

Safe storage of solid ammonium nitrate

Code of practice



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Resources Safety 

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Foreword

The Act

The *Dangerous Goods Safety Act 2004* (the Act) provides risk management dangerous goods legislation for the first time in Western Australia. A key focus of the Act is the duty to minimise risk from dangerous goods.

The duty to minimise risk not only applies to employers and employees but to all persons, including members of the public. This duty is placed on everyone involved with dangerous goods and goes beyond the workplace duties of the *Occupational Safety and Health Act 1984* and the *Mines Safety and Inspection Act 1994*. Public safety is one of the most important features of the Act.

Regulations

The Act is supported by the Dangerous Goods Safety (Storage and Handling Non-Explosives) Regulations 2007 for safety requirements and the Dangerous Goods Safety (Security Risk Substances) Regulations 2007 for security requirements.

All storages of ammonium nitrate (AN) require a security licence under the Dangerous Goods Safety (Security Risk Substances) Regulations 2007, except where less than 3 kg of AN is stored for use at laboratories under specific conditions.

If the quantity of AN exceeds 10 t, it is subject to safety requirements and must be licensed under the Dangerous Goods Safety (Storage and Handling Non-Explosives) Regulations 2007.

Some stores may be classified as a major hazard facility (MHF) and will be subject to the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007, with the requirement to produce a safety report.

The regulations are enforceable, and breaches may result in licence suspension, prosecution or directions to cease operations and undertake remedial action.

Acknowledgement

The material safety data sheet for ammonium nitrate in Appendix 3 is reproduced with permission from CSBP Limited.

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1 Introduction

1.1 Scope

This code of practice has been produced to assist people storing solid ammonium nitrate (AN) to comply with important AN safety requirements.

It describes the preferred safe work practices that can be readily used at places such as ports, merchant stores, mine sites and manufacturers' facilities to reduce the risks associated with the storage of solid AN, primarily addressing the prevention of fires and explosions. It may be possible to use other measures that provide the same or a lower level of risk — the code is not intended to prevent innovative safety practices and equipment that give at least equivalent safety performance.

The risk control information is based on a detailed knowledge and practical understanding of the properties and hazards of solid AN gained from testing and research, and the experience of past fires and explosions. However, it cannot cover every possibility.

People who have duties under the *Dangerous Goods Safety Act 2004* (the DGS Act) and relevant regulations should remain alert to developments and hazards that may not be fully dealt with by this code of practice or other guidance material, and assess what further measures may be necessary or desirable, considering good working practice and local circumstances.

A glossary of terms used in this code of practice is given in Appendix 1.

Note: This code of practice should be read and applied in conjunction with the code of practice on the storage and handling of dangerous goods, available from the Resources Safety website.

1.2 Application

This code of practice applies to the storage of solid AN in Class 5.1 – oxidising agent, as classified into United Nations numbers UN 1942 and UN 2067 by the 7th edition of *Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG7)* and 15th edition of *Recommendations on the Transport of Dangerous Goods: Model Regulations* (UN 15), published in 2007 by the United Nations.

The code does not apply to AN substances classified as Class 1 explosives, Class 9 miscellaneous dangerous goods or non-dangerous goods.

The safety provisions of this code of practice apply to storages of solid AN of Class 5.1, except for:

- sites storing less than 1,000 kg of AN; or
- a 'rural dangerous goods location', where AN is stored and used (not retailed) on an agricultural site of more than 5 hectares that is used exclusively for primary production.

Note: Under the DGS Act, a general duty exists in relation to minimising the risk to people, property and the environment from dangerous goods, such as AN, in any quantity.

2 Characteristics of ammonium nitrate

2.1 Properties

Pure AN (NH_4NO_3) is a white, odourless salt with a melting point of about 170°C.

AN is highly soluble, tends to absorb water from the atmosphere, and can attract enough water to dissolve into aqueous solution if kept at high humidity.

Solid AN has five transitional crystalline forms depending on the temperature. Changes of form result in density changes that may lead to breakdown of the AN prill structure and caking of the product.

AN can facilitate the initiation of fire and intensify fires in combustible materials.

AN may detonate, particularly when heat or fire is present with contamination, confinement or both.

Appendices 2 and 3 contain detailed information on the properties and hazards of AN.

2.2 Hazards

As summarised below, AN has three main hazards:

- fire due to its oxidising nature;
- decomposition with the formation of toxic gases; and
- explosion.

Fire

AN is not combustible and does not burn but, being an oxidising agent, it can facilitate the initiation of fire and will assist the combustion of other materials, even if air is excluded.

AN products contaminated with oil or combustible materials can initiate a fire when hot. Similarly, combustible materials impregnated with AN have been known to start burning spontaneously when left on hot surfaces.

Hot AN melt or solutions can initiate fires when coming into contact with combustible materials such as rags, wooden articles or clothing. Hot AN solutions present the additional hazard of causing burns if in contact with the skin.

Decomposition

If AN is heated, it will decompose to give off toxic gases. In an open and unconfined situation, it will decompose completely to give gaseous products of nitrous oxide (N_2O), ammonia (NH_3) and nitric acid (HNO_3) in a steady controlled way, with white fumes and vapours.

If heated sufficiently (such as in a fire), combined with contamination, confinement (such as in enclosed drains or enclosed parts of equipment) or both, other gases, including brown vapours of toxic nitrogen dioxide (NO_2), will be given off, and the explosive

sensitivity of the AN will increase. Through self-accelerating reactions, the temperature will continue to rise and a detonation could occur.

Fires involving AN have caused many explosions but there have been many more fires involving AN that did not lead to explosions.

Explosion

AN is ideally set up as an explosive substance, since it carries the oxidising nitrate ion in intimate contact with the fuel element, the ammonium ion. Only small amounts of contaminants are required to act as a catalyst, explaining the unpredictability of AN under fire conditions.

As a result of the decomposition reactions of AN, the risk of an explosion is increased by heating AN in combination with contaminants, confinement or both.

In a fire situation, pools of molten AN may be formed. If the molten mass becomes confined, such as in drains, pipes, plant or machinery, or combines with contaminants, it can explode.

2.3 Hazard management

Fires are avoided by rigorously eliminating and reducing the amount of potential fuel, combustible materials and dangerous contaminants in and around the AN store.

Fires involving AN cannot be extinguished by oxygen deprivation because of the provision of oxygen from AN. Water is the most effective means of fire fighting — attempts to smother fires with dry chemical, carbon dioxide or foam extinguishers will not succeed.

Given the nature of modern formulations of AN, explosions (excluding those initiated by explosives) without prior fire are not a credible accident scenario for solid AN. If all potential sources of fuel can be eliminated, the chance of an accidental explosion is remote. However, such explosions can and have occurred with concentrated hot solutions, particularly during manufacture.

Suitably designed, constructed and maintained AN storage facility and AN transfer equipment play a vital role in minimising the risk of fire — as does appropriate training of all relevant persons.

2.4 Evacuation distances

Globally, explosions resulting from fires involving AN, even in recent years, have killed and injured emergency personnel.

When a fire involving AN is judged to be out of control, or if the fire is engulfing the AN, it is recommended to evacuate everyone, including fire fighters, to a safe distance where they will not be harmed if there is an explosion. The evolution of toxic brown nitrogen dioxide is a sign that immediate evacuation is required.

The process of promptly evacuating on-site and off-site people in the event of a fire involving AN must be clearly documented in the dangerous goods emergency plan for the site, with a clearly established process for alerting people and preventing entry into an evacuated area.

For a storage quantity greater than 1,000 kg, the recommended minimum evacuation distance for all non-emergency personnel is 1,500 m, and 1,000 m for emergency personnel.

