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Draft code of practice

Minimising the risk of tyre fires when transporting ammonium nitrate explosion risk goods

2024

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**Foreword**

**The Act**

A key focus of the *Dangerous Goods Safety Act 2004* (the Act) is the duty to minimise risk from dangerous goods. This duty 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 *Work Health and Safety Act 2020*. Public safety is one of the most important features of the Act.

The Act is supported by several sets of regulations. The Dangerous Goods Safety (Road and Rail Transport of Non-explosives) Regulations 2007 (DGS Transport Regulations) deliver safety outcomes related to the transport of ammonium nitrate explosion risk goods. The security of ammonium nitrate explosion risk goods is captured within the Dangerous Goods Safety (Security Sensitive Ammonium Nitrate) Regulations 2007.

**Background**

On 24 October 2022, on the Great Central Road approximately 150 kilometres east of Laverton, Western Australia (WA) a tanker trailer carrying Ammonium Nitrate Emulsion (ANE) exploded as a result of a tyre fire on the trailer. The explosion caused considerable damage, including the destruction of the trailer, formation of a crater, and the scattering of shrapnel up to 800 metres away from the centre of the blast.

The[*Ammonium nitrate emulsion tanker trailer explosion*](https://www.dmp.wa.gov.au/Documents/Dangerous-Goods/ANETankerExplosion_Report.pdf):Incident investigation report was released on 19 September 2023, and included 16 recommendations to improve safety in the transport of ANE. This Code has been developed as a result of the recommendations from the investigation report and enhances fire detection, fire fighting capacity and training for drivers.

**Codes of practice**

Approved codes of practice provide safety recommendations to assist people in meeting their obligations under the Act and related regulations. The codes are approved and gazetted by the Minister under section 20 of the Act, and compliance with them may be used as a defence in law (s. 62 of the Act).

Although compliance with an approved code is not mandatory, it is expected that deviations from recommended practice will be justified and it can be demonstrated that the use of alternative risk control measures provides an equivalent or higher level of safety.

**Scope and application**

This Code applies to the transport of ammonium nitrate explosion risk goods on public roads within Western Australia. It is noted that other Australian states and territories may wish to adopt this Code and apply it within their jurisdictions.

The Code is intended to be read by prime contractors, owners, drivers and consignors of vehicles that transport the following placarded goods:

* Ammonium nitrate – UN 1942 and UN 2067
* Ammonium nitrate emulsion and suspension gels – UN 3375
* Ammonium nitrate, liquid (hot concentrated solution) – UN 2426

Mobile processing units (MPUs) are exempt from the requirements of this Code. However, if the MPU is towing an ammonium nitrate or ammonium nitrate emulsion trailer, the trailers are covered by and have to comply with the Code.

Dangerous Goods Safety regulations are actively enforced by inspectors which include Dangerous Goods Officers, WA Police and Main Roads Transport Inspectors. Breaches are likely to result in remediation notices or infringements to improve safety requirements, and in serious cases can lead to prosecution or the suspension of licences.

This Code of practice does not prevent the use of designs, materials, methods of assembly, procedures and similar that are above the minimum requirements of this Code or are not mentioned in it (for example nitrogen tyres), provided that the code of practice is complied with.

This Code should be read in conjunction with the DGS Transport Regulations and the Australian Dangerous Goods Code (ADG Code).

**Acknowledgement**

The Department of Energy, Mines, Industry Regulation and Safety recognises the contributions received during public consultation and thanks respondents for their feedback. This feedback has been considered when finalising the structure and content of this Code.

Contents

Foreword

[1 Introduction 6](#_Toc163050217)

[1.1 What are ammonium nitrate explosion risk goods? 6](#_Toc163050218)

[1.2 Duties under the Dangerous Goods Safety Act 6](#_Toc163050219)

[1.3 General duties as to dangerous goods 6](#_Toc163050220)

[1.4 Safety equipment – duty on prime contractors 6](#_Toc163050221)

[1.5 Safety equipment – duty on the consignor 7](#_Toc163050222)

[2 Vehicle fire fighting equipment 8](#_Toc163050223)

[3 Driver training 9](#_Toc163050224)

[3.1 Requirements for drivers 9](#_Toc163050225)

[4 Temperature monitoring tyres or wheel assemblies 10](#_Toc163050226)

[4.1 Manual monitoring 10](#_Toc163050227)

[4.2 Automatic monitoring 10](#_Toc163050228)

[Appendix 1: Glossary and definitions 12](#_Toc163050229)

[Appendix 2: Relevant legislation and guidance 13](#_Toc163050230)

# 1 Introduction

This Code of practice provides guidance on managing the hazard of fires on vehicles transporting placarded loads of ammonium nitrate explosion risk goods.

