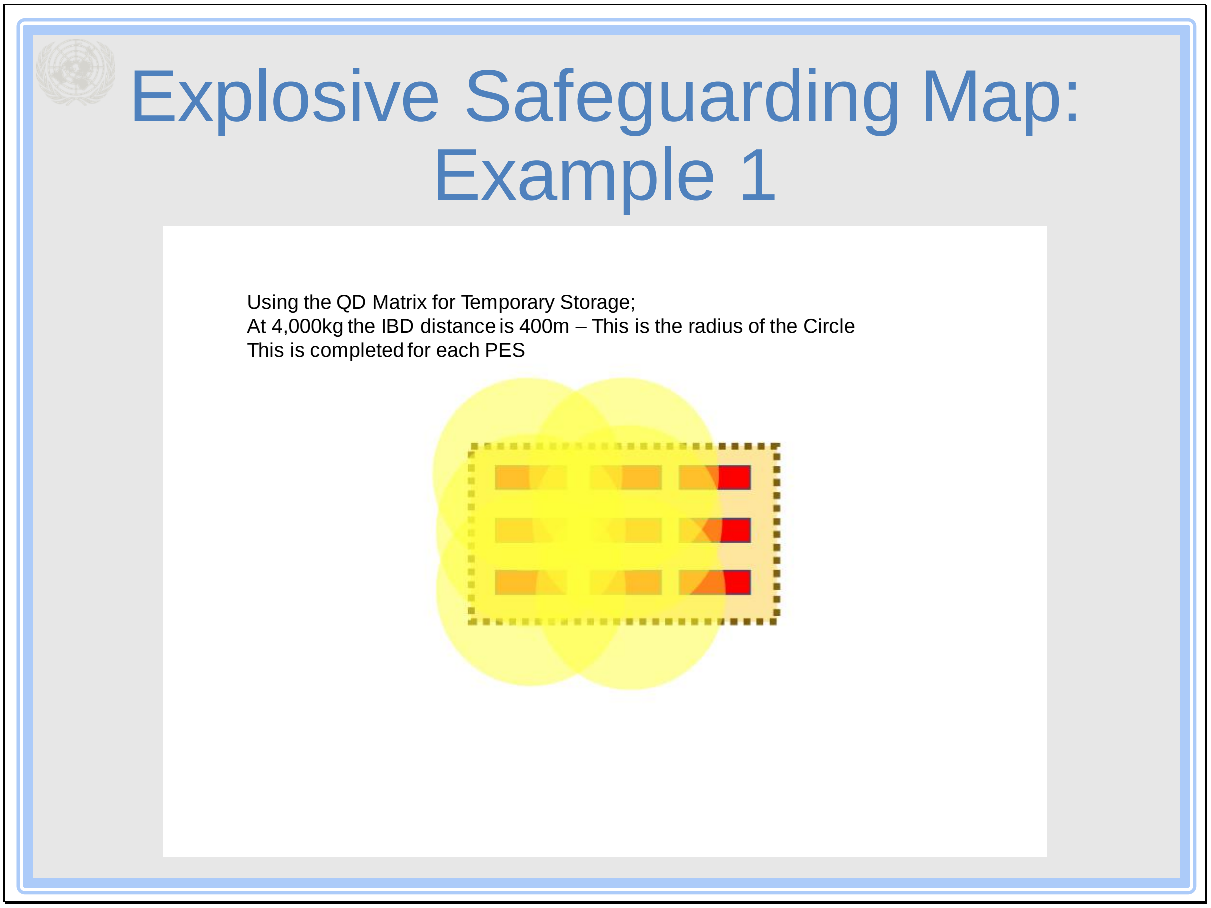
- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be individually measured

Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m



# Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

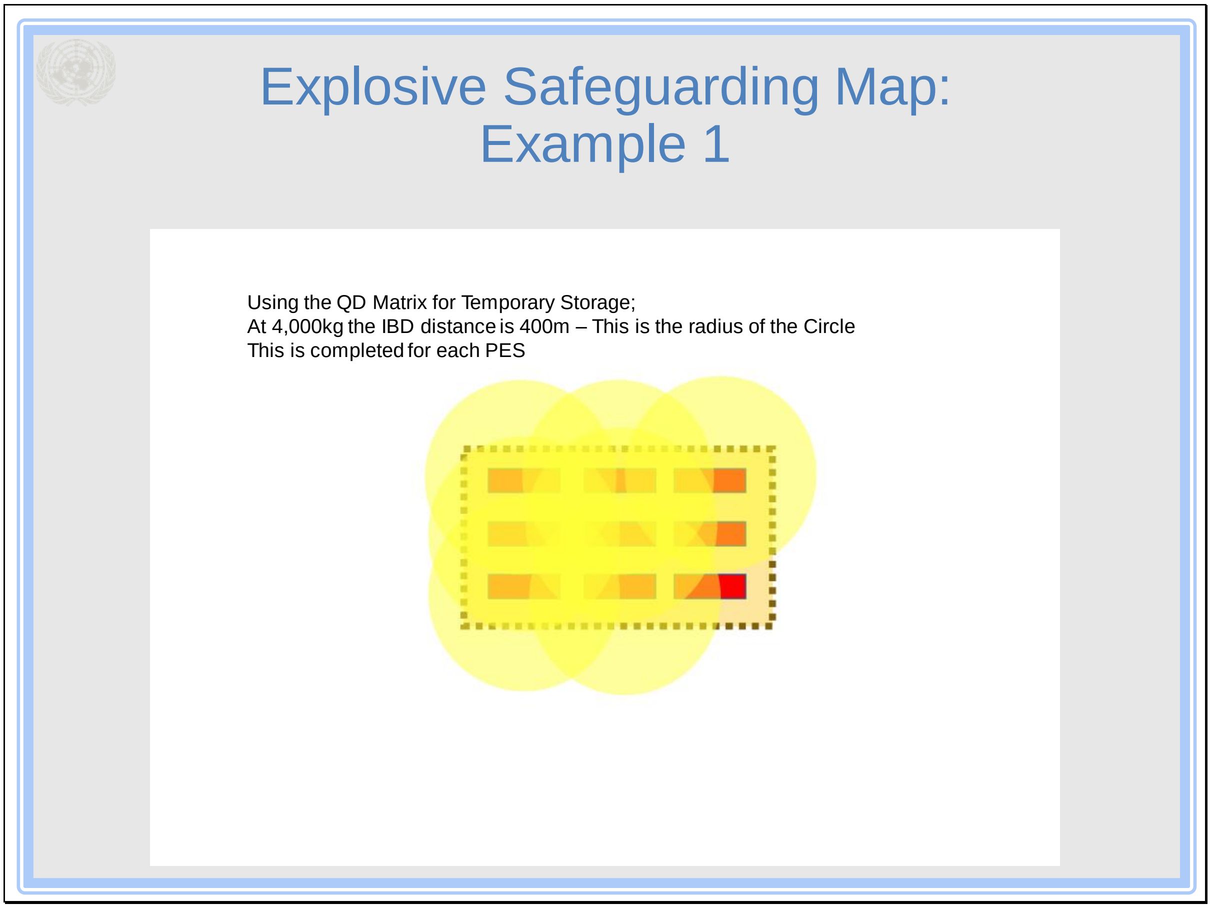
What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be individually measured

Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m

Slide 72



# Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

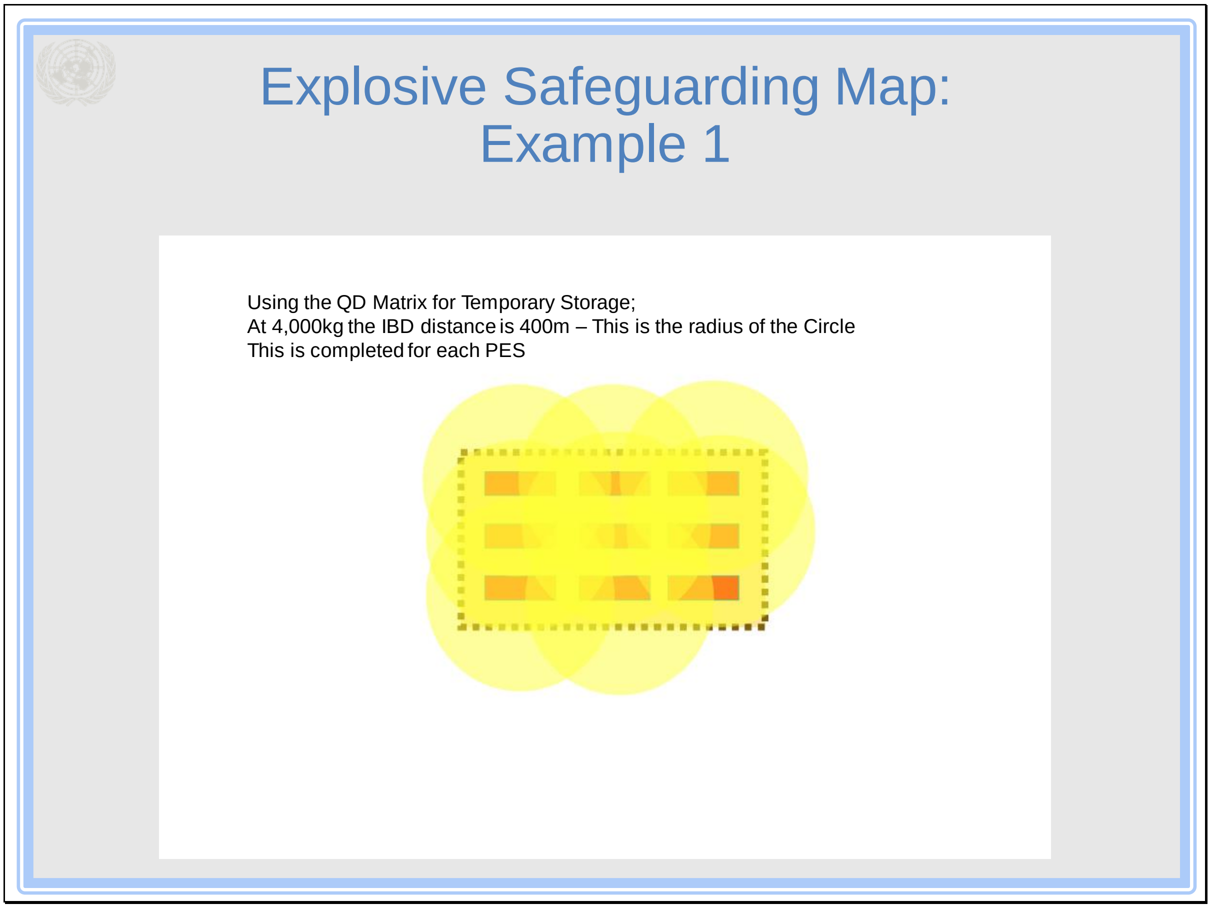
What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be individually measured

Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m

Slide 73



# Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

**Main idea/objective for slide:**

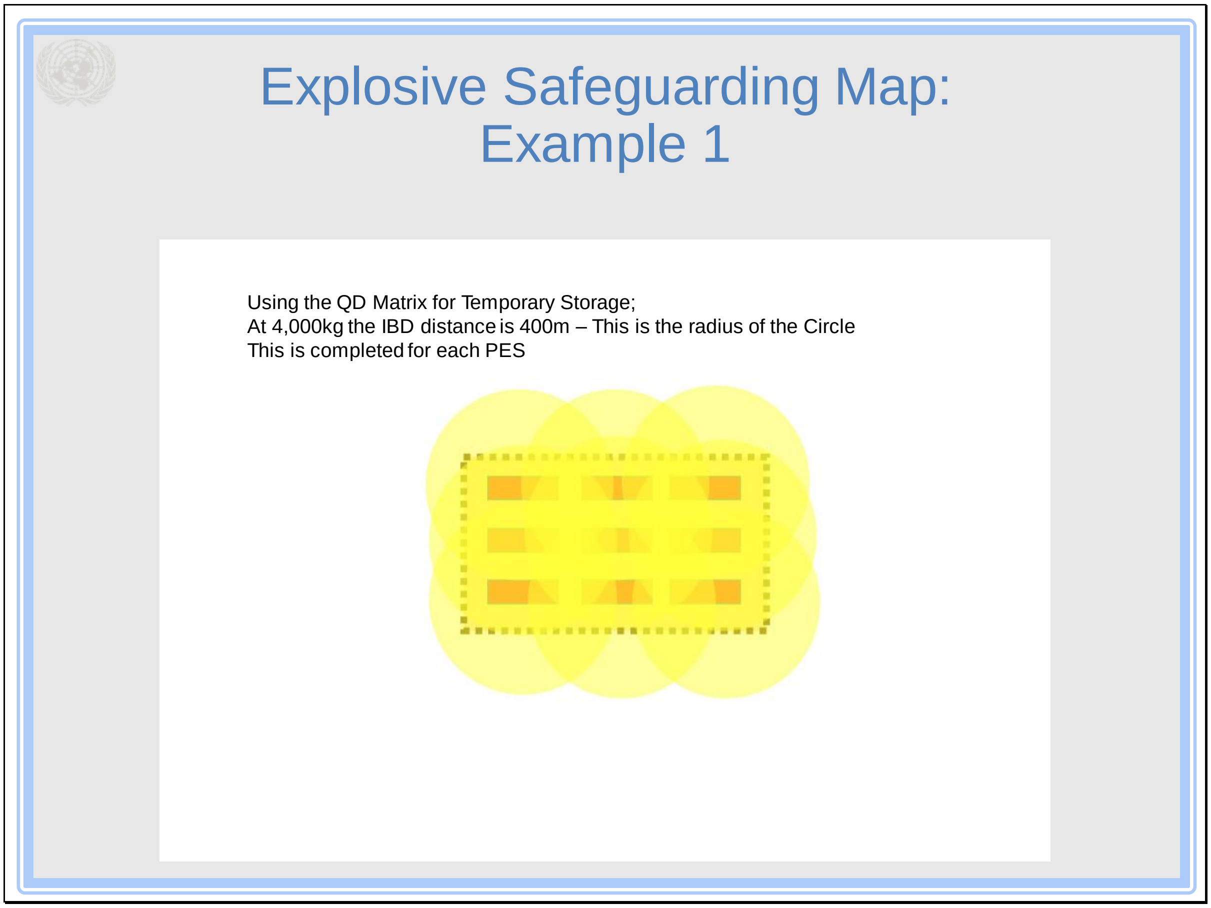
- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Explain that each container is a Potential Explosion Site and so must be individually measured

Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m



### Explosive Safeguarding Map: Example 1

Using the QD Matrix for Temporary Storage;
At 4,000kg the IBD distance is 400m – This is the radius of the Circle
This is completed for each PES

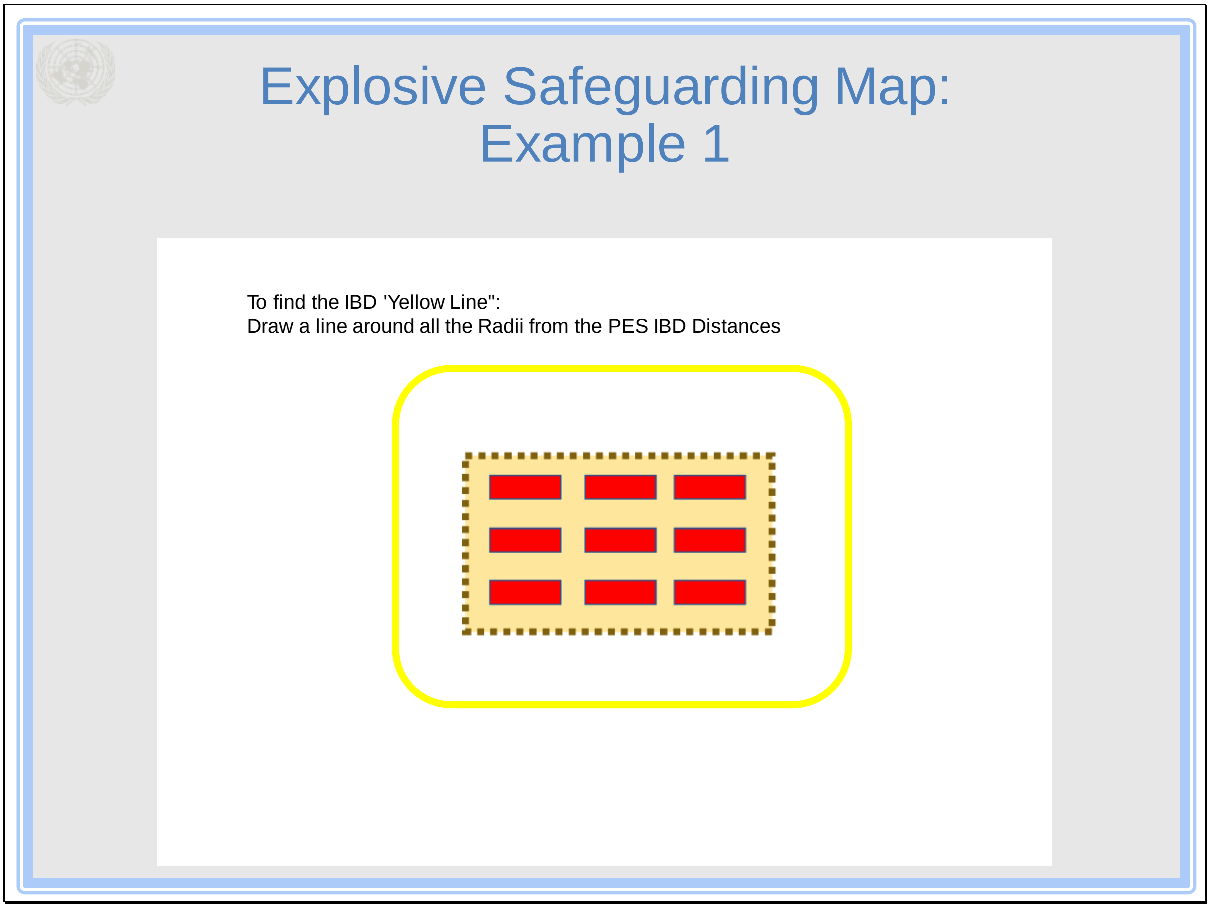
**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
Explain that each container is a Potential Explosion Site and so must be individually measured
Using the Temporary Storage Reduced Quantity Distances:

- Determine the NEQ, which in this case is 4,000kg
- Apply the Reduced Quantity Distances tables for an Unbarricaded Light structure to Unprotected civilian population – T9
- Using the Reduced QD tables, we find that the for 4,000kg we have a radius distance of 400m

Slide 75



# Explosive Safeguarding Map: Example 1

To find the IBD 'Yellow Line":
Draw a line around all the Radii from the PES IBD Distances

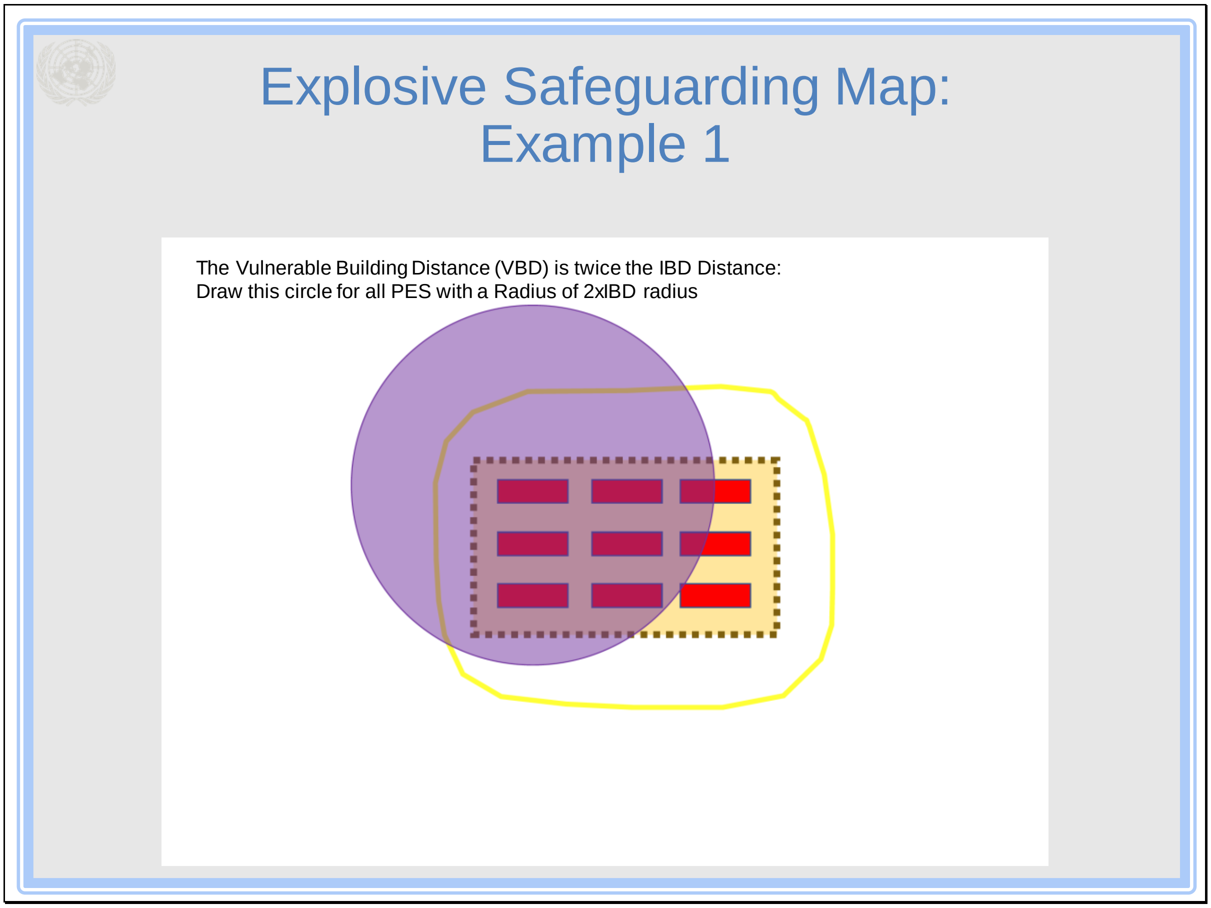
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

When each IBD circle has been included, draw a yellow line around all the circles – this is the IBD 'Yellow Line"

Slide 76



# Explosive Safeguarding Map: Example 1

The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

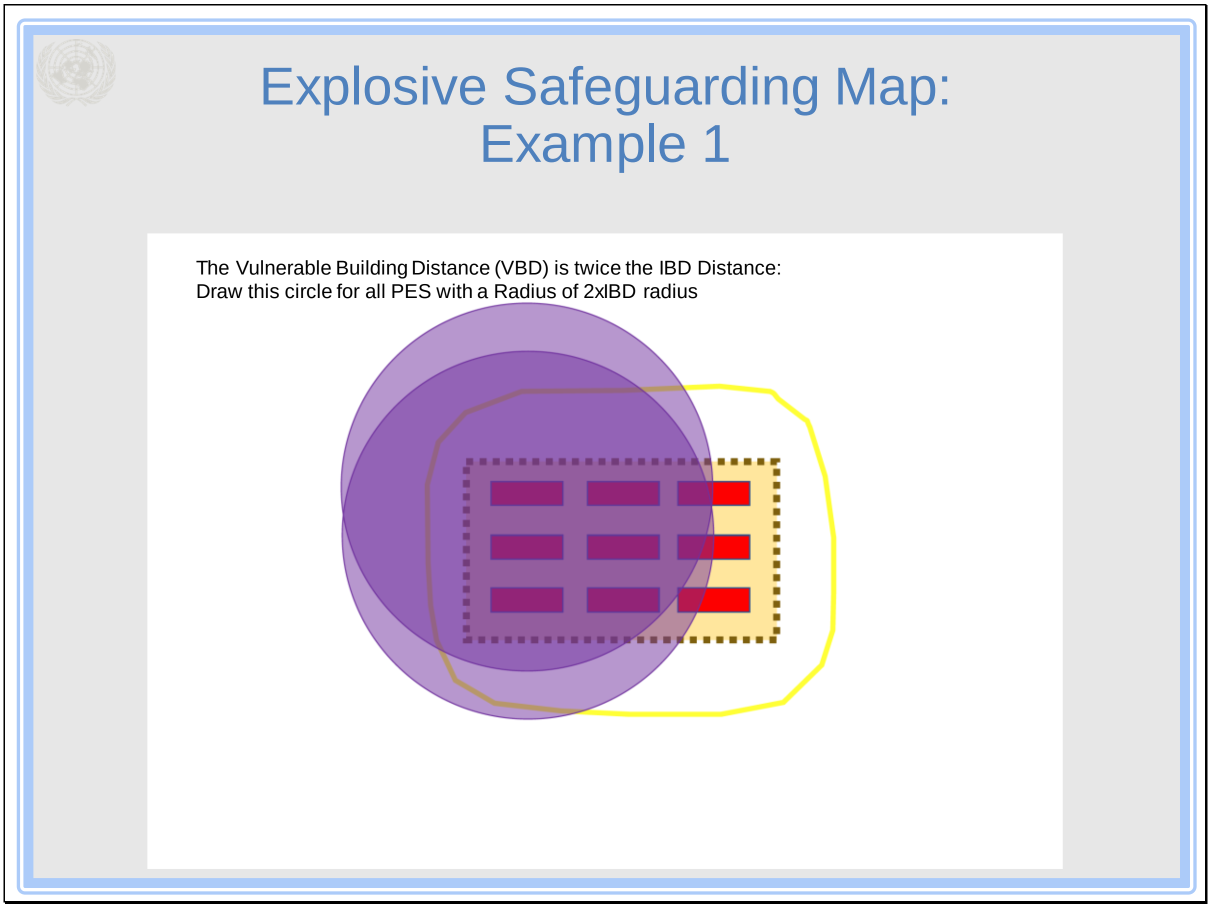
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 77