Note: Further information on emergency planning is contained in 'Dangerous goods sites — emergency planning code', available from the Resources Safety website.

3 Store design and construction

3.1 Types of stores

AN may be stored in Western Australia in a number of recognised ways, including:

- open-air storage — intermediate bulk containers (IBCs) or packages only;
- freight container storage — IBCs or loose bulk (not in a package or IBC);
- dedicated, stand-alone building storage — packages, IBCs or loose bulk;
- storage attached to, or within, a non-AN dedicated building — packages or IBCs (10 t limit);
- storage in silos — loose bulk; and
- storage in blasting explosive magazines — packages.

Storage in a completely open-air store or freight container offers distinct safety advantages to storage in a building, providing it is in a secure area away from combustible materials and sources of contamination.

3.2 Open-air storage

In open-air stores, the risk from accidental fire, explosion and arson is reduced due to the:

- lack of combustible materials, sources of ignition and situations leading to confinement; and
- provision of excellent natural ventilation.

For safe storage in open-air stores, no special construction requirements apply except to provide adequate protection from the weather and security controls.

IBCs or packages in an open-air store must be suitably covered and located on ground that is slightly raised and sloped to prevent the accumulation of rainwater. Slopes must be designed to fall away from any surrounding structures or storages.

Open-air storage is allowed for sealed IBCs (i.e. there is a means of detecting tampering) provided the site is surrounded by a security fence that is:

- at least 2.45 m high;
- galvanised or plastic coated, with both top and bottom formed edges of the chain mesh being twisted and barbed, capped with three rows of barbed wire at 15 cm spacing; and
- at least 3 m from the AN IBCs or packages.

Open-air storage of packages (typically 20–50 kg) requires additional security provisions.

Note: Guidance on AN security requirements is available from the Resources Safety website in the security risk substances section.

3.3 Freight container storage

A freight container may be used for the dedicated storage of AN provided it is constructed in accordance with Australian Standard AS/NZS 3711:2000 *Freight containers* or the relevant International Organization for Standardization (ISO) standard for freight containers used to transport dangerous goods. The freight container must not contain any wood lining or have a wooden floor.

3.4 Building storage

All buildings used for AN storage must be designed and constructed to comply with the requirements listed below.

- There must be adequate ventilation.
- AN is to be stored on a level that has immediate access from outside the building.
- The entire building must be constructed from non-combustible material, with the floor being made from concrete (protected from AN attack where necessary).
- Any materials or fittings used in the building construction that could come into contact with AN during normal operations or in the event of spillage must not contain zinc, copper or other incompatibles unless suitably protected (e.g. by coating with epoxy tar or chlorinated rubber).
- The AN store must be designed so that, in the event of fire, molten AN will not become confined within the building in which it is being stored or any enclosure such as a drain, bund, pit or tunnel. The design must also ensure that any molten AN will flow clear of all other storage areas, buildings and combustible materials, and be retained on the site.
- The AN store, including any shelving or racking, must be designed and constructed to allow the easy detection and clean-up of any spilt AN.
- AN must not be stored in a cabinet or in a similar enclosed and confined manner.
- The entire building must be dry and free from water seepage.
- Where there is a risk of corrosion from AN, electrical equipment must have a rating of not less than IP65 in accordance with Australian Standard AS 60529:2004 *Degrees of protection provided by enclosures* (IP Code).
- Buildings must be protected against lightning as specified in Australian Standard AS/NZS 1768:2007 *Lightning protection*. In assessing the level of lightning protection required, AN is deemed to be non-flammable and non-explosive.

Where an AN store of 10 t or less is either attached to another building or located inside a building that is not dedicated to the storage of AN, it must be isolated by a horizontal distance of at least 5 m that must be left clear. This distance may be measured around a wall extending 1 m above the roof of the AN store and having a 240/240/240 fire resistance level (FRL), as per the *Building Code of Australia*.

An AN store inside a building must be located on at least one external wall with the facility to allow molten AN to flow clear of the building in the event of a fire.

Examples of the required isolation of AN stores of 10 t or less are shown in Figure 3.1.

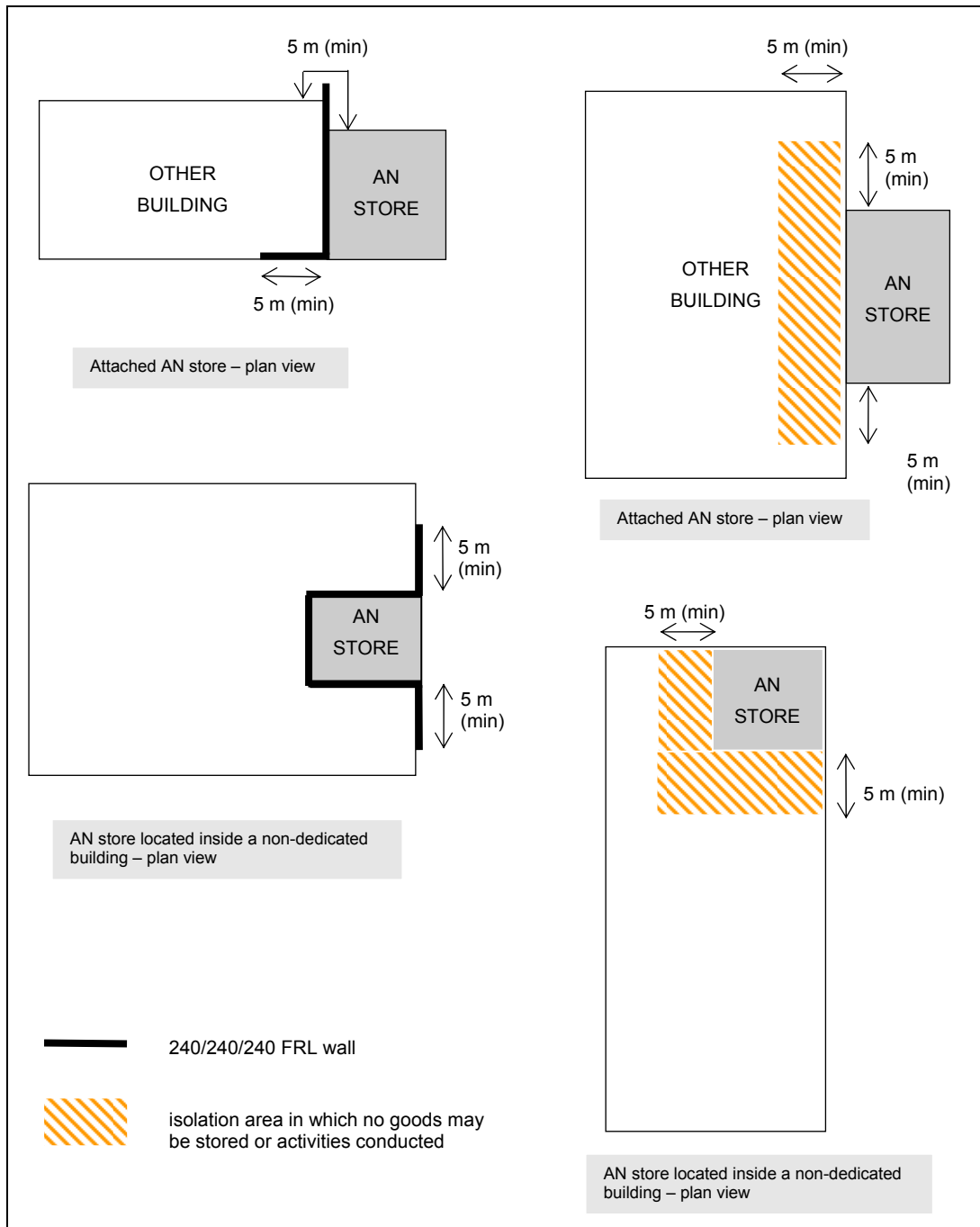


Figure 3.1 Examples illustrating the required isolation of AN stores of 10 t or less

3.5 Silo storage

All silos used for AN storage must comply with the requirements listed below.