The most significant risk associated with ‘ammonium nitrate explosion risk goods’ is the risk of an explosion. The event of a fire on board a vehicle transporting ammonium nitrate explosion risk goods has the potential, under particular circumstances, to result in an explosion.

This Code provides guidance on minimising the potential for fires on vehicles transporting ammonium nitrate explosion risk goods, and mitigating the severity of such fires, particularly tyre fires.

## 1.1 What are ammonium nitrate explosion risk goods?

Ammonium nitrate explosion risk goods are used extensively within the mining industry to manufacture explosives. These goods refer to the following products:

1. ammonium nitrate emulsions, suspensions and gels conforming to UN 3375. These materials are collectively referred to in this Code as ANE
2. solid ammonium nitrate (AN) prill of UN 1942 and UN 2067, and
3. ammonium nitrate solutions (ANSOL), UN 2426.

This group of dangerous goods all contain AN, which in a fire scenario may decompose and potentially explode.

## 1.2 Duties under the Dangerous Goods Safety Act

The DGS Act places a duty of care on people involved in the transport of dangerous goods, which includes ammonium nitrate explosion risk goods.

## 1.3 General duties as to dangerous goods

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| **DGS Act s. 8**  Duty to minimise risk from dangerous goods |

A person who is directly or indirectly involved in transporting dangerous goods, such as the prime contractor, owner, driver and consignor, has a duty to minimise the risk of harm to people, property and the environment from dangerous goods.

The DGS Transport Regulations further detail specific requirements for duty holders to minimise the risks of ammonium nitrate explosion risk goods during transport.

## 1.4 Duty on prime contractors

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| Duty on prime contractors |

A prime contractor is a person, in conducting a business for or involving the transport of dangerous goods by road, who undertakes to be responsible, or is responsible, for the transport of the dangerous goods by road.

The prime contractor must not use the road vehicle, or allow the road vehicle to be used, to transport a placard load if the road vehicle is not equipped with:

1. fire extinguishers and portable warning devices that comply with the ADG Code Part 12
2. any other equipment required under that Part, and
3. a foam or water fire fighting system when transporting ammonium nitrate explosion risk goods.

A foam or water fire fighting system designed for the load using compressed air, electric pumps or other means must be still operational even when the engine of the vehicle is turned off and must be suitable for the types of fire scenarios likely to be encountered with the aim of preventing the spread of fire to the load.

## 1.5 Duty on the consignor: safety equipment

Duty on consignors

The consignor is a person who consigns dangerous goods or other goods for transport and is responsible for the safe transport of goods by road.

This applies to a person who:

* engages a prime contractor either directly or through an agent, or
* has possession of, or control over the goods immediately before the goods are transported, or
* loads a vehicle with the goods for transport.

The consignor must not allow a road vehicle to be used to transport a placard load if the road vehicle is not equipped with:

1. fire extinguishers and portable warning devices that comply with the ADG Code Part 12
2. any other equipment required under that Part, and
3. a foam or water fire fighting system when transporting ammonium nitrate explosion risk goods.

# 2 Vehicle fire fighting equipment

Prime contractors are required to provide a suitable foam or water fire fighting system, in addition to the fire extinguishers required by the Australian Dangerous Goods Code (ADG Code), on vehicles transporting a placarded load of ammonium nitrate explosion risk goods on public roads.

There are many variables that contribute to the fire’s intensity and size, and the location and capacity of fire fighting systems is required to be risk assessed to determine the most suitable arrangement for a company’s vehicle fleet.

There are three options to consider when choosing a suitable foam or water fire fighting system to comply with this Code. A prime contractor must use one of these options in addition to fire extinguishers required by the ADG Code.

**Option A: Fixed fire fighting system**

A suitable fixed fire fighting system that meets the requirements detailed within Table 12.1 Note 4 of the ADG Code and additional criteria as follows:

* A foam or water fire fighting system designed for the load using compressed air, electric pumps or other means, which must still be operational even when the engine of the vehicle is turned off. The system must be suitable for the types of fire scenarios likely to be encountered, with the aim of preventing the spread of fire to the load.
* Minimum capacity of 60 litres. The capacity should be risk assessed and the location should be positioned away from high risk areas.
* Minimum of at least one system for each combination vehicle.
* The system(s) must be capable of reaching all parts of the vehicle.
* The system should be filled with a suitable medium such as a foam or an encapsulating agent.
* The fire fighting system is required to be maintained in accordance with manufacturer requirements.

