

GOVERNMENT CHEMIST LABORATORY AUTHORITY

GUIDELINES FOR MANAGEMENT OF AMMONIUM NITRATE

PRESENTATED AT THE
SUPERVISORS TRAINING WOREKSHOP
15 DECEMBER 2024, ARUSHA

www.gcla.go.tz



PRESENTATION OUTLINE

1. Introduction
2. Properties and Use of Ammonium Nitrate
3. Reported Incidences Related to AN
4. Required Risk Control Measures of AN.
5. Objective and Scope of the AN Guidelines
6. Safe Handling, Loading and Unloading of AN
7. Safe Storage
8. Safe Transportation of AN
9. Management of Spills and Disposal of Waste AN

INTRODUCTION

- GCLA is the implementing of the ICCA and its Regulations.
- The Act provides for the management and control of the
 - production,
 - importation,
 - usage,
 - transportation,
 - exportation,
 - storage,
 - dealing and disposal of chemicals.
- Among the chemicals regulated by the law is Ammonium Nitrate (AN)
- AN if not properly managed can cause explosions and endangering of life, damage of properties and the environment

PROPERTIES AND USE OF AMMONIUM NITRATE

- Four key main hazards properties of AN
 - Fire due to its oxidising nature
 - itself is not **combustible and does not burn**, it can facilitate the initiation of fire and assist the combustion of other materials, even if air is excluded.
 - When contaminated with **oil or combustible materials can initiate** fire when hot
 - AN solutions can initiate fires when in **contact with combustible materials** such as rags, wooden articles, or clothing.

PROPERTIES AND USE ...

- Chemical Reaction
 - AN is hygroscopic and absorbs water from the atmosphere at high humidity
 - It is capable of attracting so much water under hot and humid
- Explosion
 - AN is an **explosive precursor substance** since it carries the oxidizing nitrate ion in intimate contact with the fuel element
- The use of AN is predetermined by its form it appears
 - Liquid Ammonium Nitrate may be sold as a fertilizer, generally in combination with urea
 - High density prills, granules, and crystals are used as fertilizer
 - grains are used solely in explosives;

REPORTED INCIDENTS RELATED TO AN

- Port of **Beirut incidence** on 4 August 2020 involving explosion of 2,750 tons of AN resulting to:
 - 190+ deaths and 6000+ injures.
 - immense damage throughout the entire city.
- **Port of Tianjin** incidence on 12 August, 2015 involving 800 tons of AN stored nearby leading to:
 - 165 deaths and 798 injures.
 - extensive damage to structures and goods at the port, apartment blocks, and a railway station.
- Use of AN in terrorist attacks:
 - A bomb in **Oklahoma City**, on 19 April 1995 leading to 168 deaths and 500 injures
 - two blasts occurred within 100 meters apart and within a short time on 23 February 2013 in Hyderabad leading to 16 deaths and 100+ injures:

REQUIRED RISK CONTROL MEASURES OF AN

- Prevent external fires from impacting on the AN by **removing all combustible material and sources of ignition**.
- Guard against **theft and sabotage** by preventing unauthorized access to the storage site.
- Implement safety distances to reduce the consequence of an explosion at nearby occupancies:
 - The storage location of AN should be **separated from exposed sites or protected works** by minimum safety distances.
 - AN should be divided into **sufficiently separated stacks** to prevent a sympathetic detonation between stacks and reduce the consequence of an explosion.
 - Prepare a site-specific **emergency plan**, practice the evacuation of people

OBJECTIVE AND SCOPE OF THE AN GUIDELINES

- Based on the intrinsic properties of AN and the reported incidences caused by AN
- These guidelines therefore is aimed to:
 - provide guidance and directives for sound management of Ammonium Nitrate (AN)
 - in order to protect human health, the environment and properties in the country.
- The guidelines shall apply to:
 - importers, exporters, warehouse operators, re-bagging, transporters, users and ports of entry/exit,
 - owners of disposals facilities and any other dealers involved in handling of AN.
- The guidelines apply to AN meant for use in industries and mining activities.