- The silo must be constructed from non-combustible, corrosion-resistant materials.
- Materials and fittings containing zinc, copper or other incompatibles, which could come into contact with AN during normal operations or in the event of spillage, must

not be used unless suitably protected (e.g. by coating with epoxy tar or chlorinated rubber).

- The silo must be designed and constructed to be capable of resisting all foreseeable forces to which it may be exposed. It is important to take into account AN's tendency to cake when determining the magnitude of forces that may occur.
- The area below the AN silo must be constructed from concrete (protected from AN attack where necessary).
- Where there is a risk of corrosion from AN, electrical equipment must have a rating of not less than IP65 in accordance with the IP Code.
- The silo must be protected against lightning as specified in AS/NZS 1768:2007. In assessing the level of lightning protection required, AN is deemed to be non-flammable and non-explosive.
- The design and construction must allow for an adequately ventilated air space without the ingress of water.
- The silo must be positioned so that, in the event of fire, molten AN will not enter any enclosure such as a drain, bund, pit or tunnel, and will flow clear of all other storage areas, buildings and combustible materials, and be retained on the site.
- All silos for AN must be stand-alone (i.e. they must not be inside or attached to a building).

3.6 Magazine storage

Storage of packaged AN is allowed inside a blasting explosive magazine subject to it being treated as an explosive. AN stored in a blasting explosive magazine must comply with the Dangerous Goods Safety (Explosives) Regulations 2007.

4 Store location

4.1 Requirements

The location of an AN store is subject to acceptance by Resources Safety with respect to its proximity to other sites such as residential occupancies, places of public assembly, academic establishments, health care facilities and pipelines.

If the separation distance between an existing store of AN and off-site protected works is less than that indicated below, Resources Safety may limit the maximum amount of AN within the store or impose other conditions to reduce off-site risk. A risk assessment may be requested to come to an understanding of the required separation distances.

4.2 Separation distances

Minimum separation distances to on-site and off-site protected works as well as vulnerable facilities and critical infrastructure are detailed here. The intention of these separation distances is *not* to ensure that people, property and the environment are completely protected in the highly unlikely event of an AN detonation.

When considering the location of an AN storage, it is essential to maximise separation distances as far as is reasonably practicable and consider how all on-site and off-site people can be promptly alerted and evacuated to a safe distance in the event of a fire involving the AN.

Note: In some cases, Resources Safety may require separation distances that differ from those indicated here. Resources Safety must be consulted in all cases where more than one AN store is proposed for a site or where the quantity of AN exceeds 250 t.

AN stores of 10 t or less

Stores of AN of 10 t or less are required to be separated from the site boundary and on-site protected works by a distance of at least 5 m. The separation distance must be at least 15 m for off-site protected works, and at least 50 m for vulnerable facilities.

AN stores of more than 10 t

Where AN is stored in quantities exceeding 10 t, it must be separated from the boundary of the site and from on-site protected works by a distance of at least 15 m. For off-site protected works, vulnerable facilities and critical infrastructure, separation distances are determined using the flowchart in Figure 4.1 and Table 4.1.

Where AN is stored in a manner that would prevent sympathetic detonation of the total storage, reduced separation distances may be acceptable.

High explosive and detonator storage

A store of AN must be separated from high explosives and detonators by the minimum distances given in Australian Standard 2187.1. Where mounding is to be used, it must comply with the requirements of Australian Standard 2187.1. If AN is stored together with high explosives, it is to be treated as being an explosive [with 50% of the quantity of AN being added to the explosives quantity to obtain the resultant net explosives quantity (NEQ) – as indicated in AS 2187.1] and requires separation and licensing as such.

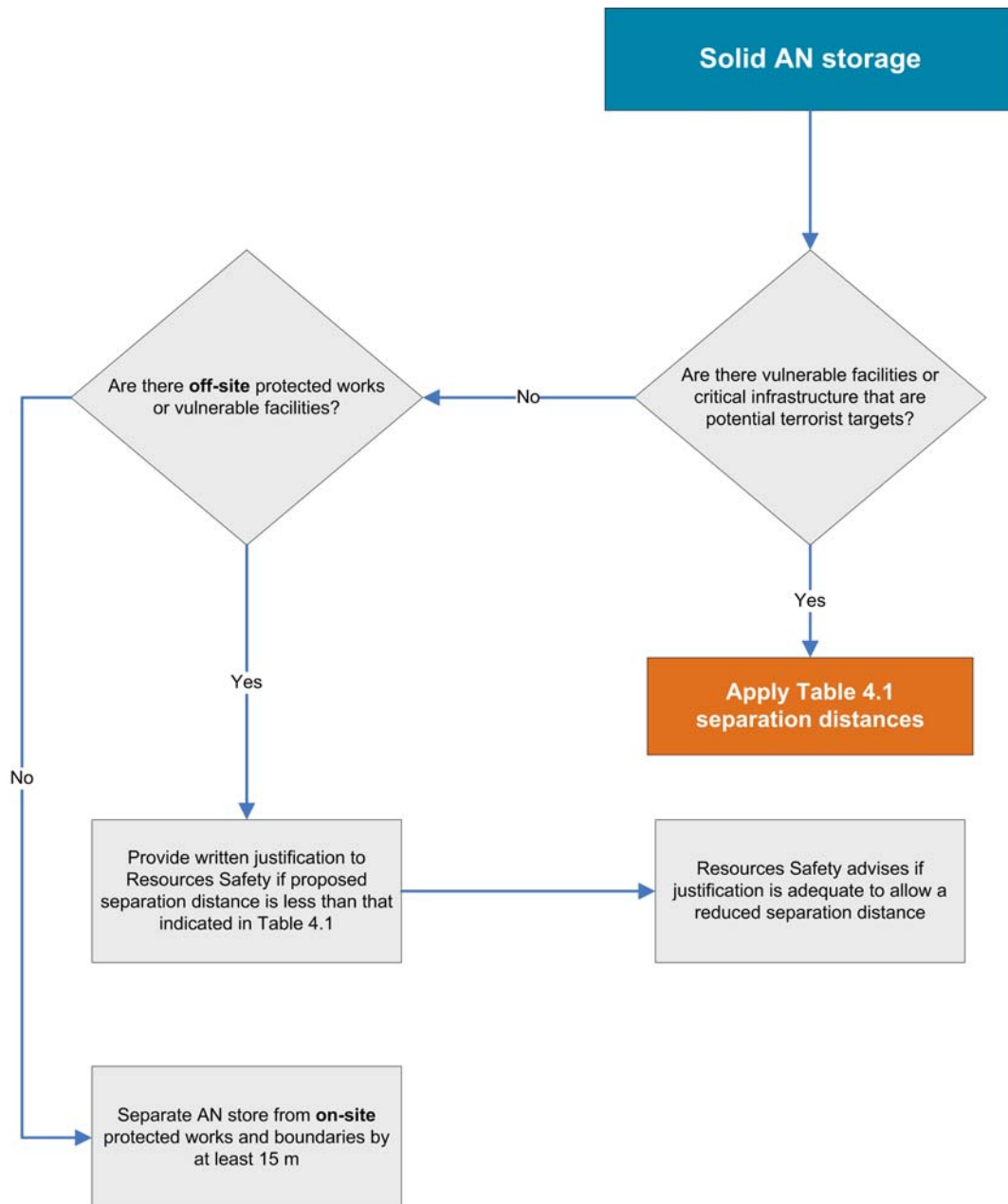


Figure 4.1 Flowchart to determine separation distances from AN stores exceeding 10 t to protected works, vulnerable facilities and critical infrastructure