**Option B: Water fire extinguishers**

At least six 9 litre water fire extinguishers on the combination vehicle in addition to fire extinguishers required by the ADG Code. The following requirements apply:

* The fire extinguishers must comply to AS1841, AS1850 and AS1851.
* Each fire extinguisher must be mounted securely by means of a quick-release attachment
* Each fire extinguisher must be located so as to be readily accessible for use.
* The locations and spacing of fire extinguishers should be risk assessed.

**Option C: Encapsulating agent fire extinguishers**

At least three 9 litre encapsulating agent fire extinguishers on the combination vehicle in addition to the fire extinguishers required by the ADG Code. The following requirements apply:

* The fire extinguishers must comply to AS1841, AS1850 and AS1851.
* Each fire extinguisher must be mounted securely by means of a quick-release attachment.
* Each fire extinguisher must be located so as to be readily accessible for use.
* The locations and spacing of fire extinguishers should be risk assessed.

# 3 Driver training

### 3.1 Requirements for drivers

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| **DGS Transport Regulations r. 14**  Instruction and training |

There are a number of requirements for drivers detailed within the DGS Transport Regulations r. 14 relating to appropriate instruction and training. To transport ammonium nitrate explosion risk goods by road, drivers must receive regular practical training in:

* the use of the vehicle’s fire fighting equipment, and
* product awareness of the dangerous goods being transported, and
* fighting tyre fires safely.

The regulation requires the driver to undergo practical training in the use of the vehicle’s onboard fire fighting equipment as well understanding the chemical properties of the dangerous goods being transported and suitable emergency response actions.

**Theoretical**

* Training must provide details on the different fire fighting media and delivery systems available, as well as their applicability in different fire scenarios relevant to the vehicle.
* Fire fighting training must include instruction on the use of the specific fire fighting equipment fitted to the vehicle(s).
* Drivers should be provided with suitable training in the chemical hazards, safety implications and explosion risk of ammonium nitrate explosion risk goods when subjected to fire, for example, theory around decomposition process and timeframes.
* Training on the characteristics of a tyre and wheel fire versus a fire involving the load should be included. The importance and methodology of fighting a fire, if safe to do so, should be emphasised as well emergency evacuation distances as per the National Transport Commission: *Australian Emergency Response Guide Book*.

**Practical**

* The prime contractor is to ensure the drivers (including sub-contractors) are familiar with the fire fighting equipment and systems on their specific vehicle.
* Practical training in the fighting of fires must be conducted, at a minimum, every two years. Credible fire scenarios are considered extremely beneficial to simulate anticipated conditions and enable individuals to accurately assess a fire situation and choose an appropriate response.
* Training must include how to discharge and operate different types of fire extinguishers and fire fighting systems on board a company’s vehicle fleet. Training should also emphasise the ability to distinguish between types of vehicle fires, for example, tyre fires and a cargo fire (i.e. a fire where the AN product is involved).
* The procedures which detail the operation of any fire fighting systems are required to be documented. This information should be readily available to drivers in event of an emergency.
* Training is required to be documented and drivers are required to undergo a practical and written competency assessment that is witnessed and signed off by a trainer.
* Training records for individuals are required to be kept for a period of at least two years and may be audited by inspectors.

In addition to this, companies must incorporate fire fighting systems into their pre-start checks before commencing transport of ammonium nitrate explosion risk goods. Drivers should familiarise themselves with how to initiate the fire fighting system on board for each journey, as they may differ for different vehicle combinations.

Compliance will be monitored by the Department through transport audits and inspections.

# 4 Temperature monitoring tyres or wheel assemblies

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| Temperature monitoring tyres or wheel assemblies |

The primary cause of a tyre fire is the application of heat to the tyre or the development of heat within the tyre structure. Manual or automatic monitoring of tyre temperatures may prevent the occurrence of a fire on a vehicle.

### 4.1 Manual monitoring

Regular monitoring of tyre or wheel hub temperatures with a thermal imaging camera (TIC) can provide an indication of temperatures that are outside normal operating temperatures.

It is recommended that temperatures are manually checked frequently. This includes at the time of loading and prior to unloading product and each time a vehicle parks, for example, at fatigue breaks.

Temperature checks must be performed on all readily accessible tyres or wheel hubs and recorded. This must be incorporated into the journey management plan.