SAFE HANDLING, LOADING AND UNLOADING OF AN

- **Pre-arrival Arrangement Requirement** for a Vessel Carrying AN
- The shipping agent of a ship carrying AN shall inform the receiving port at **least seven days of its intended arrival** at the Port.
- Terminal operator to convene a stakeholder's **pre-arrival meeting aiming to ensure the adherence of compliance** issues to relevant authorities
- The meeting among others issues, will discuss:
 - Special area where the ship/vessel carrying AN will anchor
 - **timeframe** for clearance and offloading the AN consignment
 - **Awareness and training** of all operational staff on the safe handling
 - Availability and enforcement on the use of **appropriate person protective equipment**

SAFE HANDLING, LOADING AND UNLOADING ...

- Availability, appropriateness and **quality of operational equipment** such as forklifts that will be used.
- The readiness of each **responsible institution and other private stakeholders** in facilitating the clearance and offloading of AN within the agreed timeframe.
- Availability of **Safety Data Sheet** (i.e. the Agent of the vessel to submit the SDS to terminal operator and to other relevant institution seven prior arrival).
- General **preparedness and response** to any emergency that might occur with regard to the properties of Ammonium Nitrate.

SAFE HANDLING, LOADING AND UNLOADING ...

- General Safety Principles for Unloading from a Vessel
 - Avoid unloading of AN near combustible and incompatible substances
 - Avoid cross contamination of AN with remains of previous cargoes
 - Avoid cross contamination of next cargo with AN
 - Avoid sources of heat likely to affect the AN
- Requirements for Unloading Ammonium Nitrate (AN) from a Vessel
 - All safety precautions as per SDS shall be in place and made aware to the employees.
 - Unloading shall be conducted under supervision of trained personnel from the owner or representative of the AN cargo.

SAFE HANDLING, LOADING AND UNLOADING ...

- Unloading Ammonium Nitrate from Vehicles, any person who is involved in unloading of AN vehicle shall ensure that:
 - Unloading is conducted under supervision of trained personnel from the owner or representative of the AN cargo.
 - Unloading exercise is monitored by GCLA.
 - Unloading of vehicles conducted outside the warehouse.
 - Any sources of ignition are avoided (i.e do not smoke and do not use fire and any heating devices during unloading).
 - Any AN spillage is avoided during unloading.
 - All safety precautions as per SDS are in place and made aware to the employees.
 - Appropriate protective equipment is used during unloading.
 - AN is prevented from contacting fuel, oil or grease during unloading.

SAFE HANDLING, LOADING AND UNLOADING ...

- **General Labelling Requirements**

- All AN shall be properly labeled.
- A person shall not alter the name of AN provided on the label of a package or container.
- The information on the label or outside of a package shall be conspicuously, legibly and indelibly written or printed in both English and Swahili.
- The label shall appear on one exposed face of the package or label;
- The label should be of a size and color that can be easily read.
- No label shall contain any incorrect or misleading information.

SAFE STORAGE

- Appropriate storage of Ammonium Nitrate (AN) is critical for life, environment and infrastructure safety.
- AN is a strong oxidizer (support burning) and can react violently with incompatible materials.
- Storage of AN Requirements
 - Storage shall be buildings constructed of non-flammable materials such as brick, concrete or steel.
 - Storage buildings shall be well-ventilated to allow in and out air circulation.
 - Floors should be non-flammable material with no open drains, pits, or voids, to prevent accumulation of molten AN.
 - If AN is stored in a shade, such shades shall be secured and protected from any ignition sources, the weather (i.e. waterproof material), direct sunlight.

SAFE STORAGE ...