# Explosive Safeguarding Map: Example 1

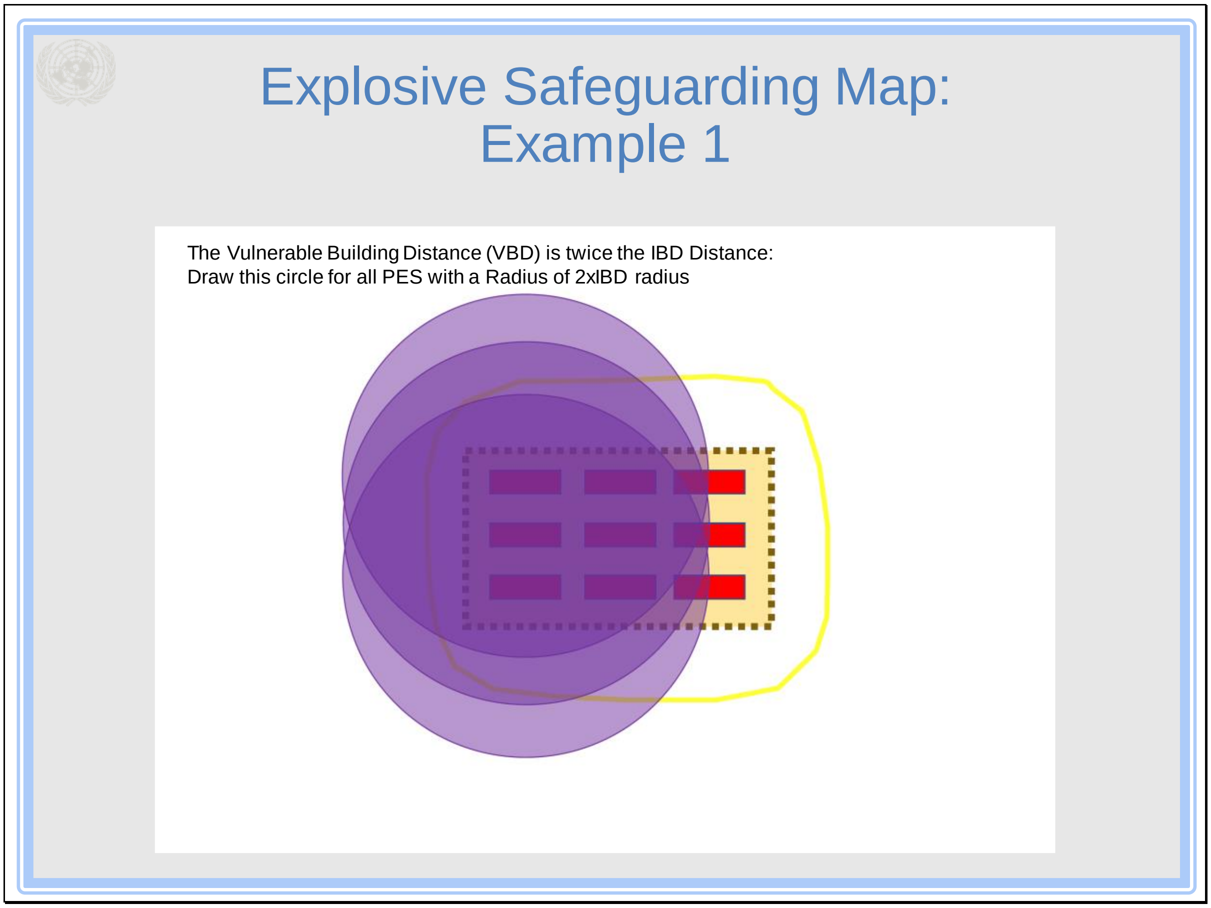
The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 78



Explosive Safeguarding Map:
Example 1

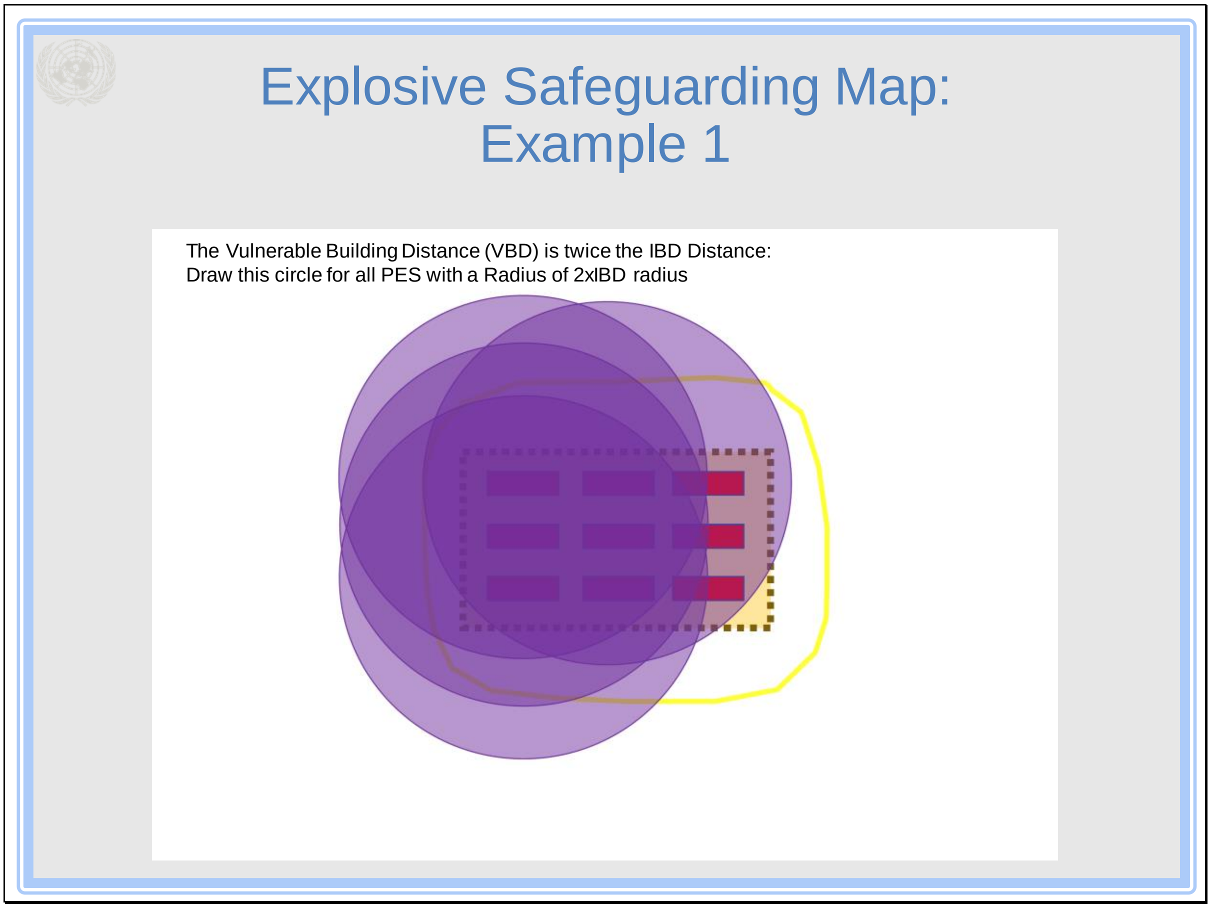
The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 79



# Explosive Safeguarding Map: Example 1

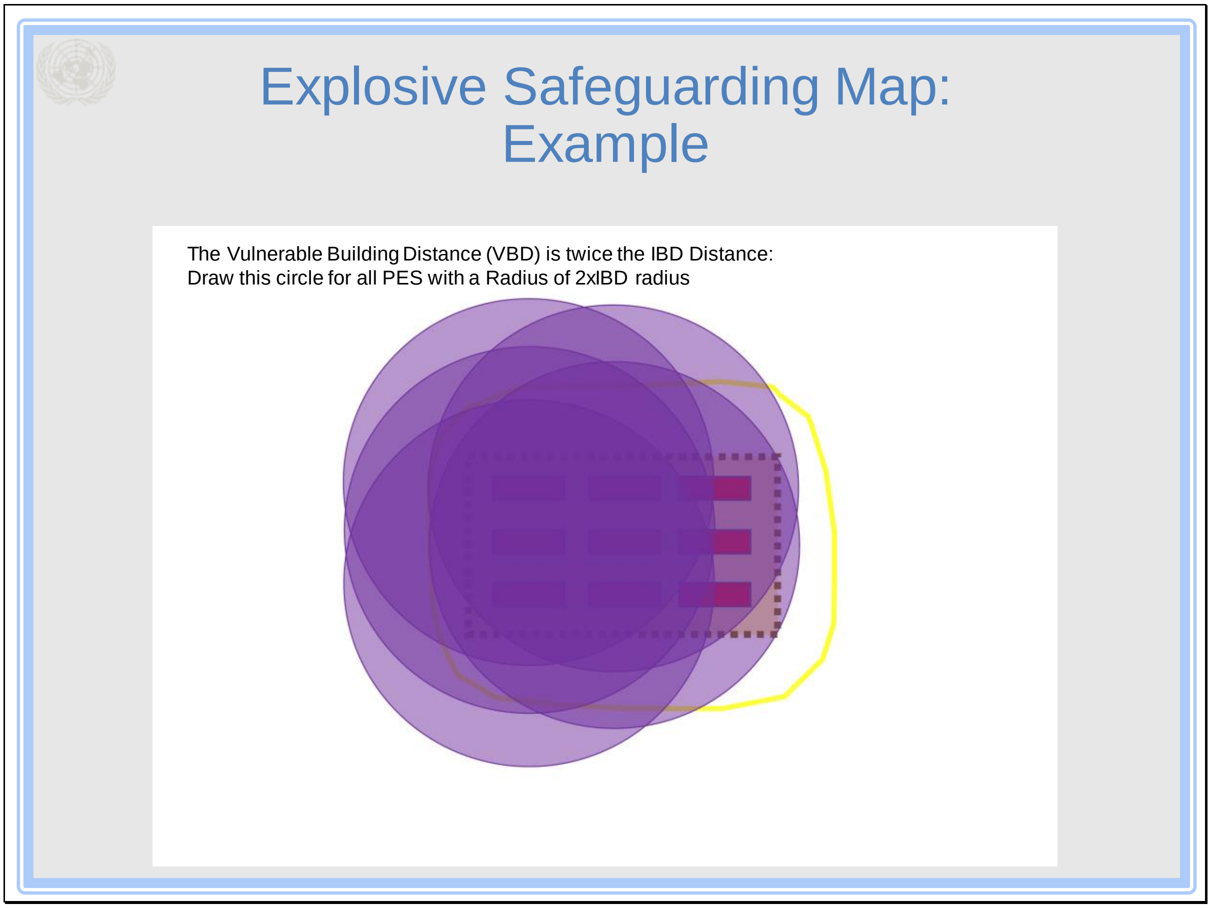
The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

<u>**Main idea/objective for slide:**</u>

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 80



## Explosive Safeguarding Map: Example

The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

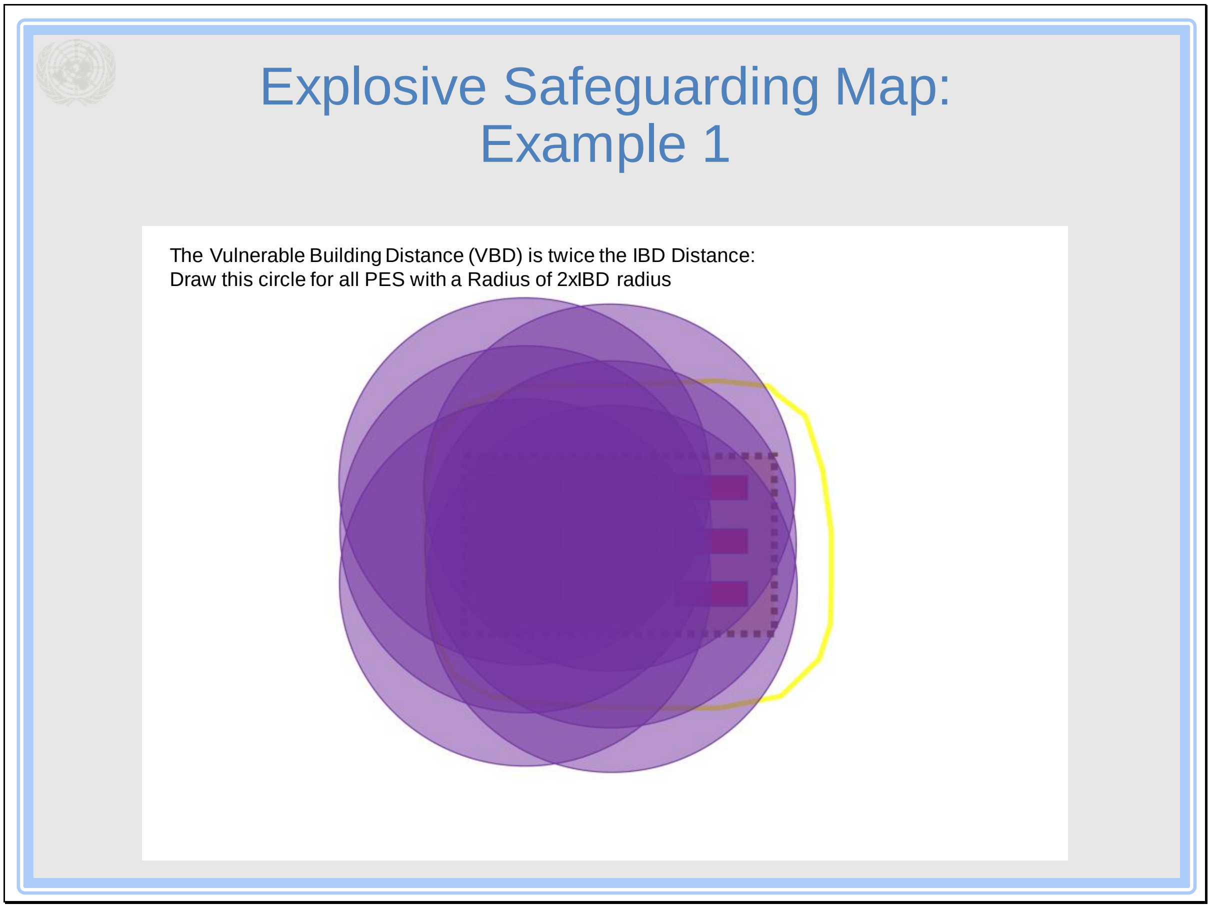
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 81



Explosive Safeguarding Map:
Example 1

The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

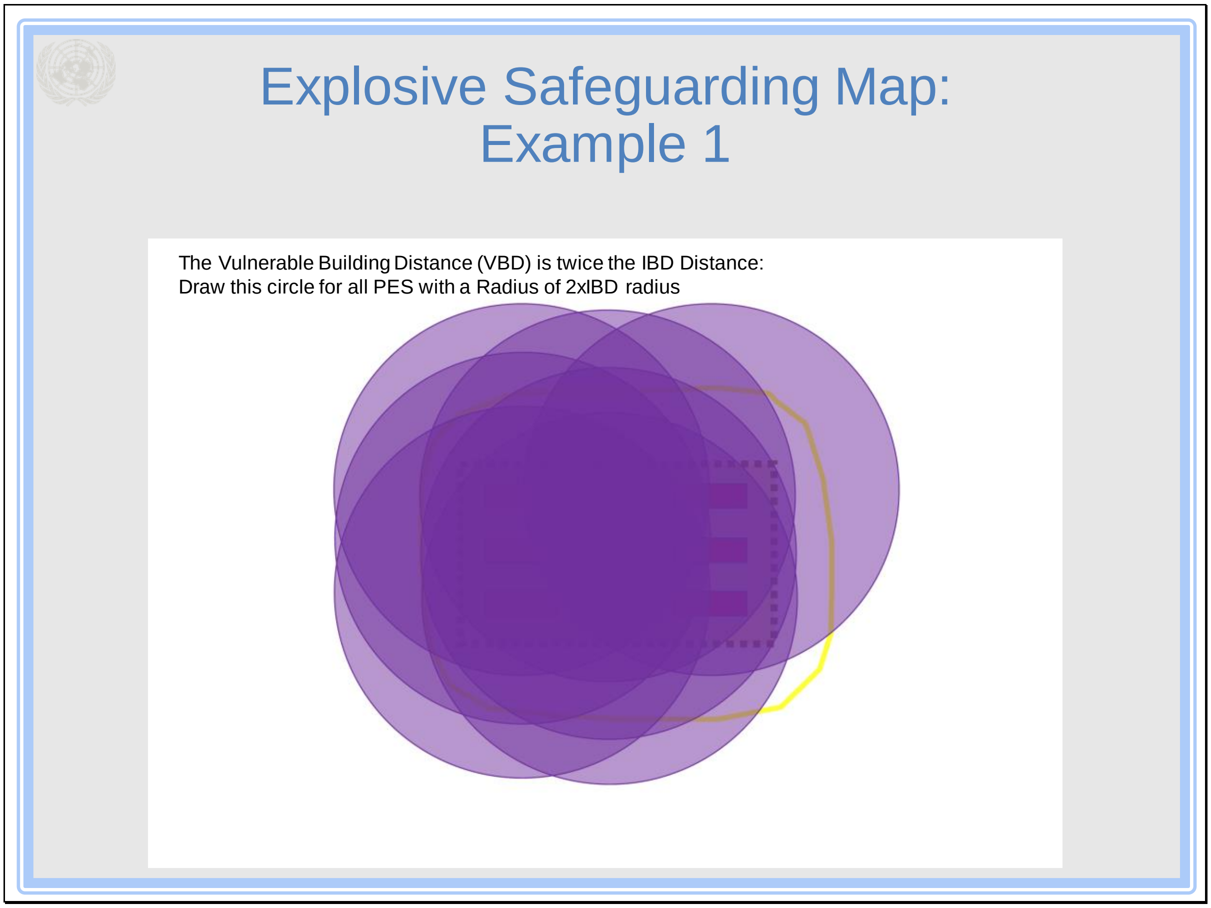
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 82



# Explosive Safeguarding Map: Example 1

The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

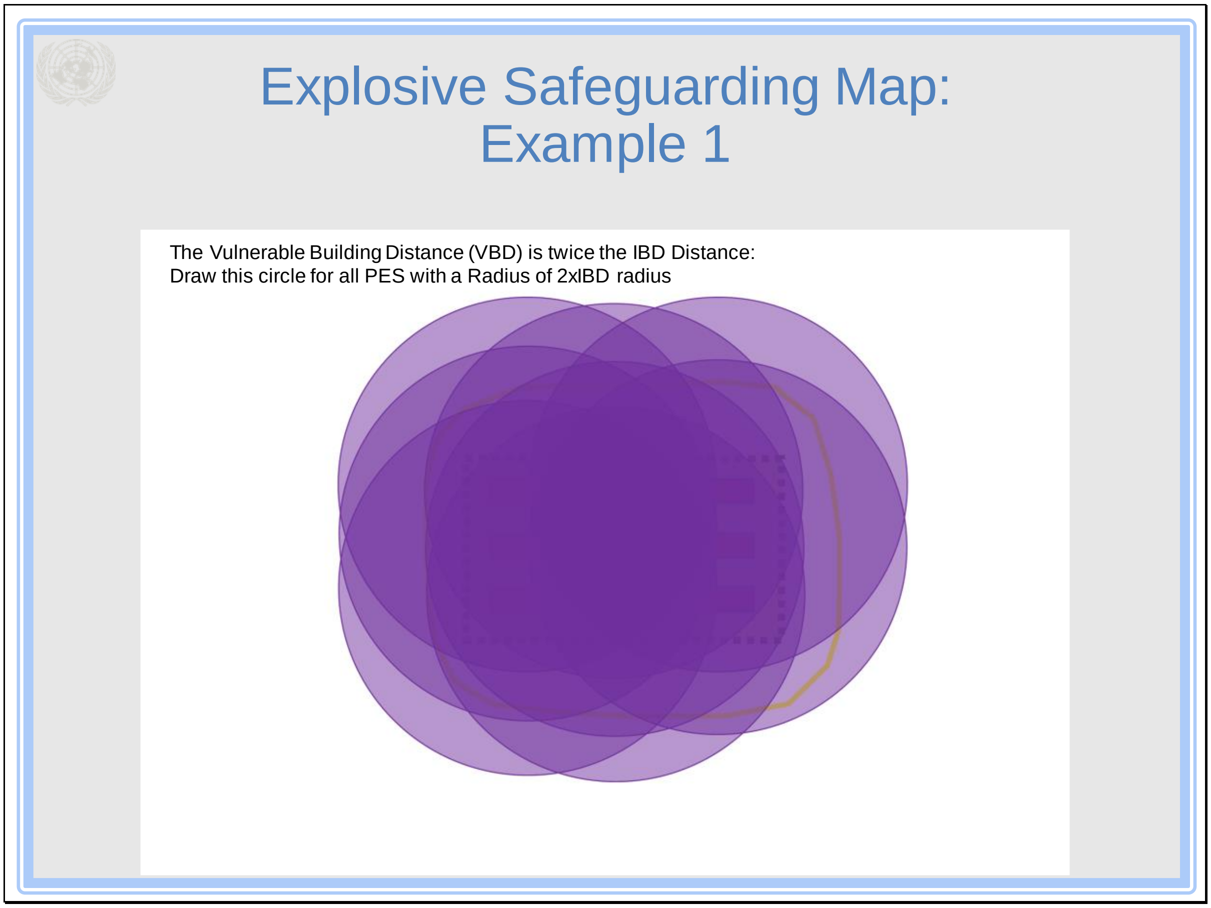
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 83