Table 4.1 Separation distances to be used in conjunction with Figure 4.1 flowchart

Quantity of AN stored	Separation distance (D) from off-site protected works, vulnerable facilities and critical infrastructure
10,001 kg	300 m
15,000 kg	350 m
20,000 kg	380 m
25,000 kg	410 m
30,000 kg	440 m
40,000 kg	480 m
50,000 kg	520 m
75,000 kg	590 m
100,000 kg	650 m
125,000 kg	700 m
150,000 kg	740 m
175,000 kg	780 m
200,000 kg	820 m
250,000 kg	880 m
300,000 kg	940 m
350,000 kg	990 m
400,000 kg	1,030 m
450,000 kg	1,070 m
500,000 kg	1,110 m

Notes:

1. Distances in Table 4.1 were obtained by using the formula $D = 22.2 Q^{1/3}$, with Q being the quantity of explosive stored – see note below. Distances have been rounded to closest multiple of 10 m.
2. In calculating separation distances, AN is taken to have a TNT equivalence of 25%, as sourced from Proceedings No. 580 – Safety Testing of Ammonium Nitrate Products, published in 2006 by The International Fertiliser Society, which indicates:
“The TNT equivalence, used for practical situations, is a combination of the ‘explosive power’ and the ‘efficiency’ (i.e. the part of the bulk which contributes to the blast effect in a detonation). The ‘explosive power’ is based on the TNT equivalence of the full scale test. Based on a combination of the results of the tests and the TNT equivalence in accidents for TGAN (Technical Grade AN) a TNT equivalence of 20-25% appears appropriate for practical situations.”

5 Storage requirements

5.1 General

AN must be stored in an adequately ventilated place away from possible sources of heat, fire or explosion, such as oil storages, gas pipelines, timber yards, flammable liquids and solids and explosives.

Covers help to protect AN from the rain and sun thereby reducing caking and assisting with the preservation of the prill structure, which is particularly important if the AN is to be used to make AN fuel oil (ANFO) explosives.

5.2 Storage conditions

- Wooden pallets must not be used when storing more than 10 t of AN in IBCs.
- AN in packages, IBCs or as loose prill may be stored in maximum stack sizes of 500 t separated from each other in a manner that will prevent sympathetic detonation. The maximum capacity of a store should not exceed 5,000 t.

Note: Do not rely on a single reinforced concrete wall to prevent sympathetic detonation between stacks of AN because there are significant uncertainties regarding the effectiveness of such a measure.

- The stacking height must not exceed three IBCs of AN or three pallets of AN packages, with stack stability being maintained at all times. For packaged AN and AN in IBCs, a free air space of at least 1.2 m must be maintained between the AN and the outer walls of the buildings and the lowest support beam of the roof.
- Every AN store must have a clear area of at least 5 m surrounding it — vegetation, combustible materials, vehicles and non-associated equipment must be kept clear of the store. Trees must be cleared for at least 15 m from the AN store.
- Smoking and naked lights must not be permitted inside an AN store, and notices to this effect must be displayed.
- Floors, walls and equipment must be kept clean and spillages cleared promptly. Organic materials (e.g. sawdust) must not be used to clean floors.
- Unused wooden pallets, empty bags and packaging must be removed promptly from the AN store and kept at least 5 m from the store in a dedicated location.
- Pallets, ropes, covers or other equipment must not be allowed to become impregnated with AN.
- Given AN's tendency to cake, appropriate measures must be in place to ensure that it is not stored for longer than necessary, especially when stored loose, such as in a silo.

Note: Explosives or detonators must never be used to break up caked AN.

- Appropriate measures must be in place to prevent the introduction of contaminated AN (e.g. contaminated through spillage) into an AN store of uncontaminated product.

5.3 Storage of other substances and equipment

A dedicated store is required when storing more than 10 t of AN. For a building, this means that a stand-alone structure that contains no other substances or equipment unless approved by Resources Safety.

For a store containing 10 t or less of AN, it is strongly recommended that any building in which the AN store is located is not used for any other purpose. However, if this is not practicable then all other substances (including compatible substances) and equipment must be located at least 5 m from the AN store as indicated in Figure 3.1. Where the other substances are liquid, and are incompatible with AN, they must be provided with fire-resistant spillage containment capable of holding at least 100% of the liquid volume stored and designed so that liquid cannot encroach within 5 m of any stored AN. However, those substances listed under 'Incompatible substances that are to be excluded from AN storage buildings' must *never* be stored in the same building as AN or within a building attached to an AN store.

Compatible substances

Unless substances are known to be compatible with AN, assume they are incompatible.

The following fertilisers are considered compatible with AN but they must still be separated from AN as indicated above.

- potassium nitrate;
- sodium nitrate;
- calcium nitrate;
- ammonium sulphate;
- AN-based fertiliser mixtures of the nitrogen, phosphate or potash type;
- calcium sulphate;
- ammonium phosphate;
- calcium ammonium nitrate;
- calcium or magnesium carbonate; and
- superphosphate

Expert advice is necessary when deciding on the compatibility of other fertilisers.

Incompatible substances that are to be excluded from AN storage buildings

The following incompatible substances *must not* be stored in any building used to store AN or within any building attached to an AN store.

- flammable or combustible liquids such as petrol, kerosene, solvents, diesel fuel, lubricating and fuel oils or hydrocarbon formulated pesticides;
- flammable gases such as LP gas, acetylene, ethylene and hydrogen;

- sulfur, hexamine and finely divided metals;
- explosives and substances sensitive to explosive decomposition;
- readily combustible solids such as hay, straw, grain, grain husks, animal feed, wax, paper and cotton;
- fertilisers containing trace metals and organic substances; and
- Class 5.1 dangerous goods such as calcium hypochlorite, chromates, chlorates, nitrites perchlorates, chlorites, permanganates, chloroisocyanurates, tetranitromethane or di- or tri-chloroisocyanuric acid.

Many pesticide formulations contain appreciable quantities of combustible solvents and *must not* be stored in any building used to store AN or within any building attached to an AN store.

Other known incompatible substances include:

- corrosive liquids;
- reducing agents;
- products that can liberate ammonia gas if mixed with AN, such as cement, lime, basic slag and other alkaline substances;
- urea;
- copper, cadmium, chromium and zinc metals and their salts; and
- chlorides.

5.4 Fire protection

Fires involving AN cannot be extinguished by oxygen deprivation, and attempts to smother fires with dry chemical, carbon dioxide or foam extinguishers will prove unsuccessful.

Water is the most effective means of fire-fighting, and must be applied promptly to any external fire threatening the AN, as well as to the AN storage to keep it cool.

Compliance with Australian Standard AS 4326:2008 *The storage and handling of oxidising agents* is required regarding fire protection unless a suitable risk assessment demonstrates that a lesser level of fire protection is justified and approved by Resources Safety. In general, approval to deviate from AS 4326:2008 would only be considered when the following conditions are met:

- the AN storage is located remotely from off-site persons and property;
- people on-site are not placed at increased risk as a result of having a lesser level of fire protection; and
- all flammable and combustible materials are completely excluded for a distance that ensures fire in such materials cannot impact on the AN store.

6 Powered transfer equipment

6.1 General

Powered transfer equipment refers to all powered equipment that may be used to move AN into, within or from a store, and includes forklift trucks, front-end loaders, augers, chain-conveyors and belt-conveyors.