- AN should not be stored in enclosed and confined manner.
- At least one-metre-wide lanes between AN stack and between the stack and the walls, roof and lights of the storage building (this keeps the AN away from sources of contamination and heat).
- Combustible materials (such as wooden pallets and empty packaging, saw dusts) must be stored away from AN or separated by a suitable non-flammable barrier.
- Any spillages are to be cleaned up quickly and the waste disposed off in accordance with approved disposal method.
- Never allow water to contaminate AN because it will form a cake which detonate easily, since it is highly soluble in water and is hygroscopic (it absorbs water fr

SAFE STORAGE ...

- Avoid storing large amounts of AN in one stack, where the weight of the stack compresses it into a solid mass.
- This compacting effect, or caking as it is called, increases the likelihood of a detonation if the AN is exposed to heat or shock.
- The maximum number of bags is three and the height of stacks from the roof is 1 meter.
- If the storage warehouse is located in an industrial area near residentials, the Registrar will prescribe additional conditions including:
 - installation of thermo-detectors for alerting in case of extreme rise of temperature,
 - fixing of insulation material for regulation
 - control of temperature and setting of maximum time for storage of AN under such situations.

SAFE STORAGE ...

- If AN is stored outside it should be protected from the weather.
- Keep AN dry as the risk of explosion increases once the product becomes caked.
- Avoid drains, channels and pits where molten AN from a fire could become confined.
- Locate storage away from sources of heat, fire or explosion.
- Do not store AN in the same stack as other products.
- It is preferable to store AN in a separate building from urea.
- Wooden pallets are a fire risk; do not store unused wooden pallets in the store unless separated by a suitable distance or barrier.
- Prohibit smoking in storage areas and display NO SMOKING signs or symbolic prohibition signs.
- Outside the store there should be no combustible material within 8 metres and no standing timber within 15 metres.

SAFE STORAGE ...

- **Ignition Sources Consideration**

- AN shall be stored away from **sources of heat, fire and explosion** (e.g. fuels, compressed gas, fireworks and ammunition).
- AN shall be moved to a **safe distance and the area cleaned before any hot work** (exposing electrical systems, cutting, welding etc.) is conducted.
- Suitable firefighting **precautions shall be in place** whilst the work is conducted.
- AN is a **fire hazard and explosive substance**, therefore, for its safe storage, it is necessary to **ensure reliable protection against direct lightning strikes**.
- The permanent storage facility for **AN also must be fitted security camera, fire alarm with security fencing/walls** to prevent access of unauthorized personnel.

SAFE STORAGE ...

- **Location of Storage Facility**

- Storage of AN for clearance process of Transit Cargo shall abide to quantity and distance requirements.
- Warehouses of AN located in **Tanga, Mtwara and Dar es Salaam regions** located within densely populated areas,
 - shall be **temporary storage and serve as receiving warehouses** from the ports with a **maximum quantity of 10,000 Metric Tonnes**
 - The maximum time of Sixty days (60) per single company at a time.
- The permanent storage facility of AN for a quantity between **1,000 to 20,000 Metric Tonnes**, shall be far away from populated area not less than **15km to 20km**.
- The permanent storage facility of AN for a **quantity above 20,000 Metric Tonnes**, shall be far away from populated area not less than **20km to 25km**.

SAFE STORAGE ...

Table 1: Storage Requirements for Keeping for Clearance Process of Transit Cargo

Quantity of AN to be Stored in Metric Tones	Minimum Distances (in Km) from Populated Area
1000	1.4
5000	2.4
10000	3.0
15000	3.5
20,000	3.7

SAFE STORAGE ...

Table 2: Storage Requirements for Distribution/ Storage/ Manufacturing

Quantity of AN to be Stored in Metric Tones	Minimum Distances (km) from Populated Area
1000 to 20,000	Not less than 15 to 20
Above 20,000	Not less than 20 to 25

SAFE STORAGE ...