## Explosive Safeguarding Map: Example 1

The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

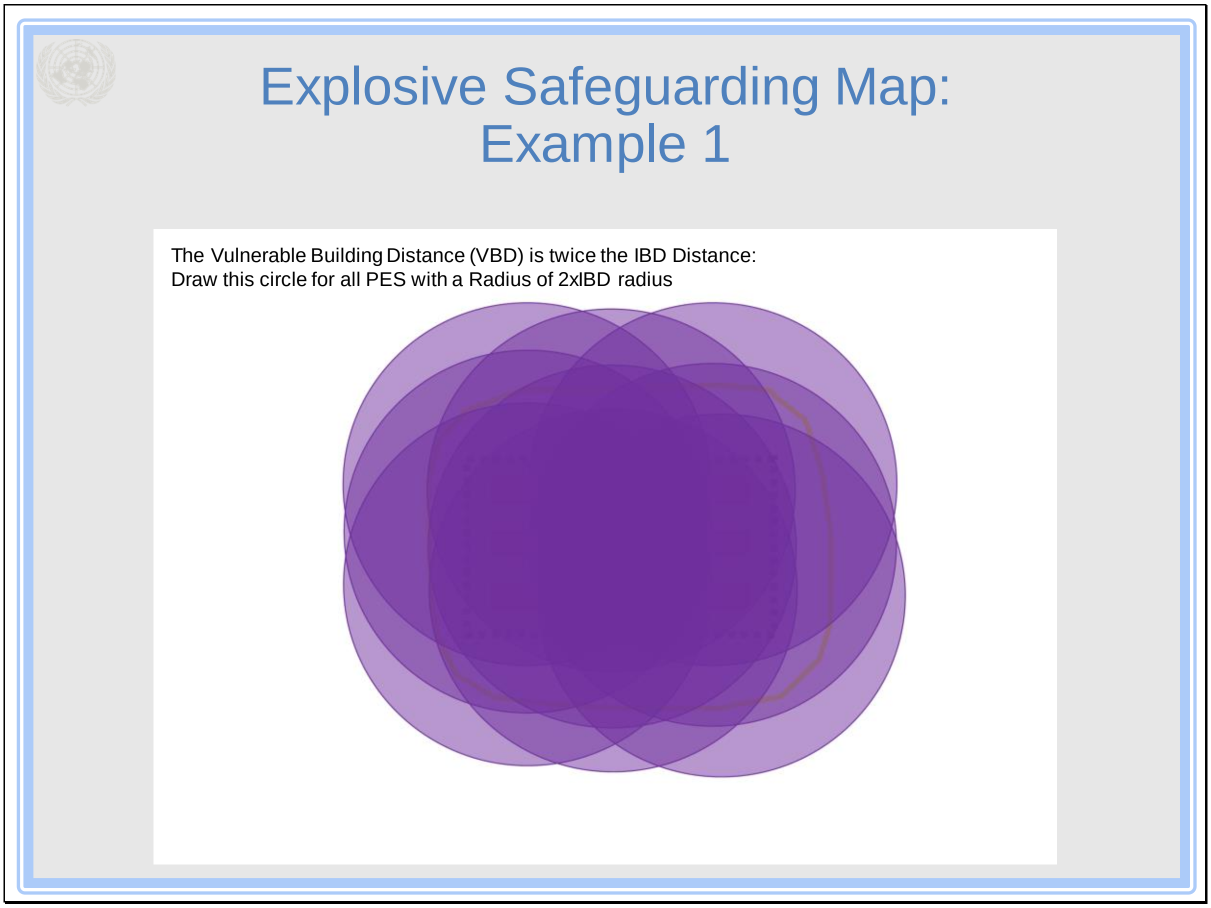
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 84



## Explosive Safeguarding Map: Example 1

The Vulnerable Building Distance (VBD) is twice the IBD Distance:
Draw this circle for all PES with a Radius of 2xIBD radius

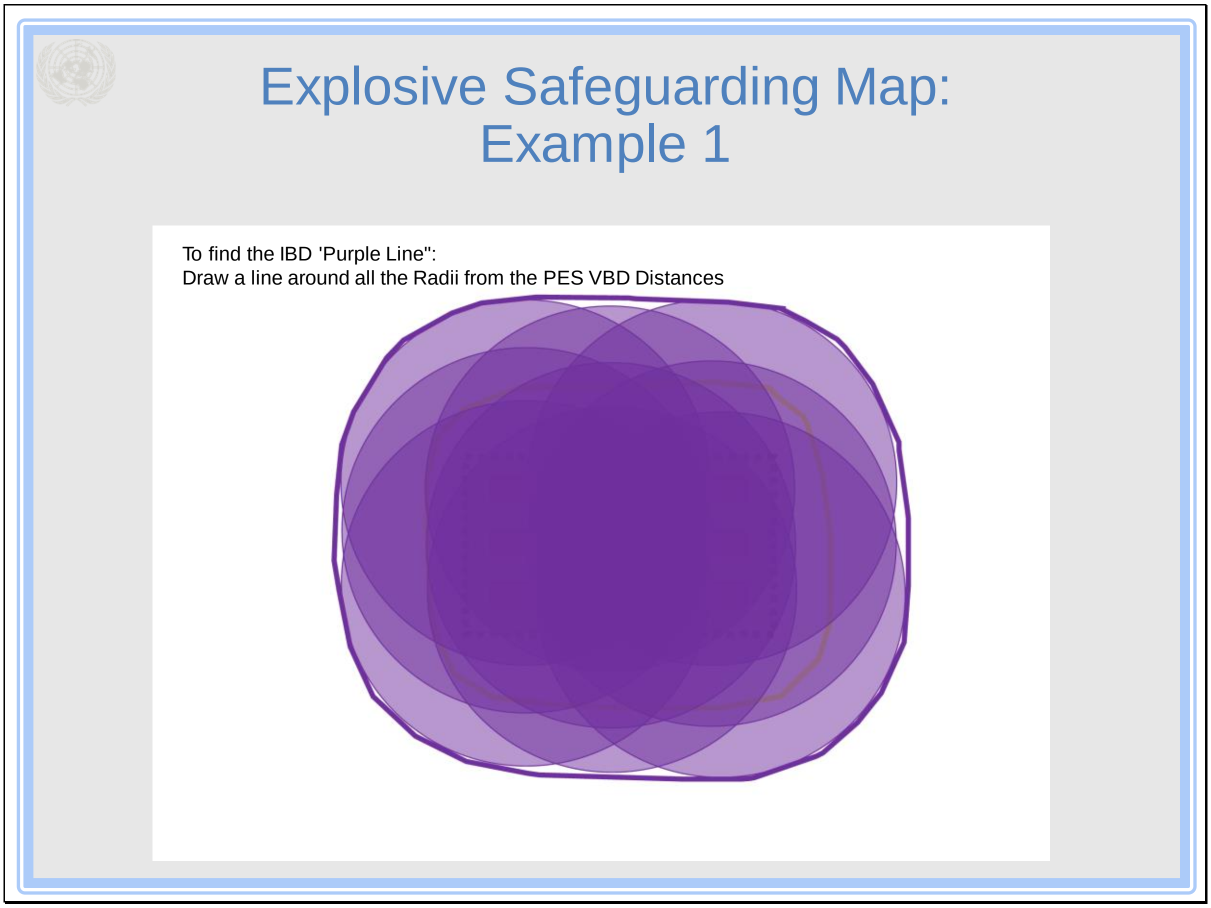
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

To find the Vulnerable Building Distance (Purple Line) - double the IBD distance, use as the radius and place a circle over each PES

Slide 85



## Explosive Safeguarding Map: Example 1

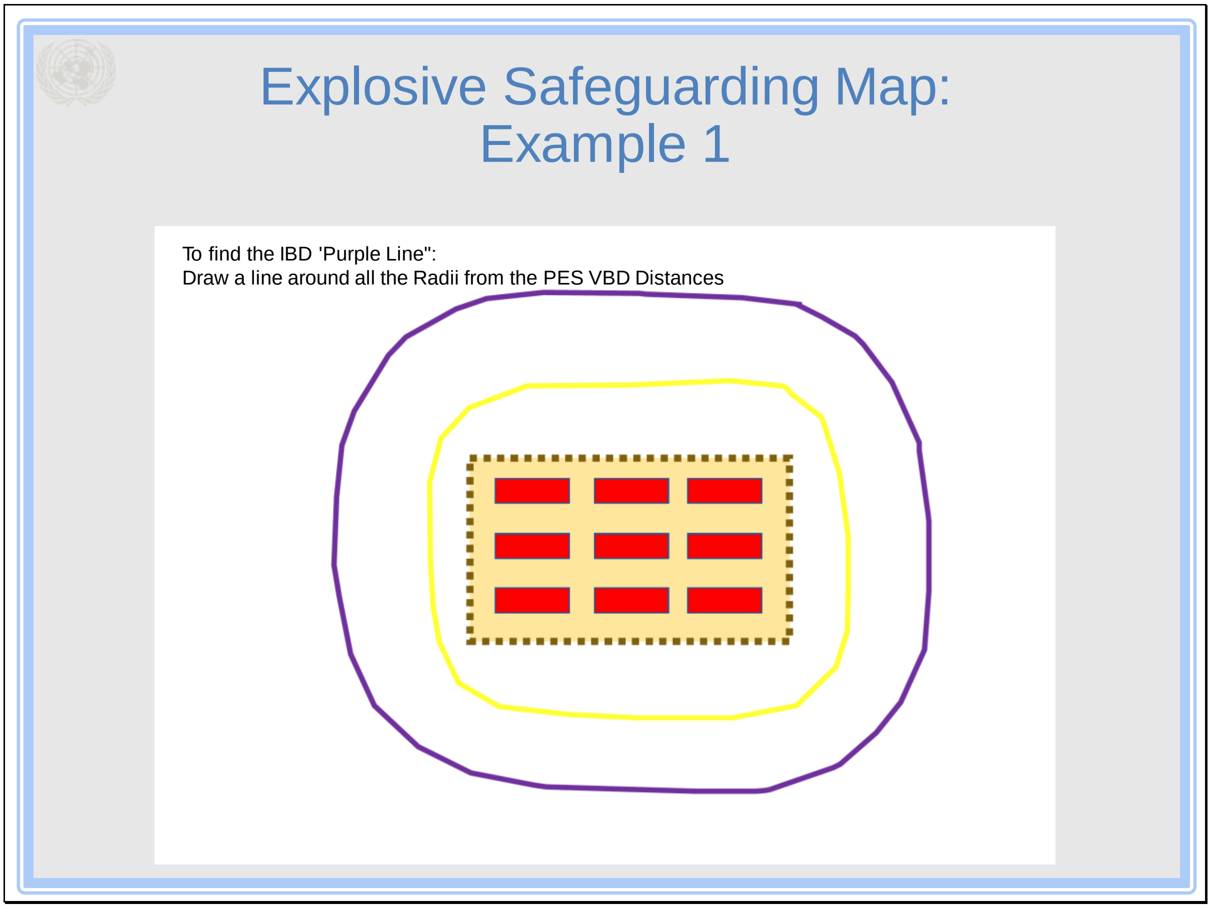
To find the IBD 'Purple Line'':
Draw a line around all the Radii from the PES VBD Distances

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)
When each VBD circle has been included, draw a purple line around all the circles – this is the VBD 'Purple Line''

Slide 86



## Explosive Safeguarding Map: Example 1

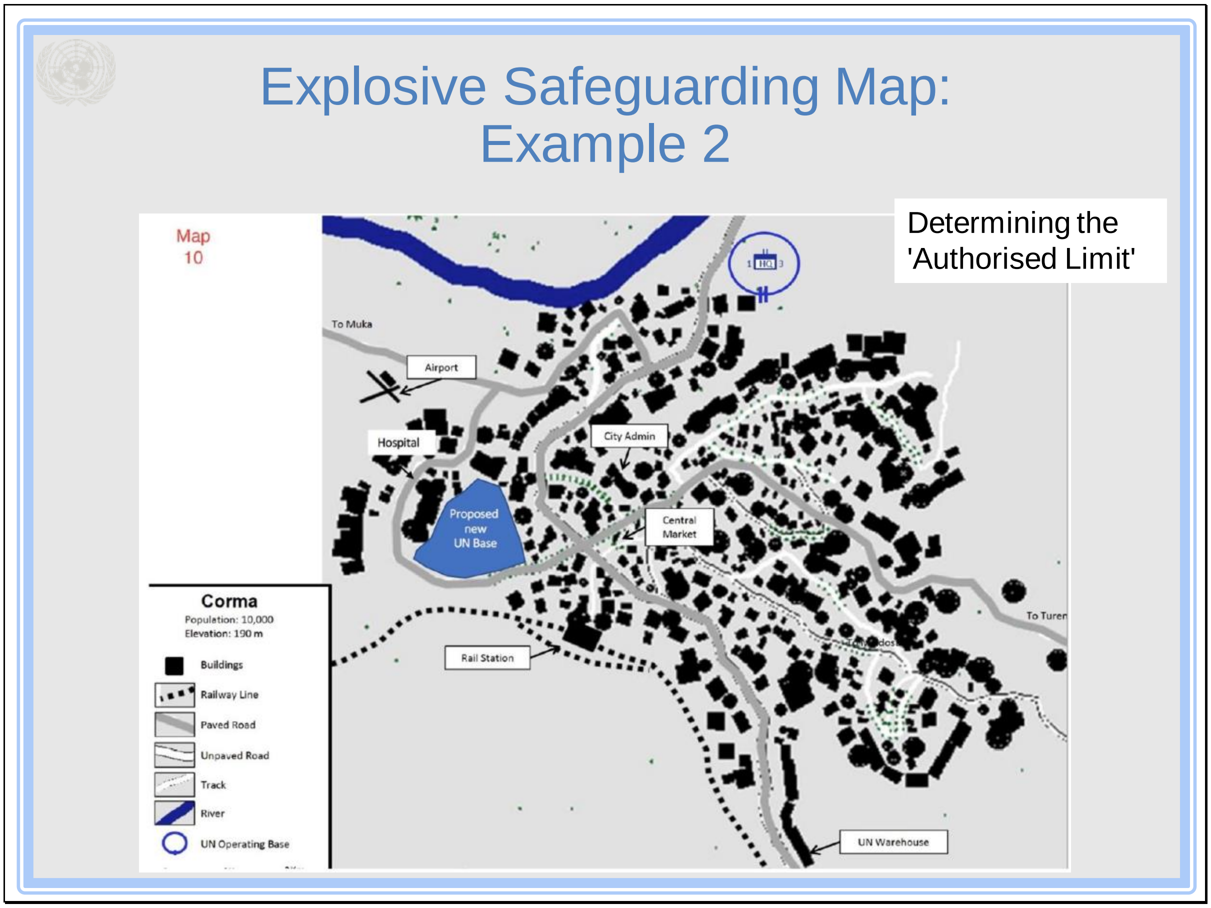
To find the IBD 'Purple Line":
Draw a line around all the Radii from the PES VBD Distances

**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
When each VBD circle has been included, draw a purple line around all the circles – this is the VBD 'Purple Line"

Slide 87



# Explosive Safeguarding Map: Example 2

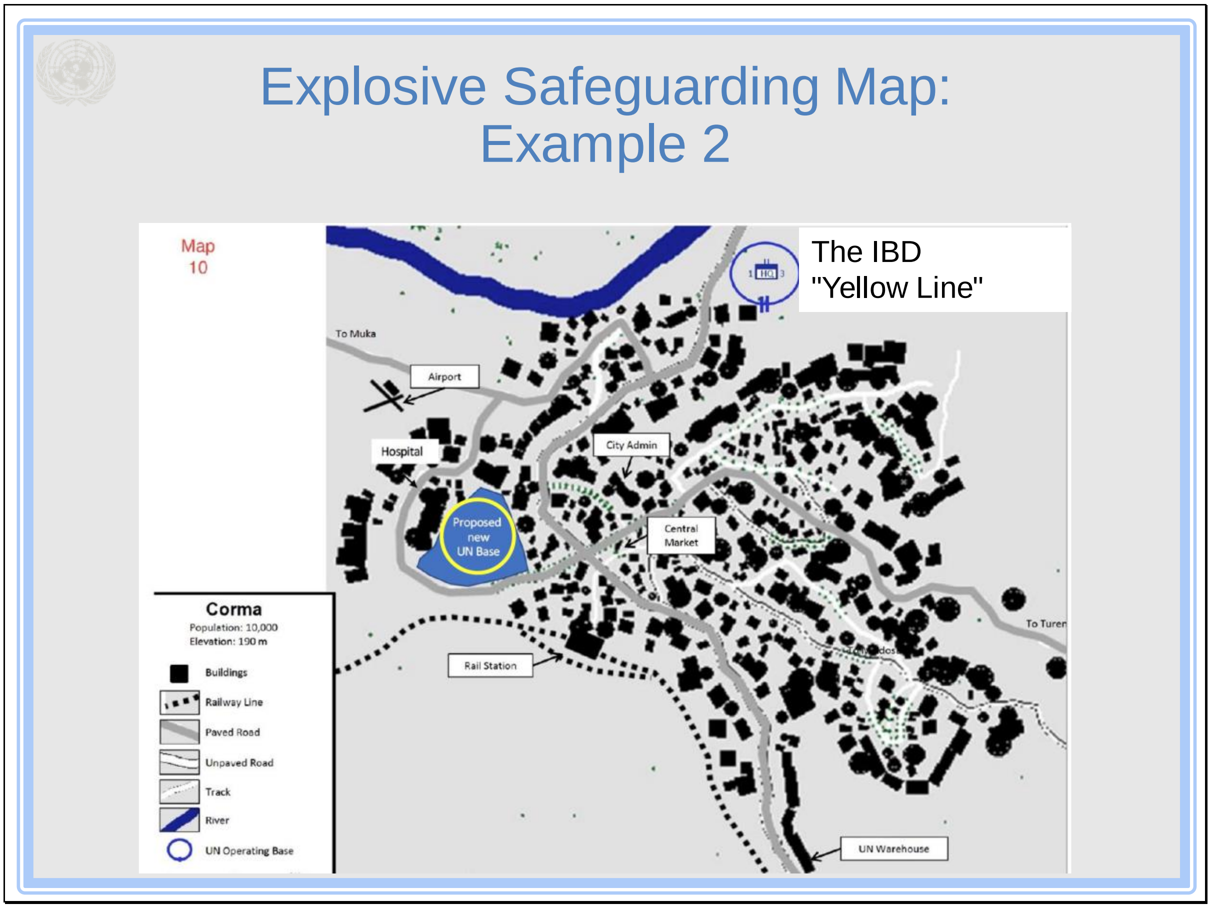
Determining the 'Authorised Limit'

<u>**Main idea/objective for slide:**</u>

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
This example is slightly different in that the Temporary Storage Area is forced to restrict the amount of NEQ in each PES based on the proximity of inhabited buildings or vulnerable buildings.

Slide 88



## Explosive Safeguarding Map: Example 2

The IBD "Yellow Line"

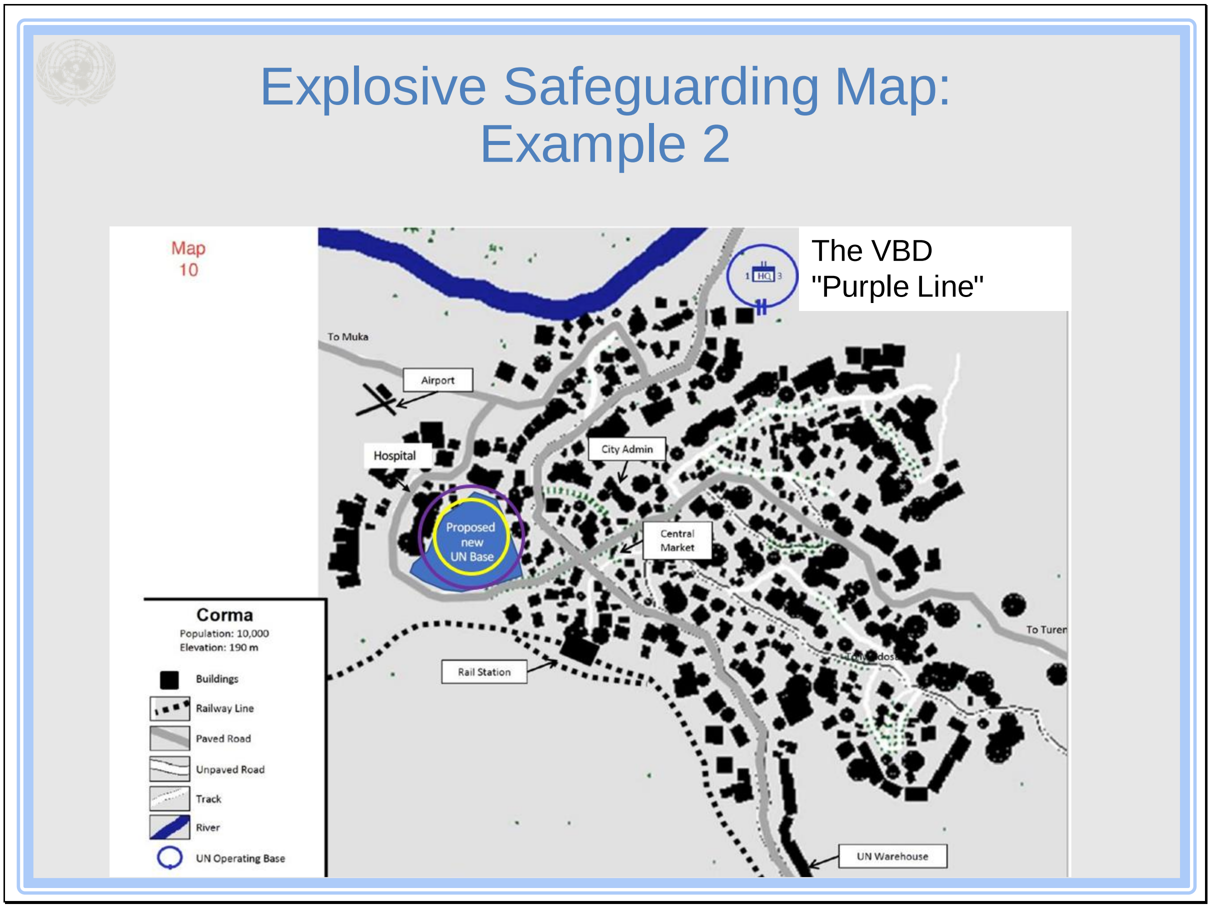
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

The IBD "Yellow Line" distance is measured from the PES to the nearest Inhabited Building. This distance is then applied to the Reduced Quantity Distance table to find out what is the permissible NEQ is for that PES.
The closer the inhabited building, the less quantity of NEQ may be held.
This is called the 'Authorised Limit'

Slide 89



## Explosive Safeguarding Map: Example 2

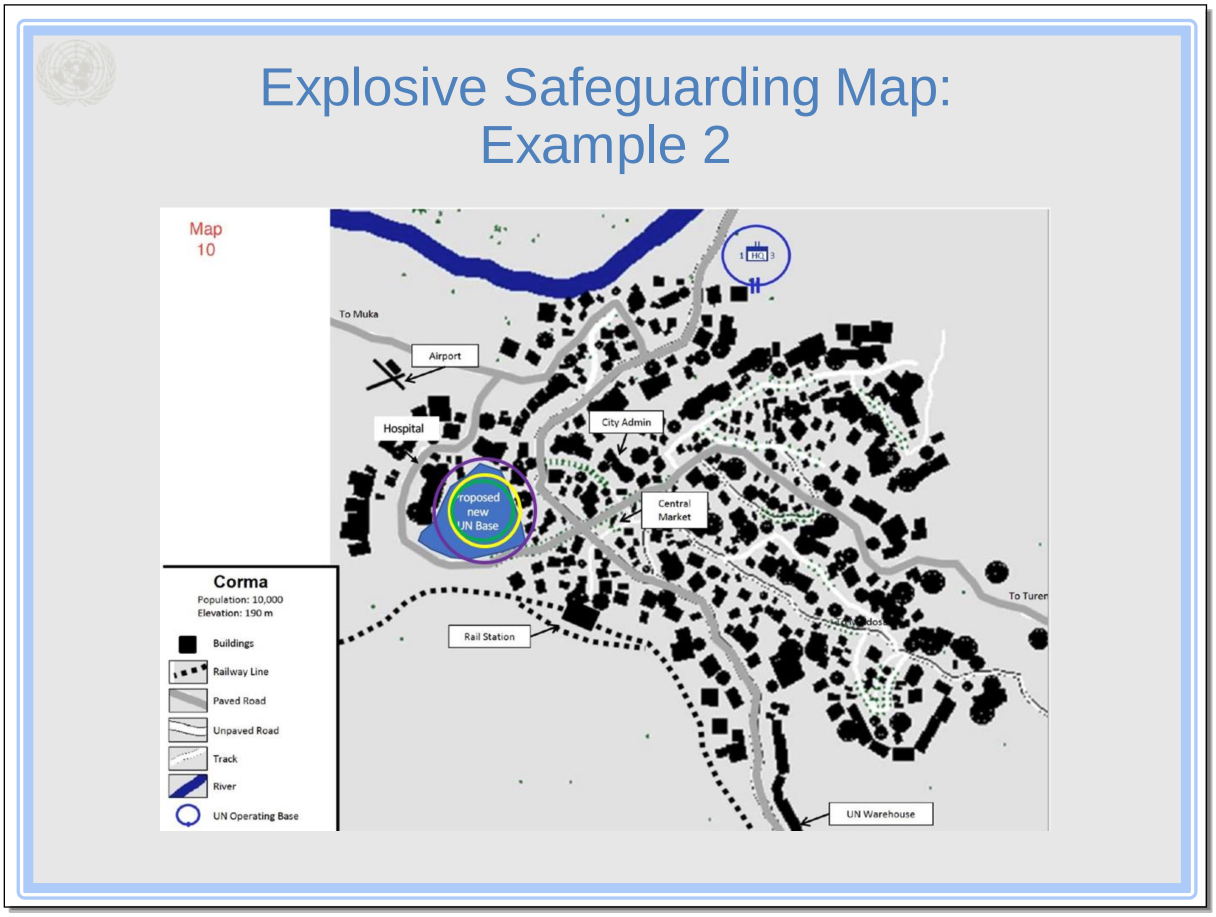
The VBD "Purple Line"