The use of suitably designed, constructed and maintained powered transfer equipment is essential where AN is involved in order to reduce the risk of contamination, fire and explosion.

One of the most serious contamination hazards occurs if AN comes into contact with combustible liquids, since AN readily absorbs spills such as oil and fuel by capillary action.

Vehicles used to move AN into, within or from an AN store may be powered by electricity, diesel fuel or LP gas, but not petrol.

Note: 'Store' must be taken to include the entirety of any building in which AN is stored and any attached buildings.

6.2 Equipment requirements

Unless approved by Resources Safety, powered transfer equipment (other than vehicles such as forklift trucks and front-end loaders) may only be used to move AN if:

- it is powered by electricity or diesel fuel;
- the power source for the equipment (i.e. power outlet or generator) is located outside, and at least 5 m from, the AN store; and
- it is electrically or hydraulically driven.

All powered AN transfer equipment must:

- be free of any leaks of fuel, lubricating oils or hydraulic fluid;
- not include in its construction any copper, zinc (including galvanised iron), cadmium or their alloys that can come into contact with AN;
- be constructed from materials that, if in contact with AN, will not corrode;
- * have all non-essential electrical equipment removed, and all remaining equipment sealed against dust ingress in accordance with IP65 of the IP Code or, where such equipment is not produced, comply with the highest rating possible — equipment must be designed and constructed to resist dust ingress as far as is reasonably practicably, and must be inspected and cleaned regularly;
- where mobile, be kept outside of the AN store when not in use and parked at least 10 m from the AN store — control measures must be in place to prevent contamination (e.g. dirt, other products) being brought into the AN store on vehicles that enter (e.g. vehicles such as front-end loaders should be dedicated to AN activities);
- be refuelled or recharged at a distance of at least 10 m from the AN store;

- * be fitted with a spark arrester and started outside of the AN store if they use diesel fuel or LP gas;
- be provided with a dry-powder fire-extinguisher having a rating of not less than 40(B);
- * if it incorporates a battery, be provided with a clearly marked battery isolation switch and insulated cover for the battery terminals;
- if it is a vehicle, be attended at all times when it is inside the AN store, and for all other transfer equipment, be attended when operating;
- if it is a vehicle, be provided with unhindered egress from the store at all times;
- be designed and constructed, including consideration of failure modes, to avoid situations where AN may become trapped, heated or brought into contact with incompatible substances — items to consider include suitability of seals, gaskets, bearings and clearance distances; use of solid equipment components as opposed to hollow ones; provision of alarms and shut-down systems for over-speed, under-speed, no-flow and over-heat;
- be regularly maintained;
- unless it is a vehicle, be provided with a clearly labelled and readily accessible emergency stop; and
- be cleared of as much AN as is reasonably practical after each use.

Note: Items that are asterisked do not apply to vehicles that deliver AN to the site and that do not enter the actual AN store.

Appendix 1 – Glossary

Ammonium nitrate (AN): The ammonium salt represented by the formula NH_4NO_3 .

Compatible: In relation to two or more substances or items, they will not react together to cause a fire, explosion, harmful reaction or the evolution of flammable, toxic or corrosive vapours.

Critical infrastructure: Those physical facilities, supply chains, information technologies and communication networks that, if destroyed, degraded or rendered unavailable for an extended period, would significantly impact on the social or economic well-being of the nation or affect Australia's ability to conduct national defence and ensure national security. Critical infrastructure involves the sectors of energy, utilities, transport, communications, health, food, supply, finance, government, services, national icons and essential manufacturing.

Dedicated, stand-alone building storage: A stand-alone building used only for ammonium nitrate storage and for no other purpose.

Intermediate bulk container (IBC): A rigid or flexible portable packaging for the transport of dangerous goods that:

- has a capacity of not more than:
 - for solids of Packing Group I packed in a composite, fibreboard, flexible, wooden or rigid plastics or wooden container – 1,500 L; or
 - for solids of Packing Group I packed in a metal container – 3,000 L; or
 - for solids or liquids of Packing Groups II and III – 3,000 L;
- is designed for mechanical handling; and
- is resistant to the stresses produced in usual handling and transport.

Loose bulk: Refers to ammonium nitrate that is not contained in a package or IBC.

Package: Refers to a container with a net mass of not more than 400 kg of solid ammonium nitrate.

Protected works: These are deemed to include a dwelling, public building, place of worship, theatre, cinema or other building or structure where the public is accustomed to assemble, shop, factory, warehouse, store, building in which any person is employed in any trade or business, store for the keeping of dangerous goods.

Rural dangerous goods location: A place that:

- is outside the part of the State that comprises the metropolitan region as defined in the *Planning and Development Act 2005* section 4(1) or a townsite as defined in the *Land Administration Act 1997* section 3(1);
- occupies an area of 5 hectares or more;
- is used by the operator for agricultural, horticultural, floricultural, aquacultural or pastoral purposes; and
- at which dangerous goods are stored or handled for the purposes other than for sale;

Security risk substance (SRS): Any substance that contains more than 45% ammonium nitrate is a security risk substance unless it is an:

- explosive; or
- aqueous solution, being a homogeneous mixture of two or more components in a single phase.

UN number: The identification number assigned to dangerous goods by the United Nations Committee of Experts on the Transport of Dangerous Goods, as published in UN 15 and outlined in ADG7. Some SRS, such as calcium ammonium nitrate, do not have a UN number.

Vulnerable facility: A category of facility that includes, but is not restricted to, multistorey buildings (e.g. above four storeys), large glass-fronted buildings of high population, health care facilities, childcare and aged care facilities, schools, major traffic terminals (e.g. railway stations and airports), major public utilities (e.g. gas, water and electricity works) and sports stadiums.

Appendix 2 - AN properties and hazards

Physical and chemical properties

Pure AN is a white, odourless salt with a melting point of 169.6°C, molecular formula NH_4NO_3 and molecular weight 80.

Solid AN occurs in five different stable crystalline forms, depending on the temperature. Pure AN undergoes phase changes when heated. Of most commercial significance is the phase change occurring near ambient temperatures at 32°C. This transition results in a density change with an increase of 3.6% in volume.

The major problems associated with the storage of AN are hygroscopicity and phase changes leading to the breakdown of the prill and caking of the product. Very small amounts of various proprietary additives are therefore used to minimise, but not eliminate, the effects of hygroscopicity and phase changes. The amount of carbonaceous additives must be kept below 0.2% of carbon in order for the product to be classified as a Class 5.1 oxidising agent. The UN classification system for dangerous goods classifies AN with a higher carbon content as a 1.1D explosive.

AN is highly soluble in water, with solubility increasing rapidly with temperature. At 20°C, 1 mL of water will dissolve 1.877 g of AN, and at 50°C, it will dissolve 3.440 g of AN.

AN is hygroscopic and deliquescent in that it tends to absorb water from the atmosphere, and is capable of attracting so much water that it dissolves into an aqueous solution. Aqueous solutions are slightly acidic (i.e. a 0.1 Molar solution has a pH of 5.4).

While it is not in itself combustible, it is an oxidising agent, can facilitate the initiation of fire and will assist combustion of other materials, even if air is excluded.

Hazards

The main chemical hazards to consider are:

- fire;
- decomposition with formation of toxic gases, and
- explosion.

Hot AN solutions present the additional hazard of causing burns if in contact with the skin, but this hazard is not considered here.

Fire

AN itself does not burn. Being an oxidising agent, it can facilitate the initiation of fire and intensify fires in combustible materials.