Storage in Bags, Drums or Other Containers

- Piles of bags, drums and other containers should be no closer than **three Meter** below the roof or supporting beams.
- Bags should be stored no less than **One meter from walls or partitions**.
- Piles of bags, drums, and other containers should not exceed a **height of three-meter**, width of six meter, and length of 15 meter, the building is of **noncombustible construction or protected** by automatic sprinklers.
- **Maintain passageways** of at least one-meter width between piles.
- For stability purpose and assurance of **enough ventilation**, **stacks of AN** shall be stored in the form of pyramid.

SAFE STORAGE ...

- **Firefighting Consideration**
 - AN storage area should be equipped with:
 - an **automatic sprinkler system**, or
 - have an automatic **fire detection and alarm system** if the areas are not continuously occupied.
 - Facilities should NOT store more than 2500 tons of bagged AN without an **automatic sprinkler system**.
 - An automatic sprinkler system, if installed, should be provided in accordance with **set Standards for the Installation of Sprinkler Systems**.
 - Water supplies and **fire hydrants** should be available.
 - **Smoking and other flame producing materials** should be banned in the storage location. Display **NO SMOKING notices**

SAFE STORAGE ...

- **Firefighting Consideration**
 - Extinguish AN fire only **effectively by water.**
 - Personnel should be **trained in the use of firefighting equipment**
 - Fixed **firefighting equipment** and hydrants should be maintained not to leak water and then contaminate the AN.
 - When a fire involving AN is out of control an **evacuation to an appropriate separation distance.**
 - Water from hoses and fixed monitors should be able to **reach all parts of the store**

SAFE STORAGE ...

- **Security Requirements**

- The minimum-security requirements shall include:

- Identify the **existing security measures** and **examine the level and type of risks** (internal and external) to the AN stockpile.
- Consideration of whether current security arrangements leave the **AN vulnerable to diversion** (theft or loss),

- Water from hoses and fixed monitors should be **able to reach all parts of the store**

SAFE STORAGE ...

- **Security Requirements**

- **Identification of hazards** from AN in the context it is being handled, transported, stored or used in.
- Installation of **CCTV Camera** for monitoring of security and detection of any crime
- Implementation of **preventive and mitigation** measures for minimizing the risk to people, infrastructure and environment.
- Access to areas where AN is stored should be **limited to authorized individuals** only.
- Authorized individuals should go through **relevant training on proper management of AN**
- Maintain keep **record on AN**

SAFE TRANSPORTATION OF AN

- equipment used to lift and transport Ammonium Nitrate should be suitable and fit for the purpose. It should be:
 - Mechanically sound.
 - Free of any **leaks of fuel, lubricating oil** or hydraulic oil.
 - Fitted with appropriate measures to **prevent initiation of fire.**
 - Trucks transporting Ammonium Nitrate shall use **diesel as a source of power.**
- Driver shall be aware on any:
 - **temperature increase or ignition sources** during transportation.
 - Have the correct **transport documentation.**

SAFE TRANSPORTATION OF AN ...

- The parking requirements of all AN vehicles include:
 - Vehicles loaded with AN should be **parked no closer than 10 m from AN store**, except for the loading of mobile processing units.
 - Parking of AN vehicles loaded with AN shall be **parked at designated areas**.
 - In case there is no designated parking area, vehicles loaded with AN shall be **parked away from densely populated areas**,
 - *any sources of heat and, or 50 meters from fuel tanker or petrol station.*
 - The parking areas and vehicle bays for AN shall be **clearly marked**.
 - **Access and escape routes** should be clearly defined and kept clear at all times.

SAFE TRANSPORTATION OF AN ...

