

Appendix J

Preliminary Hazard Analysis, GHD 2024

Tocumwal Magazine Compound Upgrade

Preliminary Hazard Analysis

Orica Australia Pty Ltd

23 July 2024

→ The Power of Commitment



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Executive Summary

Orica have proposed to redevelop the Tocomwal Explosives Reserve Magazines. The proposal is to build four 250 tonne high explosive (HE) magazines and a detonator improvised explosive (IE) magazine in new locations on the existing site. The primary objective of these upgrades is to enable the site to comply with Australian Standards (AS) and relevant codes of practice. Whilst the storage orientation is changing due to the proposal, the overall quantity of explosives and diesel is not increasing. The upgraded facility will continue to operate using the existing safety management system and major hazard facility licence, updated to reflect the new magazines.

GHD Pty Ltd (GHD) was commissioned by Orica to prepare a risk screening to determine if the proposed development 'Tocomwal Magazine Compound Upgrade' ('the proposal') is 'potentially hazardous or offensive' in accordance with the State Environment Planning Policy (SEPP) (Resilience and Hazards). To meet this requirement, the following steps were taken:

- A summary of Dangerous Goods (DGs) used on-site during construction and operation
- A risk screening of DGs
- A hazard identification to demonstrate that potential hazards have been identified and control measures are in place
- A consequence analysis was conducted for hazards identified as having potential off-site impacts

The results of the hazard identification (HAZID) revealed that six hazards have the potential for off-site harm.

1. Loss of containment of diesel from the on-site storage tank
2. Loss of containment of diesel from delivery tank
3. Explosion due to pentex boosters, cordtex detonating cords or senatel magnum
4. Explosion of detonators
5. Natural hazards (e.g., flooding, earthquake, lightning, bushfire)
6. Fire started within the project area (e.g hot works)

The consequence modelling for these scenarios was performed using DNV's PHAST version 8.71 commercial software package [1] and the UN SaferGuard Quantity Distance (QD) calculator [2]. The results from the modelling of the explosives and diesel stored on-site showed that there is appropriate separation distance between the storages and the site boundary. Additionally, the consequence analysis results validate that the site upgrades specifically the relocation of the magazines further from the site boundary are an improvement. Furthermore, the new placement of the diesel tank ensures a safer distance between the diesel, which is a possible fuel source, and the magazines.

It was determined that the hazards with potential off-site impact would be suitably controlled with the control measures listed in Table 7. With these safeguards, the risk scenarios identified are controlled to an acceptable level and the project is not a hazardous industry under SEPP (Resilience and Hazards).

The analysis completed demonstrate that the proposal can be designed, constructed, and operated in a manner that will minimise hazardous impact to the public.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.2 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

Orica is proposing to redevelop the Tocumwal Explosives Reserve Magazines. The proposal would bring the Tocumwal site in line with AS 2187 Australian Standards Explosives - Storage, Transport and Use [3].

The intent of the project is to remove the reliance on the exemption and become fully compliant with the Australian Standards and codes of practice. To achieve this Orica proposes to build four 250 tonne (t) HE magazines and a detonator IE magazine in new locations on the existing site. The same, or slightly reduced quantity of explosives would be stored, and the operational procedures would remain unchanged. The ten old magazines currently existing on the site would be removed and decommissioned.

1.1 Purpose of this report

GHD was commissioned by Orica to prepare a risk screening to determine if the proposed development 'Tocumwal Magazine Compound Upgrade' ('the proposal') is 'potentially hazardous or offensive' in accordance with the State Environmental Planning Policy (SEPP) (Resilience and Hazards) [4] formerly named SEPP No. 33 - Hazardous and Offensive Development.

This assessment has been prepared to inform an Environmental Impact Statement (EIS) and development application under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The assessment has been prepared in accordance with relevant statutory considerations.

This report addresses the relevant criteria in the NSW Secretary's Environmental Assessment Requirements (SEARs) (as outlined in Section 3.1) and assesses the potential hazards and risks of the project under the SEPP (Resilience and Hazards).

This report provides sufficient information and assessment of risks to demonstrate that the project will prevent, or mitigate the identified impacts, including human health, the environment and property, associated with the proposal and that the residual risk levels are acceptable in relation to the surrounding land use.

As such, this report focuses on the impact of potential hazards associated with the use of dangerous goods (DGs) and hazardous substances that may arise during the construction and operation of the project. Specifically, this report:

- Describes the existing environment with respect to the project
- Screens the quantities of DGs expected to be used during construction and operation of the project
- Assesses the impacts of construction and operation of the project specific to DGs and other hazardous substances
- Determines if the proposal is deemed a 'potentially hazardous or offensive industry'.

1.2 Scope and limitations

This report: has been prepared by GHD for Orica Australia Pty Ltd and may only be used and relied on by Orica Australia Pty Ltd for the purpose agreed between GHD and Orica Australia Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Orica Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

The following assumptions have been made in the preparation of this report:

- DG quantities provided are true and correct at the time of the screening
- All plant and equipment items are installed and operated in accordance with appropriate Australian Standards, codes, and guidelines
- DGs are stored in accordance with the Australian Dangerous Goods Code (ADG Code), relevant standards and guidelines, even if not a licensable quantity
- All equipment and systems are designed to be inherently safe
- All equipment is maintained and operated as designed
- The location of the Tocumwal Magazine Compound Upgrade, as assessed in this report, is as shown in the site plan Appendix A
- The chemical data (UN number, dangerous goods classification) was based on available Safety Data Sheets (SDS) and are referenced in Appendix B
- Potential repurposing or decommissioning of the old magazines would be undertaken in the future as a separate activity and is not considered in this scoping report.
- This report is limited to assessing the number of transport movements, as required by SEPP (Resilience and Hazards) and does not assess hazards associated with hazards on the road network or Major Incidents (as defined by Major Hazard Facility regulations).

Any changes to the assumptions used in this report should result in a review of the screening process and update as required.

2. Site description

2.1 Site information

The Tocumwal Explosives Reserve is an established site responsible for storing and distributing explosives used in the mining and quarrying sector. Operated by Orica since 1966, it is situated on the Newell Highway, approximately four kilometres north of the township of Tocumwal on the NSW and Victoria (VIC) border. This site spans approximately 750 hectares of open grazing land, enclosed by a fence. It includes an office, basic machinery and storage sheds.

The existing magazine complex at Tocumwal comprises ten approximately 100-tonne magazines constructed from corrugated iron. These magazines serve as storage units for cast boosters and cord products which are both locally produced by Thales and imported from the Philippines, China, and Chile.

Tocumwal plays a crucial role as the staging point for supplying the full range of explosive products to Australian states. Given the limited magazine storage capacity in the broader supply chain, Tocumwal stands as a pivotal stock centre.

2.2 Land use

The project site is enveloped by agricultural land, with portions currently serving as grazing areas for sheep and cattle through leasing agreements. These agreements will continue after the project's completion. Additionally, the site features small farm dams and drainage lines that further facilitate its agricultural use.

Figure 1 illustrates the existing site layout and surrounding waterways, farmhouses and roads.

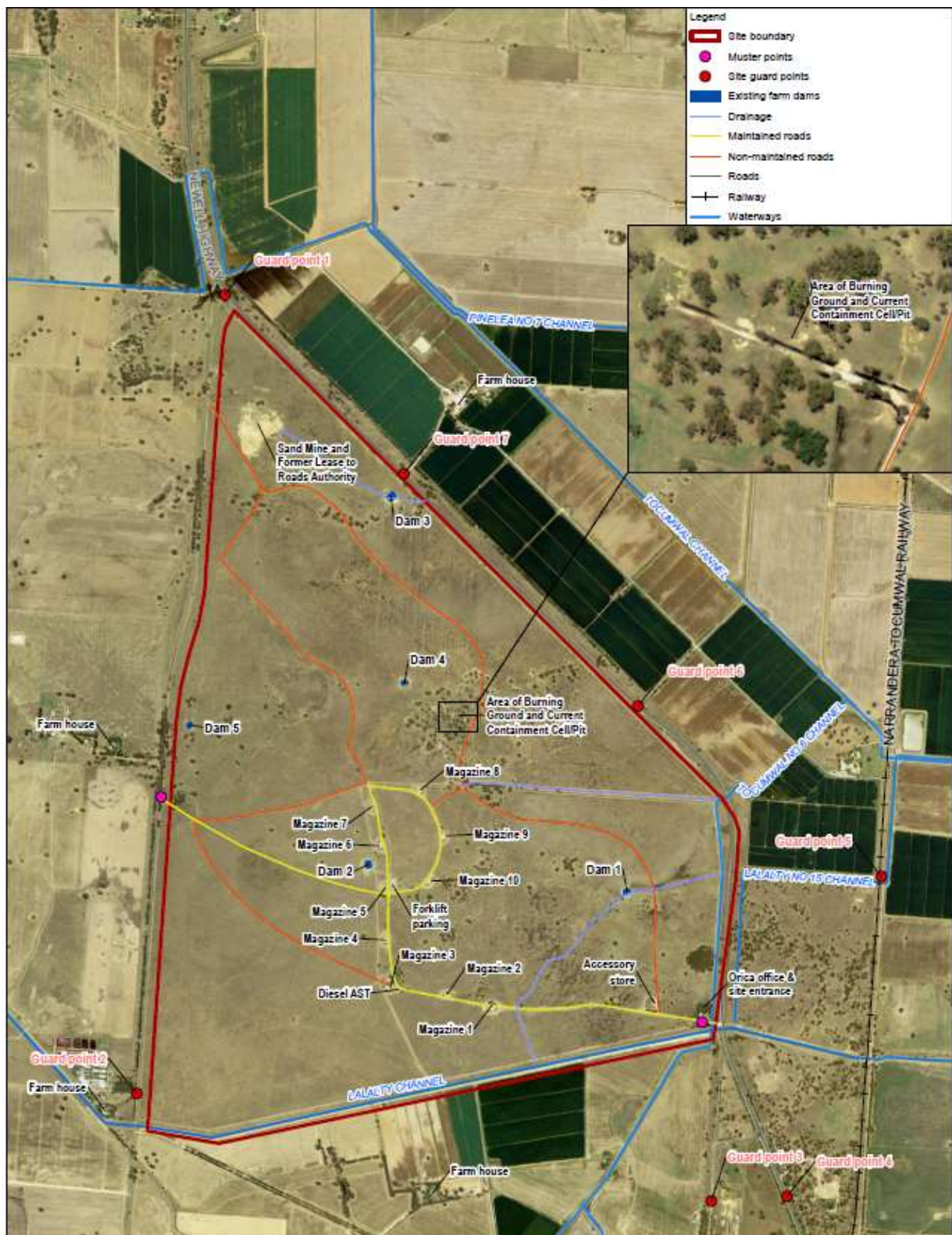


Figure 1 Existing site layout

3. Legislative and policy context

3.1 Secretary's Environmental Assessment Requirements

The SEARs requested a PHA prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis [5] and Multi-Level Risk Assessment [6]. The SEARs relevant requirements with a reference to where they are addressed in this report, are outlined in Table 1.

Table 1 Hazard and risk SEARs

Requirements	Reference
Identifications of hazards posed by shipping generated by the project	Section 6
Verification that the overall site complies with the requirements under Australian Standard AS 2187 Explosives – Storage, transport and use	Section 8
Verification that the overall site complies with the requirements for ammonium nitrate (security sensitive or otherwise) under Australian Standard AS 4326 – The storage and handling of oxidising agents, if relevant	Section 8
Outcomes and all necessary actions arising from the consultation with safework NSW regarding compliance with the Explosives Act 2003 and Chapter 9 of the Work Health and Safety Regulation 2017.	Section 8

3.2 State Environmental Planning Policy (Resilience and Hazards)

The NSW Department of Planning and Environment consolidated the state environmental planning policies (SEPPs) in December 2021, for introduction in March 2022. As a result, the previously named SEPP 33 – hazardous and offensive development provisions have been transferred to the SEPP (Resilience and Hazards). No policy changes have been made. The SEPP consolidation does not change the legal effect of the SEPPs being repealed and section 30A of the Interpretation Act 1987 applies to the transferred provisions, meaning the transfer does not affect the operation or meaning of the SEPP provisions.

The Department of Planning and Environment, NSW, 2011, Applying SEPP 33: Hazardous and Offensive Development Application Guidelines continues to provide the process for assessing if developments are potentially hazardous or offensive, including threshold levels that trigger the potentially hazardous or offensive status. Applying SEPP 33 is the main guidance document that has been followed for this PHA.

3.3 Hazardous Industry Planning Advisory Paper No 4

The Department of Planning and Environment, NSW, 2011, Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning (HIPAP No 4) [7] sets out risk criteria for industries that are considered hazardous to comply to. This document is used when Applying SEPP 33 [4] indicates a development is potentially hazardous.

3.4 Hazardous Industry Planning Advisory Paper No 6

The Department of Planning and Environment, NSW, 2011, Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis (HIPAP No 6) [5] lists the process required for undertaking a PHA. This document is used when Applying SEPP 33 [4] indicates a development is potentially hazardous.

4. Methodology

The method to determine whether a project would be deemed potentially hazardous or potentially offensive and the required follow up assessments is provided in Table 2.

Table 2 Applying SEPP 33 method for potentially hazardous or offensive industries

Issue	Methodology to determine if potentially hazardous / offensive	Follow up assessment if confirmed as potentially hazardous / offensive industry
Potentially hazardous industry	Applying SEPP 33 risk screening process	Preliminary Hazard Analysis (PHA) required
Potentially offensive industry	Review of potential impacts to the amenity of the site or discharges, such as emissions (e.g., noise, air)	Meeting any licencing requirements issued by relevant authorities e.g., NSW Environmental Protection Agency (EPA) is required

The Applying SEPP 33 process is discussed in Sections 4.1 to 4.3.

4.1 Risk screening

Applying SEPP 33 relates to any project which falls under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'.

A 'hazardous industry' is one in which when all locational, technical, operational, and organisational safeguards are employed, continues to pose a significant risk, as per the requirements of SEPP (Resilience and Hazards). A 'potentially offensive industry' is one which would, in the absence of safeguards, emit a polluting discharge which would cause a significant level of offence.

SEPP (Resilience and Hazards) requires a screening process be undertaken. The overall risk screening process, as outlined in Applying SEPP 33 is summarised in Figure 2.

The risk screening process concentrates on the storage of specific DG classes that have the potential for significant off-site effects. Specifically, the assessment involves the identification of classes and quantities of all DGs to be used, stored, or produced on-site with an indication of storage locations. The quantities of DGs are then assessed against the Applying SEPP 33 threshold quantities. If any of the Applying SEPP 33 threshold quantities are exceeded, then that the project is potentially hazardous, then a PHA is required.

If the project is potentially offensive, after considering the quantity and nature of any discharges and the significance of the offence likely to be caused, having regard to surrounding land use and the proposed controls, then additional controls are required.

4.2 Hazard identification

Following screening, Applying SEPP 33 requires a determination of whether the proposal poses significant risk or offence. This requires identification of potential hazards to highlight any risks associated with the interaction of the proposal (as a whole) with the surrounding environment (i.e., a systematic process to identify any potential off-site impacts).

The Hazard Identification (HAZID) process is a desktop assessment and involves documenting possible events that could lead to a possible off-site incident. The assessment then lists the potential causes of the incident, as well as identification of operational and organisational safeguards to prevent the incidents from occurring or mitigate their impact. The HAZID process identifies the scenarios relevant to the PHA, should it be required.

4.3 Preliminary hazard analysis

For a development proposal classified as 'potentially hazardous', a PHA is required to determine the risk to people, property, and the environment at the proposed location and in the presence of controls. Criteria of acceptability are used to determine if the development proposal is classified as a 'hazardous industry'. If this is the case, the development proposal may not be permissible within most industrial zonings in NSW.

The PHA identifies the potential hazards, analyses these hazards in terms of their impact to people and the environment and their likelihood of occurrence, quantifies the resulting risk to surrounding land uses and assess the risk to demonstrate that the proposal will not impose an unacceptable level of risk.

Applying SEPP 33 identifies three levels of PHA. If a PHA is required, a judgement of the level of risk associated with the proposal is determined using the results of the screening and HAZID stages.

The three levels of PHA are:

- Level 1 – if low potential for harm is identified, a qualitative PHA is completed
- Level 2 – if medium potential for harm is identified, a semi-quantitative PHA is completed
- Level 3 – if high potential for harm is identified, a quantitative PHA is completed.

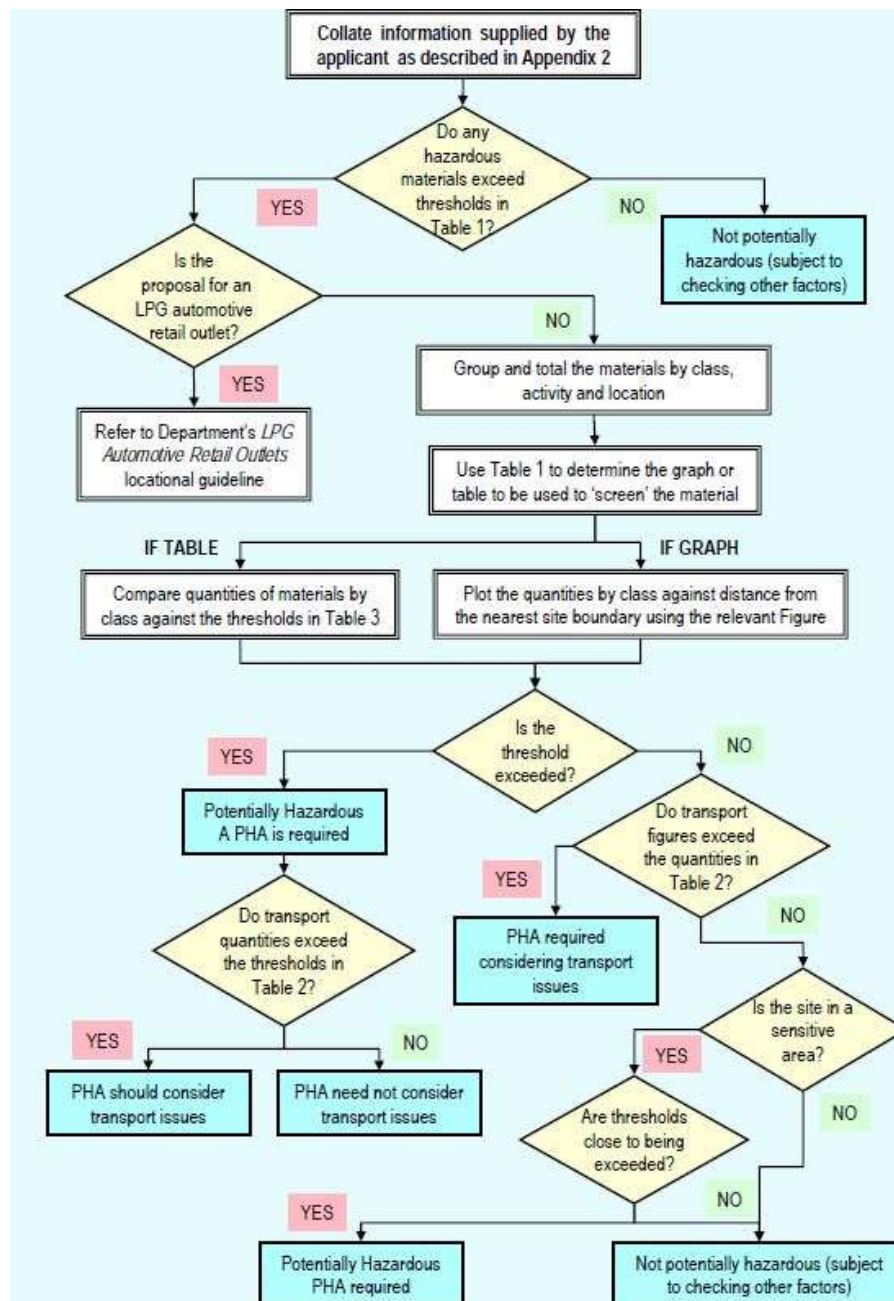


Figure 2 SEPP (Resilience and Hazards) risk screening process

5. Risk screening and emissions

5.1 Dangerous goods screening

A DG is a substance or article that poses a risk to people, property, or the environment [4]. Each class represents a different type of DG. Some classes are divided into packing groups, where Packing Group (PG) I substances present a high level of danger, PG II substances present a medium level of danger, and PG III substances present a low level of danger. A summary of the different DG classes is shown in Table 3.