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

The VBD "Purple Line" distance is measured from the PES to the nearest Vulnerable Building or twice the IBD (which ever is closer). This distance is then applied to the Reduced Quantity Distance table to find out what is the permissible NEQ is for that PES.
The closer the Vulnerable building, the less quantity of NEQ may be held.
This is called the 'Authorised Limit'



## Explosive Safeguarding Map: Example 2

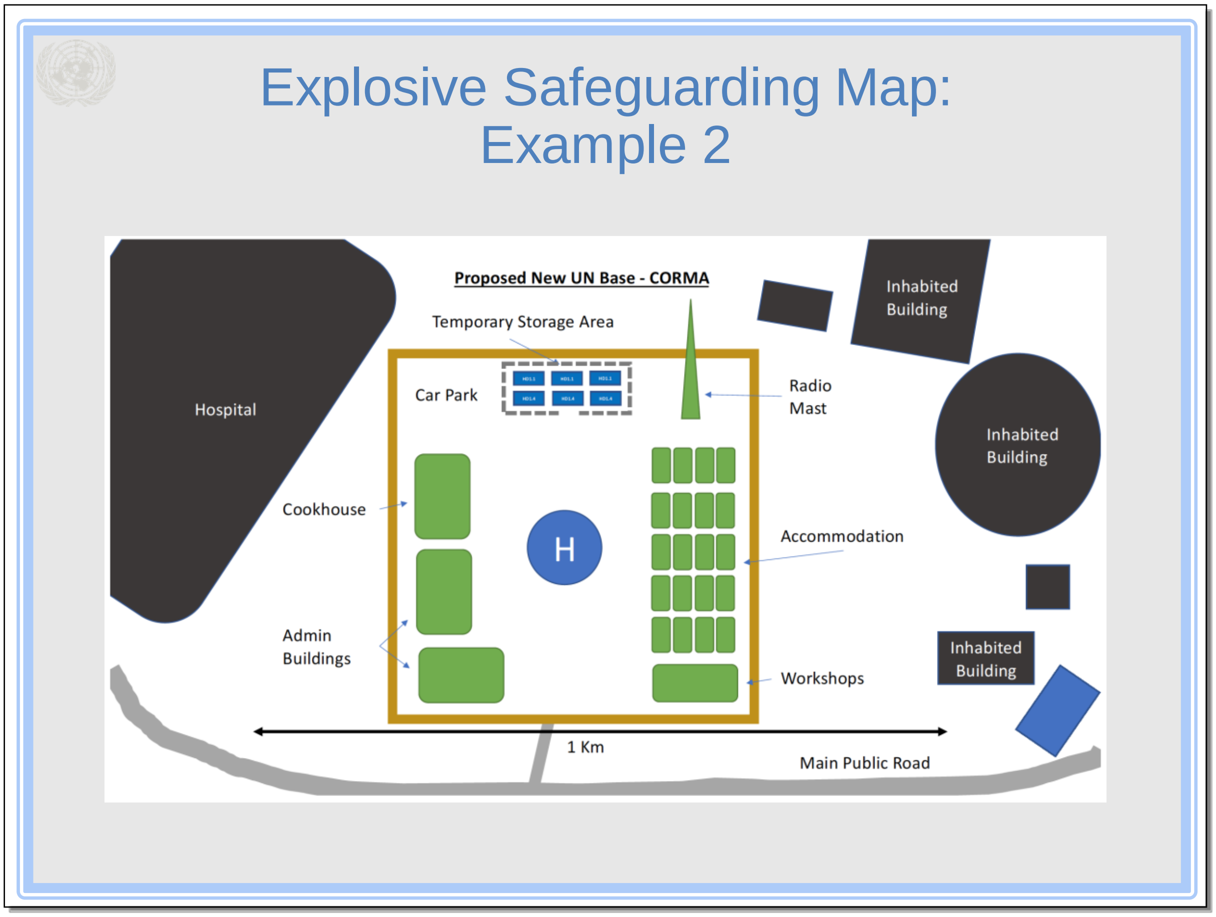
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

The PTRD "Blue Line" distance is measured from the PES to the nearest Public Traffic Route. This distance is then applied to the Reduced Quantity Distance table to find out what is the permissible NEQ is for that PES.
The closer the Public Traffic Route, the less quantity of NEQ may be held.
This is called the 'Authorised Limit'

Slide 91



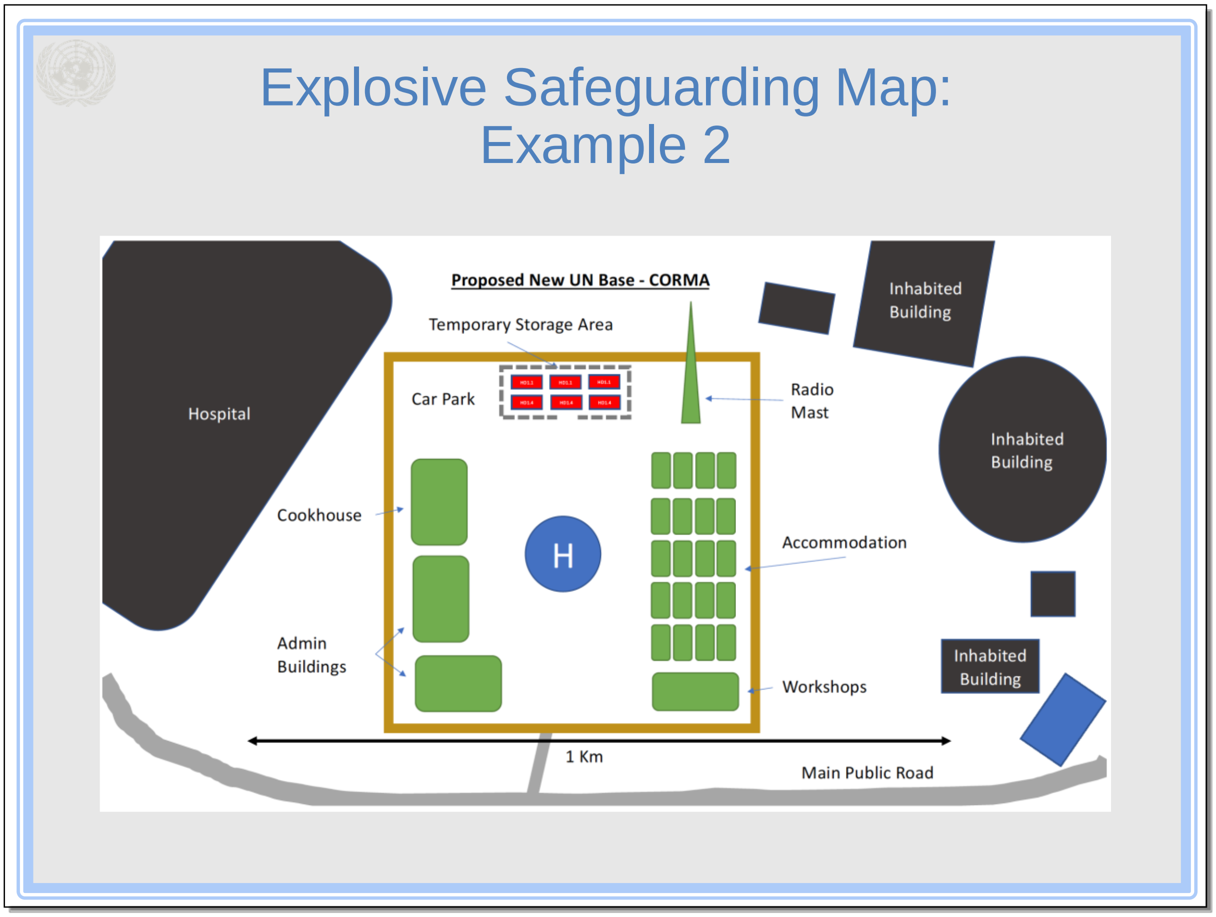
## Explosive Safeguarding Map: Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



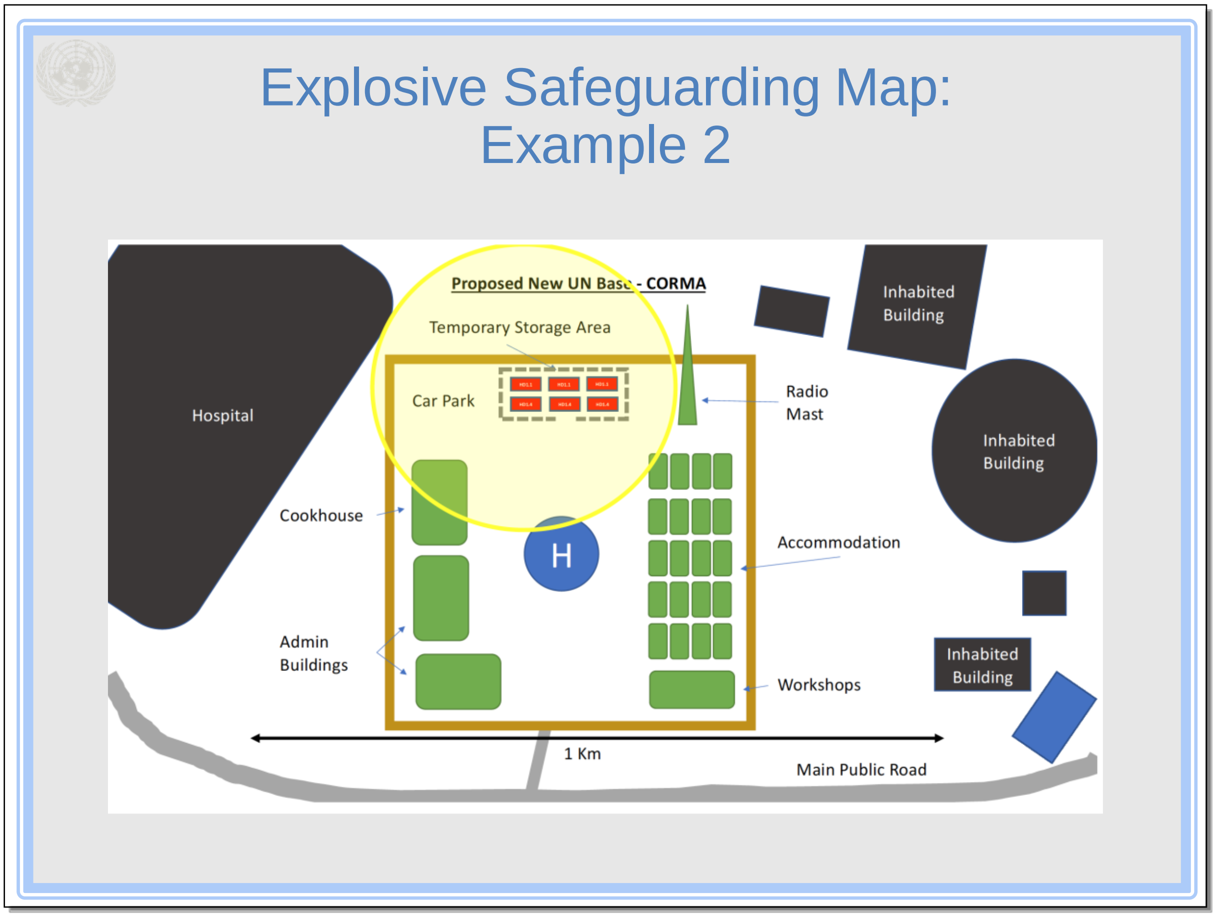
# Explosive Safeguarding Map: Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



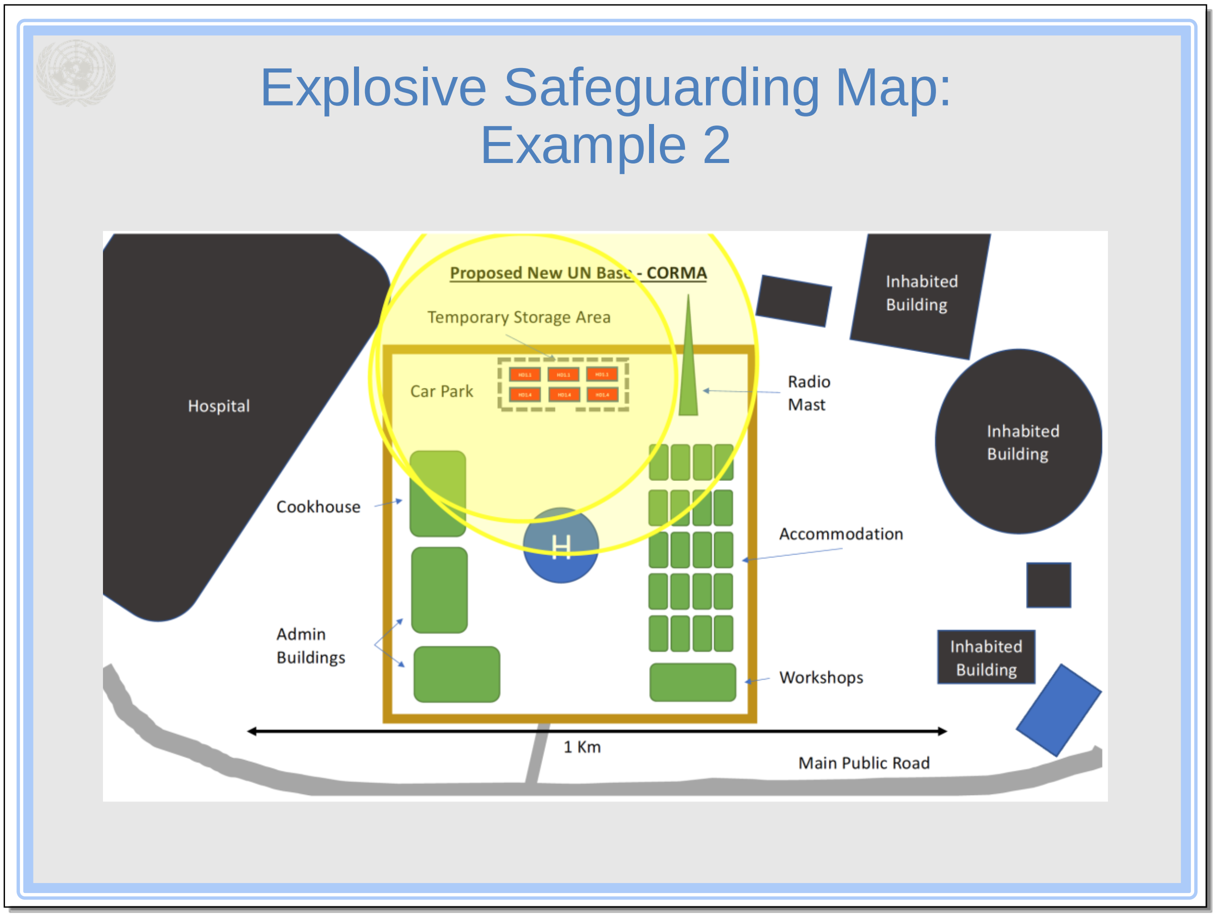
# Explosive Safeguarding Map: Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



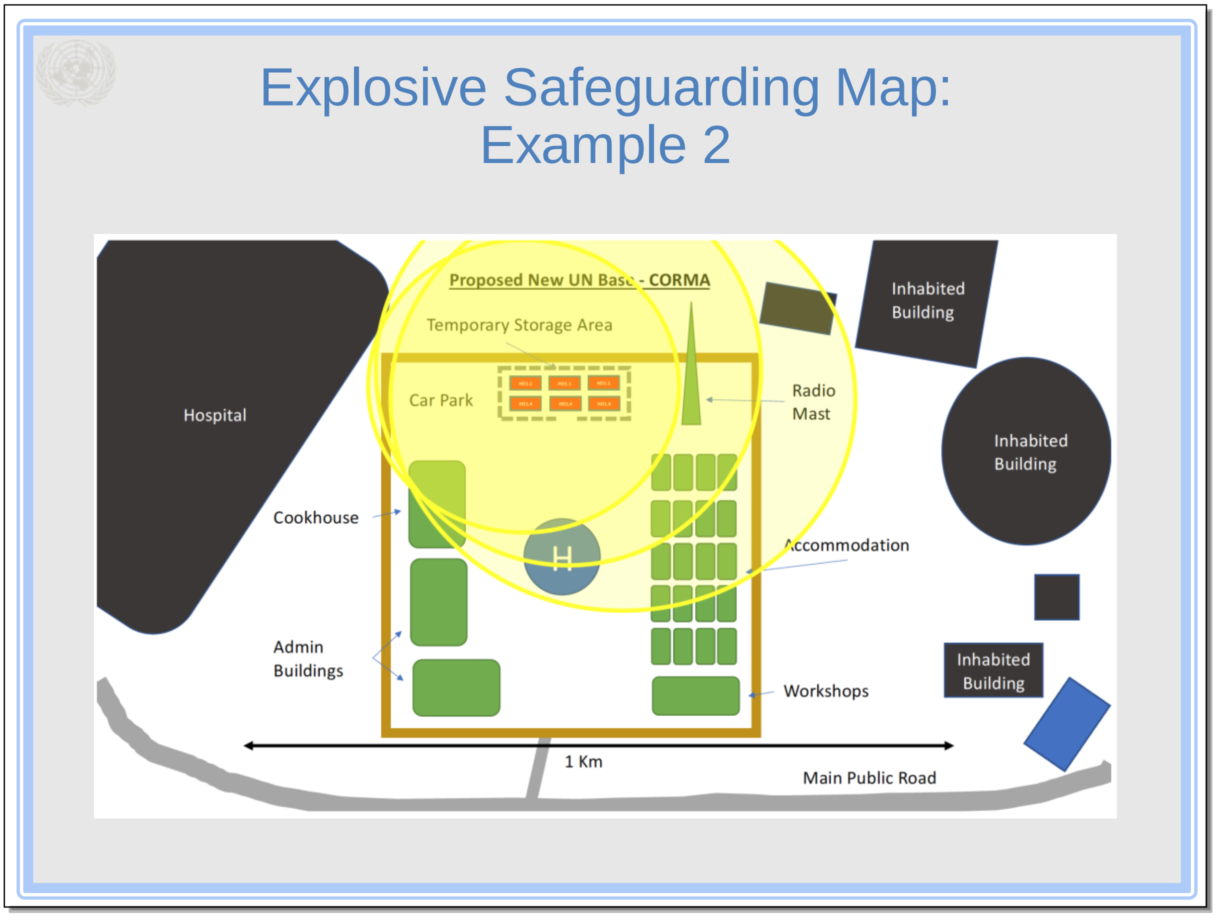
# Explosive Safeguarding Map: Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



Explosive Safeguarding Map: Example 2

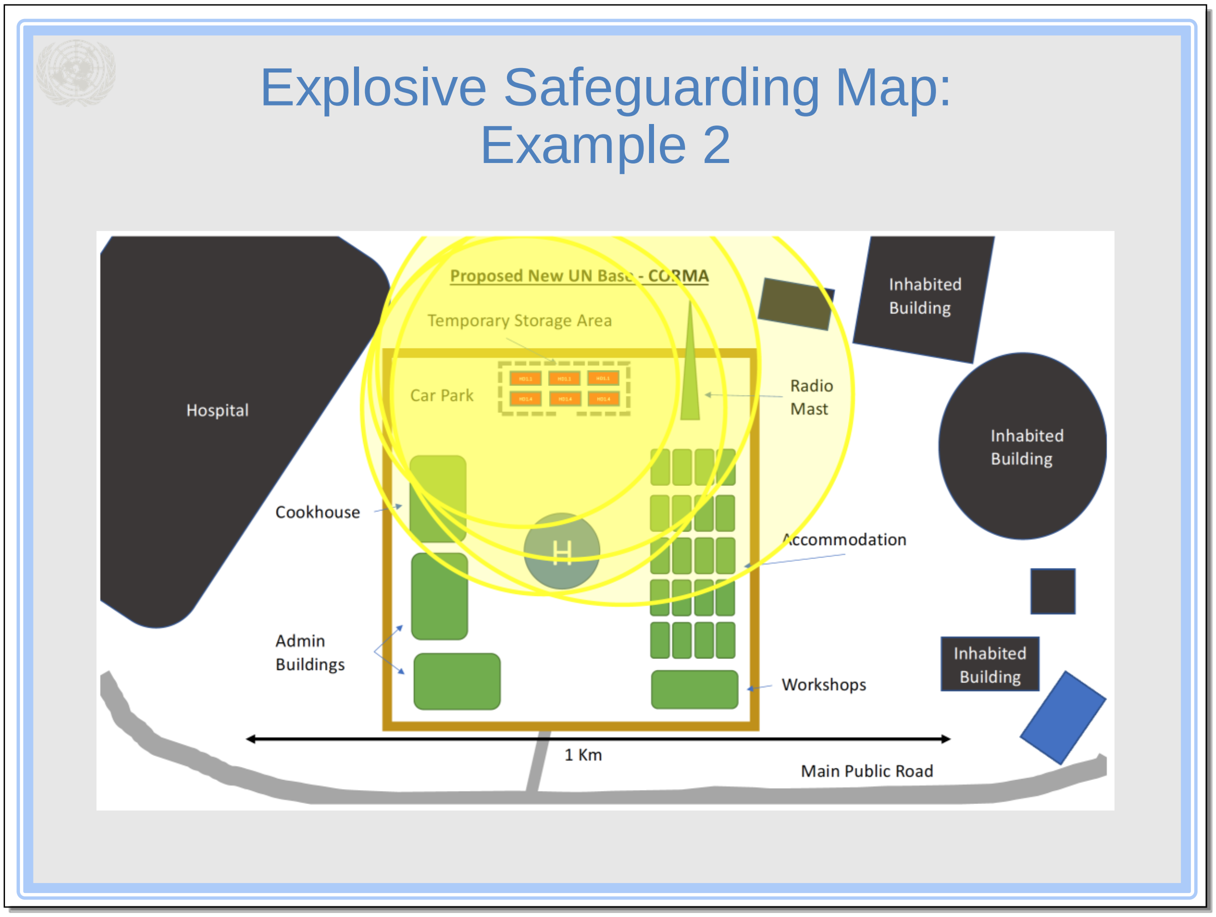
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here

