



04.04.2018

# Olo Quarry Explosives Principal Hazard Management Plan

This forms part of the Olo Quarry Management Plan



Southern Screenworks Ltd known as  
"Screenworks"

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## 1. Introduction

The Explosives Principal Hazard Management Plan (PHMP) forms part of the Olo Quarry Health and Safety Management System. It provides a framework for the systematic and proactive management of the principal hazard of explosives at Olo Quarry.

## 2. Referenced Documents

This PHMP has been produced referencing the following documents:

Olo Quarry Management Plan  
Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2016  
WorkSafe Interpretive Guidelines

**Prepared by:**

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Signed: 

Date: 04.04.18

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### 3. Review Schedule

This written document will be reviewed once during the term of the project.

This procedure will also be reviewed when any of the following occurs:

- The occurrence of an accident at the quarry operation involving a principal hazard that it was intended to manage,
- A material change in the management structure at the quarry operation that may affect the PHMP,
- A material change in plant used or installed at the quarry operation that may affect the PHMP, or
- The occurrence of any other event as provided in the PHMP as requiring a review of the plan.

In addition, at the completion of the first blast, a meeting will be held between the client and the Quarry Manager to discuss compliance with the PHMP, along with any resulting changes required.

| Version | Items   | Date     |
|---------|---|----------|
| 1.0     | Draft PHMP developed for review to Geotech for review<br>Rob Cameron, Geotech approved content 27.03.18   | 26.03.18 |
| 2.0     | Updated the training register and details around notification<br>Emergency plan to be incorporated once received from Prime Explosives<br>Quantities to be inserted once data received from Prime Explosives<br>Reviewed by Nick Weekes and Jamey Watson 28.03.18 | 29.03.18 |
| 3.0     | Sent to Craig Smart for review and comment<br>Still awaiting on emergency procedure from Prime Explosives and data for<br>quantities and storage with heat (extreme heat) exposure controls to be<br>inserted   | 29.03.18 |
| 4.0     | Updated emergency plan coordinates and incorporated customs records of<br>quantities into the plan. Updated emergency procedures.   | 03.04.18 |
| 5.0     | Requirements around the detonation of unexploded product updated after<br>review by Downer, reformatted document – final for consultation   | 04.04.18 |
| 6.0     |   |          |
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#### 4. Purpose of the Explosive Principal Hazard Management Plan (PHMP)

The PHMP addresses the assessed risks of explosives, for each phase of the quarrying operation and each part of the quarrying operation, at Olo Quarry.

The Risk Assessment for Explosives will be fully completed (refer to **Appendix A** Section 26) once a physical site inspection has been made. The PHMP refers to the systems, standards, procedures used to effectively manage and control explosive hazards in and around the quarrying operations. These may be in other documents, which are in **Appendix B** Section 27.

#### 5. Who does the PHMP apply to?

The PHMP applies to all personnel employed in any capacity at the quarrying operation and visitors to Olo Quarry. See **Roles and Responsibilities** Section 20 for the specific roles and responsibilities in relationship to the preparation, implementation and control of the PHMP.

#### 6. Resources Required

The Quarry Manager of Olo Quarry will supply all necessary resources to ensure the PHMP is fully implemented.

#### 7. Quarry Overview

The facilities to be developed at Olo Quarry include working faces and benches, processing and stockpiling areas, a hardstand area for the storage of plant, equipment and fuel tank, and office/rest amenities for use by workers during working hours. The quarry development will overlay and extend the working area of the previous quarry operations.

Once the quarry site has been stripped of vegetation, a physical survey will be undertaken, and a topographical plan will be prepared showing the existing contours of the site. This will serve as the basis for a Site Layout Plan detailing where the various facilities and sediment controls will be located, and a Development Plan showing the planned location of faces and benches formed as extraction proceeds.

#### 8. Geological Setting

The site is inland from Faleolo International Airport in a southwest direction from the main access road to the airport terminal at a direct distance of 4,900m. At its closest point the coast is approximately 3,500m due west of the quarry. The quarry site consists of an existing rock face that has previously been quarried. It is understood that the last major extraction of rock from this site occurred for the resurfacing of the Faleolo runway in 1999/2000. The rock face is approximately 15m high and extends for 450m in an approximate north – south direction.