Table 3 Dangerous good classes [4]

DG Class	Packing Group	Description
1.1	N/A	Substances and articles which have a mass explosion hazard
1.2	N/A	Substances and articles which have a projection hazard but not a mass explosion hazard
1.3	N/A	Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both but not a mass explosion hazard
1.4	N/A	Substances and articles which present no significant hazard
1.5	N/A	Very insensitive substances which have a mass explosion hazard
1.6	N/A	Extremely insensitive articles which do not have a mass explosion hazard
2.1	N/A	Flammable gases
2.2	N/A	Non-flammable, non-toxic gases
2.3	N/A	Toxic gases
3	I, II, or III	Flammable liquids
4.1	I, II, or III	Flammable solids, self-reactive substances and solid desensitised explosives
4.2	I, II, or III	Substances liable to spontaneous combustion
4.3	I, II, or III	Substances which in contact with water emit flammable gases
5.1	I, II, or III	Oxidising substances
5.2	I, II, or III	Organic peroxides
6.1	I, II, or III	Toxic substances
6.2	I, II, or III	Infectious substances
7	N/A	Radioactive material
8	I, II, or III	Corrosive substances
9	I, II, or III	Miscellaneous dangerous goods and articles

Note, class C1 combustible liquids are not classified as DGs under the United Nations (UN) but are considered DGs under workplace legislation.

5.1.1 Construction

Due to the nature of constructing the Tocumwal Magazine Compound Upgrade it is expected that chemicals used during the construction of the proposal will be present in small quantities. A standard list of construction material and quantities have been included in Table 4. Therefore, the SEPP (Resilience and Hazards) threshold is not expected to be exceeded during construction.

Table 4 Construction dangerous goods screening

Chemical/ product	UN #	DG class	Packing group	Expected storage quantity	SEPP (Resilience and Hazards) combined storage threshold	Exceedance of SEPP (Resilience and Hazards) threshold	
Spray paint	multiple	2.1 – pressurised	N/A	0.02	0.1	Pass (does not exceed)	
LPG	1075	2.1 – liquified and pressurised	N/A	0.09	10	Pass (does not exceed)	
Acetylene (welding)	1001	2.1 – liquified and pressurised	N/A	0.33	0.5	Pass (does not exceed)	
Oxygen (welding)	1072	5.1	N/A	0.3	5	Pass (does not exceed)	
Paint (oil based considered worst case)	1263	3	II	0.1	5	Pass (does not exceed)	
Solvents	multiple	3	II	0.1			
Epoxy resins	multiple	3	III	0.1	5	Pass (does not exceed)	
Cleaning products	multiple	8	II	0.005	25	Pass (does not exceed)	
Diesel (C1)	3082	9	III	2.5	None	Pass (excluded) *	
General oils and lubricants (C2)	1791	9	III	0.5			
Sealants / joint fillers	N/A	Not classified as DG		0.05	Not applicable		
Detergent	N/A	Not classified as DG		0.005	Not applicable		
Cement, grout, ready-mix concrete	N/A	Not classified as DG		Used on demand	Not applicable		
Concrete curing compounds and formwork de-bonding	N/A	Not classified as DG		Used on demand	Not applicable		
Steel – reinforcing steel and structural steel	N/A	Not classified as DG		Used on demand	Not applicable		

* This refers to dangerous goods that SEPP 33 has excluded from requiring a threshold quantity.

5.1.2 Operations of the project

A summary of the chemicals proposed to be used and/or stored on-site during operation of the proposal is shown in Table 5. Assumptions that have been made about the usage of these chemicals on-site, DG classification, quantities, and whether the chemicals exceed the SEPP (Resilience and Hazards) threshold have also been provided in Table 5. Therefore, the SEPP (Resilience and Hazards) threshold is not exceeded during operation.

Table 5 Operations dangerous goods screening

Chemical/ product	UN #	DG class	Packaging group	Expected storage quantity	SEPP (Resilience and Hazards) combined storage threshold	Exceedance of SEPP (Resilience and Hazards) threshold	Comments / assumptions
Diesel	3082	Class C1 combustible liquids		2,000 Litre	None	Pass (excluded) [*]	
Detonators, Electric for blasting	0030	1.1B	-	10 Tonne	300 m from the site boundary	Pass (does not exceed threshold)	10 million detonators with 0.001 kg of explosives per unit each equals 10000 kg or 10 tonnes. The 0.001 kg of explosive is based on the technical data sheets in Appendix B
Detonators, non-electric for blasting	0029	1.1 B	-				
Detonator Assemblies, non-electric for blasting	0360	1.1 B	-				
Others: i-kon™ III Electronic Detonator Electric Instantaneous II Detonators Carrick II Detonators eDev™ II Electronic Detonator Exel™ Long Period Detonators Exel™ Connectadet™ Detonators Exel™ Millisecond Connectors i-kon™ III Extreme Electronic Detonator uni tronic™ 600 Electronic Detonator	0456	1.4 ¹	-			Pass (excluded) ²	

¹ Detonators are DG Class 1.4 or 1.1 B based on manufacture, the technical data sheets for the detailed type of detonators is available in Appendix B

² According to Applying SEPP 33 'Classes 1.4, 1.5, 1.6, 2.2, 7 and 9 are excluded from the risk screening' [4]

Pentex Boosters	0042	1.1D	-	1,000 Tonne	1,100 m from the site boundary	Pass (does not exceed threshold)	Tocumwal Explosives licence is for a maximum of 1000 tonnes (250 tonnes in four magazines)
Cordtex Detonating Cords	0065	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	
Senatel Magnum	0241	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	
PETN	0150	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	
ANFO (Explosive, Blasting, Type B)	0082	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	

* This refers to dangerous goods that SEPP 33 has excluded from requiring a threshold quantity.

5.2 Transport screening

It is assumed that during construction of the project, there will be low volumes of DGs stored in the construction compound. Therefore, the transportation volumes of chemicals during construction are minimal. Based on this, the construction of the proposal will not exceed transport screening thresholds.

Table 6 shows the transport screening for the operation of the proposal. The diesel is expected to be delivered in 20,000 L truck and the storage tank re-filled four times a year. Based on this, the operation of the proposal will not exceed transport screening thresholds.

There is no assigned transport threshold for DG class 1 as explosives are considered an accountable item and managed separately.

Table 6 Operations transport screening

Chemical/ product	DG Class	Combined transport movements (annual)	Transport movements threshold (annual)	Exceedance of SEPP (Resilience and Hazards) threshold
Diesel	9	4	>1000	Pass (does not exceed threshold)

5.3 Summary of a risk screening results

According to Applying SEPP 33, if any of the screening thresholds are exceeded then the proposed development should be considered a 'potentially hazardous industry' and a PHA is required.

The results of the dangerous goods screening and the transport screening indicate that the proposed Tocumwal Explosives Reserve magazines upgrade does not exceed the thresholds within the SEPP (Resilience and Hazards) requirements. The project is therefore not considered a 'potentially hazardous industry' and a PHA is not required.

Any change to the separation distance, the proposed design or increase in DG inventories will require a review of this assessment.

5.4 Summary of emissions

An assessment of the air quality and odour, noise and vibration and visual impacts of the proposal will be completed through the EIS. The current operation meets the relevant amenity criteria. As a result, the proposal is not considered to be 'potentially offensive'.

6. Hazard identification and management

Due to the nature of the class 1 explosives located on-site during operation, a hazard identification process was completed, as outlined in Table 7, to demonstrate that potential hazards have been identified and control measures are in place. The basis for the hazard identification in Table 7 is taken from the Sherpa Consulting hazard and operability (HAZOP) study [8] that was completed on 19 January 2023 in line with Orica's Hazard Study 3 Guidance.

Excluding the construction risk, diesel and explosive storage hazards have existed on-site since 1966. There have been no recorded incidents in over 50 years, indicating effective risk control. The proposal will not be increasing the storage quantities on site. Additionally, relocating the magazine storage away from site boundaries reduces the risk of off-site impact or fatality. The new facility will continue to operate using existing processes and procedures once updated to reflect the new configuration.

The existing operation at Tocumwal has a dedicated truck parking area adjacent to the existing administration building complex. This operation is currently managed by the site's MHF safety management system, which includes, but is not limited to:

- Maintaining adequate distance between parked loaded trucks;
- Limiting parking to two loaded trucks at any given time;
- Contractor management of transport trucks and drivers;
- Transport Management Plan.

This operation is acknowledged as an ongoing major hazard on this site. The management of this operation will continue unabated during the completion of the project that is the subject of this preliminary hazard assessment and EIS. The presence of these trucks will be considered during construction phase hazard and Constructability (HAZCON) study and any other safety studies or hazard studies to determine any additional risk and control measures when required.

Table 7 *Hazard identification*

ID	Hazard scenario	Cause	Consequences	Potential to cause off-site impact	Identified / recommended safeguards
Construction					
1	Vehicle interaction within the modification area	– Vehicle movements in vicinity of personnel – Vehicle movements in vicinity of other vehicles	Personnel injury	No	– HAZCON – Prepare construction traffic management plan including standard traffic rules and signage for construction, site speed limits, site layout to minimise vehicle reversing and designated pedestrian areas where required – Driver competency – Construction machine inductions/licensing

ID	Hazard scenario	Cause	Consequences	Potential to cause off-site impact	Identified / recommended safeguards
2	Contact with chemicals, including dangerous goods	- General construction activities (welding, refuelling) - Vegetation management (herbicides)	Personnel injury	No	- Store chemicals in line with appropriate standards, such as AS1940 for flammable and combustible liquids, and AS3780 for corrosives. - Regular inspection of chemical storage areas - Safe Work Method Statement detailing safe procedures for chemical handling and transfer - Spill kits to be used in the event of an incident involving release of chemicals - PPE to all personnel handling chemicals
3	Fire started within the project area	- Hot works - Arson	Personnel injury / fatality	Yes	- Prepare construction environmental management plan, including emergency response, refuelling process and hot work permit process - Compliance with existing housekeeping standards - Existing site security (fencing and CCTV) - Inspection and maintenance regime for construction equipment
Construction and Operation					
4	Natural hazards	Flooding, earthquake, lightning, bushfire	Personnel injury Asset damage Plant shut down	Yes	- Prepare construction environmental management plan, including emergency response - Update existing operational Safety Management System to include new infrastructure including bushfire management plan and emergency response plan - Compliance with existing earthing and bonding strategy, including provision of lightning arrestors. - Compliance with existing housekeeping standards - Site drainage design
Diesel Storage (Operation)					
5	Loss of containment of diesel from the on-site storage tank	- Large spill or leak - Human error - Damage to storage tank e.g., due to external impact or wear/ corrosion	Fire Explosion Asset Damage Personnel injury/fatality	Yes	- Store chemicals in line with AS1940 for flammable and combustible liquids - Bunded area around the tank - Emergency spill kits - Update existing operational Safety Management System to include new infrastructure including bushfire management plan and emergency response plan - Existing fire and evacuation training for staff

ID	Hazard scenario	Cause	Consequences	Potential to cause off-site impact	Identified / recommended safeguards
					- Existing fire water supply and fire main - Existing asset management system, including tanks inspections and maintenance
6	Loss of containment of diesel from delivery tank	- Overfill of tank during tank filling - Tanker drive away whilst connected - Flexible hose failure (leak/rupture) - Operator error - incorrect connection of flexible hose (connection fails)	Fire Explosion Asset Damage Personnel injury/fatality	Yes	- Store chemicals in line with AS1940 for flammable and combustible liquids - Bunded area around the tank - Emergency spill kits - Update existing operational Safety Management System to include new infrastructure including bushfire management plan and emergency response plan - Existing fire and evacuation training for staff - Existing fire water supply and fire main - Driver competency
Magazine Storage (Operation)					
7	Explosion due to: - Pentex Boosters - Cordtex Detonating Cords - Senatel Magnum	- Ignition source - Malicious intent (unauthorised access)	Explosion Asset Damage Personnel injury/fatality	Yes	- Storage complies with AS 2187 Australian Standards Explosives - Storage, Transport and Use - Existing security to prevent unauthorised entry including locks, alarms, fencing and seven guard points - Existing asset management system, including magazine inspections and maintenance - Separation distance from site boundary - Appropriately designed earthen blast mounds to minimise risk of knock-on detonation - Earth grid and lightning protection masts and conductors
8	Explosion of: Electric Detonators	- Ignition source - Malicious intent (unauthorised access)	Explosion Asset Damage Personnel injury/fatality	Yes	- Storage complies with AS 2187 Australian Standards Explosives - Storage, Transport and Use - Existing security to prevent unauthorised entry including locks, alarms, fencing and seven guard points - Existing asset management system, including magazine inspections and maintenance - Separation distance from site boundary

7. Consequence analysis

Whilst the preliminary risk screening determined that the proposal was not potentially hazardous and a PHA is not needed, the hazard identification process indicated that there are scenarios with the potential for off-site impact. In order to confirm off-site impact, consequence analysis of these scenarios was completed.

7.1 Summary or hazard scenarios

The following six scenarios were identified to potentially have an off-site impact in the HAZID phase of the study.

1. Loss of containment of diesel from the on-site storage tank
2. Loss of containment of diesel from delivery tank
3. Explosion due to pentex boosters, cordtex detonating cords or senatel magnum
4. Explosion of detonators
5. Natural hazards (e.g., flooding, earthquake, lightning, bushfire)
6. Fire started within the project area (e.g hot works)

Hazards 5 of natural hazard like bushfire are covered in the other SEARs requirements of a bush fire assessment report. Hazard 6 is an ignition source which in a worst-case scenario could lead to an explosion, subsequently is covered in hazards 3 and 4. Therefore, only hazards 1 to 4 were modelled for consequence results.

The diesel consequence modelling was performed using DNV's PHAST version 8.71 commercial software package [1]. A summary of the model input parameters and PHAST outputs are presented in Section 7.2.

The explosion modelling was performed using the UN SaferGuard Quantity Distance (QD) calculator [2]. The calculator provides an internationally recognised review of the appropriate separation distances. It does not negate or invalidate Orica's existing process. A summary of the calculator is available in Appendix C.

7.2 Consequence results

7.2.1 Diesel loss of containment scenarios

The general modelling input parameters used in the diesel consequence modelling are shown in Table 8.

Table 8 General diesel loss of containment modelling input parameters

Parameter	Value	Units	Comment
Release location	-	-	All releases are assumed to be outdoor releases, over land
Release direction	-	-	Vertical
Height of interest	1.5	m	Representing the height of a typical person standing or crouching at work
Surface roughness	1	m	Representing regular large obstacle coverage. The surface roughness affects the turbulence in the air as it reaches the release
Ambient temperature	17	°C	Average based on the Bureau of Meteorology (BoM) statistics for Tocumwal Airport [9]
Surface temperature	17	°C	Average based on the BoM statistics for Tocumwal Airport [9]
Humidity	60	%	Average based on the BoM statistics for Tocumwal Airport [9]
Weather conditions	1/F		Wind speed: 1m/s, stability: night, moderate wind
	3/D		Wind speed: 3m/s, stability: neutral, high wind
	5/D	-	Wind speed: 5m/s, stability: neutral, high wind
Material	Diesel Fuel	-	

7.2.2 Diesel flammable limits

The flammable range of a gas is the concentration range for which it will burn if an ignition source is present. This is described by the following:

- **Upper Flammable Limit (UFL)**

This is the upper air fuel mixture concentration at which the material will burn in air. Concentrations higher than the UFL are considered too rich to burn.

- **Lower Flammable Limit (LFL)**

This is the lower air fuel mixture concentration at which the material will burn in air.

- **Fraction Lower Flammable Limit (0.5 LFL)**

This is a concentration (50% LFL) providing a safety factor that gives an indication of the maximum distance at which a flammable cloud could be ignited. This considers the effects of imperfect mixing that may lead to local concentrations higher than those predicted by the dispersion modelling.

The flammability limit values are defined for diesel in Table 9, value is in ppm (parts per million).

Table 9 Flammability Limit Values

Material	0.5 LFL	LFL	UFL
Diesel fuel	2,500 ppm	5,000 ppm	45,000 ppm

7.2.2.1 Scenario 1: diesel tank

Scenario 1 is the loss of containment of the on-site tank containing 2,000 L (2 m³) of diesel. The input parameters for scenario 1 are shown in Table 10.

Table 10 Diesel storage modelling input parameters

Parameter	Value	Units	Comment
Model	Atmospheric tank	-	-
Scenario	Catastrophic rupture	-	-
Inventory	2	m ³	Maximum inventory of the tank
Elevation	1	m	-
Tank Head	1.5	m	Average height of a small tank
Surface area under tank	Concrete		-
Bund height	0.5	m	Low wall height
Bund area	4.8	m ²	Minimum bund capacity based on 120% of the tanks inventory

The following results and respective tables were generated for this scenario. The only consequence results generated for scenario 1 are late pool fire and flash fires.

Table 11 is the dispersion result of scenario 1, the results indicate that this diesel will travel 2.7 m at 0.5 LFL (2,500 ppm) from the tank based on the downwind direction. This is minimal movement and will be effectively controlled by safeguards identified in Table 7. The dispersion results correspond with flash fire impacts. Flash fire is the combustion of flammable vapour and air mixture in which the flame passes through the mixture at a rate less than sonic velocity so that negligible damaging overpressure is generated.

Table 11 Scenario 1: dispersion and flash fire results

	Distance downwind to defined concentrations (m)		
	0.5 LFL	LFL	UFL
Scenario 1: diesel tank	2.7	2.7	2.5

Pool fire will form if a flammable or combustible liquid spill ignites. Pool fires have low momentum flames and therefore their direction is dependent on wind conditions. Late pool fire heat radiation distances for each of the relevant loss of containment scenarios are presented in Table 12 and Figure 3. The red circle (23 kW/m²) in Figure 3 indicates an area where a pool fire is likely fatal for personnel in the area. However, it's important to note that this area does not necessitate prolonged presence of personnel nearby.

Table 12 Scenario 1: late pool fire results

	Distance downwind to intensity level (m)			
	4.7 kW/m ²	10 kW/m ²	12.6 kW/m ²	23 kW/m ²
Category 1/F	13.1	9.6	8.7	6.7
Category 3/D	13.4	10.3	9.5	7.8
Category 5/D	13.2	10.4	9.7	8.2



Figure 3 Scenario 1: late pool fire results

7.2.2.2 Scenario 2: diesel tanker

Scenario 2 is the loss of containment of the tanker containing 20,000 L (20 m³) of diesel. The input parameters for scenario 2 are shown in Table 13.

Table 13 Diesel tanker modelling input parameters

Parameter	Value	Units	Comment
Model	Atmospheric tank		
Scenario	Catastrophic rupture		
Inventory	20	m ³	
Elevation	1	m	
Tank Head	3.6	m	Height of a gas tanker

The following results and respective tables were generated for this scenario: The only consequence results generated for scenario 2 are late pool fire and flash fires.

Table 14 is the dispersion result of scenario 2, the results indicate that this diesel will travel 5.4 m at 0.5 LFL (2,500 ppm) from the tanker based on the downwind direction. This is minimal movement and will be effectively controlled by safeguards identified in Table 7. The dispersion results also correspond with flash fire impacts.

Table 14 Scenario 2: dispersion and flash fire results

	Distance downwind to defined concentrations (m)		
	0.5 LFL	LFL	UFL
Scenario 2: diesel tanker	5.9	5.9	5.9

Late pool fire heat radiation distances for each of the relevant loss of containment scenarios are presented in Table 15 and Figure 4. The results show that the pool effect zone stays within the boundaries of the site at level 2 (12.6 kW/m²).