Slide 96



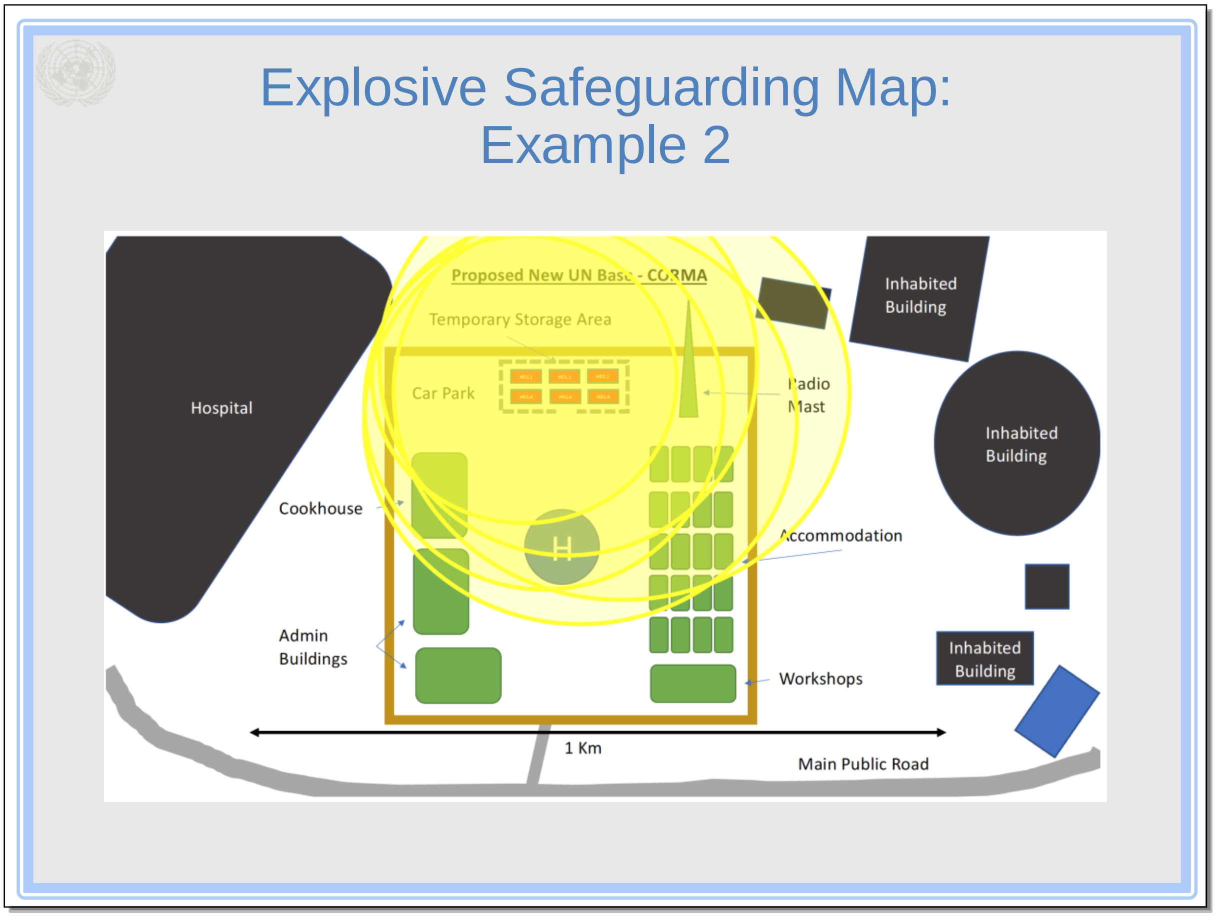
Explosive Safeguarding Map:
Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



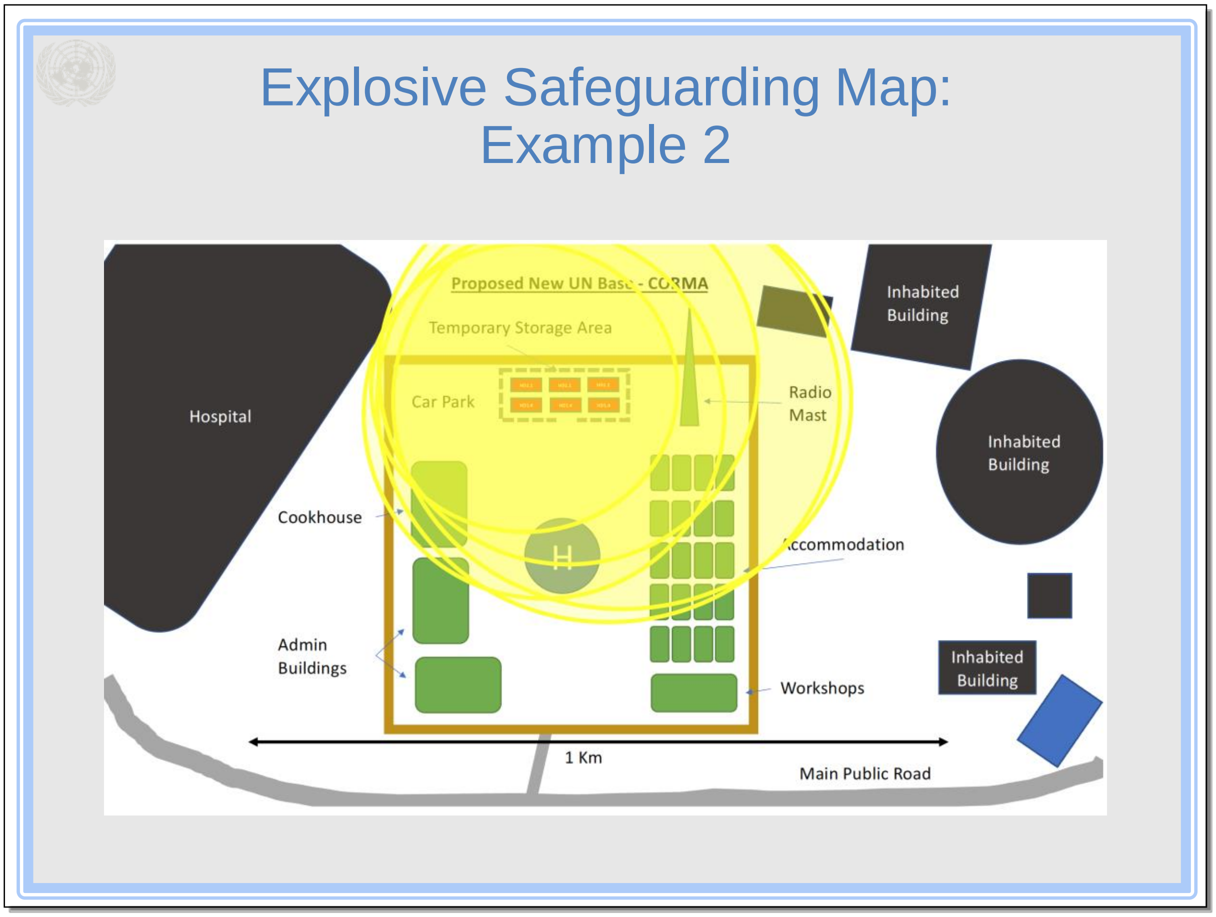
## Explosive Safeguarding Map: Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



Explosive Safeguarding Map: Example 2

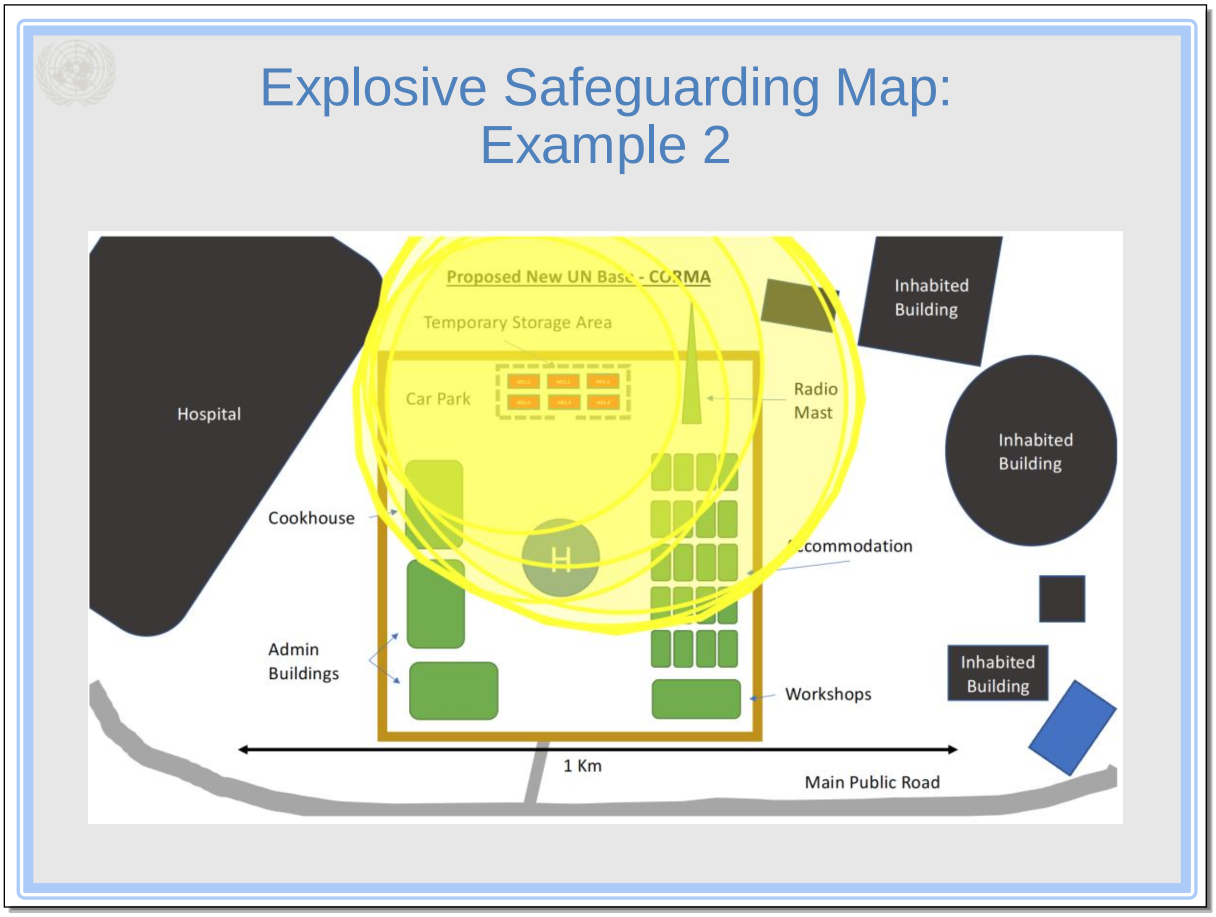
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here

Slide 99



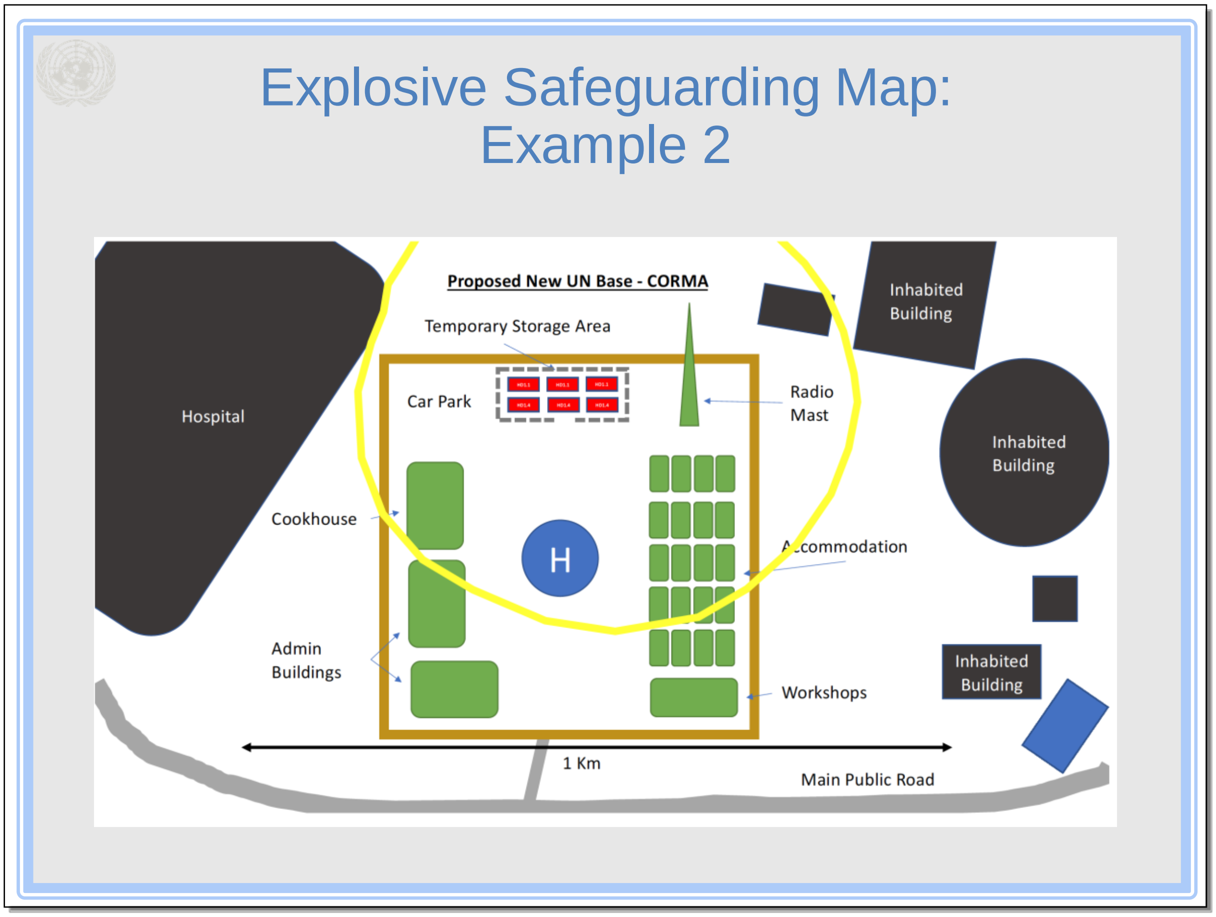
## Explosive Safeguarding Map: Example 2

**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
Using the ESM model, build out the example map here

Slide 100



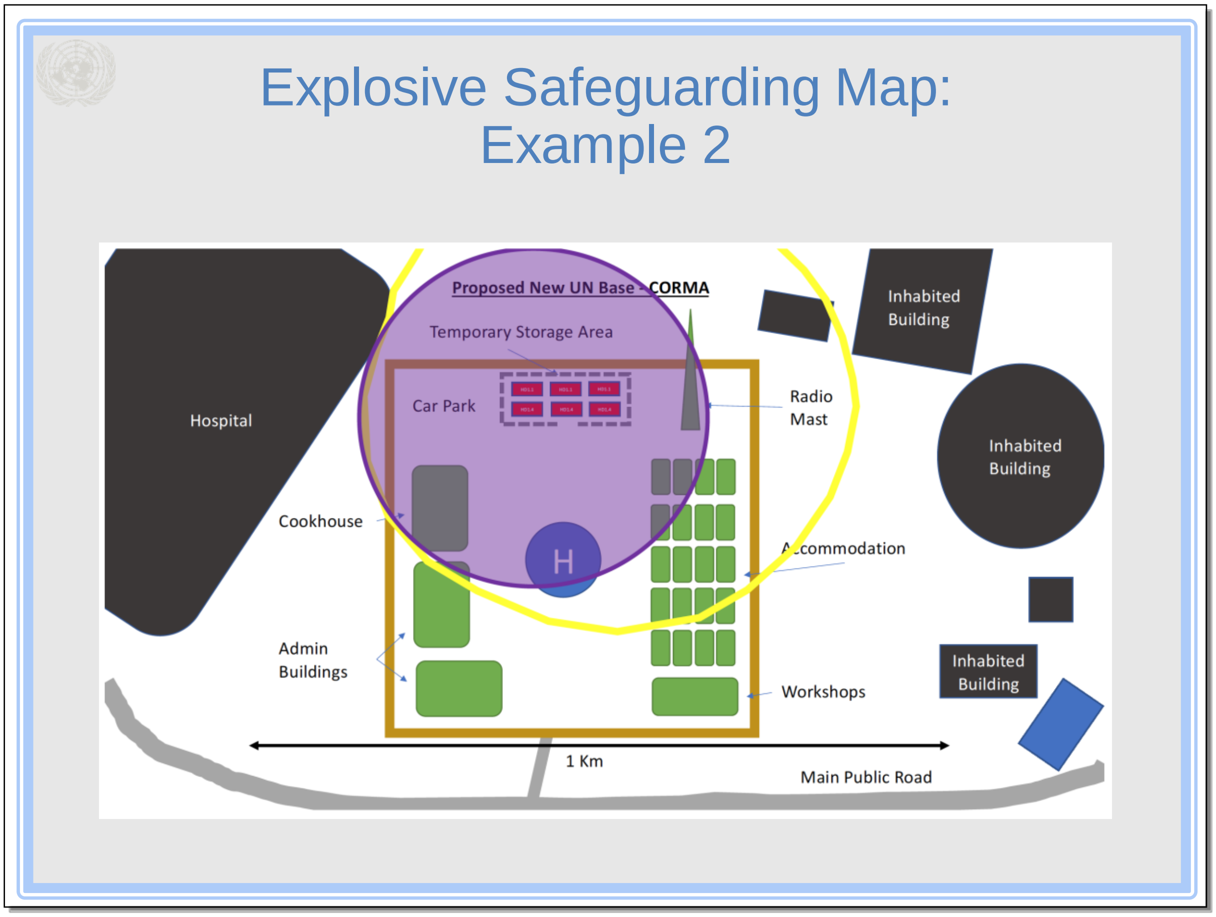
## Explosive Safeguarding Map: Example 2

**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
Using the ESM model, build out the example map here

Slide 101



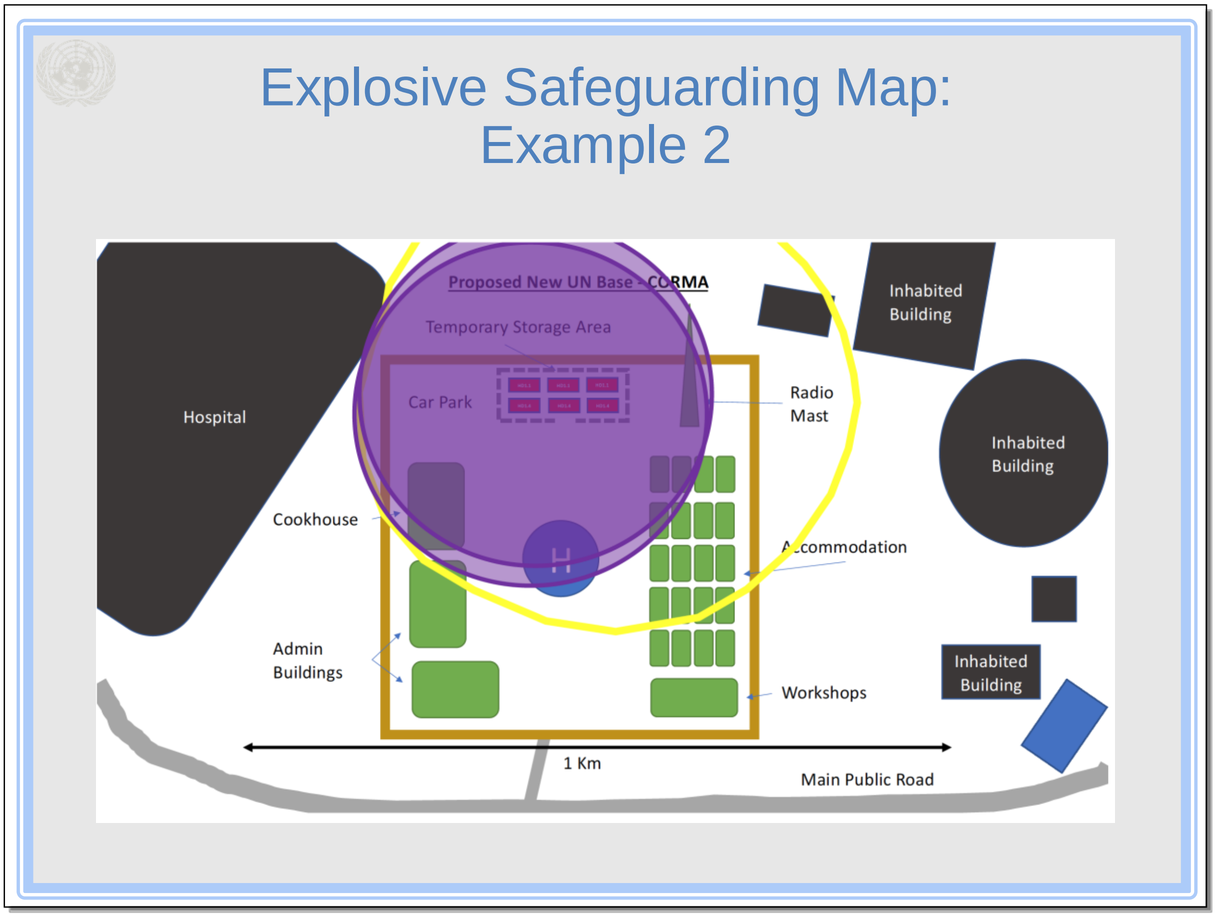
## Explosive Safeguarding Map: Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



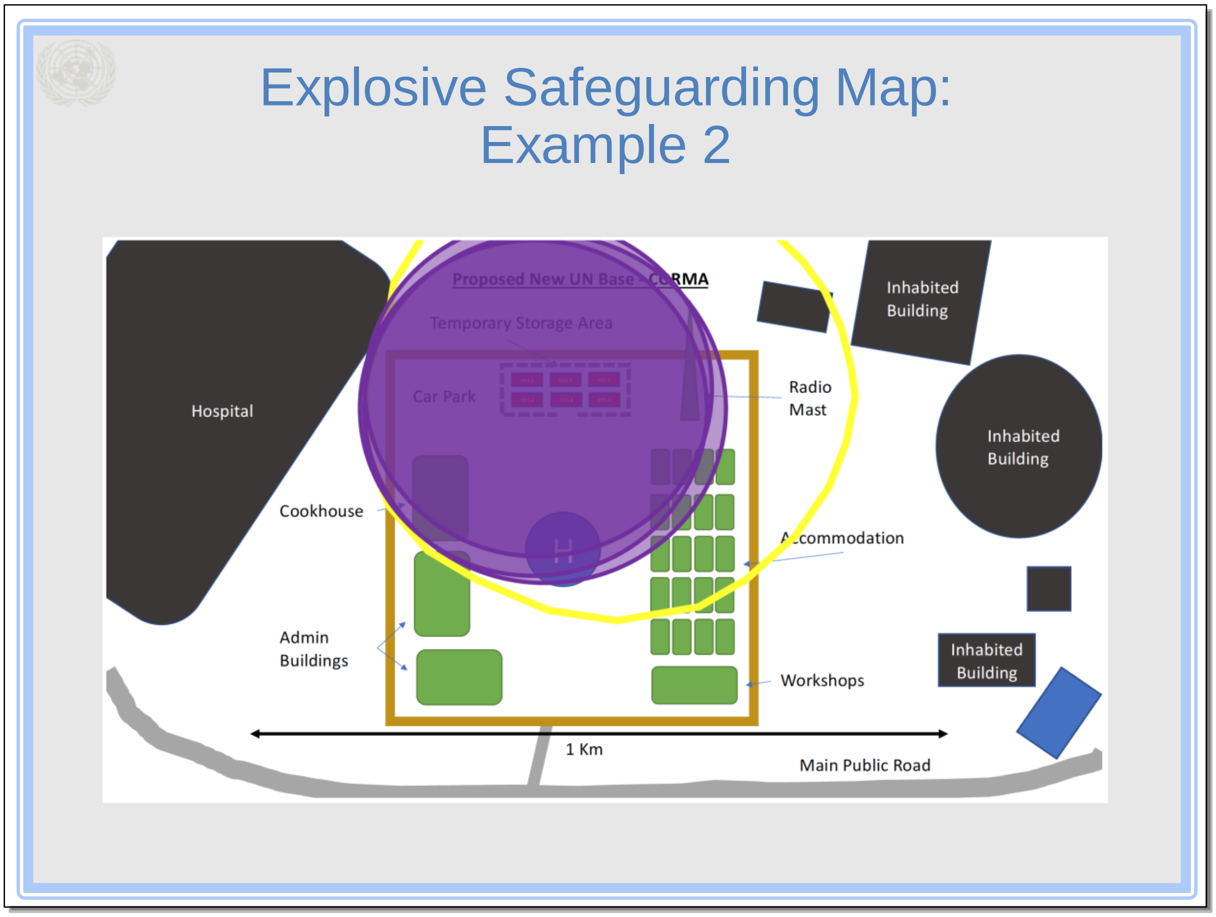
Explosive Safeguarding Map:
Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