To the west of the face, previous quarrying has created a level quarry “floor” that appears to extend over a large area of approximately 40,000m<sup>2</sup>. Low vegetation and regrowth covers most of this quarry floor area and the rock face and original ground contour on top of the face is completely covered in medium sized trees 2m to 8m in height including significant regrowth on the face.<sup>1</sup>



*A panorama looking east showing the tree covered rock face and low vegetation on quarry “floor” in foreground.*

<sup>1</sup> Site Description Olo Quarry Management Plan (Downer) Version 2.0



## 9. Geotechnical Assessment

Olo quarry is a previously worked quarry. Rock from it was previously and successfully used for making asphalt for the Faleolo runway in 2000. Currently there is an old face approx. 15 m high with the rock exposed and clearly visible. The project is to advance that face a further 50m (approximately) to obtain the volume of rock required for the current project.

## 10. Nature of the principal hazard

The principal hazard addressed by this management plan is the use of **explosives**.

### 11. Identified Principal Hazard

The purpose of the PHMP is to address a principal hazard being the use of explosives at the quarry.

The procurement, storage, transport and use of explosives at quarry operations introduces risks that, if not properly controlled, could result in injuries or fatalities for those using the explosives and/or bystanders due to unplanned or uncontrolled ignition.

While modern explosives are designed to be safe and stable, their safe use is largely procedurally controlled therefore it is imperative that robust controls are correctly implemented and followed at each stage of application.

The elimination of explosive hazards from the Olo Quarry is not considered practicable for economic reasons, as it is often the most cost- effective and efficient method of fragmenting the rock in advance of excavator production.

### 12. Hazard Management Procedure

This plan sets out the measures that will be used to ensure that the principal hazard is effectively managed.

Explosives<sup>2</sup> will be required in the quarrying process and ammonium nitrate emulsion which is rated as an oxidising agent (UN rating 5.1) will be employed.

Packaged explosives (UN rating 5.1D) will not be used.

"Emulsion" is a liquid form of ammonium nitrate dissolved in water and is not an explosive until mixed with sensitising chemicals. These chemicals are added/mixed during pumping the emulsion into the drilled blast area. Once in ground, the chemicals react, and the emulsion is sensitised to become an explosive, which can be initiated with detonators and boosters.

Non-electric detonators called Nonels and booster (150 grams) will be used to initiate the blast. All explosives will be provided by the New Zealand Company, "Prime Explosives".

The booster and detonators will be stored in separate, secure magazines located in an appropriate area of the quarry to be shown on the Site Layout Plan. There are no storage or safety issues with emulsion.

Screenworks has engaged Geotech for the handling, transport, storage and use of explosives. Screenworks relies on their expertise and the systems that they work under. However, when conditions change or deteriorate, the situation requires review and a higher level of evaluation and control may be required. Geotech may include initiation of trigger action response plans or risk assessment, to manage the situation. Where uncertainty or concern exists, employees and contractors shall stop work and consult with their supervisor before proceeding.

## 13. Conducting a Risk Assessment

A risk assessment will be completed to ensure that the systems for the safe management of explosives are robust and not to determine whether a PHMP is required.

While there is a statutory requirement and specific controls are required by Regulation 86 as a minimum to mining operations, this does not apply currently to quarrying operations. However, given that explosives are Class 1 substances and are being used in a similar context to mining, it is appropriate to have a PHMP in place.

<sup>2</sup> Section 6.5 Explosives Olo Quarry Management Plan (Downer) Version 2.0

There will be an explosive magazine located on the quarrying operation site. A risk assessment will be conducted to before using the explosives. This can be found in **Appendix A** Section 26.

A formal risk assessment will be completed for each blast, identifying the hazards and controls at each stage, including the extent of the blast exclusion zone during the firing sequence.

Any risk assessment and subsequent hazard controls will be agreed to and approved by all the relevant parties involved in the blasting process before blasting.

The nature of the hazards may also change. Periodic reviews will be conducted.

The Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001 also apply for the handling, transport, storage and use of explosives. (Class 1).

## 14. Results of the Risk Assessment

The results of the risk assessment will be included in this plan in **Appendix A** Section 26.

## 15. Explosives Quantities, Storage and Process

### • Quantities of Explosives

Refer to **Appendix H** Section 33.

### • **Dangerous Goods area**

A defined area has been set aside for the storage of the explosives. This is available in the Traffic Management Plan and is provided for in Appendix E Section 30. This area is managed by the approved handler/shot firer. The containers are suitable for the storage of the materials within. The ambient temperature of the emulsion inside the ISO tank is 38 degrees. The temperature outside of up to 30 degrees will not put any safety/fire hazard on the ISO tank as the emulsion itself is heated up to 82 degrees when it is manufactured<sup>3</sup>.

### • **Drilling<sup>4</sup>**

The drilling of holes to receive explosive materials will be undertaken from the top of the rock face. It is proposed to drill the holes approximately 12m deep from the cleared rock surface. The depth and diameter of drill holes determines the amount of explosive used to loosen the rock for excavation.