Table 15 Scenario 2: late pool fire

	Distance downwind to intensity level (m)			
	4.7 kW/m ²	10 kW/m ²	12.6 kW/m ²	23 kW/m ²
Category 1/F	71.7	44.7	40.7	Not reached
Category 3/D	85.0	50.6	43.8	Not reached
Category 5/D	91.5	54.3	45.1	Not reached

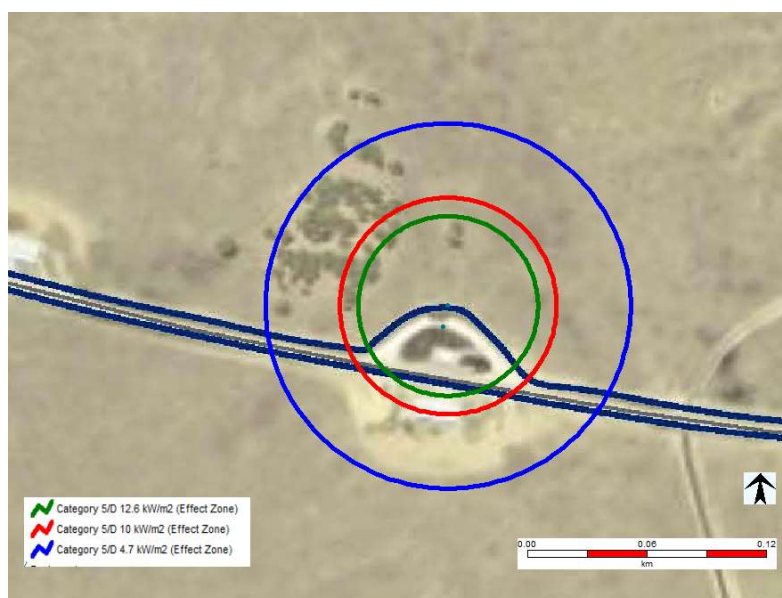


Figure 4 Scenario 2: late pool fire results

Scenario 2 has a greater impact due to the truck holding more diesel than the tank. However, both loss of containment scenarios resulting in minor on-site impacts, which can be effectively managed through proper diesel storage and refilling procedures. Furthermore, the diesel is being relocated to have a larger separation distance from the magazines.

7.2.3 Explosive

7.2.3.1 Scenario 3: magazines

The proposed site will have 4 magazines with 1.1D explosives, these magazines will have a maximum license quantity of 250 T each. This is a reduction from the original class 1.1D licence limit of 1100 T down to 1000 T.

The results in Table 16 are based on 250 tonnes of pentex boosters, cordtex detonating cords and senatel magnum using the Hopkinson-Cranz scaling law in Appendix C.

Table 16 Scenario 3: magazine explosion results

Coefficient Z (m/kg ^{1/3})	Definitions	Range (m)
8	Distances between ammunition process buildings (APB) within an explosive storage area (ESA).	504
14.8	Distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	932
22.2	Distances between an explosive storehouse (ESH) and a building inhabited by civilians.	1396
44.4	Distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	2797

Figure 5 presents the results from Table 16 measuring from the new HE Magazine 05 which is closest to the site boundary. The figure highlights that coefficients 22.2 m/kg^{1/3} and 44.4 m/kg^{1/3} will have an off-site influence as they cross the site boundary (red line). However, it's worth noting that the orange area corresponding to 22.2 m/kg^{1/3} (1396 m from the magazine) does not encompass any buildings inhabited by civilians, as indicated by the presence of green house markers. Similarly, the pink area associated with 44.4 m/kg^{1/3} (2797 m from the magazine) excludes venerable buildings such as schools or nursing homes.

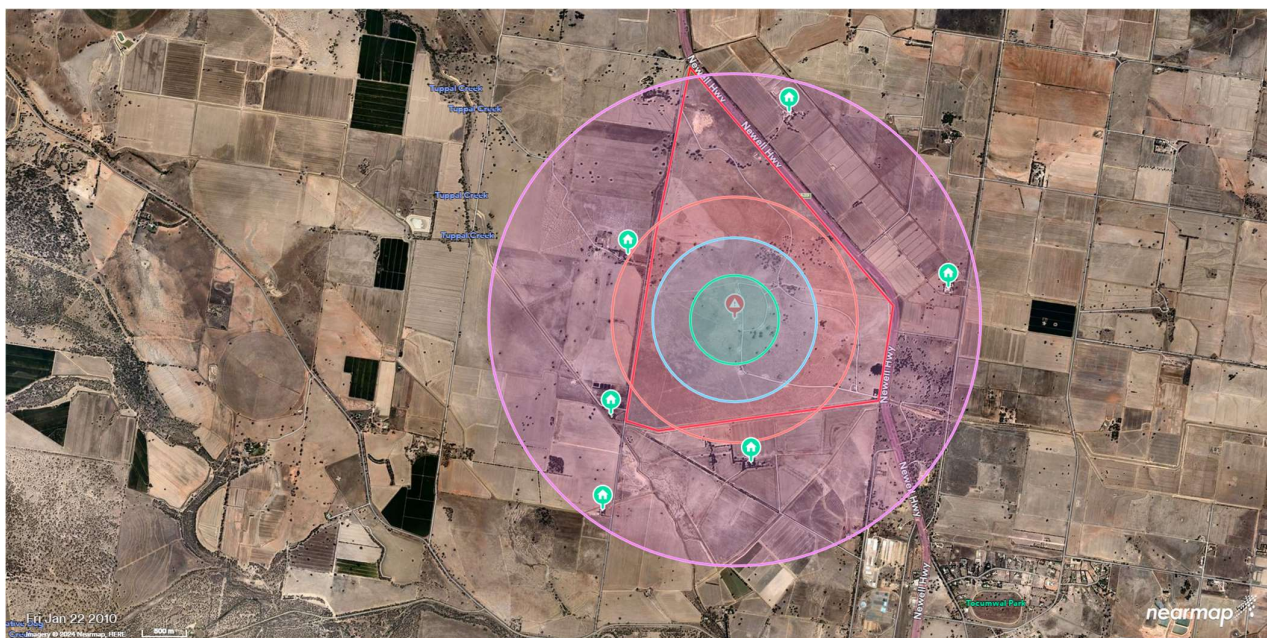


Figure 5 Scenario 3: magazine explosion results

It is important to note that these areas in Figure 5 could shift slightly depending on whether the explosion occurred at one of the other three magazines. However, HE Magazine 05 is closest to the site boundary therefore the worst case scenario.

7.2.3.2 Scenario 4: detonators

The results in Table 17 are based on 10 T of electric detonators using the Hopkinson-Cranz scaling law in Appendix C.

Table 17 Scenario 4: detonators explosion results

Coefficient Z (m/kg ^{1/3})	Definitions	Range (m)
8	Distances between ammunition process buildings (APB) within an explosive storage area (ESA).	172

Coefficient Z ($\text{m/kg}^{1/3}$)	Definitions	Range (m)
14.8	Distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	318
22.2	Distances between an explosive storehouse (ESH) and a building inhabited by civilians.	478
44.4	Distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	957

Figure 6 presents the results from Table 17 measuring from the only IE Magazine indicated by the red marker. The $44.4 \text{ m/kg}^{1/3}$ pink area (809 m from the magazine) is the only coefficient Z which is outside the site boundary (red line). However, that area only includes a public traffic route with civilian access and no vulnerable building inhabited by civilians.

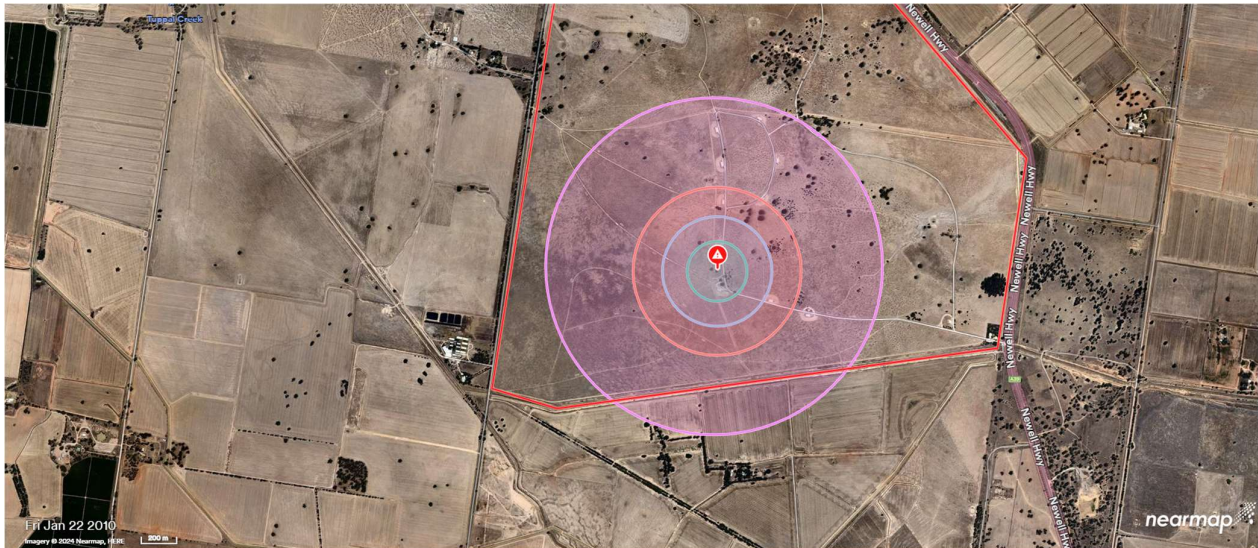


Figure 6 Scenario 4: detonator explosion results

Scenario 4 has a smaller impact compared to Scenario 3 due to the 6 T of explosives being stored, as opposed to the 250 T. While Scenario 3 could potentially have a significant impact and does affect off-site areas, it is unlikely to occur due to the safeguards in place and compliance with AS 2187.

Notably, the original site has no reported incidents in its over 50 years of operation that indicate an explosion has occurred. Furthermore, the magazines are currently undergoing upgrades to position them further away from the site boundary than the original layout. Previously, Magazine 1 was only 375 meters from the site boundary, but now the IE Magazine is the closest, situated at 640 meters from the boundary.

8. Standards and other requirements

The SEARs required verification that the whole site complied to Australian Standard AS 2187.1 Explosives – Storage, transport and use [10] and Australian Standard AS 4326 – The storage and handling of oxidising agents [11], if relevant. Whilst AS 2187.1 compliance is required, AS 4326 is not relevant³, as none of the DGs stored on site have a DG division 5.1 classification. The following sections provide a response to the compliance to requirements. This section does not constitute an audit of the site.

8.1 Australian Standard AS 2187 1 Explosives – Storage, transport and use compliance

Table 18 provides commentary on the compliance to AS2187.1. Only the applicable sections are included.

Table 18 AS 2187.1 requirements

Sections	Applicable to Orica	Response
Section 2 design requirements	2.1 General requirements for above – ground magazine	The finalised design will include: – appropriate consideration of siting the magazines – appropriate drainage – the required vegetation clearances – the required separation distances – the required signage – appropriate lighting – the required lightning protection – the required magazine access controls, including locks – appropriate internal and external finishes
	2.4 Fixed or permanent magazines – above ground	The finalised design will include: – appropriate construction materials – the required layout dimensions – appropriate doors – appropriate ventilation – appropriate lightning protection – appropriate lighting – appropriate signage/markings
Section 3 segregation and separation distances	3.1 Segregation	The finalised design will include: – appropriate storage segregation – appropriate storage compatibility
	3.2 Separation distances - class I explosives	The finalised design will include: – appropriate magazine location to manage risk – appropriate separation distances between explosive classes – appropriate separation distances between magazines – appropriate separation from other site works, including protected works
Section 4 management of magazines	4.1 General requirements	The finalised design will include updated (as required) management plans for:

³ AS 4326 clause 1.2.2 (b) states that this standard does not apply to forms and concentrations of ammonium nitrate that are not Division 5.1 dangerous goods.

Sections	Applicable to Orica	Response
		– appropriate handling exclusion zones – appropriate safety equipment
	4.2 Person in charge of a magazine	The finalised design will include updated (as required) management plans for: – appropriate nomination of persons in charge – appropriate duties
	4.3 Housekeeping	The finalised design will include updated (as required) management plans for: – appropriate exclusion of articles and materials – appropriate cleanliness – appropriate restrictions of activities
	4.4 Maintenance	The finalised design will include updated (as required) management plans for: – authorising maintenance – appropriate maintenance activities
	4.5 Materials handling equipment	The finalised design will include updated (as required) management plans for: – appropriate maintenance activities of equipment – use of appropriate powered vehicles – use of appropriate lifting appliances – use of appropriate miscellaneous equipment
	4.6 Management	The finalised design will include updated (as required) management plans for: – appropriate rules – appropriate access to site – appropriate package stacking – appropriate storage – appropriate issuing and disposal of explosives
	4.7 Records	The finalised design will include updated (as required) management plans for: – appropriate record keeping
Section 5 emergency procedures	5.1 Thunderstorms and dust storms	The finalised design will include updated (as required) management plans for: – management of activities for approaching thunderstorms and dust storms
	5.2 Theft	The finalised design will include updated (as required) management plans for: – treating explosives as an accountable item
	5.3 Fire	The finalised design will include updated (as required) management plans for: – fighting fires and firefighter risk
Appendix B	Mounding of magazines	The finalised design will include: – appropriate mounding size, location and material
Appendix C	Fencing of magazines	The finalised design will include: – appropriate fence type, location and size

8.2 Explosives Act 2003 and Chapter 9 of the Work Health and Safety Regulation 2017 compliance

SafeWork NSW provided a list of actions required as part of the proposal. These are listed in Table 19.

Table 19 SafeWork NSW requirements

Requirements	Response
Implement a security fence around the MHF facility	A security fence exists around the site.
Implement a vegetation management plan for the facility.	There is no change to the existing vegetation management because of the proposal.
Provide details for security coverage off CCTV for the magazines and the truck parking area.	The finalised design will include CCTV security coverage of relevant areas on site.
The separation distance between trucks whilst parked should meet the requirements of the relevant Australian standards.	The finalised design will meet Australian Standard requirements.
Provide details of the lightning protection system.	The finalised design will incorporate a lightning protection system.
Ensure that all safety assessments are current before implementing the change for each magazine	As part of the existing MHF Safety Case, all documentation will be reviewed and updated as required.
Prepare construction, operational hazard and risk assessments that should be submitted to SafeWork NSW	As part of the planning approval process, Final Hazard Assessment and Hazard and Operability Studies are required to be submitted. A Construction Management Plan, including associated risk assessments, will also be completed. Copies can be provided to SafeWork.
Perform a bush fire assessment report for the proposed development	A bushfire assessment has been completed as part of the EIS
Details should be provided of what will happen to the old magazines after the construction of the new magazines	The finalised design will include the decommissioning and removal of the old magazines.

9. Conclusion

This report includes a risk screening of the proposal in accordance with the requirements of the SEPP (Resilience and Hazards). The results indicate that the screening thresholds for DG storage and transportation during construction and operation are not exceeded by any of the DGs proposed to be stored.

Although none of the thresholds are exceeded a hazard identification process was completed to identify hazards with potential for off-site impacts. The process identified six hazards with the potential for off-site impact.

A consequence analysis was completed to confirm any off-site impacts. The consequence results validated that there is suitable separation of the magazine and diesel storages from, each other and the site boundary. The site upgrades, specifically the relocation of the magazines further from the site boundary, are an improvement from the previous storage arrangement. Furthermore, the new placement of the diesel tank ensures a safer distance between the diesel which is a possible ignition source and the magazines. The consequence analysis found that the hazards with potential off-site impact can be suitably controlled using the safeguards defined in Table 7.

The hazard identification and analysis demonstrate that the proposal can be designed, constructed, and operated in a manner that will minimise hazardous impact to the public.

Any changes to the assumptions used in this report should result in a review and update of the screening, HAZID, and consequence analysis processes.

10. Abbreviations

Table 20 Terms and abbreviations

Abbreviation	Description
0.5 LFL	Fraction Lower Flammable Limit
AASTP	Allied Ammunition Storage and Transport Publication
ADG	Australian Dangerous Goods Code
AS	Australian Standards
BoM	Bureau of Meteorology
DG	Dangerous Good
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
GHD	GHD Pty Ltd
ha	hectares
HAZID	Hazard Identification
HAZCON	Hazard and Constructability
HAZOP	Hazard and Operability
HE	High Explosive
HIPAP	Hazardous Industry Planning Advisory Paper
IE	Improvised Explosive
km	Kilometres
L	Litre
LFL	Lower Flammable Limit
m	Metres
NSW	New South Wales
PG	Packing Group
PHA	Preliminary Hazard Analysis
ppm	parts per million
QD	quantity distance
SA	South Australia
SDS	Safety Data Sheet
SEARs	Secretary's Environmental Assessment Requirements
SEPP	SEPP (Resilience and Hazards), formerly called State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
T	tonnes
TNT	Trinitrotoluene
UFL	Upper Flammable Limit
UN	United Nations
US	United States
VIC	Victoria

11. References

- [1] DNV, "Software for the Assessment of Flammable, Explosive and Toxic Impact (SAFETI)," DNV, Version 8.71.
- [2] UN SaferGuard, "Quantity Distance Calculator," UN SaferGuard, [Online]. Available: <https://unsafeguard.org/un-safeguard/quantity-distance-calculator>. [Accessed 13 March 2024].
- [3] Australian Standards, "AS 2187 Explosives - Storage, transport and use," Australian Standards, 2006.
- [4] Department of Planning (DoP), Applying SEPP 33: Hazardous and Offensive Development Application Guidelines, NSW, 2011.
- [5] Department of Planning (DoP), Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis, NSW, 2011.
- [6] Department of Planning & Infrastructure, "Multi-level Risk Assessment," Department of Planning & Infrastructure, NSW, 2011.
- [7] NSW Planning, "Hazardous Industry Planning Advisory Paper No 4 (HIPAP 4) – Risk Criteria for Land Use Safety Planning," NSW Planning, 2011.
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- [11] Australian Standards, "AS 4326 – The storage and handling of oxidising agents," Australian Standards, 2008.
- [12] UN SaferGuard, "INTERNATIONAL AMMUNITION TECHNICAL GUIDELINES - Formulae for ammunition management," United Nations Office for Disarmament Affairs, New York, 2021.
- [13] Department of Planning (DoP), "Applying SEPP 33: Hazardous and Offensive Development Application Guidelines," NSW, 2011.
- [14] Department of Planning (DoP), Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning, NSW, 2011.
- [15] Department of Planning (DoP), "State Environmental Planning Policy (Resilience and Hazards) 2021," NSW, 2021.
- [16] Australian Standard, "AS 2187.2 Explosives - Storage and use," Australian Standard, 2006.
- [17] Australian Standards, "AS 2187 3 Explosives – Storage, transport and use (Pyrotechnics - Shopgoods fireworks - Design, performance and testing)," Australian Standards, 1999.
- [18] Australian Standards, "AS 2187.4 Explosives – Storage, transport and use (Pyrotechnics - Outdoor displays)," Australian Standards, 1998.
- [19] Johnex Explosives, "Johnex Instantaneous Electric Detonators," Johnex Explosives, Australia.

Appendix A

Site layout

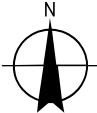


Legend

- Roads
- Light vehicle passing lane
- Earthen blast mound
- Phase 1 layout
- Site boundary

Paper Size ISO A4
0 50 100 150 200
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. 12597123
Revision No. 1
Date 13/09/2023

Project Footprint

FIGURE 3.1

Appendix B

Safety data sheets

SAFETY DATA SHEET



Revision date: 20-Apr-2022

Revision Number 17

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name PENTEX BOOSTERS

Product Code(s) 000000009017

Other means of identification

Proper shipping name BOOSTERS

UN number 0042

Synonyms Pentex AP, Pentex AU, Pentex G, Pentex G L, Pentex G400, Pentex H, Pentex PP900, Pentex PPK, Pentex PPP, Pentex ProTECT, Pentex Stopeprime, Pentex W, Pento-Seis

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Initiating explosive charges. Restricted to professional users.

Uses advised against No information available.