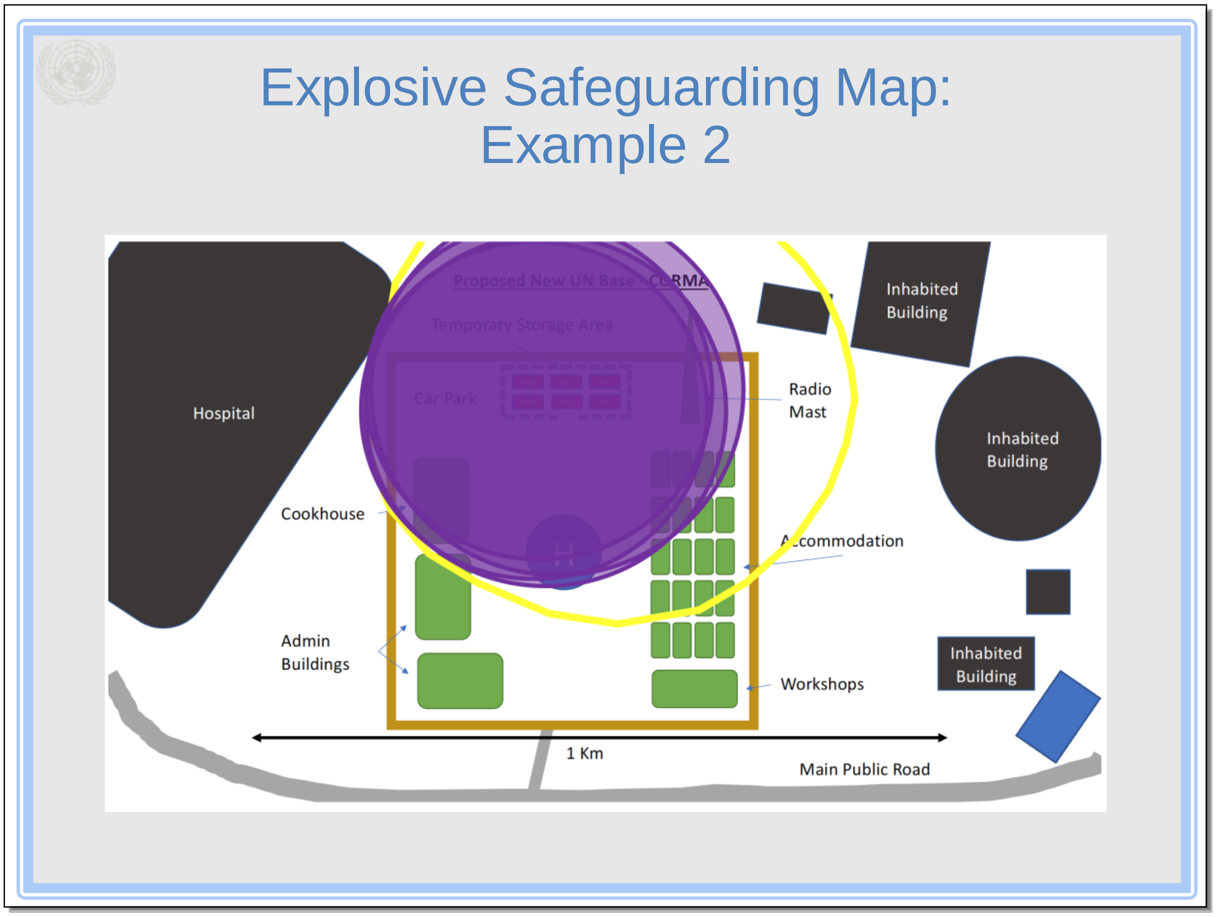
## Explosive Safeguarding Map: Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



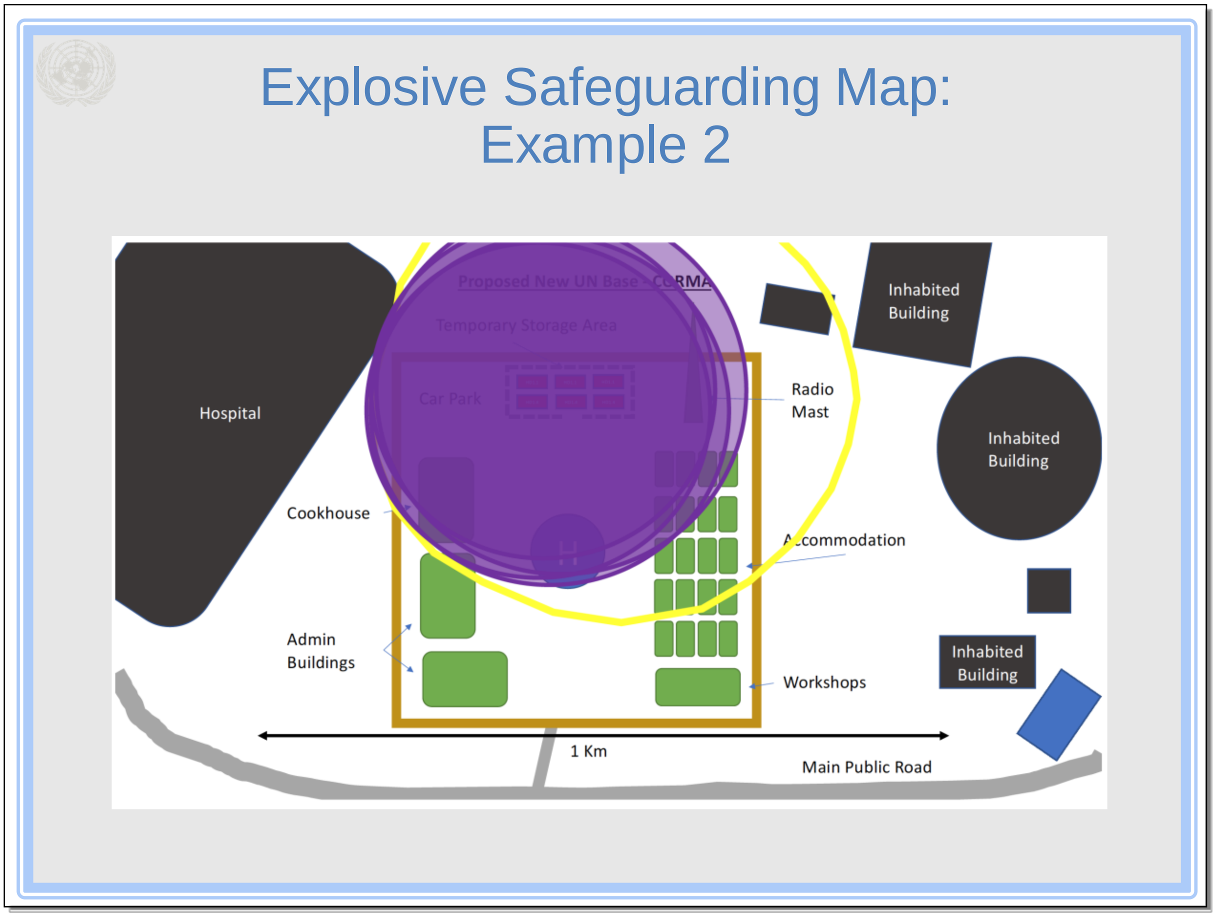
Explosive Safeguarding Map:
Example 2

**<u>Main idea/objective for slide:</u>**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

<u>What the instructor should cover (in addition to slide content)</u>
Using the ESM model, build out the example map here

Slide 105



# Explosive Safeguarding Map: Example 2

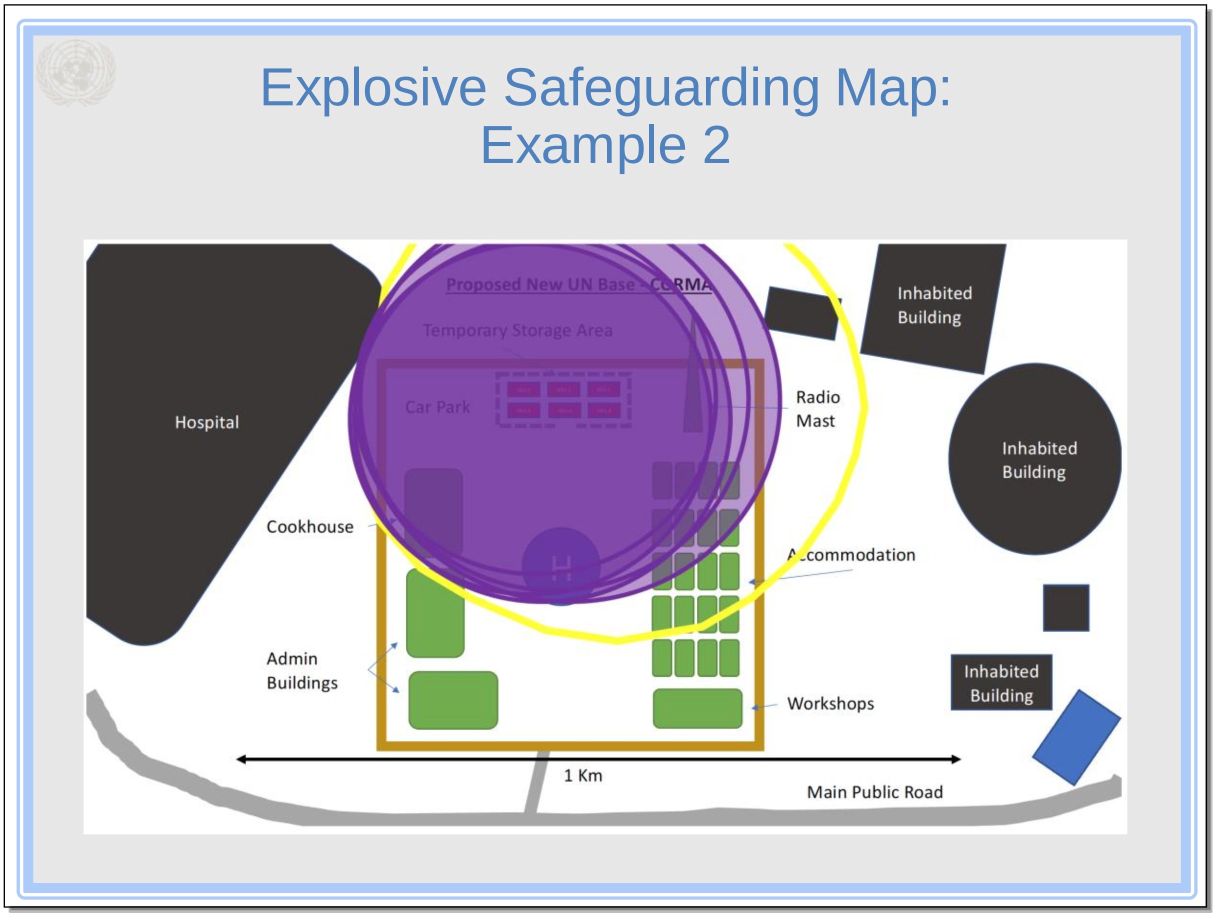
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here

Slide 106



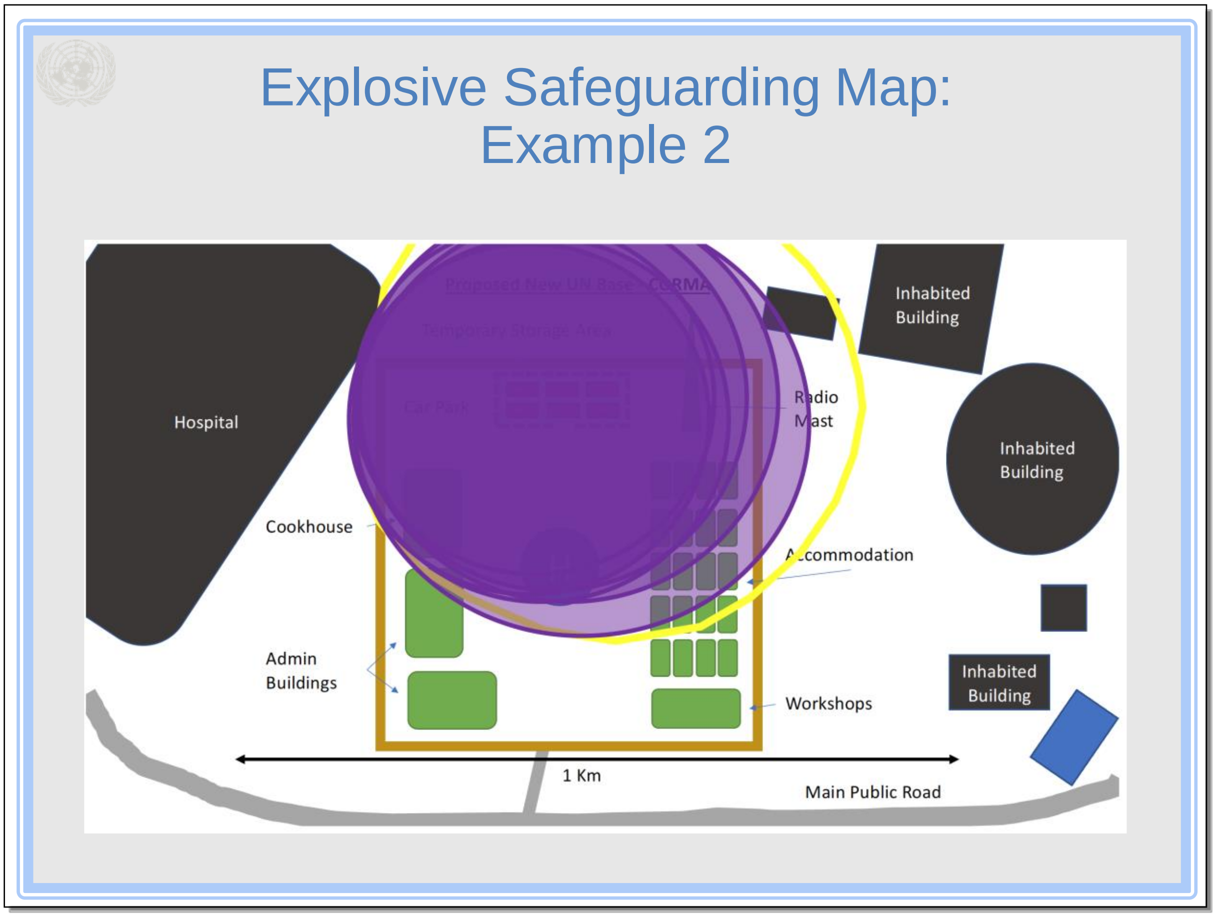
Explosive Safeguarding Map:
Example 2

**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here



# Explosive Safeguarding Map: Example 2

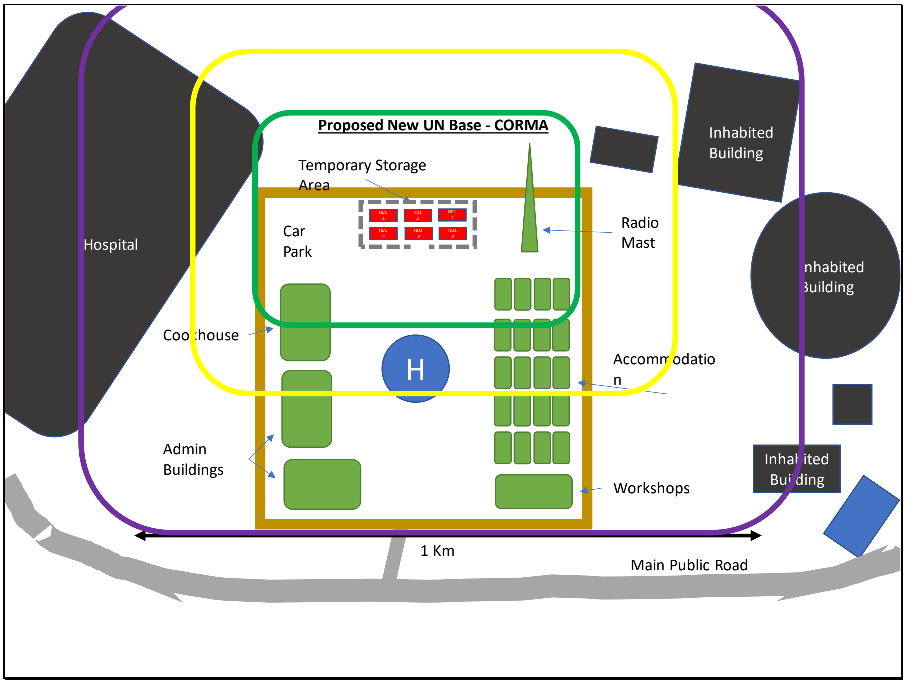
**Main idea/objective for slide:**

- **Introduce the explosive safeguarding map to the participants and explain the significance of the yellow line and the purple line**

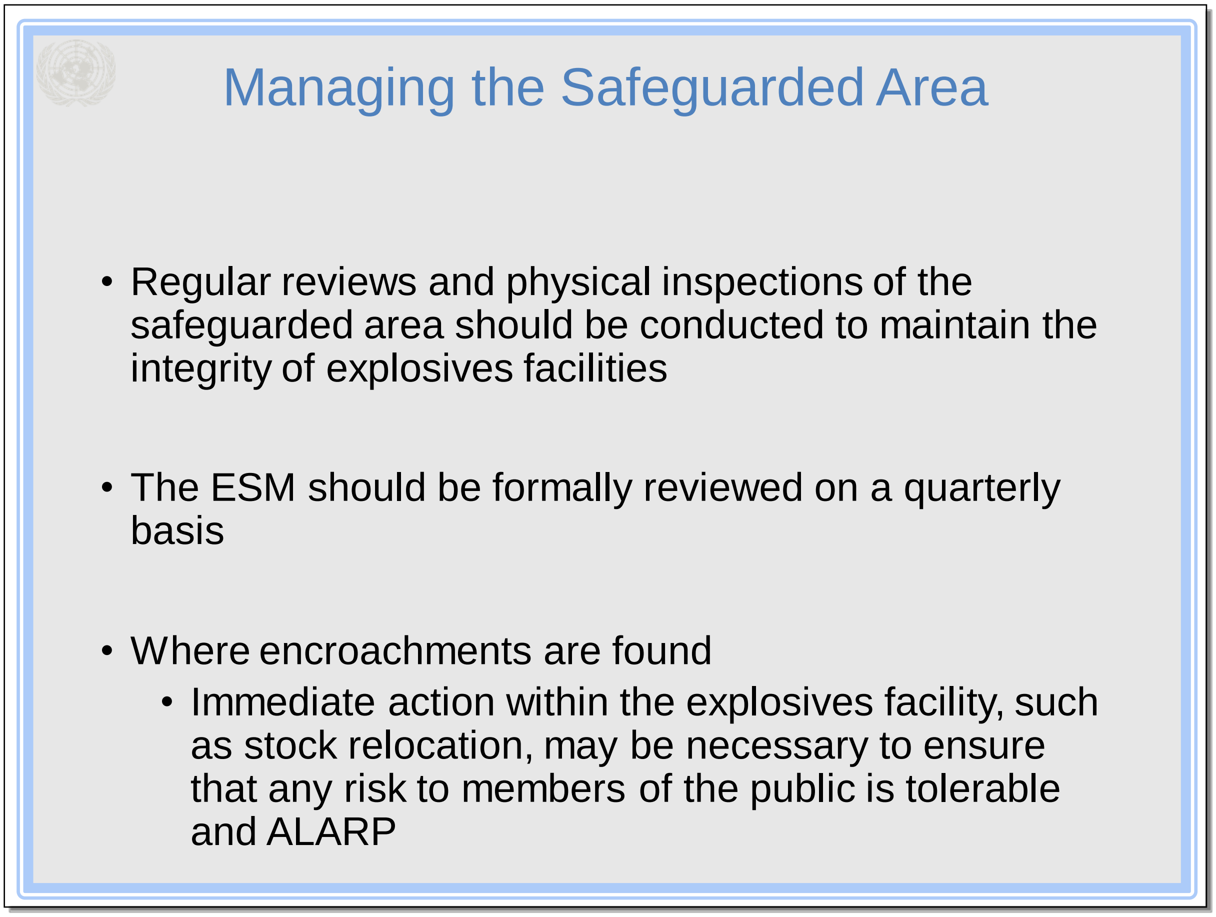
What the instructor should cover (in addition to slide content)

Using the ESM model, build out the example map here

Slide 108


Proposed New UN Base - CORMA
Temporary Storage Area
HD1 .1
HD1 .1
HD1 .1
HD1 .4
HD1 .4
HD1 .4
Car Park
Radio Mast
Hospital
Inhabited Building
nhabited Building
Coo house
H
Accomm odatio n
Admin Buildings
Workshops
Inhab ited Bui ding
1 Km
Main Public Road

Slide 109



## Managing the Safeguarded Area

- Regular reviews and physical inspections of the safeguarded area should be conducted to maintain the integrity of explosives facilities
- The ESM should be formally reviewed on a quarterly basis
- Where encroachments are found
  - Immediate action within the explosives facility, such as stock relocation, may be necessary to ensure that any risk to members of the public is tolerable and ALARP

**Main idea/objective for slide:**

- **Outline the requirements of safeguarding systems, the responsibilities of key personnel in completing the documentation and the preparation of the Explosive Safety Case to include safeguarding maps.**

What the instructor should cover (in addition to slide content)

Highlight how critical it is to regularly monitor and inspect the Explosive Safeguarding Map, the NEQ of the ammunition container and that the local population have not encroached on the Temporary Storage areas, as this will affect safety.

References/further reading

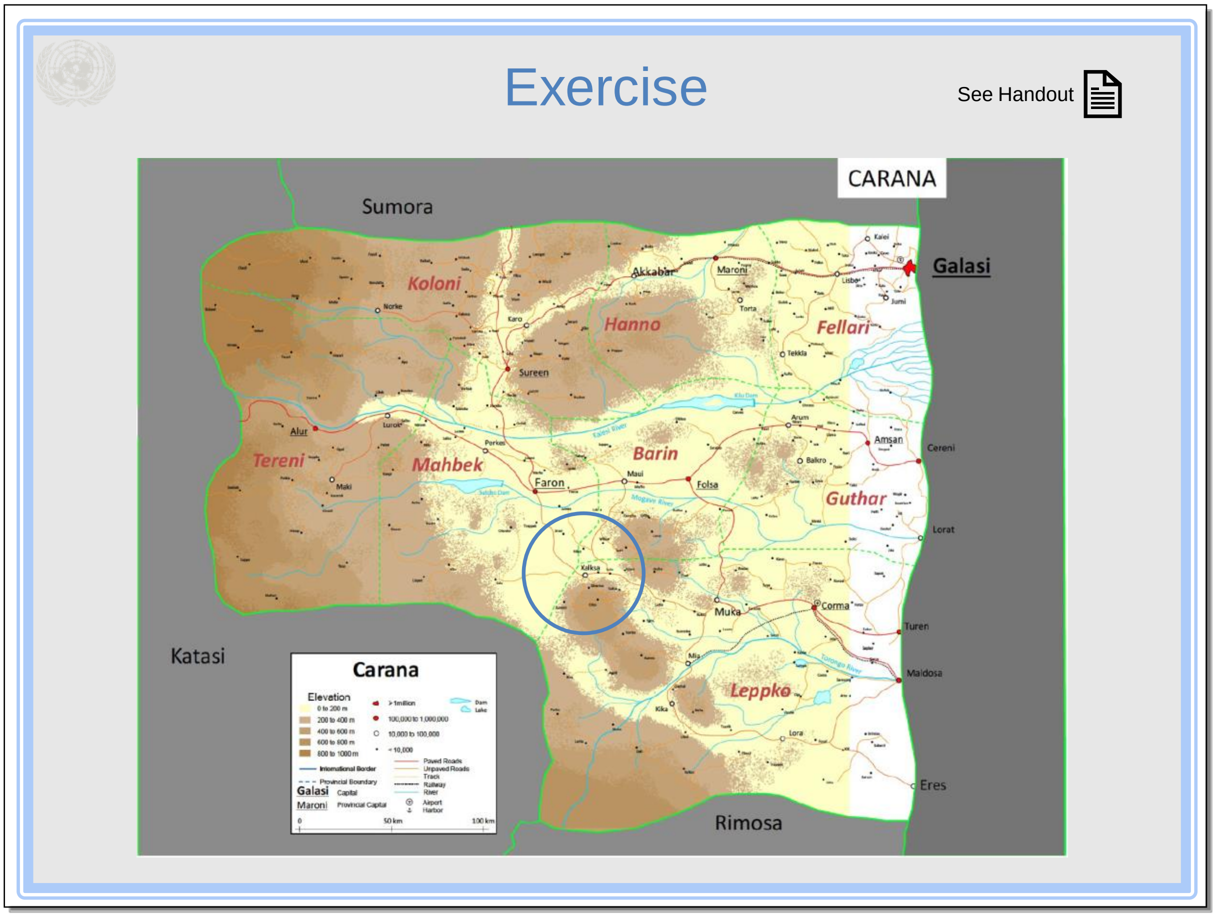
http://data.unsaferguard.org/iatg/en/IATG-02.40-Safeguarding-explosives-facilities-IATG-V.3.pdf

Slide 110

Participant Exercise

**Phase 2. Development (**Time allocation - 220 min**)**

Stage 3 (Time allocation 120 mins) – participant Exercise



Exercise

See Handout

**Main idea/objective for slide:**

- **Introduce participant exercise to compile Explosive Safety case to qualify and ammunitions storage licence for a field storage area, using the CARANA scenario**

What the instructor should cover (in addition to slide content)

- All ‘Exercise’ slides should be provided as full size handouts to participants
- Instructors are to work closely with the syndicate groups to ensure the knowledge is effectively applied and that the participants gain a full understanding of this risk management process.
- When complete, work through the answers with the class and ask questions.