It is proposed that the bottom of the drill hole that will receive explosives is always above the level of the adjacent quarry floor formed during previous extraction works at the quarry.

Based on an estimated existing rock face height of 15m we propose drilling only 12m deep. This will allow us to minimise the amount of explosive materials to achieve a satisfactory quantity of rock for excavation without adverse impact on the integrity of the rock below the existing quarry floor. This conforms with the undertaking Downer have given to protect the Olo aquifer, that new extraction will stop at a level 2m above the low point of the existing quarry floor.

The Topographic Map, prepared after vegetation clearing, and included as Appendix C in the Quarry Management Plan, shows the low point on the old floor is 43.88m, meaning that new extraction will be above RL 45.88m.

This method of working means that there will only be a working face without intermediate benches. The single face will maintain the safe slope of the current face and steady recede as material is blasted and extracted for processing through the crushers and screens.

### • **Blasting<sup>5</sup>**

Blasting duration is estimated to be 4-5 weeks only.

<sup>3</sup> Prime Explosives Advice dated 29.03.18

<sup>4</sup> Section 7.3 Drilling Olo Quarry Management Plan (Downer) Version 2.0

<sup>5</sup> Section 7.4 Blasting Olo Quarry Management Plan (Downer) Version 2.0

The vibration that results from an explosion is related to the amount of explosive charge used. The measure used to determine how damaging the vibration resulting from an explosion is called Peak Particle Velocity (PPV). Experience has shown us that when working with solid basalt rock like that at Olo Quarry, minimal damage occurs at PPV of 200mm/second or less.

The explosive to be used is a very safe material: emulsified liquid form ammonia nitrate, an oxidising agent rated with the UN rating 5.1.

It is NOT packaged explosive that carries a UN rating 5.1D and can be dangerous to handle.

The liquid emulsion ammonia nitrate is not an explosive until it is mixed with a sensitising agent and initiated with non-electric detonators. The mixing is carried out in a special purpose plant mounted on a 4x4 truck that mixes and pumps the explosive into the drill hole in a single procedure.

Once plant arrives and has been set up on site, blasting is expected to occur at a regular time mid to late afternoon every second day (except Sunday's). A siren and loud speaker will give a five-minute warning then a 30 second warning prior to each blast. The loud speaker will give an all clear after the blast.

In conjunction with community consultation and site development a programmed trial of the warning system will be held prior to any blasting occurring. Twenty-four hours' notice of the commencement of blasting will be given to all adjoining neighbours. Check points will stop traffic on the quarry access route prior to each blast until the all clear has sounded. Refer to **Appendix C** Section 28. The control measures will be available on site the Site Environmental and Health and Safety Management Plan.

- **Unused Explosives**

Any explosives that are not required will be exploded in the last blast to ensure that no detonators or boosters remain on site or leave Samoa. This information is recorded in the comprehensive material register that has been used from the commencement of the project to the completion of the project and is managed by the Approved Handler.

## 16. Description of Control Measures

| Item | Controls   | Site documents   |
|------|--|--|
| 1    | Transportation of explosives from NZ to Samoa to the quarrying operation | NZTA compliance<br>Silva Transport<br>HSNO approved handlers (refer to <b>Appendix D</b> Section 29)<br>The person in charge of any transportation of explosives must ensure all requirements listed in regulations 51 and 52 of the Hazardous Substances (Class 1-5) Regulations  |
| 2    | Storage  | HSNO requirements such as location and test certificates<br>Control zones<br>Magazine rules<br>Security of storage with comprehensive register<br>6.5 Explosives & Appendix E Site Facilities Plan (QMP)<br>Approved Code of Practice for Storage of Explosives (HSNOCOP 55) and AS 2187.1-1998 Explosives – Storage, transport and use Part 1: Storage.<br>Hazardous Substances (Class 1-5) Regulations |
| 3    | Manufacture on site  | Drilling and charging  |
| 5    | Site preparation   | Procedure for blasting   |