Supplier

Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111

Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1
Acute toxicity - Oral	Category 3

Acute toxicity - Dermal	Category 3
Acute toxicity - Inhalation (Dusts/Mists)	Category 3
Specific target organ toxicity (single exposure)	Category 1
Specific target organ toxicity (repeated exposure)	Category 2
Chronic aquatic toxicity	Category 2

SIGNAL WORD

Danger

Label elements

Exploding bomb
Skull and crossbones
Health hazard
Environment

**Hazard statements**

H201 - Explosive; mass explosion hazard
H301 - Toxic if swallowed
H311 - Toxic in contact with skin
H331 - Toxic if inhaled
H370 - Causes damage to organs
H373 - May cause damage to organs through prolonged or repeated exposure
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements - Prevention

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Keep only in original packaging
Ground and bond container and receiving equipment
Do not subject to grinding/shock/friction
Do not breathe dusts or mists
Wash hands thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Wear protective gloves / protective clothing / eye protection / face protection
Avoid release to the environment

Precautionary Statements - Response

If exposed or concerned: Call a POISON CENTER or doctor
Get medical advice/attention if you feel unwell
Specific treatment (see First aid on this SDS)
IF ON SKIN: Wash with plenty of soap and water
Call a POISON CENTER or doctor/physician if you feel unwell
Take off immediately all contaminated clothing and wash it before reuse
IF INHALED: Remove person to fresh air and keep comfortable for breathing
Call a POISON CENTER or doctor/physician
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives
Collect spillage

Precautionary Statements - Storage

Store in accordance with:
AS2187.1 in a well ventilated magazine.
Store in a well-ventilated place. Keep container tightly closed
Store locked up

Precautionary Statements - Disposal

Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable
Refer to manufacturer/supplier for information on recovery/recycling

Other hazards which do not result in classification

Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS**Mixture**

Chemical name	CAS No.	Weight-%
Trinitrotoluene (TNT)	118-96-7	30-70%
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	121-82-4	0-70%
Pentaerythritol tetranitrate (PETN)	78-11-5	0-70%
Barium sulfate	7727-43-7	<10%
Ingredients determined not to be hazardous	-	to 100%

4. FIRST AID MEASURES**Description of first aid measures**

General advice	For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment. Take off contaminated clothing and shoes immediately.
Inhalation	Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, (trained personnel should) give oxygen. Immediately give oxygen if victim turns blue (lips, ears, fingernails). If breathing has stopped, give artificial respiration. Get medical attention immediately.
Eye contact	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin contact	Immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician immediately.
Ingestion	Rinse mouth immediately and drink plenty of water. Drink 1 or 2 glasses of water. Do NOT induce vomiting. Get immediate medical advice/attention. Never give anything by mouth to an unconscious person.
Self-protection of the first aider	Remove all sources of ignition. Avoid contact with skin. Do not breathe fume, gas, mist, vapours, spray. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms	See Section 11 for additional Toxicological Information. Nitrates can be absorbed through cut, burnt or broken skin. Dizziness. Drowsiness. May cause allergic skin reaction. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically. Explosive material. Shrapnel from detonation may cause burns, wounds and bruises. PETN is a vasodilator. Maintain blood pressure by fluid administration. May cause methemoglobinemia. Clinical findings: The smooth muscle relaxant effect of nitrate salts may lead to headache,
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dizziness and marked hypotension. Cyanosis is clinically detectable when approximately 15% of the haemoglobin has been converted to methaemoglobin (ferric iron). Symptoms such as headache, dizziness, weakness and dyspnoea occur when methemoglobin concentrations are 30% to 40%; at levels of about 60% stupor, convulsions, coma and respiratory paralysis occur and the blood is a chocolate brown colour. At higher levels death may result. Spectrophotometric analysis can determine the presence and concentration of methemoglobin in the blood.

Treatment:

1. Give 100% oxygen.
2. In cases of (a) ingestion: use gastric lavage, (b) contamination of skin (unburnt or burnt): continue washing to remove salts.
3. Observe blood pressure and treat hypotension if necessary.
4. When methaemoglobin concentrations exceed 40% or when symptoms are present, give methylene blue 1 or 2 mg/kg body weight in a 1% solution by slow intravenous injection. If cyanosis has not been resolved within one hour a second dose of 2 mg/kg body weight may be given. The total dose should not exceed 7 mg/kg body weight as unwanted effects such as dyspnoea, chest pain, vomiting, diarrhoea, mental confusion and cyanosis may occur. Without treatment methaemoglobin levels of 20-30% revert to normal within 3 days.
5. Bed rest is required for methaemoglobin levels in excess of 40%.
6. Continue to monitor and give oxygen for at least two hours after treatment with methylene blue.
7. Consider transfer to centre where haemoperfusion can be performed to remove the nitrates from the blood if the condition of the patient is unstable.
8. Following inhalation of oxides of nitrogen the patient should be observed in hospital for 24 hours for delayed onset of pulmonary oedema.

Further observation for 2-3 weeks may be required to detect the onset of the inflammatory changes of bronchiolitis fibrosa obliterans.

Liver and kidney damage are possible complications. Effects may be delayed.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media Do not fight fires involving explosives.

Unsuitable extinguishing media

Specific hazards arising from the chemical

Specific hazards arising from the chemical Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen. Environmentally hazardous.

Hazardous combustion products Carbon oxides. Nitrogen oxides. Oxides of sulfur. Barium oxide.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Fight fire remotely due to the risk of explosion. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.

A major fire may involve a risk of explosion. An adjacent detonation may also involve the

risk of explosion. Mass explosion hazard. Risk of explosion by shock, friction, fire or other sources of ignition.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid contact with skin, eyes and inhalation of vapors. Ensure adequate ventilation. Avoid generation of dust. Do not breathe dust.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Should not be released into the environment. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Use non-sparking tools. Ground and bond containers when transferring material. Pick up and transfer to properly labelled containers. Avoid contamination with other substances. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Keep out of reach of children. Handle with care. Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid breathing vapors or mists. Use personal protection equipment. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Avoid contamination with other substances. Avoid impact with solid surfaces or other boosters. Do not drill into explosive.

General hygiene considerations Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with the particular national regulations. Keep

away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from other materials. Protect from physical damage. Keep/store only in original container. Protect from moisture.

Incompatible materials

Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases.

Poisons Schedule (SUSMP)

None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**Control parameters****Exposure Limits**

No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s) and decomposition product(s):

2,4,6-Trinitrotoluene (TNT): 8hr TWA = 0.5 mg/m³, Sk

Cyclonite: 8hr TWA = 1.5 mg/m³, Sk

Barium sulfate: 8hr TWA = 10 mg/m³

Nitrogen dioxide: 8hr TWA = 5.6 mg/m³ (3 ppm), 15 min STEL = 9.4 mg/m³ (5 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

'Sk' (skin) Notice - absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls**Engineering controls**

Apply technical measures to comply with the occupational exposure limits. Ensure adequate ventilation, especially in confined areas.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.

**Eye/face protection**

Wear safety glasses with side shields (or goggles).

Skin and body protection

Overalls. Protective shoes or boots.

Hand protection

Protective gloves.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES**Information on basic physical and chemical properties**

Physical state	Solid
Appearance	Article. Cardboard or plastic tubes, with or without caps. Various colours.
Color	Tan to Brown (contents)
Odor	Mild
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	No data available	None known
pH (as aqueous solution)	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.5-1.8 @ 20C	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**

Reactivity**Reactivity** Explosive.**Chemical stability****Stability** Explosive. Risk of explosion by shock, friction, fire or other sources of ignition. Heating, particularly under confinement, may cause an explosion. May cause a mass explosion. Detonation may occur from impact, friction, or excessive heating.**Explosion data****Sensitivity to mechanical impact** Yes.**Sensitivity to static discharge** Yes.**Possibility of hazardous reactions****Possibility of hazardous reactions** A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.**Hazardous polymerization** Hazardous polymerization does not occur.**Conditions to avoid****Conditions to avoid** Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture. Avoid impact with solid surfaces or other boosters. Avoid contamination of the material.**Incompatible materials****Incompatible materials** Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases.**Hazardous decomposition products****Hazardous decomposition products** Carbon oxides. Nitrogen oxides. Oxides of sulfur. Barium oxide.**11. TOXICOLOGICAL INFORMATION****Acute toxicity****Information on likely routes of exposure**

Product Information	No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:
Inhalation	May cause irritation of respiratory tract. Toxic by inhalation. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. May cause a reduction in blood pressure.
Eye contact	May cause irritation.
Skin contact	May cause irritation. Toxic in contact with skin. May be absorbed through the skin in harmful amounts. Nitrates can be absorbed through cut, burnt or broken skin. May cause sensitization in susceptible persons. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons. Shrapnel from detonation may cause burns, wounds and bruises. Further information is provided under 'Chronic Effects'.

Ingestion

Toxic if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. May cause central nervous system depression. May cause a lowering of blood pressure (hypotension). May cause adverse liver effects. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). May cause drowsiness or dizziness. May cause seizures, convulsions.

Symptoms

Dizziness. Drowsiness. May cause allergic skin reaction. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

Numerical measures of toxicity - Product Information

No information available.

Numerical measures of toxicity - Component Information**Component Information**

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Trinitrotoluene (TNT)	= 795 mg/kg (Rat) = 607 mg/kg (Rat)	-	-
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	= 71 mg/kg (Rat)	-	-
Pentaerythritol tetranitrate (PETN)	= 1660 mg/kg (Rat)	-	-
Barium sulfate	= 307000 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity No information available.

Reproductive toxicity No information available.

STOT - single exposure Causes damage to organs.

STOT - repeated exposure May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard No information available.

Chronic effects: Available evidence from animal studies indicate that repeated or prolonged exposure to a component of this material could result in effects on the blood system, central nervous system, bone marrow, eye, kidneys and liver. Repeated or prolonged skin contact may cause dermatitis.

For TNT, evidence from studies on exposed workers has shown increased incidences of cataracts following chronic exposure. Blood effects observed in exposed workers include aplastic anaemia, leucocytosis, leucopenia and methaemoglobinaemia.

2,4,6-Trinitrotoluene is mutagenic in bacteria with and without metabolic activation. This

material has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. Data available is insufficient for an assessment to be made.

Workers exposed to oral doses of the component RDX (unspecified amounts) have experienced neurological dysfunction (mainly seizures and convulsions), alterations in blood pressure, disorientation, nausea, restlessness, muscle twitching and lethargy. Rats and other exposed animals were reported to develop seizures, tremors, decreased body weight, liver and kidney damage, blood disorders and hyperactivity.

PETN is absorbed slowly through the lungs and gastrointestinal tract but not appreciably through the skin. Vasodilatory agent, therefore causes dilation of the blood vessels and a reduction in blood pressure. Exposure to high doses may cause methaemoglobinaemia. Negative in AMES test for mutagenicity.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity

Keep out of waterways. Toxic to aquatic life with long lasting effects.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	-	LC50: 1.9 - 6.6mg/L (96h, <i>Lepomis macrochirus</i>) LC50: 5.6 - 10mg/L (96h, <i>Lepomis macrochirus</i>) LC50: 5.4 - 7.4mg/L (96h, <i>Oncorhynchus mykiss</i>) LC50: 5 - 8.7mg/L (96h, <i>Pimephales promelas</i>) LC50: 3.0 - 5.0mg/L (96h, <i>Pimephales promelas</i>)	-	-
Pentaerythritol tetranitrate (PETN)	-	LC50: =926mg/L (96h, <i>Pimephales promelas</i>)	-	-

Persistence and degradability

Persistence and degradability

No information available.

Bioaccumulative potential

Bioaccumulation

Bioaccumulation is not expected.

Chemical name	Partition coefficient
Trinitrotoluene (TNT)	1.6

Mobility

Mobility in soil

For RDX: Expected to be mobile in soil.

Other adverse effects

Chemical name	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Endocrine disrupting potential
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	Group III Chemical	-	-

13. DISPOSAL CONSIDERATIONS**Waste treatment methods****Waste from residues/unused products**

Dispose of in accordance with local regulations. Should not be released into the environment. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION**ADG**

Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number	0042
Proper shipping name	BOOSTERS
Hazard class	1.1D
Hazchem code	E

IATA

Forbidden

IMDG

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0042
UN proper shipping name	BOOSTERS
Transport hazard class(es)	1.1D
IMDG EMS Fire	F-B
IMDG EMS Spill	S-X

15. REGULATORY INFORMATION**Safety, health and environmental regulations/legislation specific for the substance or mixture****National regulations****Australia**

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP)	None allocated
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International Inventories

AIIC	All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.
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Legend:

- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

International Agency for Research on Cancer. In: 'IARC Monographs on the Evaluation of Carcinogenic Risk to Humans'. World Health Organisation, Vol 65, 1996
Toxicology Profile for RDX; Agency for Toxic Substances and Disease Registry; US Department of Health and Human Services; 01/2012

Reason(s) For Issue: Revised Primary SDS
Change to Product Name

Issuing Date: 20-Apr-2022

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet**Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material

and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET



Revision date: 21-Aug-2020

Revision Number 6

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name ANFO
Product Code(s) 000022013201

Other means of identification

Proper shipping name EXPLOSIVE, BLASTING, TYPE B
UN number 0082
Synonyms Ammonium nitrate/fuel oil, ANFO 94/6
Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Blasting explosive.
Uses advised against Do not use in reactive ground.

Supplier

Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1
Serious eye damage/eye irritation	Category 2A
Carcinogenicity	Category 2

SIGNAL WORD

Danger

Label elementsExploding bomb
Exclamation mark
Health hazard**Hazard statements**H201 - Explosive; mass explosion hazard
H319 - Causes serious eye irritation
H351 - Suspected of causing cancer

The following health/environmental hazard categories fall outside the scope of the Workplace Health and Safety Regulations:
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements - Prevention

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Do not subject to grinding/shock/friction
Wash hands thoroughly after handling
Wear eye protection/ face protection

Precautionary Statements - Response

IF exposed or concerned: Get medical advice/attention
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
In case of fire: Evacuate area
Explosion risk in case of fire
DO NOT fight fire when fire reaches explosives

Precautionary Statements - Storage

Store in accordance with:
AS2187.1 in a well ventilated magazine.
Store locked up

Precautionary Statements - Disposal

Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Other hazards which do not result in classification

Harmful to aquatic life with long lasting effects

Poisons Schedule (SUSMP)

None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS**Substance**

Not applicable

Mixture

Chemical name	CAS No.	Weight-%
Ammonium nitrate	6484-52-2	>90%

Fuels, diesel	68334-30-5	<10%
Ingredients determined not to be hazardous	-	<1%

4. FIRST AID MEASURES

Description of first aid measures

General advice	For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment.
Emergency telephone number	Poisons Information Center, Australia: 13 11 26 Poisons Information Center, New Zealand: 0800 764 766
Inhalation	Remove to fresh air and keep at rest in a position comfortable for breathing. Administer oxygen if breathing is difficult. If breathing has stopped, give artificial respiration. Get medical attention immediately.
Eye contact	Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Get medical attention immediately if symptoms occur.
Skin contact	Wash off immediately with plenty of water. Get medical attention if irritation develops and persists. Take off contaminated clothing and wash before reuse.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Get medical attention. Never give anything by mouth to an unconscious person.
Self-protection of the first aider	Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms	May cause redness and tearing of the eyes. Nitrates can be absorbed through cut, burnt or broken skin.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically. Explosive material. Shrapnel from detonation may cause burns, wounds and bruises. Treat as for exposure to nitrates. May cause methemoglobinemia. Clinical findings: The smooth muscle relaxant effect of nitrate salts may lead to headache, dizziness and marked hypotension. Cyanosis is clinically detectable when approximately 15% of the haemoglobin has been converted to methaemoglobin (ferric iron). Symptoms such as headache, dizziness, weakness and dyspnoea occur when methemoglobin concentrations are 30% to 40%; at levels of about 60% stupor, convulsions, coma and respiratory paralysis occur and the blood is a chocolate brown colour. At higher levels death may result. Spectrophotometric analysis can determine the presence and concentration of methemoglobin in the blood. 1. Give 100% oxygen. 2. In cases of (a) ingestion: use gastric lavage, (b) contamination of skin (unburnt or burnt): continue washing to remove salts. 3. Observe blood pressure and treat hypotension if necessary. 4. When methaemoglobin concentrations exceed 40% or when symptoms are present, give methylene blue 1 or 2 mg/kg body weight in a 1% solution by slow intravenous injection. If cyanosis has not been resolved within one hour a second dose of 2 mg/kg body weight may be given. The total dose should not exceed 7 mg/kg body weight as unwanted effects such as dyspnoea, chest pain, vomiting, diarrhoea, mental confusion and cyanosis may occur.
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- Without treatment methaemoglobin levels of 20-30% revert to normal within 3 days.
5. Bed rest is required for methaemoglobin levels in excess of 40%.
 6. Continue to monitor and give oxygen for at least two hours after treatment with methylene blue.
 7. Consider transfer to centre where haemoperfusion can be performed to remove the nitrates from the blood if the condition of the patient is unstable.
 8. Following inhalation of oxides of nitrogen the patient should be observed in hospital for 24 hours for delayed onset of pulmonary oedema.

Further observation for 2-3 weeks may be required to detect the onset of the inflammatory changes of bronchiolitis fibrosa obliterans.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media Do not fight fires involving explosives.

Unsuitable extinguishing media .

Specific hazards arising from the chemical

Specific hazards arising from the chemical Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen.

Hazardous combustion products Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.

A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid contact with skin, eyes and inhalation of vapors. Ensure adequate ventilation.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Take up with inert, damp, non-combustible material using clean non-sparking tools and place into loosely covered plastic containers for later disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE**Precautions for safe handling**

Advice on safe handling Keep out of reach of children. Handle with care. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Use personal protection equipment. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Avoid contamination with other substances.

General hygiene considerations Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Wear suitable gloves and eye/face protection.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with local regulations. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from strong acids, strong alkalis, nitrites, chlorates, chlorides and permanganates. Store away from other materials. Protect from physical damage.

Incompatible materials Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chlorisocyanurates, nitrites, powdered metals.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**Control parameters**

Exposure Limits This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Chemical name	Australia	ACGIH TLV
Fuels, diesel 68334-30-5		TWA: 100 mg/m ³ total hydrocarbons inhalable fraction and vapor S*

Decomposition product(s):

Nitrogen dioxide: 8hr TWA = 5.6 mg/m³ (3 ppm), 15 min STEL = 9.4 mg/m³ (5 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

TWA (ACGIH - Time-weighted Average) the time-weighted average concentration for a conventional 8-hour work day and a 40-hour work week, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits. Eyewash stations. Ventilation systems.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Eye/face protection

Goggles.

Skin and body protection

Overalls. Protective shoes or boots.

Hand protection

Protective gloves.

Respiratory protection

No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Color	Off-white or Pink
Odor	Slight Kerosene / Diesel
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	>61 C	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	0.8 @ 20C	None known
Water solubility	Partially soluble	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information**10. STABILITY AND REACTIVITY****Reactivity**

Reactivity Explosive.

Chemical stability

Stability Explosive properties. Risk of explosion by shock, friction, fire or other sources of ignition. Capable of detonation, explosive decomposition, or explosive reaction but requires a strong initiating source or must be heated under confinement before initiation. Detonation may occur from static electricity discharge or mechanical/heavy impact, particularly under confinement.

Explosion data

Sensitivity to mechanical impact Yes. However, this type of explosive is relatively insensitive.

Sensitivity to static discharge Yes. However, this type of explosive is relatively insensitive.

Possibility of hazardous reactions

Possibility of hazardous reactions A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid**Conditions to avoid**

Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture.

Incompatible materials**Incompatible materials**

Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chloroisocyanurates, nitrites, powdered metals.

Hazardous decomposition products**Hazardous decomposition products**

Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia. When heated to decomposition (unconfined) ammonium nitrate produces nitrous oxide, white ammonium nitrate fumes and water. When mixed with strong acids, and occasionally during blasting, it produces an irritating toxic brown gas, mostly nitrogen dioxide. When molten it may decompose violently due to shock or pressure.

11. TOXICOLOGICAL INFORMATION**Acute toxicity****Information on likely routes of exposure****Product Information**

No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation

May cause irritation of respiratory tract. Causes headache, drowsiness or other effects to the central nervous system. Blasting may produce a toxic brown gas of nitrogen dioxide. Inhalation of the gas may result in chest discomfort, shortness of breath and possible pulmonary oedema, the onset of which may be delayed.

Eye contact

Causes eye irritation.

Skin contact

May cause irritation. Prolonged skin contact may defat the skin and produce dermatitis. Shrapnel from detonation may cause burns, wounds and bruises. Nitrates can be absorbed through cut, burnt or broken skin. Further information is provided under 'Chronic Effects'.

Ingestion

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). May cause a lowering of blood pressure (hypotension).

Symptoms

May cause redness and tearing of the eyes.

Numerical measures of toxicity - Product Information

No information available.