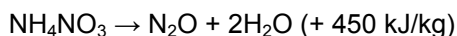
Hot AN solutions can initiate fires when coming into contact with rags, wooden articles and clothing. Other combustible materials impregnated with AN have been known to start burning spontaneously when left on hot surfaces. Similarly, AN products contaminated with oil or combustible materials can start a fire when hot.

Fires involving AN cannot be extinguished by the prevention of air ingress because of the in situ provision of oxygen from AN.

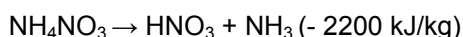
Decomposition

Molten AN decomposes at about 210°C to give off toxic gases.

If AN is heated in an open and unconfined situation, it will decompose completely to give gaseous products in a steady controlled way with white fumes and vapours. The primary reaction is irreversible, exothermic and produces nitrous oxide (N₂O), a medical anaesthetic, and water.



If the reaction temperature is allowed to exceed 250°C then it is accompanied by an endothermic reaction producing ammonia (NH₃) and nitric acid (HNO₃).



Providing gases can escape freely, this combination of exothermic and endothermic reactions can provide a temperature limiting mechanism so that the temperature does not rise above 300°C, even with the input of a considerable amount of external heating.

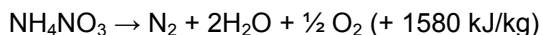
Explosion

Pure AN is difficult to detonate, and flame, spark, rough handling, impact or friction are not known to cause a propagated detonation.

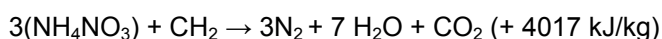
An explosion of pure AN can be initiated with high explosives under ambient conditions, and explosives must never be used to break up or loosen caked AN. Under ambient conditions, it is not possible to initiate AN by means of a bullet. However, the shock sensitivity of molten AN increases significantly with temperature, and severe mechanical impact under extreme conditions of temperature may lead to detonation in certain circumstances.

AN can also explode without shock if heated sufficiently, but only if contaminated, under confinement, or both. Under these circumstances, the temperature will quickly rise above 300°C, giving off other gases including brown vapours of toxic nitrogen dioxide (NO₂). The temperature will continue to rise through self-accelerating reactions, and a detonation may occur. In a fire, for example, pools of molten AN may be formed and if the molten mass becomes confined, such as in drains, pipes, plant or machinery, it could explode, particularly if it becomes contaminated. Fires involving AN have caused many explosions in the past. It is also true that there have been many more fires involving AN that did not lead to explosions.

The potential for an explosion is always present when the AN melt is contaminated and the following explosion reaction is catalysed:



An explosion is favoured by the increased heat of explosion and increased sensitivity when further mixed with the optimum amount of fuel (such as diesel fuel, a hydrocarbon represented by CH₂) so that the following oxygen-balanced (no net oxygen produced or required) reaction (as in the explosion of ANFO) occurs:



AN is ideally set up as an explosive substance, since it carries the oxidising nitrate ion in intimate contact with the fuel element, the ammonium ion. All that is required are small amounts of contaminants to act as a catalyst, explaining the unpredictability of AN under fire conditions.

A long list of potentially dangerous contaminants, including combustible liquids, metals and fuels of any type as well as any of the incompatible substances, is given in Chapter 5.

AN dust, being non-combustible in nature, does not give rise to dust explosion hazards such as those commonly associated with organic dusts like grain or flour.

Hazard management

In summary, the risk of an explosion is increased by heating AN, such as in a fire, in combination with:

- contamination;
- confinement; or
- both, such as in enclosed drains or enclosed parts of equipment.

Fires and resulting explosions are avoided by rigorously eliminating and reducing the amount of potential fuel in and around the storage site. If all potential sources of fuel can be eliminated, the chance of an accidental explosion is remote. Given the nature of modern formulations of AN, explosions (excluding those initiated by explosives) without prior fire are not a credible accident scenario for solid AN. However, such explosions can and have occurred with concentrated hot solutions, particularly during manufacture.

Appendix 3 - Material safety data sheets for UN1942 AN

The properties of solid AN vary according to the particular AN product and supplier — relevant material safety data sheets (MSDSs) are available from the supplier.

People involved with AN should read the sheet or sheets that relates to the AN products located on their site, as well as the MSDSs of other products that may be present.

The MSDS reproduced here for AN product (UN no. 1942) has been provided by CSBP Limited. The most recent information is available from the company's website at www.csbp.com.au or contact CSBP Limited, Safety and Emergency Services Department on (08) 9411 8777.



ABN: 81 008 668 371

MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Section 1 – Identification of the Material and Supplier

Product Name Ammonium nitrate		
Other names Detapril, Nitropril, porous prill. Company product code 1720.		
Recommended use Production of explosives and fertiliser manufacture.		
Company name CSBP Limited		
Address Kwinana Beach Road, KWINANA	State Western Australia	Postcode 6167
Telephone number (08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas)	Emergency telephone number 1800 093 333 (Australia), +61 8 9411 8444	

Section 2 – Hazard Identification

Hazard Classification, including a statement of overall hazardous nature HAZARDOUS SUBSTANCE. Ammonium nitrate is not classified as hazardous and is not specified in the NOHSC List of Designated Hazardous Substances [NOHSC:10005(1999)]. DANGEROUS GOODS. Ammonium nitrate is classified for physicochemical hazards and specified as dangerous in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code), 6 th Edition, (FORS, 1998).	
Risk Phrases Ammonium nitrate is classified as an oxidizing agent. R22 Harmful if swallowed R31 Contact with acid liberates toxic gas R36 Irritating to eyes	
Safety Phrases Ammonium nitrate is classified as dangerous goods. S14/S15 Keep away from heat, sources of ignition – No smoking, combustible material S21 When using do not smoke S29 Do not empty into drains S41 In case of fire and /or explosion do not breathe fumes S50 Do not mix with minerals acids, chlorine, oxidizing agents, alkalis, diesel, oils and greases. S56 Dispose of this material and its container to hazardous or special waste collection point S57 Use appropriate containment to avoid environmental contamination S59 Refer to manufacturer for information on recovery/recycling S60 This material and its container must be disposed of as hazardous waste	
Poison Schedule Ammonium nitrate is not listed as a poison in the Standard for the Uniform Scheduling of Drugs and Poisons.	

Section 3 – Composition/Information on Ingredients

Chemical identity of ingredients	Proportion of ingredients	CAS Number for ingredients
Ammonium nitrate	99 % (wt/wt)	6484 -52-2
Moisture and additives	Remainder	



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MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Section 4 – First Aid Measures

First Aid

Ammonium nitrate is moderately toxic if large amounts are swallowed. If more than a small quantity has been swallowed seek medical attention. Training on handling ammonium nitrate incidents using this MSDS should be provided before any ammonium nitrate handling or use commences.

First Aid Facilities

First aid procedures, equipment, medication and training for the treatment of injury by ammonium nitrate should be in place BEFORE the use commences.

Equipment in place should be:

- Safety shower and eyewash stations immediately accessible in the workplace;
- Eye-wash bottle;
- Fresh, clean cool drinking water;
- Oxygen;
- “Space” or thermal blankets for treating patients for shock;
- Personal protective equipment for use by first aid personnel.

FIRST AID PROCEDURES FOR DEALING WITH THIS PRODUCT AND EXPOSURE TO IT

1. Personal Protection By First Aid Personnel

First aid personnel providing first aid treatment to a patient injured by ammonium nitrate should observe the following precautions for their own personal protection:

- Avoid contact with ammonium nitrate by wearing protective gloves;
- Wear chemical goggles to prevent ammonium nitrate particles entering eyes;
- Wear P2 type canister respirator if rescue area is contaminated by airborne ammonium nitrate dust.