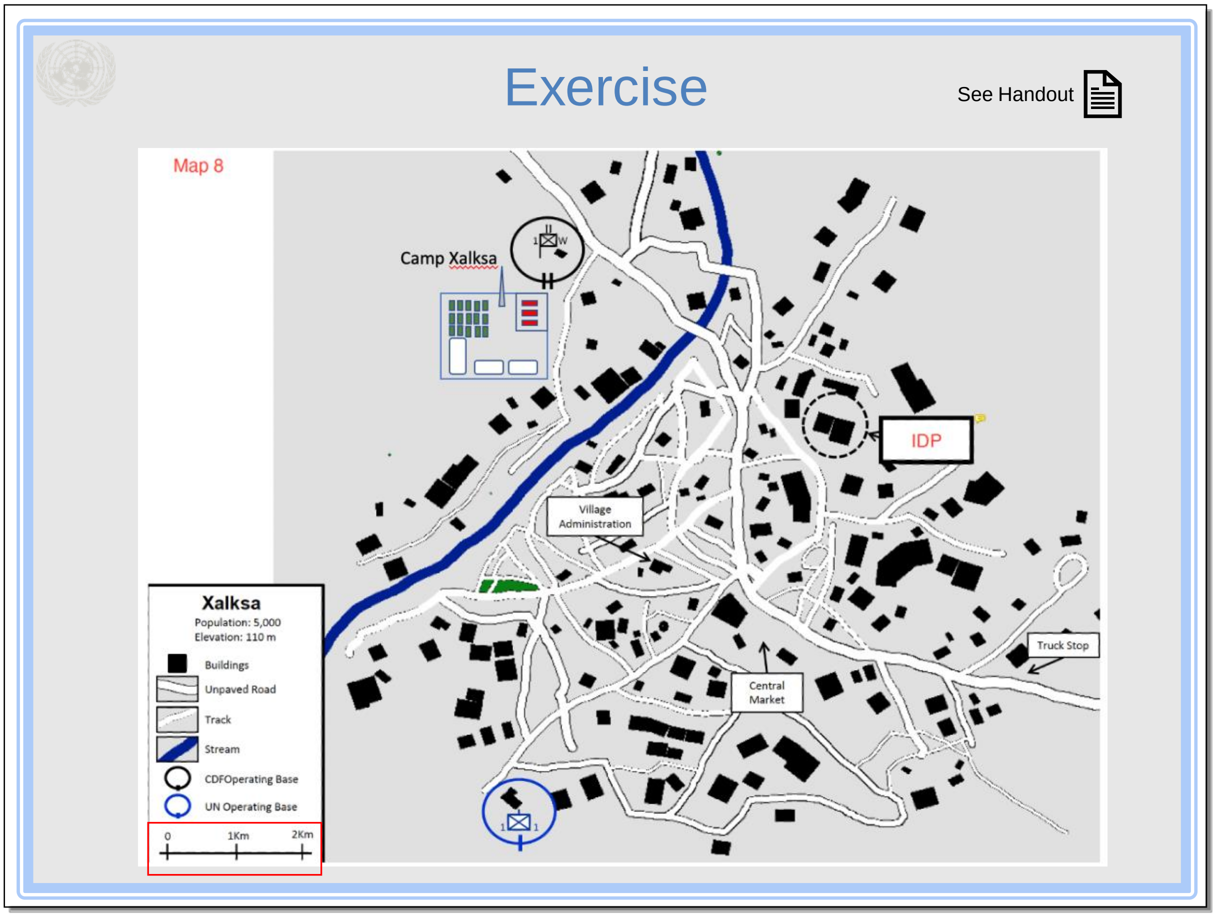
participant Activity

participants need to:

- calculate the internal quantity distances,
- Calculate outside quantity distances,
- complete the Explosive Limit Licensing matrix for each potential explosion site
- complete a safeguarding map highlighting the yellow and purple lines

The end product is for the participants to have compiled an explosive safety case to qualify an ammunition storage licence for a field storage area.

Slide 112



# Exercise

See Handout

**Main idea/objective for slide:**

- **Introduce participant exercise to compile Explosive Safety case to qualify and ammunitions storage licence for a field storage area, using the CARANA scenario**

What the instructor should cover (in addition to slide content)

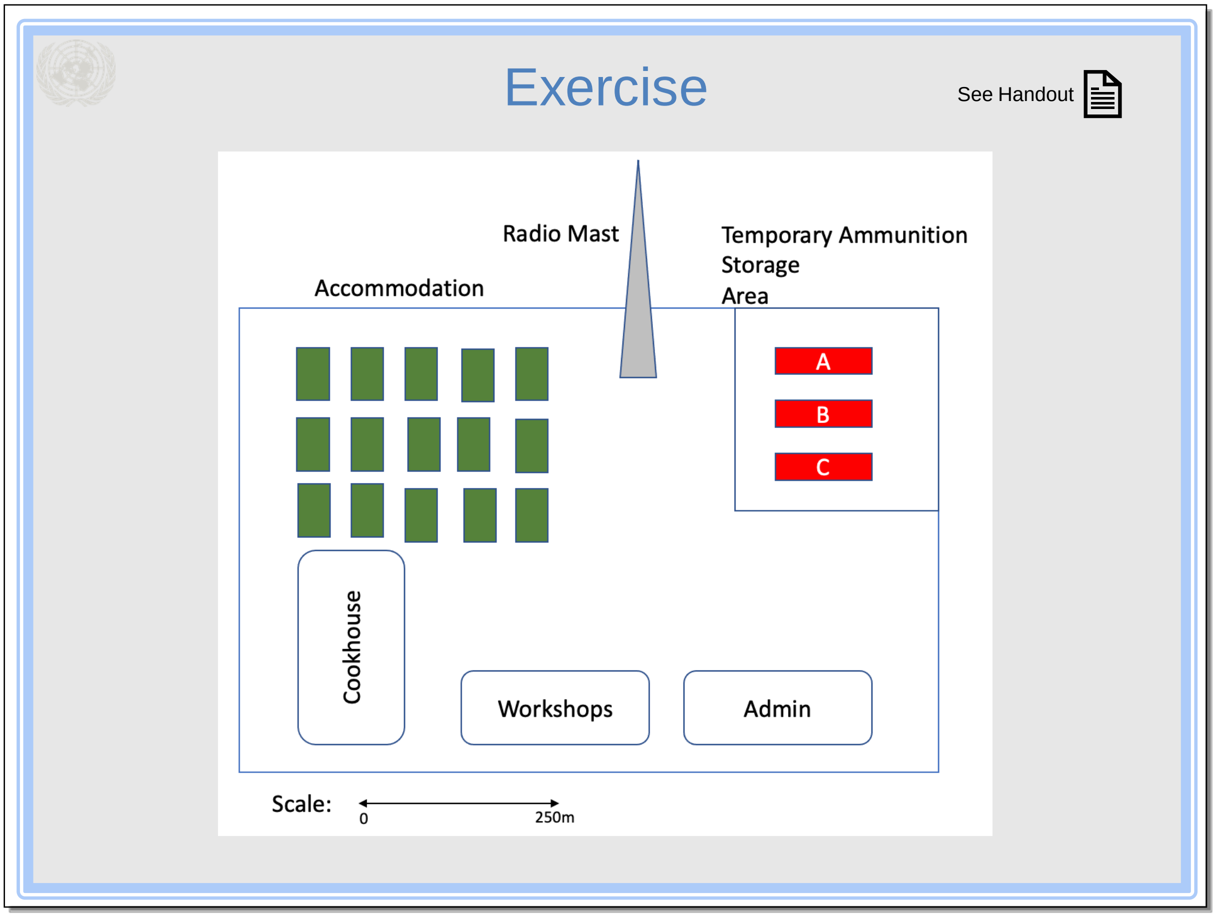
- All 'Exercise' slides should be provided as full size handouts to participants
- Instructors are to work closely with the syndicate groups to ensure the knowledge is affectively applied and that the participants gain a full understanding of this risk management process.
- When complete, work through the answers with the class and ask questions.

participant Activity

participants need to:

- calculate the internal quantity distances,
- Calculate outside quantity distances,
- complete the Explosive Limit Licensing matrix for each potential explosion site
- complete a safeguarding map highlighting the yellow and purple lines

The end product is for the participants to have compiled an explosive safety case to qualify an ammunition storage licence for a field storage area.



## Exercise

See Handout

**Main idea/objective for slide:**

- **Introduce participant exercise to compile Explosive Safety case to qualify and ammunitions storage licence for a field storage area, using the CARANA scenario**

What the instructor should cover (in addition to slide content)

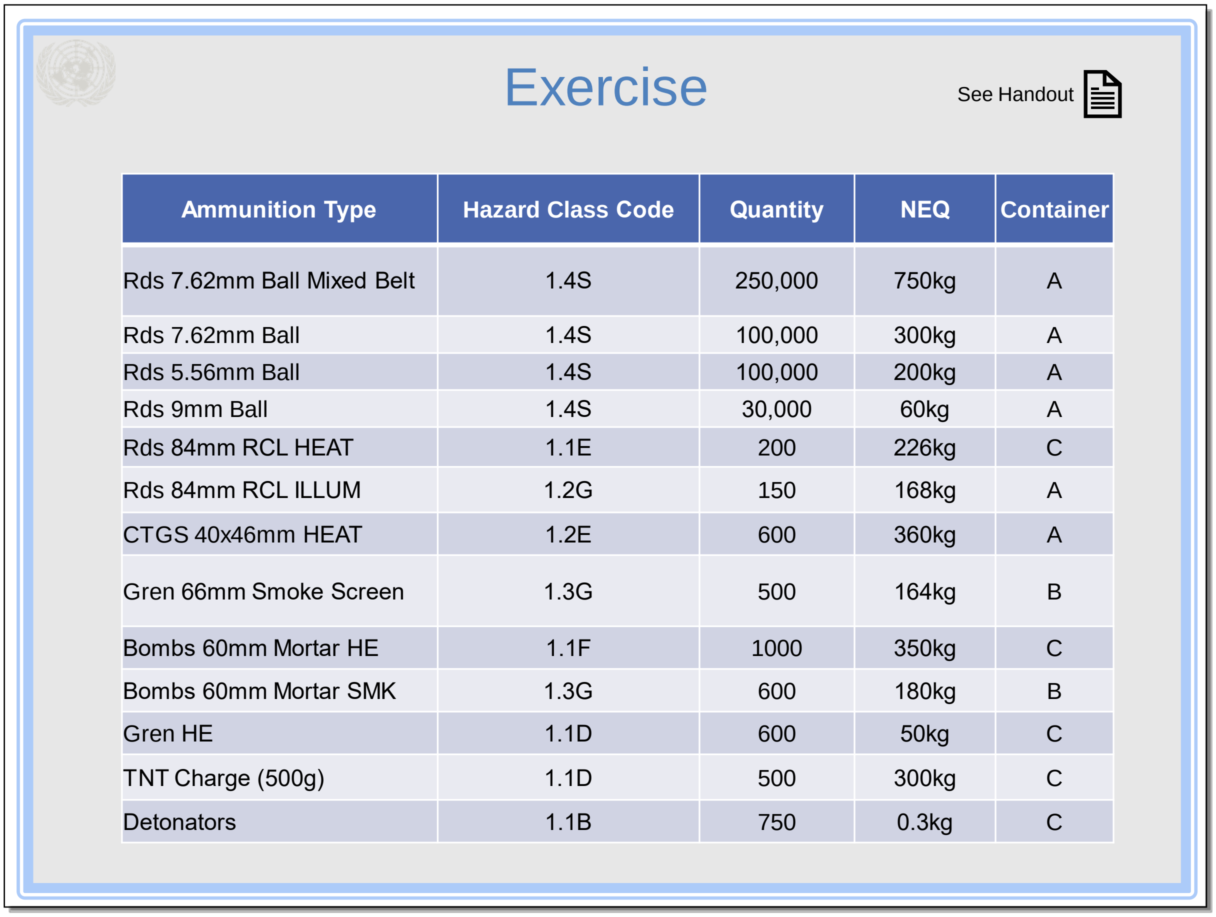
- All ‘Exercise’ slides should be provided as full size handouts to participants
- Instructors are to work closely with the syndicate groups to ensure the knowledge is affectively applied and that the participants gain a full understanding of this risk management process.
- When complete, work through the answers with the class and ask questions.

participant Activity

participants need to:

- calculate the internal quantity distances,
- Calculate outside quantity distances,
- complete the Explosive Limit Licensing matrix for each potential explosion site
- complete a safeguarding map highlighting the yellow and purple lines

The end product is for the participants to have compiled an explosive safety case to qualify an ammunition storage licence for a field storage area.



## Exercise

See Handout

| Ammunition Type | Hazard Class Code | Quantity | NEQ | Container |
|---|---|---|---|---|
| Rds 7.62mm Ball Mixed Belt | 1.4S | 250,000 | 750kg | A |
| Rds 7.62mm Ball | 1.4S | 100,000 | 300kg | A |
| Rds 5.56mm Ball | 1.4S | 100,000 | 200kg | A |
| Rds 9mm Ball | 1.4S | 30,000 | 60kg | A |
| Rds 84mm RCL HEAT | 1.1E | 200 | 226kg | C |
| Rds 84mm RCL ILLUM | 1.2G | 150 | 168kg | A |
| CTGS 40x46mm HEAT | 1.2E | 600 | 360kg | A |
| Gren 66mm Smoke Screen | 1.3G | 500 | 164kg | B |
| Bombs 60mm Mortar HE | 1.1F | 1000 | 350kg | C |
| Bombs 60mm Mortar SMK | 1.3G | 600 | 180kg | B |
| Gren HE | 1.1D | 600 | 50kg | C |
| TNT Charge (500g) | 1.1D | 500 | 300kg | C |
| Detonators | 1.1B | 750 | 0.3kg | C |

**Main idea/objective for slide:**

- **Introduce participant exercise to compile Explosive Safety case to qualify and ammunitions storage licence for a field storage area, using the CARANA scenario**

What the instructor should cover (in addition to slide content)

- All 'Exercise' slides should be provided as full size handouts to participants
- Instructors are to work closely with the syndicate groups to ensure the knowledge is affectively applied and that the participants gain a full understanding of this risk management process.
- When complete, work through the answers with the class and ask questions.

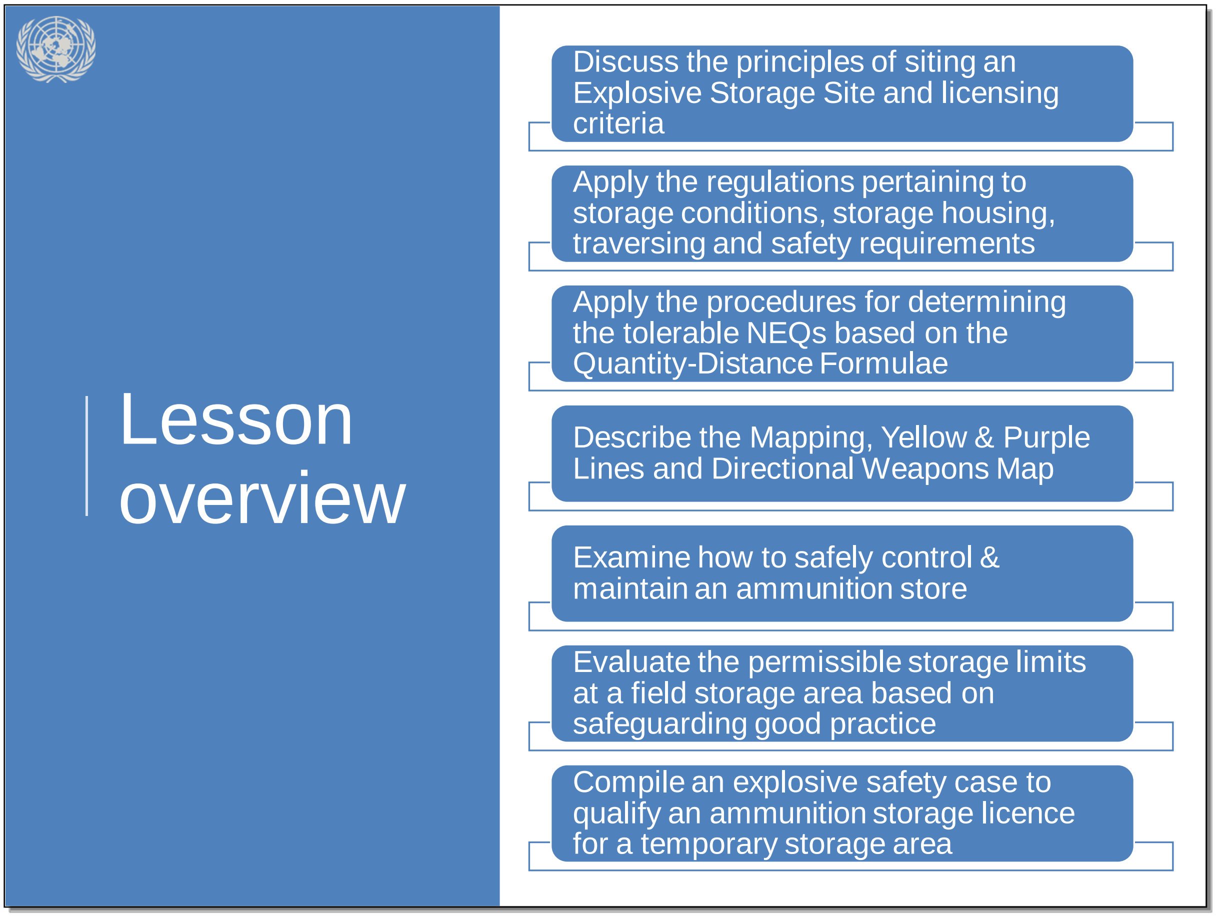
participant Activity

participants need to:

- calculate the internal quantity distances,
- Calculate outside quantity distances,
- complete the Explosive Limit Licensing matrix for each potential explosion site
- complete a safeguarding map highlighting the yellow and purple lines

The end product is for the participants to have compiled an explosive safety case to qualify an ammunition storage licence for a field storage area.

Slide 115



Lesson overview

- Discuss the principles of siting an Explosive Storage Site and licensing criteria
- Apply the regulations pertaining to storage conditions, storage housing, traversing and safety requirements
- Apply the procedures for determining the tolerable NEQs based on the Quantity-Distance Formulae
- Describe the Mapping, Yellow & Purple Lines and Directional Weapons Map
- Examine how to safely control & maintain an ammunition store
- Evaluate the permissible storage limits at a field storage area based on safeguarding good practice
- Compile an explosive safety case to qualify an ammunition storage licence for a temporary storage area

**Phase 3. Consolidation (Time allocation - 10 min)**

**<u>Main idea/objective for slide:</u>**
**Recap Key Learning Points**

<u>participant activity</u>
Give participants opportunity to ask any questions

Key Learning Points
2.2.10.1 Recall the contents of an explosive safety case
2.2.10.2 Recall the principles of siting an Explosive Storage Site and licensing criteria

2.2.10.3 Discuss the principles of siting an Explosive Storage Site and licensing criteria
2.2.10.4 Apply the regulations pertaining to storage conditions, storage housing, traversing and safety requirements
2.2.10.5 Apply the procedures for determining the tolerable NEQs based on the Quantity-Distance Formulae
2.2.10.6 Describe the Mapping, Yellow & Purple Lines and Directional Weapons Map
2.2.10.7 Examine how to safely control & maintain an ammunition store
2.2.10.8 Evaluate the permissible storage limits at a temporary storage area based on safeguarding good practice
2.2.10.9 Compile an explosive safety case to qualify an ammunition storage licence for a temporary storage area
Slide 116

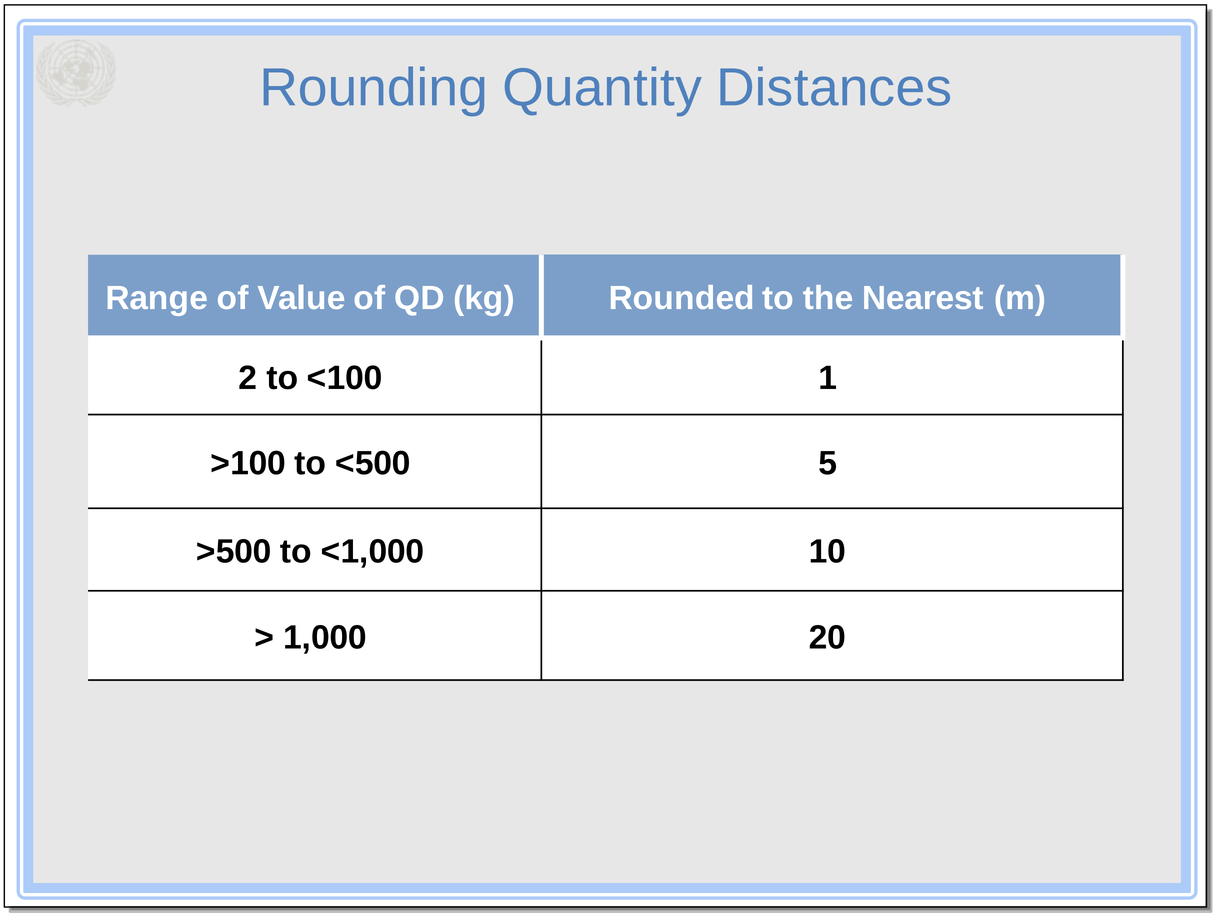
Slide 116

Weapons and Ammunition Management in UN Peace Operations

Look Ahead:
Secure Weapon Stoarge

**Main idea/objective for slide:**
Look ahead to the next lesson of the course:
STX – ERA and Camp takeover

Slide 117



## Rounding Quantity Distances

| Range of Value of QD (kg) | Rounded to the Nearest (m) |
|---|---|
| 2 to <100 | 1 |
| >100 to <500 | 5 |
| >500 to <1,000 | 10 |
| > 1,000 | 20 |

**Main idea/objective for slide:**

- **methods to measure quantity distances**

What the instructor should cover (in addition to slide content)

Check the participants understanding of rounding.
Give some examples on a whiteboard as how rounding works based on this table.