Numerical measures of toxicity - Component Information**Component Information**

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
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Ammonium nitrate	= 2217 mg/kg (Rat)	-	> 88.8 mg/L (Rat) 4 h
Fuels, diesel	= 7500 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 4.6 mg/L (Rat) 4 h

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation Causes serious eye irritation.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity Suspected of causing cancer. Contains a known or suspected carcinogen.

Chemical name	Australia
Fuels, diesel - 68334-30-5	Carc. 2

Reproductive toxicity No information available.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Aspiration hazard Not classified.

Chronic effects: No information available for the products.

NITRATES: Absorption of nitrates by ingestion, inhalation or through burnt or broken skin may cause dilation of the blood vessels by direct smooth muscle relaxation with a subsequent lowering of blood pressure and may also cause breathing difficulties, blueness of the skin (cyanosis) and methaemoglobinaemia.

For diesel: Available evidence from animal studies indicate that repeated or prolonged exposure to a component of this material could result in effects on the skin. This material contains within the diesel oil component of this formulation polycyclic aromatic hydrocarbons (PAHs). Some PAHs have been implicated as potential skin carcinogens in humans under conditions of poor personal hygiene, prolonged or repeated skin contact and exposure to sunlight. Toxic effects are unlikely to occur if good personal hygiene is practised.

Diesel fuel has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans.

Diesel fuel has been shown to be carcinogenic in animal tests and has caused mutations in vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased foetal resorptions at maternally toxic doses.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways. May cause long lasting harmful effects to aquatic life.

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

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Ammonium nitrate	-	LC50: 65 - 85mg/L (48h, <i>Cyprinus carpio</i>)	-	-
Fuels, diesel	-	LC50: ≈35mg/L (96h, <i>Pimephales promelas</i>)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Chemical name	Partition coefficient
Ammonium nitrate	-3.1

Mobility

Mobility in soil No information available.

Other adverse effects

Other adverse effects For diesel oil: Floats on water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

Ammonium nitrate was evaluated at 5, 10, 25 and 50 mg (NH₄⁺)/L. The fertility of *Daphnia magna* was decreased at 50 mg/L. Post embryonic growth of crustacea was impaired at 10, 25 and 50 mg/L.

13. DISPOSAL CONSIDERATIONS**Waste treatment methods**

Waste from residues/unused products Dispose of in accordance with local regulations. Should not be released into the environment. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION**ADG**

Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number 0082
Proper shipping name EXPLOSIVE, BLASTING, TYPE B
Hazard class 1.1D
Hazchem code E

IATA

Forbidden

IMDG

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0082
UN proper shipping name	EXPLOSIVE, BLASTING, TYPE B
Transport hazard class(es)	1.1D
IMDG EMS Fire	F-B
IMDG EMS Spill	S-Y

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

International Inventories

AICS All the constituents of this material are listed on the Australian Inventory of Chemical Substances.

Legend:

AICS - Australian Inventory of Chemical Substances

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

ACGIH is a registered trademark of The American Conference of Governmental Industrial Hygienists.

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date: 21-Aug-2020

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA Ceiling C	TWA (time-weighted average) Maximum limit value Carcinogen	STEL *	STEL (Short Term Exposure Limit) Skin designation
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Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET



Revision date: 27-Jul-2022

Revision Number 7

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name CORDTEX DETONATING CORDS

Product Code(s) 000023868401

Other means of identification

Proper shipping name CORD, DETONATING

UN number 0065

Synonyms DETONATING CORDS, CORDTEX 3.6W, CORDTEX 5W, CORDTEX 5W U/G, CORDTEX 5P, CORDTEX 10P, CORDTEX 70P, CORDTEX PYROCORD, CORDTEX AP, CORDTEX 18, CORDTEX XTL NC, CORDTEX 10G, CORDTEX POWERSPLIT 10P

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Detonating cord for initiating charges. Restricted to professional users.

Uses advised against No information available.

Supplier

Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives

Division 1.1

SIGNAL WORD

Danger

Label elements

Exploding bomb

**Hazard statements**

H201 - Explosive; mass explosion hazard

Precautionary Statements - Prevention

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

Keep only in original packaging

Ground and bond container and receiving equipment

Do not subject to grinding/shock/friction

Wear protective gloves / protective clothing / eye protection / face protection

Precautionary Statements - Response

In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives

Precautionary Statements - Storage

Store in accordance with:

AS2187.1 in a well ventilated magazine.

Precautionary Statements - Disposal

Refer to manufacturer/supplier for information on disposal/recovery/recycling

Other hazards which do not result in classification

Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS**Mixture**

Chemical name	CAS No.	Weight-%
Pentaerythritol tetranitrate (PETN)	78-11-5	10-80%
Ingredients determined not to be hazardous	-	to 100%

Additional information

Continuous PETN explosive core enclosed in plastic tapes and fibres with an outer sleeve of textiles or plastic.

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Inhalation

Remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms occur.

Eye contact

In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion	Rinse mouth immediately and drink plenty of water. Do NOT induce vomiting. Get immediate medical advice/attention.
Self-protection of the first aider	Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms	No information available.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically. Explosive material. Treat as for exposure to nitrates. May cause methemoglobinemia. PETN is a vasodilator. Maintain blood pressure by fluid administration. Shrapnel from detonation may cause burns, wounds and bruises.
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5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media**

Suitable Extinguishing Media	Do not fight fires involving explosives.
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Unsuitable extinguishing media**Specific hazards arising from the chemical**

Specific hazards arising from the chemical	Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen.
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Hazardous combustion products	Carbon oxides. Nitrogen oxides.
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Special protective actions for fire-fighters

Special protective equipment for fire-fighters	In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.
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A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.

Hazchem code	E
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6. ACCIDENTAL RELEASE MEASURES**Personal precautions, protective equipment and emergency procedures**

Personal precautions	Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid generation of dust. Do not breathe dust.
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Other information	Refer to protective measures listed in Sections 7 and 8.
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In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand

Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Handle with care. Use non-sparking tools. Ground and bond containers when transferring material. Pick up and transfer to properly labelled containers. Avoid contamination with other substances. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle with care. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Do NOT subject the material to impact, friction between hard surfaces nor to any form of heating. Avoid contact with skin and eyes. Keep out of reach of children. Protect ends of cords from contact with moisture and oil. Avoid contamination with other substances.

General hygiene considerations Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Wash hands before breaks and immediately after handling the product.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with the particular national regulations. Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from other materials. Protect from physical damage. Keep/store only in original container. Protect from moisture.

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases. Permanganates. Nitrites. Chlorates. Chlorides.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by Safe Work Australia.

Appropriate engineering controls

Engineering controls Ensure adequate ventilation, especially in confined areas.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES.



Eye/face protection Wear safety glasses with side shields (or goggles).

Skin and body protection Overalls. Protective shoes or boots.

Hand protection Protective gloves.

Respiratory protection If determined by a risk assessment an inhalation risk exists, wear a dust mask meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES**Information on basic physical and chemical properties**

Physical state	Solid
Appearance	Flexible cords with outer coverings of textiles and plastics. White powder core.
Color	Various
Odor	Odourless
Odor threshold	No information available.

Property	Values	Remarks • Method
pH	No data available	None known
pH (as aqueous solution)	No data available	None known
Melting point / freezing point	141.3 C(for PETN)	None known
Boiling point / boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.77 (for PETN)	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known

Decomposition temperature	> 150C (for PETN)	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity Explosive.

Chemical stability

Stability Explosive. Risk of explosion by shock, friction, fire or other sources of ignition. Heating, particularly under confinement, may cause an explosion. May cause a mass explosion. Detonation may occur from impact, friction, or excessive heating.

Explosion data

Sensitivity to mechanical impact Yes.

Sensitivity to static discharge Yes.

Possibility of hazardous reactions

Possibility of hazardous reactions A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture. Avoid impact with solid surfaces or other boosters. Avoid contamination of the material.

Incompatible materials

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases. Permanganates. Nitrites. Chlorates. Chlorides.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides.

11. TOXICOLOGICAL INFORMATIONAcute toxicityInformation on likely routes of exposure

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation	May cause irritation of respiratory tract. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination.
Eye contact	May cause irritation.
Skin contact	Not an expected route of exposure. Repeated or prolonged exposure may cause irritation of eyes and skin. Shrapnel from detonation may cause burns, wounds and bruises.
Ingestion	Not an expected route of exposure. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. May cause a lowering of blood pressure (hypotension). Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache).
Symptoms	No information available.

Numerical measures of toxicity - Product Information

No information available.

Numerical measures of toxicity - Component Information**Component Information**

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Pentaerythritol tetranitrate (PETN)	= 1660 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	No information available.
Serious eye damage/eye irritation	No information available.
Respiratory or skin sensitization	No information available.
Germ cell mutagenicity	No information available.
Carcinogenicity	No information available.
Reproductive toxicity	No information available.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	PETN is absorbed slowly through the lungs and gastrointestinal tract but not appreciably through the skin. Vasodilatory agent, therefore causes dilation of the blood vessels and a reduction in blood pressure. Exposure to high doses may cause methaemoglobinaemia. Negative in AMES test for mutagenicity.

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Ecotoxicity	Keep out of waterways.
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Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Pentaerythritol tetranitrate (PETN)	-	LC50: =926mg/L (96h, Pimephales promelas)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Mobility

Mobility in soil No information available.

Other adverse effects**13. DISPOSAL CONSIDERATIONS****Waste treatment methods**

Waste from residues/unused products Dispose of in accordance with local regulations. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION**ADG**

Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number 0065
Proper shipping name CORD, DETONATING
Hazard class 1.1D
Hazchem code E

IATA

Forbidden

IMDG

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number 0065
UN proper shipping name CORD, DETONATING
Transport hazard class(es) 1.1D
IMDG EMS Fire F-B
IMDG EMS Spill S-X

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture**National regulations****Australia**

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

International Inventories

AIIC All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2022

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Addition/Change of synonymous name(s)

Issuing Date: 27-Jul-2022

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)

Acute Exposure Guideline Level(s) (AEGL(s))

U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act

U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET



Revision date: 23-Mar-2021

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name ELECTRIC DETONATORS (1.1B PACKAGING)

Product Code(s) 000022014301

Other means of identification

Proper shipping name DETONATORS, ELECTRIC

UN number 0030

Synonyms Instantaneous electric detonators (1.1B); Instantaneous seismic detonators (1.1B); Zero delay electric detonators (1.1B); Short delay electric detonators (1.1B); Delay electric detonators (1.1B); Dynadet TE Instantaneous electric detonators (1.1B); Carrick R electric detonators (1.1B); Dynaseis detonators (1.1B);

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Electric detonators. Initiating explosive charges. Restricted to professional users.

Uses advised against No information available.

Supplier

Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1 Category B
Reproductive toxicity	Category 1A

SIGNAL WORD

Danger

Label elements



Hazard statements

H201 - Explosive; mass explosion hazard

H360 - May damage fertility or the unborn child

Precautionary Statements - Prevention

Obtain special instructions before use

Do not handle until all safety precautions have been read and understood

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

Keep only in original packaging

Ground and bond container and receiving equipment

Do not subject to grinding/shock/friction

Wear protective gloves / protective clothing / eye protection / face protection

Precautionary Statements - Response

If exposed or concerned: Get medical advice/attention

In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives

Precautionary Statements - Storage

Store in accordance with:

AS2187.1 in a well ventilated magazine.

Store locked up

Precautionary Statements - Disposal

Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Refer to manufacturer/supplier for information on disposal/recovery/recycling

Other hazards which do not result in classification

Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Chemical name	CAS No.	Weight-%
Pentaerythritol tetranitrate (PETN)	78-11-5	<1%
Aluminium powder (stabilised)	7429-90-5	<1%
Tetryl (N-Methyl- N,2,4,6-tetranitroaniline)	479-45-8	<1%
Lead azide	13424-46-9	<1%
Lead styphnate	15245-44-0	<1%
Metal and plastic components and other non-hazardous components	-	>60%

Additional information

Metal shell (copper or aluminium) with attached copper wires. The primary and secondary explosive powders are contained within the shell.

4. FIRST AID MEASURES

Description of first aid measures

General advice	For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment.
Emergency telephone number	Poisons Information Center, Australia: 13 11 26 Poisons Information Center, New Zealand: 0800 764 766
Inhalation	In case of inhalation of blasting fumes: Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, (trained personnel should) give oxygen. Call a physician if symptoms occur.
Eye contact	Not an expected route of exposure.
Skin contact	Not an expected route of exposure. If skin irritation or rash occurs: Get medical advice/attention.
Ingestion	Get immediate medical advice/attention.
Self-protection of the first aider	Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Most important symptoms and effects, both acute and delayed

Symptoms	None known.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically. Detonator assemblies are explosive - handle with care. Shrapnel from detonation may cause burns, wounds and bruises. Explosive material containing lead. Long term exposure to detonation fumes may result in lead poisoning.
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5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media	Do not fight fires involving explosives.
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Unsuitable extinguishing media

Specific hazards arising from the chemical

Specific hazards arising from the chemical	Explosive. May be ignited by heat, sparks or flames. Avoid stray currents. Risk of explosion by shock or heating under confinement. May explode from friction, heat or contamination.
Hazardous combustion products	Carbon oxides. Nitrogen oxides. Metal oxides. Lead oxides. Lead fume.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters	In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire. A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.
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Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Use non-sparking tools. Ground and bond containers when transferring material. Pick up and transfer to properly labelled containers. Avoid contamination with other substances. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle with care. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep out of reach of children. Take precautionary measures against static discharges. Do not allow radio transmitters near electric detonators. Do NOT subject the material to impact, friction between hard surfaces nor to any form of heating.

General hygiene considerations Wash hands before breaks and after work. When using do not eat, drink or smoke.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with the particular national regulations. Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from other materials. Protect from physical damage. Keep/store only in original container. Protect from moisture.

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits

No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s):

Chemical name	Australia	ACGIH TLV
Aluminium powder (stabilised) 7429-90-5	10 mg/m ³ 5 mg/m ³	TWA: 1 mg/m ³ respirable particulate matter
Tetryl (N-Methyl- N,2,4,6-tetranitroaniline) 479-45-8	1.5 mg/m ³	TWA: 1.5 mg/m ³

Lead, inorganic dusts & fumes (as Pb): 8hr TWA = 0.05 mg/m³

Tetryl; (2,4,6-Trinitrophenylmethylnitramine): 8hr TWA = 1.5 mg/m³, Sen

Aluminium (metal dust): 8hr TWA = 10 mg/m³

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

'Sen' Notice - sensitiser. The substance can cause a specific immune response in some people. An affected individual may subsequently react to exposure to minute levels of that substance and should not be further exposed to the substance.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

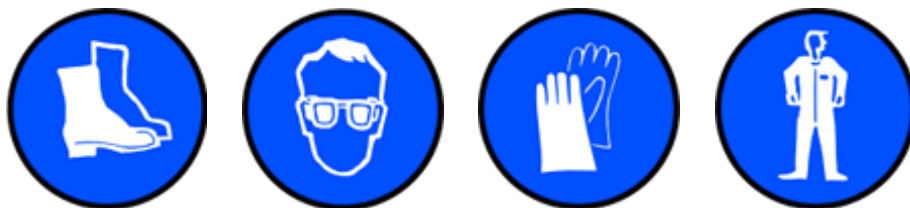
Apply technical measures to comply with the occupational exposure limits. Ensure adequate ventilation, especially in confined areas.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES.



Eye/face protection

Wear safety glasses with side shields (or goggles).

Skin and body protection	Overalls. Protective shoes or boots.
Hand protection	Protective gloves.
Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Environmental exposure controls	No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	Article.
Color	Metallic
Odor	Odourless
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	No data available	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information

10. STABILITY AND REACTIVITY

Reactivity

Reactivity	Explosive.
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Chemical stability

Stability	Risk of explosion by shock, friction, fire or other sources of ignition. Heating, particularly under confinement, may cause an explosion. Detonation may occur from static electricity discharge or mechanical/heavy impact, particularly under confinement.
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Explosion data

Sensitivity to mechanical impact Yes.

Sensitivity to static discharge Yes.

Possibility of hazardous reactions

Possibility of hazardous reactions Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Do not subject to shock. Avoid contact with other chemicals. Protect from moisture. Avoid exposure to radio transmitters (including mobile phones).

Incompatible materials

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides. Metal oxides. Lead oxides. Lead fume.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information	No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:
Inhalation	Not an expected route of exposure. Initiation can cause the presence of lead fume in air. Test firing of detonators in poorly ventilated areas can cause presence of lead fume in air. Lead fumes may be irritant to mucous membranes and respiratory tract. Harmful: danger of serious damage to health by prolonged exposure through inhalation.
Eye contact	Not expected to cause eye irritation.
Skin contact	Not expected to cause skin irritation. Contact with contents may cause irritation or dermatitis. Product is or contains a sensitizer. Shrapnel from detonation may cause burns, wounds and bruises.
Ingestion	Specific test data for the substance or mixture is not available.
Symptoms	None known.

Numerical measures of toxicity - Product Information

No information available.

Numerical measures of toxicity - Component Information**Component Information**

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Pentaerythritol tetranitrate (PETN)	= 1660 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity Not classified. Classification is based on mixture calculation methods based on component data.

Chemical name	Australia
Lead styphnate - 15245-44-0	Carc. 2

Reproductive toxicity May damage fertility or the unborn child.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Aspiration hazard Not classified.

Chronic effects: Long term exposure to low concentrations of lead (by any route) may result in blood effects, anaemia, central and peripheral nervous system damage, gastrointestinal disturbances, renal injury, foetotoxicity, developmental deficiencies in neonates and children, and testicular damage including decreased sperm count.

Exposure to explosive charge material unlikely. The main hazard is the possibility of exposure to lead fumes when test firing detonators in a poorly ventilated area. The effects of lead poisoning may not be apparent immediately but significant absorption over a period of time may produce adverse effects as noted earlier due to accumulation of lead in the body.

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Ecotoxicity Keep out of waterways. May cause long-term adverse effects in the aquatic environment.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Pentaerythritol tetranitrate (PETN)	-	LC50: =926mg/L (96h, Pimephales promelas)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Mobility

Mobility in soil No information available.

Other adverse effects

Other adverse effects Contains lead compounds which can be harmful to the environment.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION

ADG

Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number	0030
Proper shipping name	DETONATORS, ELECTRIC
Hazard class	1.1B
Hazchem code	E

IATA

Forbidden

IMDG

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0030
UN proper shipping name	DETONATORS, ELECTRIC
Transport hazard class(es)	1.1B
IMDG EMS Fire	F-B
IMDG EMS Spill	S-X

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

Chemical name	National pollutant inventory
Lead azide - 13424-46-9	10 tonne/yr Threshold category 1 2000 tonne/yr Threshold category 2b 60000 MWH Threshold category 2b 20 MW Threshold category 2b
Lead styphnate - 15245-44-0	10 tonne/yr Threshold category 1 2000 tonne/yr Threshold category 2b 60000 MWH Threshold category 2b 20 MW Threshold category 2b

International Inventories

AICS All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date: 23-Mar-2021

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
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U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal

Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET



Revision date: 25-Aug-2021

Revision Number 4

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name SENATEL MAGNUM

Product Code(s) 000000009251

Other means of identification

Proper shipping name EXPLOSIVE, BLASTING, TYPE E

UN number 0241

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Mining, quarrying and general blasting work where an energetic water-resistant explosive is required. Restricted to professional users.

Uses advised against No information available.

Supplier

Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111

Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1 Category D
Serious eye damage/eye irritation	Category 2A

SIGNAL WORD

Danger

Label elements

Exploding bomb
Exclamation mark



Hazard statements

H201 - Explosive; mass explosion hazard

H319 - Causes serious eye irritation

Precautionary Statements - Prevention

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

Keep only in original packaging

Do not subject to grinding/shock/friction

Wash hands thoroughly after handling

Wear protective gloves / protective clothing / eye protection / face protection

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

If eye irritation persists: Get medical advice/attention

In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives

Precautionary Statements - Storage

Store in accordance with:

AS2187.1 in a well ventilated magazine.

Precautionary Statements - Disposal

Refer to manufacturer/supplier for information on disposal/recovery/recycling

Other hazards which do not result in classification

Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Chemical name	CAS No.	Weight-%
Ammonium nitrate	6484-52-2	>60%
Sodium perchlorate	7601-89-0	<10%
Aluminium	7429-90-5	<10%
Non hazardous component(s)	-	to 100%

4. FIRST AID MEASURES

Description of first aid measures

General advice

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment.