2. Swallowed

If person is conscious, rinse mouth thoroughly with water immediately and give water or milk to drink. DO NOT induce vomiting. Seek medical assistance if more than a small quantity has been swallowed, when relevant symptoms occur after swallowing.

3. Eyes

Immediately irrigate with copious quantities of water, while holding eyelids open, for at least 15 minutes. Seek medical attention if irritation persists.

4. Skin

Wash affected areas with copious amounts of water. Remove all contaminated clothing and launder before re-use.

5. Inhalation

Remove affected person from exposure to a well ventilated area. Keep warm and at rest. In emergency, if breathing is difficult give oxygen. If the affected person suffers cardiac arrest commence cardio-pulmonary resuscitation immediately. Seek urgent medical attention.

ADVICE TO DOCTOR.

This product contains nitrates, which may be reduced to nitrites by intestinal bacteria. Nitrites may affect the blood (methaemoglobinaemia) and blood vessels (vasodilation and a fall in blood pressure). Effects peak within 30 minutes. Clinical signs of cyanosis appear before other symptoms because of the dark pigmentation of methaemoglobin. Institute cardiac monitoring, especially in patients with coronary, artery or pulmonary disease.

Long Term Complications

No long term complications are known.

Further information about the treatment for exposure to this product can be obtained from the Poisons Information Centre on (08) 13 1126 (Australia only)



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MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Section 5 – Fire Fighting Measures

Product flammability

Ammonium nitrate is not flammable under normal applications and is not considered a fire risk, but will support combustion in an existing fire by liberating oxygen – even if smothered. It is for this reason that fires involving ammonium nitrate cannot be extinguished by the prevention or air ingress (for example, smouldering with steam) because of the *in situ* provision of oxygen from the ammonium nitrate itself. Thermal decomposition may result in toxic gases, such as oxides of nitrogen and ammonia, being produced.

Suitable extinguishing media

Extinguish fires with large amounts of water.

Hazard from combustion products

Fire will cause ammonium nitrate to decompose giving off fumes of nitrogen oxides and ammonia.

Special protective precautions and equipment for fire fighters

Wear full protective clothing, including respiratory protection.

Inert chemical absorbent and substantial amounts of water will be required to clean up a large spill.

Portable showers and eyewash may also be needed.

Prevent run-off into drains and waterways.

Hazchem Code

1Y

Section 6 – Accidental Release Measures

Emergency procedures

Hazardous conditions may result if an ammonium nitrate spill is managed improperly. Make plans in advance to handle possible emergencies, including obtaining stocks of inert absorbent materials, to avoid both human and environmental exposure. Always wear recommended personal protective equipment and respiratory protection.

Methods and Materials for containment and clean up

For all spills, evacuate unprotected personnel upwind and out of danger. Remove sources of heat and ignition. Restrict access to spill site. Any spillage should be contained and recovered. Do not allow to mix with sawdust and other combustible organic substances.

Small Leaks

If possible contain the area of the spill, sweep into a clean labelled open container and recycle.

Large Spills

If possible contain the area of the spill. A front end loader may be required to scoop up spill into a clean container. Depending on the degree and nature of contamination, dispose of by use as fertilizer on farm or authorised waste facility.

Wash down area and prevent run-off into drains, sewers or waterways. Soak up wet material using absorbent material such as vermiculite or sand and dispose at authorised waste facility.



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MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Section 7 – Handling and Storage

Precautions for safe handling

Regulated dangerous goods as Oxidizing Agent Class 5.1.

Avoid excessive generation of dust. Avoid contamination by combustible (e.g., diesel oil, grease, etc.) and incompatible materials, which may cause fires. Avoid unnecessary exposure to the atmosphere to prevent moisture pick up, which makes the material difficult to handle. When handling ammonium nitrate over long periods use appropriate personal protective equipment, e.g., gloves.

Conditions for safe storage, including any incompatibilities

Store in accordance with Australian Standard AS 4326 *The storage and handling of oxidizing agents*.

Store away from sources of heat or fire, especially in a confined space – the heating may cause an explosion. Keep away from combustible materials and substances mentioned in *Precautions for safe handling* section above. Avoid storage and contamination with chlorine bleaches, pool chlorine and hypochlorites as a reaction, leading to the formation of explosive nitrogen trichloride, may occur. Dry ammonium nitrate has been reported to detonate in fires with dry ammonium sulfate. Ensure that ammonium nitrate fertiliser is not stored near hay, straw, grain, diesel oil, greases, etc., as these are incompatibles and may cause fires. Do not permit smoking and the use of naked lights in the storage area for ammonium nitrate. Restrict stack size for bagged product (according to local regulations). Any building used for the storage of ammonium nitrate should be dry and well ventilated. Where the nature of the bagged product and climatic conditions so require, store under conditions that will avoid breakdown by thermal cycling (wide variation in temperature). The product should not be stored in direct sunlight to avoid physical breakdown due to thermal cycling.

Section 8 – Exposure Controls/Personal Protection

National exposure standards

ES-TWA		ES-STEL		ES-Peak	
No data available	10 mg/m ³	No data available	No data available	No data available	No data available

Biological limit values

No data available.

Engineering controls

Avoid high dust concentration and provide ventilation where necessary.

Personal protective equipment

Personal protective equipment (PPE) should be used where other control measures are not practicable or adequate to control exposure. It should be chosen to prevent routine exposure and to protect workers in the case of accidental contact with ammonium nitrate.

Eye/face protection: Wear chemical safety glasses to prevent eye contact.

Skin protection: Wear PVC gloves when handling the product to prevent contact. Wear long trouser and long sleeves to prevent contact.

Respiratory protection: Use P2 type canister respirator where dust is a problem.

Personal hygiene: Change and wash clothing and PPE, if contaminated, or before storing and/or re-using. Wash hands and face thoroughly after handling and before work breaks, eating, drinking, smoking and using toilet facilities.



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MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Section 9 – Physical and Chemical Properties

Appearance (colour, physical form, shape)

White odourless prills, with strong disagreeable acid taste.

Odour

Odourless

pH

pH of 10% solution: > 4.6

Vapour pressure

Ammonium nitrate does not exert significant vapour pressure.

Vapour density

Not applicable.

Boiling point/range

Decomposes from 170 °C before boiling.

Freezing/melting point

170 °C.

Solubility

Solubility in water: 118.3 g/100g of water at 0 °C; slightly soluble in alcohol; not soluble in acetone.

Specific gravity or density

Bulk density: 755 ± 25 kg/m³.

Flash point and method of detecting flash point

Ammonium nitrate does not give off flammable vapours.

Upper and lower flammable (explosive) limits in air

Ammonium nitrate is not flammable.

Ignition temperature

Not applicable.

Viscosity

Not applicable.

Section 10 – Stability and Reactivity

Chemical stability

When stored and handled in accordance with Australian Standard AS 4326 *The storage and handling of oxidizing agents*, ammonium nitrate remains stable.

Conditions to avoid

Store away from sources of heat or fire, especially in a confined space. Keep away from combustible materials and organic substances. Avoid storage and contamination with chlorine bleaches, pool chlorine and hypochlorites. Dry ammonium nitrate has been reported to detonate in fires with dry ammonium sulfate. Ensure that ammonium nitrate fertiliser is not stored near hay, straw, grain, diesel oil, greases. Do not permit smoking and the use of naked lights in the storage area for ammonium nitrate. Restrict stack size for bagged product (according to local regulations). Any building used for the storage of ammonium nitrate should be dry and well ventilated. Where the nature of the bagged product and climatic conditions so require, store under conditions that will avoid breakdown by thermal cycling (wide variation in temperature). The product should not be stored in direct sunlight to avoid physical breakdown due to thermal cycling. Avoid excessive generation of dust. Avoid contamination by combustible (e.g., diesel oil, grease, etc.) and incompatible materials. Avoid unnecessary exposure to the atmosphere to prevent moisture pick up.