- The parking requirements of all AN vehicles include:...
 - Spill kits should be available to clean up and recover any AN spill and fuel and oil spills.
 - Before leaving the parked vehicle, the driver should ensure that wheel and bearing temperatures of the parked vehicles are within safe operational limits to prevent vehicles.
 - No any person or driver shall be allowed to sleep inside the vehicle and cook in or near the vehicle carrying AN.
 - Remain inside the store only for the time required to unload or load the vehicle.
 - Vehicles carrying AN in a private yard with restricted access, where vehicles are in transit.
 - “In transit” means vehicles carrying AN do not park for longer than five consecutive days

SAFE TRANSPORTATION OF AN ...

Requirements for Driver

Any driver of a vehicle transporting consignment of Ammonium Nitrate (AN) shall fulfil the following requirements;

- **Safety card for AN** shall be in vehicle during transportation.
- Drivers shall be **knowledgeable in chemical handling skills**.
- Drivers should **walk around their vehicle** every time they stop for a break to check safety.
- The driver shall possess during transportation **a copy of GCLA driver's training certificates**,
 - the **packing list**;
 - **Contingency plan** for hazardous,
 - an **invoice and permit** to transport AN

SAFE TRANSPORTATION OF AN ...

- **Requirements for Transporter**

- Every transporter of AN shall:

- Conduct **route risk assessment** and communicate the findings to drivers
- Request and be issued **transport permit by Registrar.**
- Maintain **appropriate and adequate personal protective gears**, first aid facilities and ensure enforcement of their use.
- Provide adequate and **appropriate transportation facilities** to ensure that all chemicals and equipment are in safe condition.
- Submit a **contingency plan** for safe handling and transportation of AN.
- Create **awareness to the public** on the inherent risks of AN along the route of transportation.

SAFE TRANSPORTATION OF AN ...

Convoy Requirements

- Transportation of AN shall:
 - Conduct a mock drill of their **contingency plan** every six months.
 - Be in a convoy under GCLA escort marked with legible warning signs written in English or Kiswahili language.
 - Be in a convoy of not more than **ten vehicles** and each vehicle shall not be loaded with not more than specified metric tons.
 - **Avoid high speed**, the recommended maximum speed limit for tarmac road is 70 KPH and 50 KPH in rough road.

MANAGEMENT OF SPILLS AND DISPOSAL OF WASTE AN

- **Management of Spillage**

- In case of a **spillage or leakage**, the **responsible person** shall:
 - Ensure that spillage is dealt with or handled by **people vested with the knowledge of handling AN** spillage.
 - Prevent further **leakage or spillage** if it is safe to do so.
 - Use appropriate **protective gear** when dealing with spillage or leakage.
 - Clean the spillage, but avoid **generating dust**. Collect in properly labelled containers or drums for disposal. **DO NOT** return spilled material to original container.
 - Not mix spilled AN with other solid wastes.
 - Spillage recovery needs to be appropriately documented and materials accurately accounted for.

MANAGEMENT OF SPILLS AND DISPOSAL OF WASTE AN

- **Management of Spillage**

- In case of a spillage or leakage, the responsible person shall:

- **Report to the registrar** for any spilled AN on quarterly basis
 - Eliminate all **ignition sources** (no smoking, flares, sparks or flames in immediate area).
 - Ensure **adequate ventilation**.
 - Avoid **contact with** skin, eyes, and clothing.
 - Wash thoroughly after handling AN.
 - Keep combustibles (wood, paper, oil, etc.) away from spilled material.
 - Prevent **entry into waterways**, sewers, basements or confined areas.

MANAGEMENT OF SPILLS AND DISPOSAL OF WASTE AN

- **Disposal Consideration**

- The disposal of waste AN should take into consideration of the following:

- Avoid disposing **AN waste into drainage** systems and environment.
- **Burying AN residues with hot earth** and organic material can result in a violent underground reaction and is not recommended.
- AN waste shall not be **transported without a permit** issued by the Registrar.
- The selection of disposal method shall depend on a proper risk assessment
- Ensure that the **employees are made aware** on the inherent nature and risks of improper handling of AN waste.

THANK YOU FOR YOUR ATTENTION