Emergency telephone number

Poisons Information Center, Australia: 13 11 26
Poisons Information Center, New Zealand: 0800 764 766

Inhalation

Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, (trained personnel should) give oxygen. Immediately give oxygen if victim turns

	blue (lips, ears, fingernails). If breathing has stopped, give artificial respiration. Get medical attention immediately.
Eye contact	Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Get medical attention immediately if symptoms occur.
Skin contact	Wash off immediately with plenty of water. Get medical attention if irritation develops and persists. Take off contaminated clothing and wash before reuse.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Get medical attention. Never give anything by mouth to an unconscious person.
Self-protection of the first aider	Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms	May cause redness and tearing of the eyes. Nitrates can be absorbed through cut, burnt or broken skin.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically. Explosive material. Shrapnel from detonation may cause burns, wounds and bruises. Treat as for exposure to nitrates. May cause methemoglobinemia. Clinical findings: The smooth muscle relaxant effect of nitrate salts may lead to headache, dizziness and marked hypotension. Cyanosis is clinically detectable when approximately 15% of the haemoglobin has been converted to methaemoglobin (ferric iron). Symptoms such as headache, dizziness, weakness and dyspnoea occur when methemoglobin concentrations are 30% to 40%; at levels of about 60% stupor, convulsions, coma and respiratory paralysis occur and the blood is a chocolate brown colour. At higher levels death may result. Spectrophotometric analysis can determine the presence and concentration of methemoglobin in the blood. Treatment: 1. Give 100% oxygen. 2. In cases of (a) ingestion: use gastric lavage, (b) contamination of skin (unburnt or burnt): continue washing to remove salts. 3. Observe blood pressure and treat hypotension if necessary. 4. When methaemoglobin concentrations exceed 40% or when symptoms are present, give methylene blue 1 or 2 mg/kg body weight in a 1% solution by slow intravenous injection. If cyanosis has not been resolved within one hour a second dose of 2 mg/kg body weight may be given. The total dose should not exceed 7 mg/kg body weight as unwanted effects such as dyspnoea, chest pain, vomiting, diarrhoea, mental confusion and cyanosis may occur. Without treatment methaemoglobin levels of 20-30% revert to normal within 3 days. 5. Bed rest is required for methaemoglobin levels in excess of 40%. 6. Continue to monitor and give oxygen for at least two hours after treatment with methylene blue. 7. Consider transfer to centre where haemoperfusion can be performed to remove the nitrates from the blood if the condition of the patient is unstable. 8. Following inhalation of oxides of nitrogen the patient should be observed in hospital for 24 hours for delayed onset of pulmonary oedema. Further observation for 2-3 weeks may be required to detect the onset of the inflammatory changes of bronchiolitis fibrosa obliterans. Effects from exposure to decomposition products including nitrogen dioxide (possible decomposition component) can include chest discomfort, shortness of breath and possible pulmonary oedema, the onset of which may be delayed. The exposed person should be kept under medical surveillance for 24 hours for delayed onset of pulmonary oedema.
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5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media Do not fight fires involving explosives.

Unsuitable extinguishing media

Specific hazards arising from the chemical

Specific hazards arising from the chemical Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen.

Hazardous combustion products Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia. Aluminium oxides.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.

A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid contact with skin, eyes and inhalation of vapors. Ensure adequate ventilation.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Collect with clean non-metallic implements. Use a spark-free shovel. Collect in properly labelled containers, with loose fitting lids, for disposal. After cleaning,

flush away traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling

Keep out of reach of children. Handle with care. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Use personal protection equipment. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Avoid contamination with other substances.

General hygiene considerations

Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Wear suitable gloves and eye/face protection.

Conditions for safe storage, including any incompatibilities

Storage Conditions

Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with local regulations. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from strong acids, strong alkalis, nitrites, chlorates, chlorides, permanganates. Store away from other materials. Protect from physical damage.

Incompatible materials

Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chloroisocyanurates, nitrites, powdered metals, strong acids, reducing agents, permanganates, combustible materials, brass, bronze, copper, zinc.

Poisons Schedule (SUSMP)

None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits

No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s):

Chemical name	Australia	ACGIH TLV
Aluminium 7429-90-5	10 mg/m ³ 5 mg/m ³	TWA: 1 mg/m ³ respirable particulate matter

Aluminium (metal dust): 8hr TWA = 10 mg/m³

Oil mist, refined mineral: 8hr TWA = 5 mg/m³

For potential decomposition product: Nitrogen dioxide: 8hr TWA = 5.6 mg/m³ (3 ppm), 15 min STEL = 9.4 mg/m³ (5 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge

this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

TWA (ACGIH - Time-weighted Average) the time-weighted average concentration for a conventional 8-hour work day and a 40-hour work week, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits. Eyewash stations. Ventilation systems.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Eye/face protection

Goggles.

Skin and body protection

Overalls. Protective shoes or boots.

Hand protection

Protective gloves.

Respiratory protection

No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Article. Cartridged into plastic 'sausages' with metal clips at both ends.
Appearance	Emulsion
Color	Grey / Cream
Odor	Negligible
Odor threshold	No information available.

Property **pH**

Values
No data available

Remarks • Method
None known

pH (as aqueous solution)	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.15-1.35 @ 20°C	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity Explosive.

Chemical stability

Stability Explosive properties. Risk of explosion by shock, friction, fire or other sources of ignition. Capable of detonation, explosive decomposition, or explosive reaction but requires a strong initiating source or must be heated under confinement before initiation. Detonation may occur from static electricity discharge or mechanical/heavy impact, particularly under confinement.

Explosion data

Sensitivity to mechanical impact Yes.

Sensitivity to static discharge Yes.

Possibility of hazardous reactions

Possibility of hazardous reactions A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture.

Incompatible materials

Incompatible materials

Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chloroisocyanurates, nitrites, powdered metals, strong acids, reducing agents, permanganates, combustible materials, brass, bronze, copper, zinc.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia. Aluminium oxides. When heated to decomposition (unconfined) ammonium nitrate produces nitrous oxide, white ammonium nitrate fumes and water. When mixed with strong acids, and occasionally during blasting, it produces an irritating toxic brown gas, mostly nitrogen dioxide. When molten it may decompose violently due to shock or pressure.

11. TOXICOLOGICAL INFORMATION**Acute toxicity****Information on likely routes of exposure****Product Information**

No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation

May cause irritation of respiratory tract. Causes headache, drowsiness or other effects to the central nervous system. Blasting may produce a toxic brown gas of nitrogen dioxide. Inhalation of the gas may result in chest discomfort, shortness of breath and possible pulmonary oedema, the onset of which may be delayed.

Eye contact

Causes eye irritation.

Skin contact

May cause irritation. Prolonged skin contact may defat the skin and produce dermatitis. Shrapnel from detonation may cause burns, wounds and bruises. Nitrates can be absorbed through cut, burnt or broken skin. Further information is provided under 'Chronic Effects'.

Ingestion

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). May cause a lowering of blood pressure (hypotension).

Symptoms

May cause redness and tearing of the eyes.

Numerical measures of toxicity - Product Information

No information available.

Numerical measures of toxicity - Component Information**Component Information**

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Ammonium nitrate	= 2217 mg/kg (Rat)	-	> 88.8 mg/L (Rat) 4 h
Sodium perchlorate	= 2100 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	No information available.
Serious eye damage/eye irritation	Causes serious eye irritation.
Respiratory or skin sensitization	No information available.
Germ cell mutagenicity	No information available.
Carcinogenicity	No information available.
Reproductive toxicity	No information available.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	No information available for the product.

NITRATES: Absorption of nitrates by ingestion, inhalation or through burnt or broken skin may cause dilation of the blood vessels by direct smooth muscle relaxation with a subsequent lowering of blood pressure and may also cause breathing difficulties, blueness of the skin (cyanosis) and methaemoglobinaemia.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways.

Ammonium nitrate is a plant nutrient. Large scale contamination may kill vegetation and cause poisoning in livestock and poultry. Ammonium nitrate was evaluated at 5, 10, 25 and 50 mg (NH₄⁺)/L. The fertility of *Daphnia magna* was decreased at 50 mg/L. Post embryonic growth of crustacea was impaired at 10, 25 and 50 mg/L. Can stimulate weed and algal growth in static surface waters.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Ammonium nitrate	-	LC50: 65 - 85mg/L (48h, <i>Cyprinus carpio</i>)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Chemical name	Partition coefficient
Ammonium nitrate	-3.1

Mobility

Mobility in soil No information available.

Other adverse effects**13. DISPOSAL CONSIDERATIONS**Waste treatment methods**Waste from residues/unused products**

Dispose of in accordance with local regulations. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATIONADG

Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number	0241
Proper shipping name	EXPLOSIVE, BLASTING, TYPE E
Hazard class	1.1D
Hazchem code	E

IATA

Forbidden

IMDG

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0241
UN proper shipping name	EXPLOSIVE, BLASTING, TYPE E
Transport hazard class(es)	1.1D
IMDG EMS Fire	F-B
IMDG EMS Spill	S-X

15. REGULATORY INFORMATIONSafety, health and environmental regulations/legislation specific for the substance or mixtureNational regulationsAustralia

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP)	None allocated
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International Inventories

AIIC	All the constituents of this material are listed on the Australian Inventory of Industrial
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Chemicals.

Legend:

- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

ACGIH is a registered trademark of The American Conference of Governmental Industrial Hygienists.

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2021

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date:

25-Aug-2021

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
 Acute Exposure Guideline Level(s) (AEGL(s))
 U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
 U.S. Environmental Protection Agency High Production Volume Chemicals
 Food Research Journal
 Hazardous Substance Database
 International Uniform Chemical Information Database (IUCLID)
 Japan GHS Classification
 Australian Industrial Chemicals Introduction Scheme (AICIS)
 NIOSH (National Institute for Occupational Safety and Health)
 National Library of Medicine's ChemID Plus (NLM CIP)
 National Library of Medicine's PubMed database (NLM PUBMED)
 National Toxicology Program (NTP)
 New Zealand's Chemical Classification and Information Database (CCID)
 Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
 Organization for Economic Co-operation and Development High Production Volume Chemicals Program
 Organization for Economic Co-operation and Development Screening Information Data Set
 RTECS (Registry of Toxic Effects of Chemical Substances)
 World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or

control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.

2795 East Cottonwood Parkway, Suite 500

Salt Lake City, Utah 84121

Phone: 801-364-4800 Fax 801-321-6703

E-Mail: dnnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1120

Date: 05/20/2015

Supersedes: 12/15/11

Product Identifier

Product Form: Substance

Product Name:

PETN, Recrystallized

PETN, Crude

PETN, Medium Fine

PETN, Super Fine

PETN, Cap Grade

PETN, Balloon Grade

PETN, Booster Grade

Other Means of Identification

Intended Use of the Product

Explosive manufacturing

Emergency Telephone Number

FOR 24 HOUR **EMERGENCY, CALL** CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture

Classification (GHS-US)

Unst. Expl

H200

Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US)

:



GHS01

Signal Word (GHS-US)

: Danger

Hazard Statements (GHS-US)

: H200 - Unstable explosives.

Precautionary Statements (GHS-US)

: P201 - Obtain special instructions before use.

P202 - Do not handle until all safety precautions have been read and understood.

P280 - Wear eye protection, face protection, face shield, protective clothing, protective gloves.

P372 - Explosion risk in case of fire.

P373 - DO NOT fight fire when fire reaches explosives.

P380 - Evacuate area.

P401 - Store local, regional, national, territorial, provincial, and international regulations.

P501 - Dispose of contents/container according to local, regional, national, territorial, provincial, and international regulations.

Other Hazards

Hazards Not Otherwise Classified (HNOC): Not available

Other Hazards: Not available

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SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Substances

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Pentaerythrite tetranitrate	(CAS No) 78-11-5	98 - 100	Unst. Expl, H200

Full text of H-phrases: see section 16

*NOTE: Must be shipped wetted with not less than 25% water by weight.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in de-minimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: PETN is a known coronary vasodilator, and ingestion or inhalation may result in a lowering of blood pressure, headache or faintness, and a decreased tolerance for grain alcohol. Repeated over-exposure may result in chest pains in the absence of exposure. Systemic effects by ingestion include dermatitis.

Inhalation: If inhaled and symptoms occur: supply fresh air; consult doctor in case of complaints.

Skin Contact: Remove contaminated clothing and rinse affected area with water. If skin irritation is experienced, consult a doctor.

Eye Contact: If contact with eyes, remove contact lenses if worn, rinse opened eye for several minutes. If symptoms persist, consult a doctor.

Ingestion: Do NOT induce vomiting; call for medical help immediately.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT fight fires involving explosive materials.

Unsuitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Water may be applied via sprinklers remotely as long as evacuation distances are maintained.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: In case of fire involving explosive materials: Evacuate area. DO NOT fight fires involving explosive materials. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information. Extreme risk of explosion from shock, friction, fire or other sources of ignition.

Explosion Hazard: Explosive. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. Extreme risk of explosion by shock, friction, fire, impact, heat or other sources of ignition.

Reactivity: Unstable explosives.

Advice for Firefighters

Precautionary Measures Fire: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Water may be applied via sprinklers remotely as long as evacuation distances are maintained.

Firefighting Instructions: DO NOT fight fires involving explosive materials. In case of fire: Evacuate area.

Protection During Firefighting: Likely to detonate under fire conditions. Burning material may produce toxic vapors.

Hazardous Combustion Products: Toxic fumes are released. Nitrogen oxides.

Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

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General Measures: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, confine spill and **keep wet**. Pick up spilled material with non-metallic dust pan, using whisk brooms, damp sponges or damp rags as aids. If product is uncontaminated, repackage product in original packaging or other clean DOT approved container. Contamination of PETN with sand, grit or dirt will render the material more sensitive to detonation. If contaminated with sand, dirt or grit, do not repackage with uncontaminated material. ALL SPILLED PETN MUST BE RECOVERED. Follow applicable Federal, State and local spill reporting requirements.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Evacuate unnecessary personnel. Stop leak if safe to do so. Eliminate ignition sources. Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters. Hazardous waste due to potential risk of explosion.

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed:

Store in cool, dry location. Store in compliance with all Federal, State and local regulations. Only properly qualified and authorized personnel should handle and use explosive materials. Keep away from heat, flame, friction, impact, ignition sources, electrostatic discharge or strong shock.

Do not allow to dry out. Re-wet if necessary prior to handling.

Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.

Other Precautions: It is recommended that users or explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Incompatible Materials: Corrosives (strong acids and bases or alkalis).

Specific End Use(s) Not available

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

No Occupational Exposure Limits (OELs) have been established for this product or its chemical components.

Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure, but are not required. Product to be handled under strictly controlled conditions. Ensure all national/local regulations are observed. Provide adequate ventilation to minimize dust concentrations.

Personal Protective Equipment: Safety glasses, gloves and general work clothing.

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Materials for Protective Clothing: Wear suitable work clothing to reduce skin contact.

Hand Protection: Suitable hand protection.

Eye Protection: Safety glasses.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits.

Other Information: When using, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	: Solid
Appearance	: White, granular crystalline material
Odor	: Slightly acidic
Odor Threshold	: Not available
pH	: Not available
Evaporation Rate	: Not available
Melting Point	: Not available
Freezing Point	: Not available
Boiling Point	: Not available
Flash Point	: Not available
Auto-ignition Temperature	: Not available
Decomposition Temperature	: Not available
Flammability (solid, gas)	: Not available
Lower Flammable Limit	: Not available
Upper Flammable Limit	: Not available
Vapor Pressure	: Not available
Relative Vapor Density at 20 °C	: Not available
Relative Density	: Not available
Density	: 1.77 g/cm ³
Specific Gravity	: Not available
Solubility	: Insoluble in water.
Partition coefficient: n-octanol/water	: Not available
Viscosity	: Not available
Explosive properties	: Unstable explosives
Explosion Data – Sensitivity to Mechanical Impact	: Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge	: Sensitive to static discharge

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SECTION 10 - STABILITY AND REACTIVITY

Reactivity: It is recommended that users or explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Chemical Stability: Store in cool, dry location. Store in compliance with all Federal, State and local regulations. Only properly qualified and authorized personnel should handle and use explosive materials. Keep away from heat, flame, friction, impact, ignition sources, electrostatic discharge or strong shock. **Do not allow to dry out.** Re-wet if necessary prior to handling.

Possibility of Hazardous Reactions: Not available

Conditions to Avoid: Heat. Sparks. Open flame or overheating.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers.

Hazardous Decomposition Products: Carbon oxides (CO, CO₂). Toxic fumes. Nitrogen oxides.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Prolonged inhalation of dust may cause respiratory irritation.

Symptoms/Injuries After Skin Contact: May cause skin irritation.

Symptoms/Injuries After Eye Contact: May cause eye irritation.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data: Not available

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Not classified

Persistence and Degradability

PETN, Recrystallized; PETN, Crude

Persistence and Degradability Not established.

Bioaccumulative Potential

PETN, Recrystallized; PETN, Crude

Bioaccumulative Potential Not established.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Hazardous waste due to potential risk of explosion.

Safety Data Sheet

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : PENTAERYTHRITOL TETRANITRATE, WETTED with not less than 25 percent water, by mass
Hazard Class : 1.1D
Identification Number : UN0150
Label Codes : 1.1D
Packing Group : II



14.2 In Accordance with IMDG

Proper Shipping Name : PENTAERYTHRITOL TETRANITRATE (PENTAERYTHRITOL TETRANITRATE; PETN), WETTED with not less than 25 percent water, by mass
Hazard Class : 1.1D
Identification Number : UN0150
Label Codes : 1.1D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y



14.3 In Accordance with IATA

Proper Shipping Name : PENTAERYTHRITOL TETRANITRATE, WETTED with not less than 25 percent water, by weight
Identification Number : UN0150
Hazard Class : 1
Label Codes : 1.1D
ERG Code (IATA) : 1L



14.4 In Accordance with TDG

Proper Shipping Name : PENTAERYTHRITOL TETRANITRATE, WETTED with not less than 25 per cent water, by weight
Packing Group : II
Hazard Class : 1.1D
Identification Number : UN0150
Label Codes : 1.1D



SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

PETN, Recrystallized; PETN, Crude	
SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard
Pentaerythrite tetranitrate (78-11-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA.

US State Regulations

Pentaerythrite tetranitrate (78-11-5)
 U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Pentaerythrite tetranitrate (78-11-5)
 WHMIS Classification : Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.

Safety Data Sheet

Listed on the Canadian DSL (Domestic Substances List)

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 05/20/2015

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Unst. Expl	Unstable explosives
H200	Unstable explosives

Party Responsible for the Preparation of This Document

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Dyno Nobel SDS

i-kon™ III Electronic Detonator Australia



Description

Orica's premium i-kon™ III system is the most sophisticated Electronic Blasting System on the market.

i-kon™ III electronic detonators have multiple safety features that are inherent in the design of the product including spark gaps, input and bleed resistors, and the chip itself. The i-kon™ III detonator is used in conjunction with the following hardware:

- i-kon™ Logger
- i-kon™ Blaster 400, 2400S or 3000
- i-kon™ Surface Remote Blaster System (SURBS hardware)
- i-kon™ Centralised Electronic Blasting System including Lock Box and Remote Blasting Box (CEBS hardware compatible with Blaster 400, 2400S)

Application

i-kon™ III detonators are the most advanced electronic detonators in the market and are particularly suitable for high value and complex blasts at large open cut and underground operations and in the most challenging environments.