Incompatible materials

Ammonium nitrate is incompatible with copper, zinc, or their alloys (i.e., bronze, brass, galvanised metals, etc.), aluminium powder and mild steel.



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MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Hazardous decomposition products

When heated to decomposition (unconfined) ammonium nitrate produces nitrous oxides, white ammonium nitrate fumes and water.

Hazardous reactions

Contamination of ammonium nitrate with chlorine bleaches, pool chlorine and hypochlorites may result in the formation of explosive nitrogen trichloride. Dry ammonium nitrate has been reported to detonate in fires with dry ammonium sulfate. When mixed with strong acid ammonium nitrate produces toxic brown nitrogen dioxide gas. When molten, ammonium nitrate may decompose due to shock or pressure. Ammonium nitrate may react violently with nitrites, chlorates, chlorides and permanganates.

Section 11 – Toxicological Information

HEALTH EFFECTS

When handled in accordance with the guidelines in this material safety data sheet, ammonium nitrate should not present any health effects. If this product is mishandled, symptoms that may arise are:

Acute:

Ammonium nitrate has moderate toxicity if swallowed. It is not classified as hazardous according to criteria of WorkSafe Australia.

Inhalation:

High mist concentration of air-borne material may cause irritation to the nose and upper respiratory tract, symptoms may include coughing and sore throat. Prolonged exposure may be harmful.

Skin:

Prolonged contact may cause some irritation, including redness and itching.

Eye:

May cause irritation, redness and pain following contact due to abrasive nature of material.

Swallowed:

Presents moderate toxicity, unless large amounts are ingested. Large amounts give large to gastro-intestinal irritation, with symptoms such as nausea, vomiting and diarrhoea. Large amounts may also cause dilation of blood vessels by direct smooth muscle relaxation and methaemoglobinaemia (excessive conversion of haemoglobin to methaemoglobin, which is incapable of binding and carrying oxygen – methaemoglobin is formed when iron in the haem molecule is oxidised from the ferrous to the ferric state). Symptoms include dizziness, abdominal pain, vomiting, bloody diarrhoea, weakness, convulsions and collapse. LD₅₀ (Oral, rat) = 2,217 mg/kg.

Chronic:

Prolonged or repeated exposure may cause drying of the skin with cracking and irritation that may lead to dermatitis.

Section 12 – Ecological Information

Ecotoxicity

Ammonium nitrate is a plant nutrient and large contamination may kill vegetation and cause poisoning in livestock and poultry.

Ammonium nitrate is of low toxicity to aquatic life and spills may cause algal blooms in static waters.

Persistence and degradability

When released into the soil, ammonium nitrate is not expected to evaporate significantly, but is expected to leach into groundwater. In damp soil the ammonium ion, NH₄⁺, is adsorbed by the soil. When released into water, ammonium nitrate is expected to readily biodegrade; the nitrate ion, NO₃⁻, is mobile in water. The nitrate ion is the predominant form of plant nutrition. It follows the natural nitrification/denitrification cycle to give nitrogen.

Mobility

Very soluble in water. The NO₃⁻ ion is mobile. The NH₄⁺ ion is adsorbed by the soil.



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MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Environmental fate (exposure)

Low toxicity to aquatic life. TL_m 96 between 10 – 100 ppm.

No effects on growth or feeding activities were observed in largemouth bass and channel catfish exposed to concentration of 400 mg NO₃⁻/L.

Acute Toxicity to Fish

48 hr LC₅₀ (*Cyprinus carpio*): 1.15 - 1.72 mg un-ionised NH₃/L; 95 – 102 mg total NH₃/L;

96 hr LC₅₀ (Chinook Salmon, rainbow trout, bluegill): 420 -1,360 mg NO₃⁻/L;

TL_m (Tadpoles): 910 mg NH₃/L.

Chronic Toxicity to Fish

7 day LC₅₀ (Fingerling rainbow trout): 1,065 mg/L.

Acute Toxicity to Aquatic Invertebrates

EC₅₀ (*Daphnia magna*): 555 mg/L; 124.9 mg total NH₃/L.

Chronic Toxicity to Invertebrates

Up to 7 days NOEC (*Bullia digitalis*): 300 mg/L.

Bioaccumulative potential

Ammonium nitrate does not show any bio-accumulation phenomena.

Section 13 – Disposal Considerations

Disposal methods and containers

Refer to local State Land Waste Management Authority. Depending on degree and nature of contamination, dispose of by use as fertiliser on farm or to authorised waste facility. Empty containers (bulka bags) must be decontaminated by rinsing thoroughly with water. Rinsing water needs to be disposed of carefully. Avoid contaminating waterways.

Special precautions for landfill or incineration

No data available.

Section 14 – Transport Information

UN Number

1942

UN Proper shipping name

Ammonium Nitrate

Class and subsidiary risk

5.1 Oxidizing Agent

Packing group

III

Special precautions for user

Not to be loaded with explosives (Class 1), flammable gases (Class 3), toxic gases (class 2.3), Flammable liquids (Class 3), flammable solids (Class 4.1), spontaneous combustible substances (Class 4.2), dangerous when wet substances (Class 4.3), organic peroxides (Class 5.2), toxic substances, where the toxic substances are fire risk substances (Class 6), radioactive substances (Class 7), corrosives (Class 8), miscellaneous dangerous goods, where the miscellaneous dangerous goods are fire risk substances (Class 9), and fire risk substances other than dangerous goods; however, exemptions apply.

Hazchem code

1.3



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MATERIAL SAFETY DATA SHEET

Ammonium Nitrate

Section 15 – Regulatory Information

Australian regulatory information

Ammonium nitrate is not classified as hazardous and is not specified in the NOHSC List of Designated Hazardous Substances [NOHSC:10005(1999)].

Ammonium nitrate is not listed as a poison in the Standard for the Uniform Scheduling of Drugs and Poisons.

Additional national and/or international regulatory information

OSHA: Hazardous by definition of Hazard Communication Standard (40 CFR Part 370).

Section 16 – Other Information

Key / legend to abbreviations and acronyms used in the MSDS

NOHSC	National Occupational Health and Safety Commission
SUSDP	Standard for the Uniform Scheduling of Drugs and Poisons
ES-TWA	Exposure Standard – Time weighted average
ES-STEL	Exposure Standard – Short term exposure level
ES-Peak	Exposure Standard – Peak level
FORS	Federal Office of Road and Safety
LC ₅₀ :	Lethal concentration 50, median lethal concentration
LD ₅₀	Lethal dose 50. The single dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route other than inhalation
%(^{wt} / _{wt})	Percent amount on a weight per weight basis
%(^{wt} / _{vol})	Percent amount on a weight per volume basis
PPM	Parts per million
Zone 1 Class 1	An area in which an explosive gas atmosphere can be expected to occur periodically or occasionally during normal operation. (More than 10 hours per year but less than 1000 hours per year)

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Ammonium Nitrate

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Sources for data

No data available.

Important Notes

1. To the best of our knowledge this document complies with the National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC:2011 (2003)].
2. This material safety data sheet summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this material safety data sheet and consider the information in the context of how the product will be handled and used in the workplace, including in conjunction with other products.
3. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact the Safety and Emergency Services Department, CSBP Limited on (08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas).
4. Our responsibility for products sold, is subject to our terms and conditions, a copy of which is sent to our customers, and is also available on request.
5. CSBP reserves the right to make change to material safety data sheets without notice.