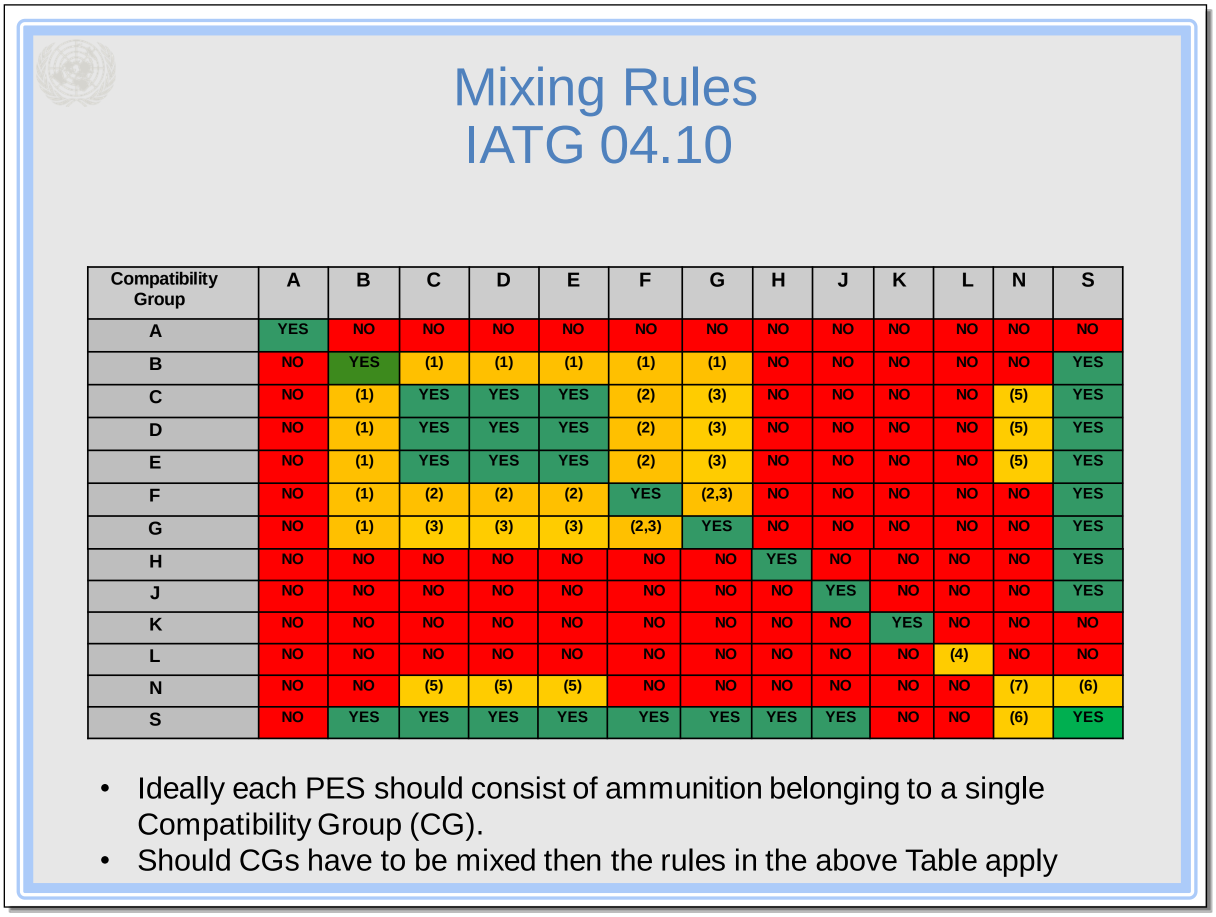
References/further reading

**IATG 02.20 – Quantity and Separation Distances**

- The values of QD in the QD Tables that follow have been rounded up in accordance with the table above
- It is permitted to determine a QD using the distance function formulae at the foot of the appropriate column in the QD Table.

- A calculated distance, rounded up to the nearest metre, may be used in place of any value in the QD Tables.
- If an NEQ is back calculated from a distance, using the appropriate QD formula, the answer should be rounded down to the nearest kg.

Slide 118



## Mixing Rules
## IATG 04.10

| Compatibility Group | A | B | C | D | E | F | G | H | J | K | L | N | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | YES | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| B | NO | YES | (1) | (1) | (1) | (1) | (1) | NO | NO | NO | NO | NO | YES |
| C | NO | (1) | YES | YES | YES | (2) | (3) | NO | NO | NO | NO | (5) | YES |
| D | NO | (1) | YES | YES | YES | (2) | (3) | NO | NO | NO | NO | (5) | YES |
| E | NO | (1) | YES | YES | YES | (2) | (3) | NO | NO | NO | NO | (5) | YES |
| F | NO | (1) | (2) | (2) | (2) | YES | (2,3) | NO | NO | NO | NO | NO | YES |
| G | NO | (1) | (3) | (3) | (3) | (2,3) | YES | NO | NO | NO | NO | NO | YES |
| H | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO | NO | YES |
| J | NO | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO | YES |
| K | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO |
| L | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | (4) | NO | NO |
| N | NO | NO | (5) | (5) | (5) | NO | NO | NO | NO | NO | NO | (7) | (6) |
| S | NO | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | (6) | YES |

- Ideally each PES should consist of ammunition belonging to a single Compatibility Group (CG).
- Should CGs have to be mixed then the rules in the above Table apply

**<u>Main idea/objective for slide:</u>**

- **Discuss the concept of aggregation of Net Explosive Quantity**

<u>What the instructor should cover (in addition to slide content)</u>

- Ask the participants the benefits of this aggregation and why is it useful.
- Give this table as a Handout. <u>http://data.unsaferguard.org/iatg/en/IATG-01.50-Explosive-hazard-classification-system-IATG-V.3.pdf</u> page 9

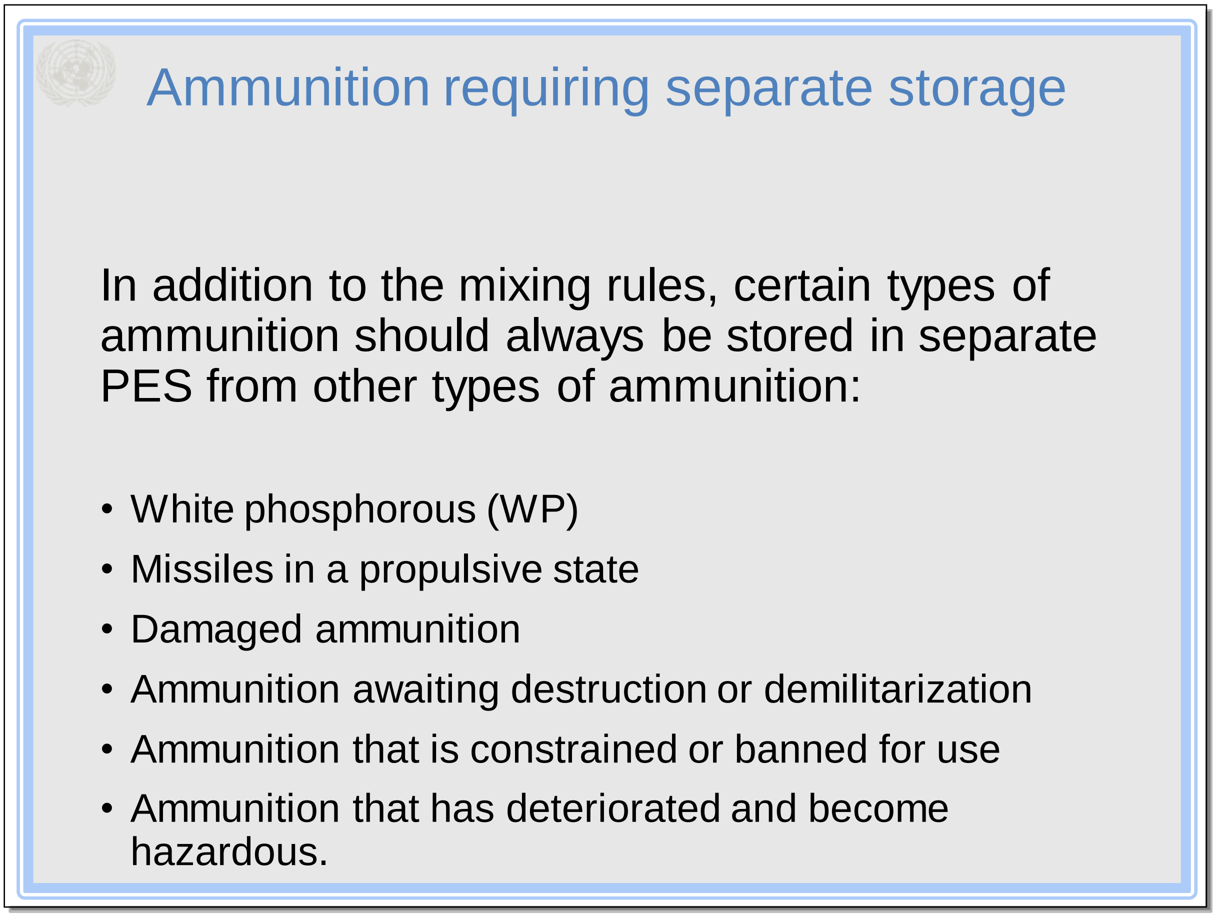
<u>References/further reading</u>

**IATG 04.10 – Temporary Storage**

- NOTE 1 Compatibility Group B fuzes may be stored with the articles to which they belong, but the NEQ shall be aggregated and treated as Compatibility

Group F. Compatibility Group B ammunition (other than fuzes) shall be stored in a separate site.

- NOTE 2 Storage in same area permitted if effectively segregated to prevent propagation.
- NOTE 3 Providing Compatibility Group G is still in its authorised outer packaging and at discretion of national authority.
- NOTE 4 Compatibility Group N articles shall always be stored separately from all articles of other compatibility groups as well as from other articles of different types of Compatibility Group L.
- NOTE 5 Articles of Compatibility Group N should not be stored with other Compatibility Groups except S. However if such articles are stored with articles of Compatibility Groups C, D and E, the articles of Compatibility Group N should be considered as having the characteristics of Compatibility Group D and the Compatibility group mixing rules apply accordingly.
- NOTE 6 A mixed set of munitions of HD 1.6N and HD 1.6S may be considered as having the characteristics of Compatibility Group N
- NOTE 7 Compatibility Group F is to be stored separately, except that F may be stored with Hazard Division (HD) 1.4 of any Compatibility Group



## Ammunition requiring separate storage

In addition to the mixing rules, certain types of ammunition should always be stored in separate PES from other types of ammunition:

- White phosphorous (WP)
- Missiles in a propulsive state
- Damaged ammunition
- Ammunition awaiting destruction or demilitarization
- Ammunition that is constrained or banned for use
- Ammunition that has deteriorated and become hazardous.

**Main idea/objective for slide:**

- **Ammunition requiring separate storage**

What the instructor should cover (in addition to slide content)

Ask participants why these ammunition types need to have separate storage

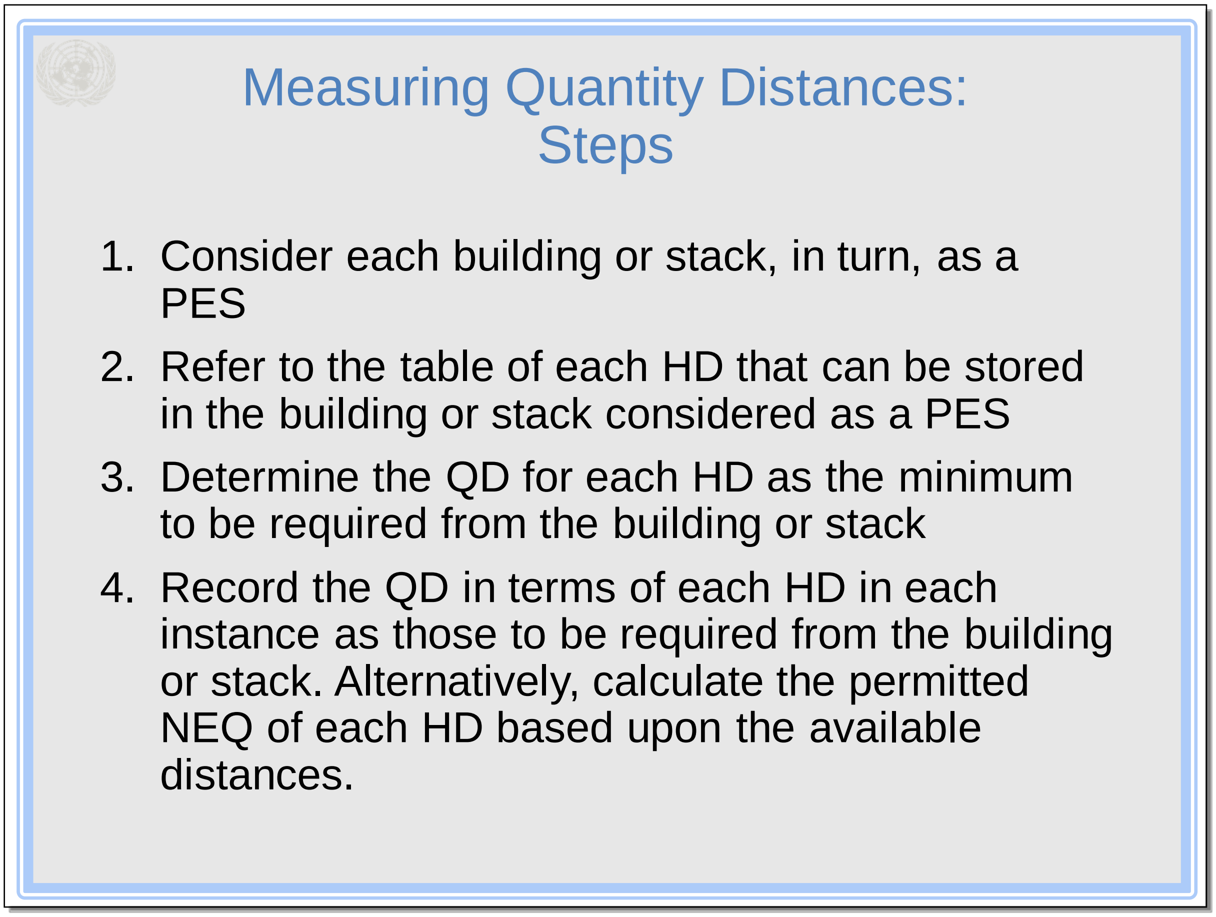
References/further reading

**UN Manual of Ammunition Management**

- White Phosphorous (WP). This manual does not authorize T/PCCs to hold WP ammunition except munitions which may have minimal incendiary effects, such as illumination, tracers, smoke or signaling systems within caliber of small arms (within 26,5mm).
- For seized/recovered WP ammunition, the PES for this ammunition shall be very near to a source of water or a water container large enough to fully fit

the largest ammunition container should be on the site. The WP ammunition should be stored in an upright position with the base nearest the ground;
- Missiles in a Propulsive State. These should be stored in a barricaded PES with the warheads pointing away from other ammunition stocks;
- Damaged Ammunition. If considered unsafe for storage by a qualified assessment, damaged munitions should be destroyed at the earliest convenience;
- Ammunition awaiting destruction or demilitarization and,
- Ammunition that has deteriorated and become hazardous. This shall be stored in isolation and destroyed at the earliest convenience.
- Expired Ammunition. See Chapter 4.

**IATG 04.10 – Temporary Storage**
- white phosphorous (WP). The PES for this ammunition should be very near to a source of water, or a water container large enough to fully accept the largest ammunition container should be on the site. The WP ammunition should be stored in an upright position with the base nearest the ground;
- missiles in a propulsive state. These should be stored in a barricaded PES with the warheads pointing away from other ammunition stocks. If barricading is not available, then they should be stored at a PES near the external perimeter of the Temporary Storage Area, even if this complicates security requirements;
- damaged ammunition. (If considered unsafe for storage, damaged munitions should be destroyed at the earliest convenience);
- ammunition in an unknown condition or of unknown origin. (This shall be stored at such a distance that detonation of this ammunition will not jeopardize other stocks);
- ammunition awaiting destruction or demilitarization;
- ammunition that is constrained or banned for use; and
- ammunition that has deteriorated and become hazardous. (This shall be stored in isolation and destroyed at the earliest convenience).



## Measuring Quantity Distances: Steps

1. Consider each building or stack, in turn, as a PES
2. Refer to the table of each HD that can be stored in the building or stack considered as a PES
3. Determine the QD for each HD as the minimum to be required from the building or stack
4. Record the QD in terms of each HD in each instance as those to be required from the building or stack. Alternatively, calculate the permitted NEQ of each HD based upon the available distances.

**Main idea/objective for slide:**

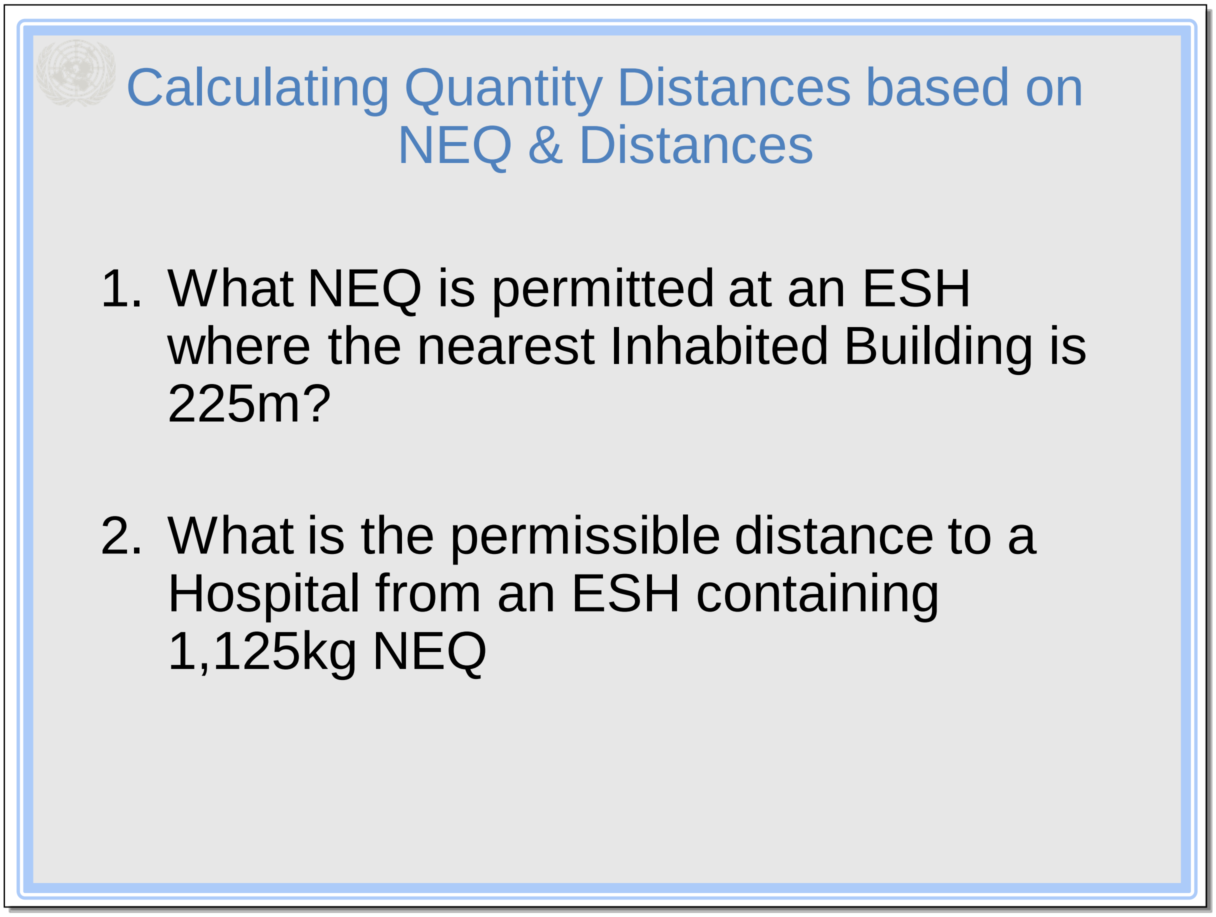
- **methods to measure quantity distances**

References/further reading

**IATG 02.20 – Quantity and Separation Distances**

- The location of PES with respect to each other and to other ES is based on the total NEQ in the individual PES unless this total NEQ is subdivided such that an incident involving any one of the smaller concentrations cannot produce a practically instantaneous explosion in adjacent stacks.
- The QD required between each of two or more nearby storage sites or ammunition process buildings that contain explosives of one HD only are determined by considering each as a PES.

- The NEQ permitted in the storage sites or ammunition process buildings is limited to the least amount allowed by the appropriate table for the distances separating the storage sites or ammunition process buildings concerned.



## Calculating Quantity Distances based on NEQ & Distances

1. What NEQ is permitted at an ESH where the nearest Inhabited Building is 225m?
2. What is the permissible distance to a Hospital from an ESH containing 1,125kg NEQ

**Main idea/objective for slide:**

- **Calculating Quantity Distance based on NEQ & Distances**

What the instructor should cover (in addition to slide content)

- Work out these examples on a White board
- The instructor can complete the first question and have the participants complete the second.

## Summary

In this lesson, participants engaged in compiling an explosive safety case to qualify for an ammunition storage license for a temporary storage area. Key learning points included:

- Participants recalled and discussed the principles governing the siting of an Explosive Storage Site and the criteria for obtaining a licensing, ensuring compliance with safety standards and regulations.
- Participants applied regulations related to storage conditions, housing, barricades, and safety requirements, emphasizing the importance of adherence to safety protocols.
- Engage in applying procedures for determining the tolerable NEQs using Quantity-Distance Formulae, ensuring safe storage practices and risk mitigation.
- Participants learned about mapping techniques, including yellow and purple lines, and directional weapons maps, essential for maintaining safe storage environments.
- Explore methods for safely controlling and maintaining an ammunition store, including regular inspections and maintenance procedures.
- Participants evaluated permissible storage limits at temporary storage areas, ensuring compliance with safeguarding good practices and safety standards.
- Practice compiling an explosive safety case to qualify for an ammunition storage license, demonstrating proficiency in documenting and justifying safety measures for regulatory compliance.

# Module 2

## Ammunition Management Wrap Up

At the conclusion of Module 2, a few concluding points are worth noting:

- Ammunition management cannot be undertaken by untrained personnel and requires specific training due to its complexity.
- Effective ammunition management guarantees that, in the event of mission drawdown or closure, the disposal of ammunition is minimized, and most ammunition can be safely repatriated.
- Inadequate practices in ammunition management highlighted that when circumstances worsen, the expenses to rectify the issues increase and carry substantial reputational risks for the organization.
- Safeguarding of ammunition storage area is crucial for minimizing the risk to peacekeepers and local populations in the event of an unplanned explosion at a munition site
- Ammunition management requires a comprehensive approach which necessitates thorough attention to various aspects, including storage, handling, transportation, risk assessment and others topic covered in this module. Each component plays a crucial role in ensuring the safe and effective management of ammunition in diverse operational contexts. By addressing these elements comprehensively, peace operations can mitigate risks and enhance operational readiness.