Key Benefits

- Robust communication between i-kon™ III hardware and detonator
- Inherently safe dual voltage design
- World's most accurate electronic detonator, combined with the longest delay time window (30 seconds), allows blasts to be designed for a wide variety of blast outcomes.
- Reliable performance in the most challenging blasting environments with corrosion resistant alloy shell.
- i-kon™ III is ideal for large blasts as delay times can be pre-programmed in ShotPlus 5, speeding up logging.
- Programmable i-kon™ III detonators simplifies inventory management at the site

Technical Properties

Wire Colour	Red
Tensile strength (kg)	25
Explosives charge weight (mg)	900 mg (# 8* strength)
Connector colour	Blue
Shell length x diameter	89 x 7.6 mm
Shell material	Bimetallic (aluminium and copper alloy)
Programmability (ms) Standard	1ms to 30s
Max delay time (seconds)	30
Precision as coefficient of variation	0.005%

Recommendations for Use

- i-kon™ III detonator delays are defined with the i-kon™ Loggers and programmed and initiated through the use of the i-kon™ Blasters.
- i-kon™ III detonators can only be tested, programmed and fired with i-kon™ Loggers and Blasters. Do not use any other programming or blasting equipment.
- Damage to the legwire insulation is the most common cause of problems with electronic blasting systems; exercise care and protect the wires when loading and stemming holes.
- i-kon™ III detonators are explosive devices and should be handled with care.
- i-kon™ Loggers and Blasters are electronic devices designed to withstand normal mine, quarry and construction environments but submersion in water and excessive impact should be avoided.
- Never open i-kon™ blasting equipment. It should be serviced or repaired only by Orica or approved agents.
- High quality i-kon™ Harness Wire is used to connect up the i-kon™ III System in the field. Other wire may look similar, but will not offer the same critical performance characteristics and is not recommended.

i-kon™ III Electronic Detonator

Australia

Sleep-Time within Blastholes

The recommended maximum sleep time is 60 days. Sleep time is dependent on environmental conditions. An Orica Technical Services Representative should be consulted to assess the appropriate maximum sleep times for your conditions.

Packaging

i-kon™ III detonators are available in the following lengths and packaging:

i-kon™ III RX detonators (all spooled)

Length m (Spool)	1.1B packaging		1.4S packaging	
	Units / Case	Weight per Case (Kg)	Units / Case	Weight per Case (Kg)
10	60	10.0	32	8.4
15	60	13.0	32	10.0
20	48	13.1	32	11.4
30	30	11.8	16	8.2
40	25	12.5	16	9.8
60	18	13.0	12	9.9
80	12	11.5	12	12.3

Storage and Handling

Product Classification

Authorised Name: i-kon™ III

Proper Shipping Name: Detonators, Electric for blasting

Hazard Class	1.1B	1.4S
UN Number	0030	0456

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store i-kon™ III detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases.

i-kon™ III detonators have a storage life of up to 5 years in an approved magazine.

Temperature Limits

Activity		Temperature
Operating	min	-20°C
	max	70°C
Storage	min	-20°C
	max	50°C
Transport	min	-40°C
	max	65°C

Disposal

The i-kon™ III electronic initiating systems provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. However, i-kon™ III detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, these detonators must be handled and stored with care. i-kon™ III detonators may only be used at temperatures up to 70°C. Seek advice from Orica for priming systems suitable for higher temperatures. See Safety Data Sheet for more information

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Emergency Telephone Numbers

Within Australia: 1800 033 111

Outside Australia: 61 3 9663 2130

Electric Instantaneous II Detonators

Australia



Description

Electric Instantaneous II Detonators are rated as 8* Strength. These detonators contain a sleeved fusehead, a priming composition and a PETN base charge inside a cylindrical aluminium alloy shell. A pair of copper lead-wires, covered by PVC closure plug, are soldered to the fuse-head and crimped into the detonator shell with a PVC closure plug. A T&T label indicating the detonator "0" delay is attached on the leg wires. The lead-wires are kept shorted by a twisted section, at a bared area, near the free ends.

Electric Instantaneous II Detonators are distributed in Australia by Orica.

Application

Electric Instantaneous II Detonators provide effective initiation for general purpose blasting, pipeline and utility trenching, underground development and construction operations. Electric Instantaneous II Detonators can be used in wet conditions if adequate precautions are taken to insulate the lead-wire connections.

Recommendations for Use

Electric Instantaneous II Detonators should only be used by personnel who have been correctly trained in the handling and use of explosives. Electric Instantaneous II Detonators contain sensitive components and must be handled with care and respect at all times. Electric Instantaneous II Detonators used inside blastholes should always be secured inside suitable primers which fully enclose the detonator shell to protect it from abrasion or impact damage during charging.

Technical Properties

Detonator	
Shell	Aluminium Alloy
Base Charge	800mg PETN
Fusehead resistance	0.8 Ohms
All fire current	0.55 Amps
No fire current	0.3 Amps
Min fire current	4.1 mJ/ohm
Lead-Wires	
PVC Colours	Yellow / White
Conductor	Copper
Wire diameter	0.57mm
Length	3.6m
Resistance	0.14 ohm/m

Each unit should be checked before use, as required by local Statutory Regulations. An approved circuit tester and a suitable container, to enclose the detonator, should be used when testing detonators. The resistance of the circuit should be measured, using an approved tester, to confirm that the exploder or firing equipment available can supply sufficient energy to reliably initiate all detonators in the circuit. Single series connections are recommended to simplify hook-up and avoid the need to "balance" parallel circuits.

Electric Instantaneous II Detonators are supplied with the leg-wires shorted together, and should remain this way until final hook-up. Before touching bare leg wires, operators should make contact with an effective earthed point to disperse any static electrical charges, which may have accumulated during charging. After joining the detonator leg-wires together, the bare connections should be insulated to minimise the possibility of current leakage from the circuit.

Electric Instantaneous II Detonators have proven to be robust in a wide variety of applications, but reasonable care should be taken to prevent damage to the leg-wires during handling.

Electric Instantaneous II Detonators

Australia

If the plastic insulation is damaged in any way which exposes the wire core within, misfires may result due to current leakage to earth.

Electric Instantaneous II Detonators can be safely used in the vicinity of radio frequency transmitters in accordance with the "safe distances" specified in Australian Standard 2187, Part 2 – 2006.

Packaging

Electric Instantaneous II Detonators are packed in UN certified cardboard cases. A case contains a total of 256 detonators. Within each case are 8 boxes each containing 32 detonators. A case has dimensions 430mm x 400mm x 320mm and weighs 13.5kg gross.

Storage and Handling

Product Classification

Authorised Name: ELECTRIC INSTANTANEOUS II
Proper Shipping Name: DETONATORS, ELECTRIC
UN No: 0456, 0030 or 0255
Classification: 1.4S, 1.1B or 1.4B

Storage

Electric Instantaneous II Detonators should be stored in a cool, dry, ventilated magazine licensed for Class 1.1B products.

The shelf life of Electric Instantaneous II detonators is 2 years from the date of manufacture.

Disposal

Disposal of explosive materials can be hazardous. Methods for safe disposal of explosives may vary depending on the user's situation. Please contact a local Orica representative for information on safe practices.

Safety

Electric Instantaneous II Detonators incorporate a plastic shield around the fusehead to minimise the possibility of static discharge between the fusehead and the detonator shell.

Electric Instantaneous II Detonators are supplied in tight coils with the ends of the lead-wires shorted. This configuration

provides safeguards against accidental initiation by stray currents or radio frequency transmissions.

Note that Electric Instantaneous II Detonators will initiate if the lead-wires touch the aerial of a radio transmitter (including mobile telephones). Normal blasting procedures must ensure that radio transmitters are not allowed near electric detonators.

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Emergency Telephone Numbers

Within (country): 1800 033 111

Outside (country): 61 3 9663 2130

Carrick II Detonators

Australia

Description

Carrick II Detonators are low incensive, short delay detonators approved for use in underground coal mines. They are an electric delay detonator, containing a sleeved fusehead, a delay element (except for 0 delay), a priming composition and a tetryl base charge inside a cylindrical copper shell. A pair of copper leg-wires, covered by PVC insulation, are soldered to the fusehead and crimped into the detonator shell with a PVC closure plug. A T&T label indicating the detonator delay number and the length of wires is attached on the leg wires. The leg-wires are kept shorted by a twist at a bared section near the free ends.

Carrick II Detonators are distributed in Australia by Orica.

Application

Carrick II Detonators are especially designed to be used in gaseous environments like those found in underground coal mines. Carrick II Detonators are compatible with all permitted types of explosives. Carrick II Detonators can be used in wet conditions under moderate heads of water, if adequate precautions are taken to insulate leg-wire connections.

Recommendations for Use

Carrick II Detonators should only be used by personnel who have been correctly trained in the handling and use of explosives. Carrick II Detonators contain sensitive components and must be handled with care and respect at all times. Carrick II Detonators used inside blastholes should always be secured inside suitable primers, which fully enclose the detonator shell to protect it from abrasion or impact damage during charging. Carrick II Detonators are tested for continuity and resistance after assembly, but each unit should be checked before use, as required by local Statutory Regulations.

An approved circuit tester and a suitable container, to enclose the detonator, should be used when testing detonators. The resistance of the circuit should be measured using an approved tester to confirm that the exploder or firing equipment available can supply sufficient energy to reliably initiate all detonators in the circuit. Single series connections

Technical Properties

Delay Detonator	
Shell	Copper
Base Charge	0.4 g Tetryl
Fusehead	Low intensity N34 TB
Fusehead resistance	1 ohm
No fire current (I ₀)	0.26 A
All fire current (I ₁)	0.8 A
Minimum firing energy	3 mJ / ohm

Leg Wires	
Conductor	Copper
Diameter	0.57mm
Insulation	PVC
Resistance	0.14 ohm/m
Colours	Pink and orange
Length	3.6 m

Delay Times

Delay #	0	1	2	3
Time (ms)	0	25	50	75
Delay #	4	5	6	7
Time (ms)	100	125	150	175
Delay #	8	9	10	
Time (ms)	200	225	250	

are recommended to simplify hook-up and avoid the need to "balance" parallel circuits.

Carrick II Detonators are supplied with the leg-wires shorted together and should remain this way until final hook-up. Before touching bare leg wires, operators should make contact with an effective earthed point to disperse any static electrical charges which may have accumulated during charging. After joining the detonator leg-wires together, the

Carrick II Detonators

Australia

bare connections should be insulated to minimise the possibility of current leakage from the circuit. Reasonable care should be taken to prevent damage to the leg-wires during handling. If the plastic insulation is damaged in a way which exposes the wire core within, misfires may result due to current leakage to earth.

Carrick II Detonators are compatible with all types of permitted explosives. For security the leg wires should be "half-hitched" around the primer cartridge to prevent separation during charging. Carrick II Detonators can be safely used in the vicinity of radio frequency transmitters in accordance with the "safe distances" specified in Australian Standard 2187, Part 2 - 2006.

Packaging

Carrick II Detonators are packed into inner cardboard cartons. Each inner carton contains 40 detonators. All detonators within a carton have the same delay. Ten inner cartons are enclosed in an UN certified outer fibreboard case. External case dimensions are 430mm x 400mm x 320mm.

Storage and Handling

Carrick II Detonators should be stored in a cool, dry magazine licensed for Class 1.1B explosives. The shelf life of Carrick II detonators is 2 years from the date of manufacture.

Product Classification

Authorised Name: ELECTRIC DETONATORS
CARRICK II
Proper Shipping Name: DETONATORS, ELECTRIC for
blasting
UN No: 0456, 0030 or 0255
Classification: 1.4S, 1.1B or 1.4B

All regulations pertaining to the handling and use of such explosives apply.

Storage

Carrick II Detonators should be stored in a cool, dry magazine licensed for Class 1.1B explosives. The shelf life of Carrick II detonators is 2 years from the date of manufacture.

Disposal

Disposal of explosive materials can be hazardous. Methods of safe disposal of explosives may vary depending on the user's situation. Please contact an Orica Technical Services Representative for information on safe practices.

Safety

Carrick II Detonators incorporate a polyethylene sleeve around the fusehead to minimise the possibility of static discharge between the fusehead and the detonator shell.

Carrick II Detonators are supplied in tight coils with the ends of the leg-wires shorted. This configuration safeguards against accidental initiation by stray currents or radio frequency transmissions. However Carrick II detonators used in the vicinity of radio frequency transmitters must comply with the "Safe distances" specified in Australian Standard 2187, Part- 2 2006.

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Emergency Telephone Numbers

Within (country): 1800 033 111
Outside (country): 61 3 9663 2130

eDev™ II Electronic Detonator Australia



Description

The eDev™ II electronic detonator is one of Orica's exciting Next Generation products. These detonators are used in conjunction with:

- SHOTPlus™ blast design software
- Blast Box 610 or 610C
- Scanner 120 or Scanner 125
- eDev™ II Test Box or Tester for inherently safe at face testing of all detonators
- Duplex harness wire

Application

This system is specifically for easy use in tunnelling. eDev™ II detonators have a bar code printed on the flag tag which contains the detonator's unique ID. The user scans this tag to capture the ID and links it with a firing time derived from SHOTPlus™. Once all detonators are connected to the harness wire at the face the Test Box can be used to test all detonators.

Key Benefits

- Reliable, effective and safe blasting is achieved because of the rugged, proven construction of the eDev™ detonator, with testability at the face.
- Efficient operations at the face are afforded by the convenient packaging, glove-friendly connector and duplex harness wire.
- Predictable blasting results with minimal vibration and overbreak and improved advance per round are achievable because of the programmability and high precision of eDev™ II electronic detonators.
- Reliable initiation of boosters and explosives is achieved by the full strength base charge in the eDev™ II detonator.

Technical Properties

Wire Colour	Yellow
Tensile strength (kg) / (lbs)	20/ 55
Explosives charge weight (mg)	900
Connector colour	Orange
Shell length x diameter	89 x 7.6 mm
Shell material	Copper alloy
Max delay time (seconds)	20
Precision (Std Dev / Mean)	+/- 0.01%

- Reduced inventory frees up working capital because eDev™ II detonators are fully programmable; any delay between 0 and 20,000ms is always in your magazine

Recommendations for Use

eDev™ II detonators can only be tested, programmed and fired using dedicated eDev™ equipment. Do not use any other programming or blasting equipment.

The recommended operating temperature range of eDev™ II detonators is -20°C to 70°C.

Sleep-Time within Blastholes

The recommended maximum sleep time is 21 days. Sleep time is dependent on ground water conditions.

Orica Technical Services Representative should be consulted if special conditions exist.

eDev™ II Electronic Detonator

Australia

Packaging

eDev™ II detonators are available in the following lengths and packaging:

	1.1B		1.4S	
Leg wire Lengths	Units / Case	Gross Weight kg	Units / Case	Gross Weight kg
2 m	120	4.8	Not Available	
3 m	100	4.9		
4 m	90	5.0		
5 m	85	5.5		
6 m	80	5.8	40	6.12
8 m	70	6.23	35	5.9

Storage and Handling

Product Classification

Authorised Name: eDev™ II
Proper Shipping Name: Detonators, Electric for blasting

Hazard Class	1.1B	1.4S
UN Number	0030	0456
EX Number	EX2010060239	EX2010080324

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store eDev™ II detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases. eDev™ II detonators have a storage life of up to 5 years in an approved magazine.

Storage and use temperatures

Activity		Temperature
Operating	min	-4°F / -20°C
	max	158°F / 70°C
Storage	min	-4°F / -20°C
	max	120°F / 50°C
Transport	min	-40°F / -40°C
	max	150°F / 65°C

Disposal

Disposal of explosive materials can be hazardous. Methods for safe disposal of explosives may vary depending on the user's situation. Please contact a local Orica representative for information on safe practices.

Safety

eDev™ II detonators provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. However, eDev™ II detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, these detonators must be handled and stored with care. eDev™ II detonators may only be used at temperatures up to 70°C. Seek advice from Orica for priming systems suitable for higher temperatures. See Safety Data Sheet for more information.

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Emergency Telephone Numbers

Within Australia: 1800 033 111

Outside Australia: 61 3 9663 2130

Exel™ Long Period Detonators Australia



Description

Exel™ Long Period Detonators are a series of high strength non-electric detonators with Long Period (LP) delay intervals between successive firing times.

Exel™ LP Detonators consist of a non-electric detonator, a length of Exel™ signal tube, and a J-hook connector. The detonator incorporates delay elements and a high strength PETN base charge inside an aluminium shell. The yellow Exel™ signal tube is a high strength, high abrasion resistant tubing which transmits the initiation signal to the detonator. One end of the signal tube is crimped into the detonator shell, and the other end is closed off by a waterproof seal. The plastic J-hook provides a rapid and secure means of attaching the signal tube to detonating cord. It is colour coded and has the detonator delay and time printed on it.

The Tangle-Free F100 winding configuration is used for all lengths except 24m, which is in F80 configuration. These configurations provide tangle-free, easy to deploy leads.

Application

Exel™ LP Detonators provide a series of delay times suitable for underground development blasting in tunnelling, raising and shaft sinking operations.

Exel™ LP Detonators will directly initiate Pentex™ boosters and packaged explosives. Refer to the relevant Technical Data Sheets for details.

Technical Properties

Signal Tube	Yellow Exel™
Outer Diameter	3 mm
Nominal Tensile Strength	45 kgf
Lengths	3.6, 4.8, 6, 24 m
Standard Detonator PETN charge	790 mg (#8* strength)

Available Delay Range

Delay #	0	1	2	3
Nominal Time (s)	0.025	0.2	0.4	0.6
Delay #	4	5	6	7
Nominal Time (s)	1.0	1.4	1.8	2.4
Delay #	8	9	10	11
Nominal Time (s)	3.0	3.5	4.5	5.5
Delay #	12	13	14	15
Nominal Time (s)	6.5	7.5	8.5	9.5

Exel™ LP Detonators can be safely used when blow-loading ANFO into unlined blastholes, but semi-conductive charging hose and properly earthed charging equipment must be used.

Recommendations for Use

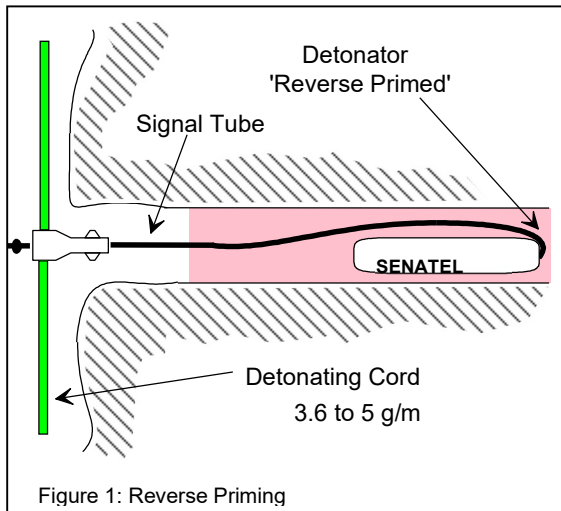
Exel™ signal tube is extremely robust, however if it is cut or split, moisture may enter the hollow core and cause a misfire. Exel™ LP Detonators should always be secured inside a suitable booster, which fully encloses the detonator. Exposed detonators should not be placed inside blastholes or charging hoses.

Exel™ LP Detonators used inside blastholes should normally be "reverse-primed", with the detonator base pointing towards the blasthole collar

Excessive force should not be applied to signal tubes connected to in-hole detonators and primers. If a primer becomes stuck when attempting to retrieve or reposition it, a replacement unit should be used. Exel™ LP Detonators can be reliably initiated by detonating cord, which has a PETN

Exel™ Long Period Detonators

Australia



core charge between 3.6 and 5.0 g/m, using standard J - Hook connections. Exel™ LP Detonators should be attached to detonating cord trunklines using the J-hook. Clip each J-hook to the detonating cord trunkline, keeping the cord and signal tube at right angles. Pull the end of the signal tube through its J-hook until the tube is straight and taut between the connection and the blasthole collar. Ensure that no signal tubes cross over or lie within 200 mm of the detonating cord.

Packaging

Exel™ LP Detonators are packed into sealed "barrier bags" which are contained within an outer cardboard case. All units within a case have the same lead length and delay. The case dimensions are 0.60 x 0.32 x 0.22 m.

Lead Length (m)	Units / Case	Nominal Gross Weight * (kg)
3.6	210	10
4.8	180	10
6	150	9
24	35	7

Storage and Handling

Product Classification

Authorised Name: Exel™ Long Period Detonators
Proper Shipping Name: Detonator assemblies non-electric for blasting
UN No: 0360
Classification: Class 1.1B

All regulations pertaining to the handling and use of such explosives apply.

Exel™ LP Detonators should be stored in a cool, dry detonator magazine licensed for Class 1.1B explosives. Stacks of cases should be no more than 2 metres high.

Exel™ LP Detonators should be used within 12 months of opening the sealed "barrier bag". Delay detonators deteriorate with age and should be used in order of manufacturing date (oldest first). Batches of detonators more than 4 years old should not be used.