| Item | Controls                        | Site documents  |
|------|---------------------------------|---|
| 6    | Planning                        | Blasting procedure<br>Accounting for stock<br>Section 7.4 Blasting QMP<br>Downer procedure for notification to the community (refer to <b>Appendix C</b> Section 28)  |
| 7    | Loading                         | Blasting procedure  |
| 8    | Stemming                        | Blasting procedure  |
| 9    | Tying up                        | Tie in plan<br>Blasting procedure   |
| 10   | Firing                          | Blast guarding<br>Section 7.4 Blasting QMP  |
| 11   | Misfires                        | Blasting procedure and recovery procedure<br>Locations surveyed to design   |
| 12   | Emergencies                     | Emergency procedure (refer to <b>Appendix G</b> Section 32.)<br>Blasting procedures<br>Lightning procedure<br>Excavation of blast zone when under lighting threat<br>Safety data sheets (Refer to <b>Appendix F</b> Section 31).  |
| 13   | Approved handler registers      | Certificates of approved handlers and controlled substances are held in the quarry office   |
| 14   | Cooperation between all parties | Tool box meetings<br>Health and safety meetings<br>Weekly operation meetings<br>Audits<br>Blasting duration estimated to be 4-5 weeks only  |
| 15   | Unused explosives               | HSNO requirements such as location and test certificates<br>Control zones<br>Magazine rules<br>Security of storage<br>6.5 Explosives & Appendix E Site Facilities Plan (QMP)<br>Approved Code of Practice for Storage of Explosives (HSNOCOP 55) and AS 2187.1-1998 Explosives – Storage, transport and use Part 1: Storage.<br>Hazardous Substances (Class 1-5)<br>Regulations |

## 17. Description of Specific Requirements for Duties

An overview of the Quarry management and staff hierarchy is shown in Figure 1.

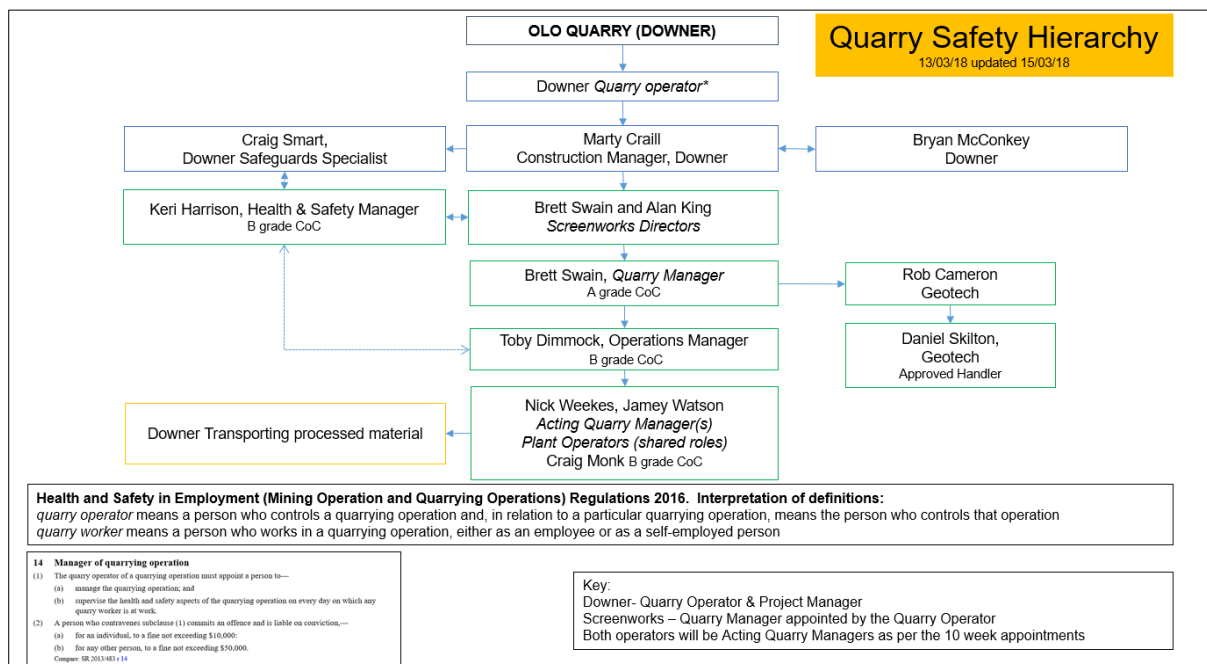


Figure 1 Quarry management and staff hierarchy

## 18. Quarry Operator Duties

- Make sure no one uses, handles or issues explosives unless the person is a holder of an approved handler, or under the direct control of an approved handler
- Make sure explosives used at the site are authorised for use by the quarry operator; they are stable; fit for their intended use; insensitive to shock, sparks, friction and the environment where they will be stored, transported and used
- Make sure explosives used are simple to store, use, transport and control
- Make sure anyone who designs or initiates a shot does so in a way that ensures the shot and any material expelled outside the declared danger zone do not cause harm to anyone in, or near, the site.
- Appoint the **Quarry Manager** for the site.