When using manual monitoring:

* companies are required to determine a policy on ‘normal operating temperatures’ and an action plan should these temperatures be exceeded, for example, ‘ground’ a vehicle for repair or plan to undertake maintenance
* tyres should be monitored with an accurate and maintained TIC
* a record of temperature checks must be kept and provided to inspectors when requested.

### 4.2 Automatic monitoring

Automatic monitoring of tyre and wheel hub temperatures may provide an early indication and alert the driver of an issue with the heating, or loss of pressure, to the vehicle’s tyres.

Where implemented, the direct tyre pressure monitoring system (TPMS) must include temperature monitoring.

There are number of TPMS available and transport companies need to consider the suitability of the systems available for their operations.

The automated system must:

* have thresholds for temperature that if exceeded alerts the driver
* be suitable for the weather, road and environmental conditions likely to be encountered
* be suitable for the type of vehicle used
* be installed as per manufacturer specifications
* have a real time monitoring system; a post journey data collection when the vehicle returns to the depot is not sufficient.
* record and store temperature data for analysis
* monitor individual tyre or wheel hub temperatures
* be inspected, maintained and calibrated in accordance with manufacturer specifications.

Drivers must be provided with awareness and response training on the TPMS.

# Appendix 1: Glossary and definitions

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| **Term** | **Description** |
| ADG Code | Australian Code for the Transport of Dangerous Goods by Road and Rail (also called the Australian Dangerous Goods Code) |
| AS/NZS 1841 series | *Portable fire extinguishers* |
| AS/NZS 1850 | *Portable fire extinguishers – classification, rating and performance testing* |
| AS 1851 | *Routine service of fire protection systems and equipment* |
| Consignor | A person who consigns dangerous goods or other goods for transport.  This applies to:   * a person who engages a prime contractor either directly or through and agent, or * has possession of, or control over the goods immediately before the goods are transported, or * loads a vehicle with the goods for transport.   DGS Transport Regulation 40 |
| The Act | *Dangerous Goods Safety Act* 2004 |
| DGS Transport Regs | Dangerous Goods Safety (Road and Rail Transport of Non-explosives) Regulations 2007 |
| Driver | Holder of a dangerous goods driver licence |
| Encapsulating agents | Additives mixed with water in fire suppression systems used to control and suppress fires as approved in National Fire Protection Association NFPA 18A *Standard on water additives for fire control and vapor mitigation* |
| Inspector | Dangerous Goods Safety Officer, or WA Police Officer or Main Roads Transport Inspector with the power to enforce the DGS Transport Regulations |
| Mobile processing unit (MPU) | A vehicle or a moveable piece of equipment (also called a mobile mixing unit  or MMU) designed to transport the constituents of a bulk AN-based explosive to the place where the explosive will be manufactured and used |
| Owner | Person who is either:   * sole, joint or part owner of the vehicle, or * has possession or use of the vehicle under a credit, hire-purchase, lease or other agreement.   DGS Transport Regulation 40 |
| Prime contractor | Person, in conducting a business for or involving the transport of dangerous goods by road, undertakes to be responsible, or is responsible, for the transport of the dangerous goods by road.  DGS Transport Regulation 43 |
| TIC | Thermal imaging camera |
| TPMS | Temperature and pressure monitoring systems |

# Appendix 2: Relevant legislation and guidance

**Legislative provisions**

*Dangerous Goods Safety Act 2004*

Dangerous Goods Safety (Road and Rail Transport of Non-explosives) Regulations 2007

Dangerous Goods Safety (Security Sensitive Ammonium Nitrate) Regulations 2007

Australian Code for the Transport of Dangerous Goods by Road & Rail Edition 7.8

Australian Code for the Transport of Explosives by Road and Rail (3rd Edition)

**Standards Australia**

AS/NZS 1841 *Portable fire extinguishers*

AS/NZS 1850 *Portable fire extinguishers – classification, rating and performance testing*

AS 1851 *Routine service of fire protection systems and equipment*

**Department of Energy, Mines, Industry Regulation and Safety**

[*Safety equipment for road vehicles transporting dangerous goods*](https://www.dmp.wa.gov.au/Documents/Dangerous-Goods/DGS_GN_SafetyEquipmentForRoadVehicles.pdf)

[*Tyre safety for earth-moving machinery on Western Australian mining operations*](https://www.dmp.wa.gov.au/Documents/Safety/MSH_G_TyreSafetyEarthMovingMachineryWAMines.pdf)