Safety

Exel™ LP Detonators provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. Exel™ LP Detonators incorporate sensitive components inside the detonator. Care should be taken not to cause initiation via intense impact, friction or heat. Exel™ LP Detonators maybe used in temperatures up to 70°C.

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Emergency Telephone Numbers

Within (Australia): 1800 033 111
Outside (Australia): +61 3 9663 2130



Exel™ Connectadet™ Detonators Australia



Description

Exel™ Connectadet™ Detonators are signal tube based detonators designed to control the millisecond delay sequence from hole to hole, across the surface of a blast. The special design of Connectadet™ Detonators allows up to six outgoing signal tubes to be initiated and provides security of tube retention. Exel™ Connectadet™ Detonators consist of a length of Exel™ signal tube and a low strength delay detonator. The free end of the tubing is closed with a waterproof seal. The delay detonator is fully enclosed in a unique colour coded connector block.

The Tangle-Free F100 winding configuration is used for tube lengths in the 3.6 to 6 m range. Tangle-Free F80 winding configuration is used for tube lengths in the 9 to 18 m range. These configurations provide tangle-free, easy to deploy leads. A plastic J-hook connector provides a rapid and secure method of attaching the signal tube to detonating cord. To simplify identification of the detonator delay time, the J-hook connector is also colour coded and has the detonator delay time printed on it.

Application

Exel™ Connectadet™ Detonators function as a surface relay system, which enables an unlimited number of blastholes to be fired in sequence. This permits large well-controlled blasts to be fired, producing better results more efficiently.

Technical Properties

Signal Tube	Pink Exel™
Outer Diameter	3 mm
Nominal Tensile Strength	45 kgf
Available Lengths	3.6, 4.8, 6, 9, 12, 15, 18 m

Available Delay Range

Delay (ms)	Block Colour
9	Green
17	Yellow
25	Red
42	White
65	Blue
100	Orange
125	Cream
150	Mustard
175	Lime Green

Exel™ Connectadet™ Detonators are commonly used in conjunction with a delay detonator in every blasthole. The normal practice is for all the in-hole detonators to have the same delay period and, as a result, the surface detonators control the firing sequence. Exel™ Connectadet™ Detonators are produced with a range of delay times matched to the needs of mines, quarries and construction projects.

Recommendations for Use

Exel™ Connectadet™ Detonators will initiate up to six 3 mm diameter signal tubes in both directions. NOTE: Connectadet™ Detonators are NOT suitable for the initiation of detonating cord. Signal tubes are attached to Exel™ Connectadet™ Detonators with the connector block. Clip each signal tube, singly into the connector block, keeping the connector and tube at right angles. Ensure that the tubes are firmly 'hooked' in place and that no signal tubes cross over or lie within 200 mm of the connector block. The signal tubes should be firmly grasped and the block should be slid down the tubes to ensure cross overs have not formed. This is referred

Exel™ Connectadet™ Detonators

Australia

to, as the “clip and slide” technique. The connector does not require burying, as the detonator is a low shrapnel design. Care should be taken to avoid damage to signal tube and detonators. Exel™ Connectadet™ detonators can be reliably initiated by Exel™ Lead-In-Lines, #8 Strength Electric Detonators, i-kon™ III Starter detonator or detonating cords having PETN core charge 3.6 to 5.0 g/m.

Packaging

Exel™ Connectadet™ Detonators are packed into sealed “barrier bags” inside cardboard cases. All detonators within a case have the same lead length and delay. The case dimensions are 0.60 x 0.32 x 0.22 m. For short lead lengths, 3.6 to 6 m, the tubing is wound in the F100 configuration. For long lead lengths, 9 to 18 m, the tubing is wound in the F80 configuration.

Lead Length (m)	Units per case	Nominal Gross Weight (kg)	
3.6	180	10	F100
4.8	160	11	
6	140	10	
9	70	8	F80
12	50	7	
15	50	7	
18	40	7	

Storage and Handling

Product Classification

Authorised Name: Exel™ Connectadet Detonators
Proper Shipping Name: Detonator assemblies non-electric for blasting
UN No: 0360
Classification: Class 1.1B

All regulations pertaining to the handling and use of such explosives apply.

Exel™ Connectadet™ Detonators should be stored in a cool, dry detonator magazine licensed for Class 1.1B explosives. Stacks of cases should be no more than 2 metres high. Exel™ Connectadet™ Detonators should be used within 12 months of

opening the sealed “barrier bag”. Delay detonators deteriorate with age and should be used in order of manufacturing date (oldest first). Batches of detonators more than 4 years old should not be used.

Safety

Exel™ Connectadet™ Detonators provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. The connector block fully encloses the delay detonator and guards against accidental initiation. However, the Exel™ Connectadet™ Detonator contains sensitive explosive components. Care should be taken to avoid accidental initiation by intense impact, friction or heat. Exel™ Connectadet™ detonators may be used in temperatures up to 70°C. The detonator is factory assembled into the connector block and no attempt should be made to disassemble it.

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Emergency Telephone Numbers

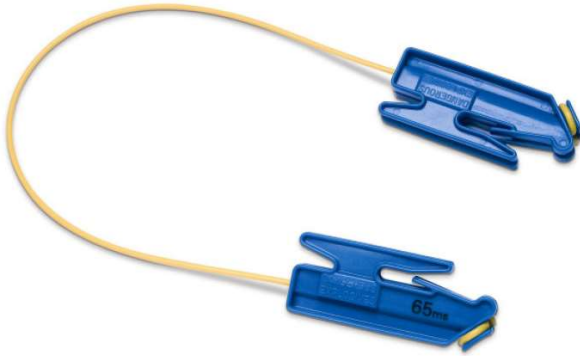
Within (Australia): 1800 033 111
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TECHNICAL DATA SHEET

Exel™ Millisecond Connectors

Australia



Description

Exel™ Millisecond (MS) Connectors are signal tube based delay connectors designed to introduce accurate delays into surface detonating cord trunklines.

Exel™ MS Connectors consist of two delay detonators encased in separate plastic cleats, connected by a length of Exel™ signal tube. The detonators incorporate delay elements and a high strength PETN base charge inside an aluminium shell. The detonators are encased in colour coded plastic cleats printed with the delay time. The cleats are designed to securely attach to detonating cord.

The yellow Exel™ signal tube is a high strength, high abrasion resistant tubing which transmits the initiation signal to the detonator. The ends of the signal tube are crimped into the detonator shells.

Application

Exel™ MS Connectors allow millisecond delay timing to be introduced into detonating cord surface trunklines.

Exel™ MS Connectors operate in both directions to simplify hookup and permit layouts which provide multiple paths of initiation to each blasthole.

Recommendations for Use

Exel™ signal tube is extremely robust, however if it is cut or split, moisture may enter the hollow core and cause a misfire. To attach the Exel™ MS Connector, start by cutting the detonating cord in the desired location using approved single bladed cord cutters.

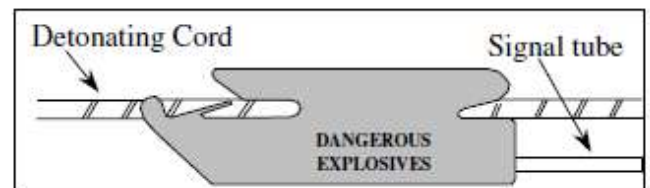
Technical Properties

Signal Tube	Yellow Exel™
Outer Diameter	3 mm
Nominal Tensile Strength	45 kgf
Length	80 cm
Standard Detonator PETN charge	(#8 strength)

Available Delay Range

Nominal Delay Time (ms)	Cleat Colour
9	Green
17	Yellow
25	Red
33	Black
42	White
65	Blue
100	Orange

Place one end of the detonating cord through the first block, leaving around 200 mm of cord pointing towards the centre of the unit.

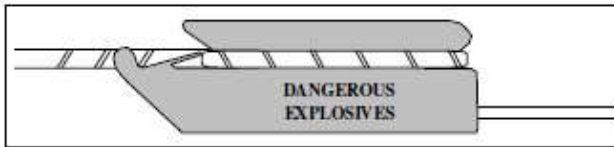


Loop the tail round one side of the block and draw it through the retaining clip. Loop the tail around both sides of the block and draw it through the retaining clip a second time.



Exel™ Millisecond Connectors

Australia



Packaging

Exel™ MS Connectors are packed into sealed "barrier bags" which are contained within an outer cardboard case. A case contains 125 units of the same delay. The case dimensions are 0.60 x 0.32 x 0.22 m and a case weighs 9.0 kg gross.

Storage and Handling

Product Classification

Authorised Name: Exel™ Millisecond Connectors
Proper Shipping Name: Detonator assemblies non-electric for blasting
UN No: 0360
Classification: Class 1.1B

All regulations pertaining to the handling and use of such explosives apply.

Exel™ MS Connectors should be stored in a cool, dry detonator magazine licensed for Class 1.1B explosives. Stacks of cases should be no more than 2 metres high. Exel™ MS Connectors should be used within 12 months of opening the sealed "barrier bag". Delay detonators deteriorate with age and should be used in order of manufacturing date (oldest first). Batches of detonators more than 4 years old should not be used.

Safety

Exel™ MS Connectors provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions.

Exel™ MS Connectors incorporate sensitive components inside the detonators. Care should be taken not to cause initiation via intense impact, friction or heat. Exel™ MS Connectors may be used in temperatures up to 70°C. The detonator is factory assembled into the connector block and no attempt should be made to disassemble it.

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i-kon™ III Extreme Electronic Detonator

Australia



Description

Orica's premium i-kon™ III system is the most sophisticated Electronic Blasting System on the market.

i-kon™ III electronic detonators have multiple safety features that are inherent in the design of the product including spark gaps, input and bleed resistors, and the chip itself. The i-kon™ III Extreme detonator is used in conjunction with the following hardware:

- i-kon™ Logger or Logger II
- i-kon™ Blaster 400, 2400S (Compatible with Logger I only)
- i-kon™ Blaster 3000
- i-kon™ Surface Remote Blaster System (SURBS hardware compatible with Logger I only)
- i-kon™ Centralised Electronic Blasting System including Lock Box and Remote Blasting Box (CEBS hardware compatible with Blaster 400, 2400S and Logger I)

Application

The i-kon™ III system is the most advanced Electronic Blasting System on the market, designed for use in high value and complex blasts at large surface and underground operations. i-kon™ III Extreme electronic detonators have premium leg wire insulation for harsh mining conditions experienced in long sleep time, long hole applications in underground, large surface coal and open-cut metal mining

Key Benefits

- The very tough insulation unique to i-kon™ III Extreme leg wires performs reliably in metal mines where hard, sharp and abrasive rock is prevalent.

Technical Properties

Wire colour	Purple
Tensile strength (kg)	45
Explosives charge weight (mg)	900 mg (# 8* strength)
Connector colour	Green
Shell length x diameter	89 x 7.6 mm
Shell material	Bimetallic (aluminium and copper alloy)
Programmability (milliseconds)Standard	1ms to 30s
Max delay time (seconds)	30
Precision as coefficient of variation	0.005%

- The i-kon™ III Extreme leg wires remain flexible even at very low temperatures.
- Robust communication between i-kon™ III hardware and detonator
- Inherently safe dual voltage design.
- World's most accurate electronic detonator, combined with the longest delay time window (30 seconds), allows blasts to be designed for a wide variety of blast outcomes.
- Reliable performance in the most challenging blasting environments with corrosion resistant bimetallic shell.
- i-kon™ III is ideal for large blasts as delay times can be pre-programmed in ShotPlus 5, speeding up logging.
- Programmable i-kon™ III detonators simplify inventory management at the site

Recommendations for Use

- i-kon™ III Extreme detonator delays are defined with the i-kon™ Loggers and programmed and initiated through the use of the i-kon™ Blasters.

i-kon™ III Extreme Electronic Detonator Australia

- i-kon™ III Extreme detonators can only be tested, programmed and fired with i-kon™ Loggers and Blasters. Do not use any other programming or blasting equipment.
- Damage to the legwire insulation is the most common cause of problems with electronic blasting systems; exercise care and protect the wires when loading and stemming holes.
- i-kon™ III Extreme detonators should always be secured inside a suitable booster, which fully encloses the detonator shell to protect it from abrasion or damage during charging.
- i-kon™ III Extreme detonators are explosive devices and should be handled with care.
- i-kon™ Loggers and Blasters are electronic devices designed to withstand normal mine, quarry and construction environments but submersion in water and excessive impact should be avoided.
- Never open i-kon™ blasting equipment. It should be serviced or repaired only by Orica or approved agents.
- High quality i-kon™ Harness Wire is used to connect up the i-kon™ III System in the field. Other wire may look similar, but will not offer the same critical performance characteristics and is not recommended.

Sleep-Time within Blastholes

The recommended maximum sleep time is 60 days. Sleep time is dependent on environmental conditions. An Orica Technical Services Representative should be consulted to assess the appropriate maximum sleep times for your conditions.

Packaging

i-kon™ III Extreme detonators are available in the following lengths and packaging:

Length	i-kon™ III Extreme 1.1B		i-kon™ III Extreme 1.4S	
metres	Units / Case	Gross Weight per case (kg)	Units / Case	Gross Weight per case (kg)
10	54	12.5	36	11.0
15	36	11.5	30	12.2
20	30	12.5	24	11.8

30	18	11.7	18	12.5
40	12	10.7	12	11.4
60	8	10.8	8	11.3
80	8	12.8	8	13.3

Storage and Handling

Product Classification

Authorised Name: i-kon™ III Extreme
 Correct Shipping Name: Detonator, Electric
 UN No: 1.1B 1.4S
 Classification: 0030 0456

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store i-kon™ III Extreme detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases.

i-kon™ III Extreme detonators have a storage life of up to 5 years in an approved magazine.

Temperature Limits

Activity		Temperature
Operating	min	-40°C
	max	70°C
Storage	min	-40°C
	max	50°C
Transport	min	-40°C
	max	50°C

Disposal

The i-kon™ III electronic initiating systems provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. However, i-kon™ III Extreme detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, these detonators must be handled and stored with care. i-kon™ III Extreme detonators may only be used at temperatures up to 70°C. Seek advice

TECHNICAL DATA SHEET

i-kon™ III Extreme Electronic Detonator Australia

from Orica for priming systems suitable for higher temperatures.

See Safety Data Sheet for more information.

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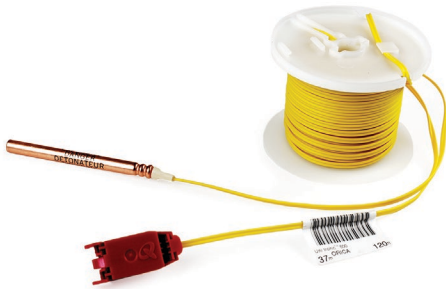
Emergency Telephone Numbers

Within Australia: 1800 033 111

Outside Australia: 61 3 9663 2130

uni tronic™ 600 Electronic Detonator

Australia



Description

The uni tronic™ 600 electronic detonator is one of Orica's exciting Next Generation products. The uni tronic™ 600 detonator is used in conjunction with:

- Blast Box 310 (with Bluetooth) or 310R (with wireless Remote firing), both with new firmware
- Scanner 120/125/200
- uni tronic™ 600 Test Box or Tester for safe on-bench communication with and testing of detonators duplex harness wire.

Application

uni tronic™ 600 detonators can be used in most surface mining applications but are particularly suitable for small and medium open cut coal mines, quarries and for construction.

Key Benefits

- Reliable, effective and safe blasting is achieved because of the rugged, proven construction of the uni tronic™ 600 detonator, with inherently safe testability on the blast pattern
- Efficient operations on the blast pattern are afforded by the convenient packaging and excellent, glove-friendly connector and duplex harness wire
- Predictable blasting results with minimal environmental impact are achievable because of the high precision of uni tronic™ 600 electronic detonators
- Reliable initiation of all boosters is achieved by the full strength base charge in the detonator

Technical Properties

Wire Colour	Yellow
Tensile strength (kg) / (lbs)	20 / 44
Explosives charge weight (mg)	900
Connector colour	Red
Shell length x diameter	89 x 7.6 mm
Shell material	Copper or alloy
Programmability (ms)	+/- 1
Max delay time (seconds)	10
Precision as coefficient of variation	+/-0.03%

Recommendations for Use

uni tronic™ 600 detonators can only be tested, programmed and fired using dedicated uni tronic™ equipment. Do not use any other programming or blasting equipment.

Damage to the legwire insulation is the most common cause of problems with electronic blasting systems; exercise care and protect the wires when loading and stemming holes.

Sleep-Time within Blastholes

The recommended maximum sleep time is 21 days. Sleep time is dependent on ground water conditions. An Orica Technical Services Representative should be consulted if special conditions exist that may reduce the allowed sleep time, or if sleep times longer than 21 days are needed.

Storage and Handling

Product Classification

Authorised Name: uni tronic™ 600

Proper Shipping Name: Detonators, Electric for blasting

Hazard Class	1.1B	1.4S
UN Number	0030	0456
EX Number	EX2010060240	EX2010080322

uni tronic™ 600 Electronic Detonator Australia

All regulations pertaining to the handling and use of such explosives apply.

Store uni tronic™ 600 detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases.

uni tronic™ 600 detonators have a storage life of up to 5 years in an approved magazine.

Storage and use temperatures

Activity		Temperature
Operating	min	-4°F / -20°C
	max	158°F / 70°C
Storage	min	-4°F / -20°C
	max	120°F / 50°C
Transport	min	-40°F / -40°C
	max	150°F / 65°C

Disposal

Disposal of explosive materials can be hazardous. Methods for safe disposal of explosives may vary depending on the user's situation. Please contact a local Orica representative for information on safe practices.

Safety

uni tronic™ 600 electronic initiating systems provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions.

However, these detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, uni tronic™ 600 detonators must be handled and stored with care. These detonators may only be used at temperatures up to 70°C.

uni tronic™ 600 detonators can only be tested, programmed and fired using dedicated uni tronic™ 600 equipment. Do not use any other programming or blasting equipment.

See Safety Data Sheet for more information.

Available Lengths / Packaging

uni tronic™ 600 detonators are available in the following lengths and packaging

Length m	1.1B packaging		1.4S packaging	
	Units / Case	Weight per Case kg	Units / Case	Weight per Case kg
* 6 coil	80	5.8	40	6.1
9 coil	60	5.9	35	6.2
spool	66	8.1	32	6.3
15 spool	66	11.3	32	8.6
20 spool	66	13.5	32	9.8
25 spool	54	13.2	32	10.7
30 spool	36	10.6	32	11.9
* 37 spool	30	10.7	16	7.7

*non-standard lengths requiring a longer lead time

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Appendix C

Explosion calculations

Hopkinson-Cranz scaling law

The online UN SaferGuard quantity distance (QD) calculator was used for section 7.2.3 [2].

The quantity distance calculator is based on the Hopkinson-Cranz scaling law [12].

Free field Trinitrotoluene (TNT) air blast has thoroughly been studied by extensive trials in the past. Free field air blast follows a QD-rule, which is also well known as the Hopkinson-Cranz cube-root scaling law (table C.1).

It is the basis of much of the work on the estimation of appropriate quantity and separation distances. Many United States (US) use rules based upon the explosives, their quantity, and the distance from the explosive to where people are at risk. For HD 1.1. ammunition the QD-concept is based on a pressure-related correlation.

Certain effects are associated with a certain scaled distance, which is directly related to a certain level of overpressure, determined by the Hopkinson-Cranz Scaling law (table C.2). This approach is used in the QD-siting concept described in Allied Ammunition Storage and Transport Publication (AASTP) 1.

Table C.1 Hopkinson-Cranz scaling law

$(R1/R2) = (W1/W2)^{1/3}$ $R = Z.W^{1/3}$	$R = \text{Range (m)}$ $Z = \text{Constant of Proportionality (dependent on acceptable blast overpressure)}$ $W = \text{Explosive Weight (kg)}$
---	---

Examples of the constant 'Z' used in explosive storage safety4 are shown in table 2:

Table C.2 Examples of Constant 'Z'

Z	Purpose	Remarks
8	Used to predict separation distances between ammunition process buildings (APB) within an explosive storage area (ESA).	Additionally, minimum safe distances further apply if R is below a certain level, which differs for each 'Z' function
14.8	Used to predict separation distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	
22.2	Used to predict separation distances between an explosive storehouse (ESH) and a building inhabited by civilians.	
44.4	Used to predict separation distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	



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