## 19. Quarry Manager Duties

In addition, to any other responsibilities and accountabilities placed on the Quarry Manager, the following also apply:

- ensuring that Geotech has documented and implemented its procedures, consistent with this PHMP,
- ensure that only qualified and competent persons undertake this task in accordance with Geotech procedures,
- carry out tool box meetings before and after the use of explosives, and
- review and sign off approval of Blast Design/Plan and Blast Review.

## *Explosives*

### **122 Explosives**

- (1) The mine operator must ensure that—
    - (a) no person uses, handles, or issues explosives at the mining operation unless the person meets the requirements of an approved handler for the purposes of the [Hazardous Substances and New Organisms Act 1996](#);
    - (b) explosives used at the mining operation are—
      - (i) authorised for use by the mine operator;
      - (ii) stable;
      - (iii) fit for their intended use;
      - (iv) insensitive to shock, sparks, friction, and the environment in which they will be stored, transported, and used;
      - (v) simple to store, use, transport, and control;
    - (c) every person who designs or initiates a shot does so in a manner that ensures that the shot and any material expelled outside the declared danger zone do not cause injury to any person in, or in the vicinity of, the mining operation.
  - (2) In subclause (1)(c), **declared danger zone** means the area that no person may enter while blasting operations are to take place, established in accordance with the principal hazard management plan for explosives.
  - (3) A person who contravenes subclause (1) commits an offence and is liable on conviction,—
    - (a) for an individual, to a fine not exceeding \$10,000;
    - (b) for any other person, to a fine not exceeding \$50,000.
- Compare: SR 2013/483 [r 123](#)

*Figure 2 Explosives requirements under the Regulations*

## **20. Description of Roles and Responsibilities**

### • **Quarry Manager Duties** **Nick Weekes, Jamey Watson**

While the Quarry Manager does not necessarily carry out the blasting, they are responsible as a “person in charge” to make sure all blasting is carried out safely by approved handlers who are experienced and competent. The Quarry Manager should ensure the adequate experience and competence of the approved handler and that all hazards are identified and controlled including:

- Transport to the blast site
- Arrival of the explosives
- Certification of the magazine
- Designated use zone
- Security of the area
- Notification to any affected parties (e.g. neighbours) – via Downer (refer to **Appendix C** Section 28)

The quarry manager must have knowledge of the requirements of HSNO that applies to explosive use, storage, transport, qualification, tracking, packaging, signage and emergency procedures.

### • **Appointed Person in Charge** **Nick Weekes, Jamey Watson**

The appointed person in charge, is responsible for ensuring the hazardous substances (including explosives) are correctly managed and the environment and health and safety of people are not adversely affected.

Person in charge, in relation to a place, a hazardous substance, location, a transit depot, or a place of work, means a person who is—

- (a) The owner, lessee, sub lessee, occupier, or person in possession of the place, location, or depot, or any part of it;
- Or
- (b) Any other person who, at the relevant time, is in effective control or possession of the relevant part of the place, location, or depot place includes any vehicle,

The specific requirements are detailed throughout the hazardous substances regulations. The person in charge must ensure the specified controls in place are being followed.

- **Blasting Contractors duties (approved handler):**  
**Geotech – Dan Skilton (Approved Handler/Shot Firer), Rob Cameron (Project Manager)**

Blasting contractors are responsible for the safe carrying out of the blast including:

- Hazard identification
  - Making sure the blast site is safe to work at
  - Making sure explosives are protected, carried and stored safely
  - Recording of explosives to be used
  - Protection against unintended initiation
  - Making sure safety features (e.g. edge protection or edge warning) are in place
  - Making sure the face is safe through a survey of the front row of holes that checks for flaws or hollows in the face that could affect the change of fly rock being ejected from the blast site
  - Making sure the blast site is secured from any unauthorised person entering during blasting
  - Carrying out the loading of the blast holes, including supervising any assistants
  - Laying out the ignition system and connecting it correctly
  - Carrying out or checking all pre-firing blast checks are completed
  - Giving suitable audible and visual warning signals prior to blasting
  - Ensuing suitable clearance or shelter is taken prior to the blast
  - Firing the blast
  - Carrying out post blast checks prior to the all-clear signal being given
  - Removing all explosives from the blast site and placing them securely in transport to the magazine
  - Making sure explosives are returned to the magazine and signed back in
- **All personnel:**  
All personnel are required to:
    - Maintain awareness of hazards and the methods to identify and control them, as they relate to their role
    - Inspect their workplace before starting work
    - Notify their supervisor and others of hazards that they become aware of using the company's hazard reporting system
    - Use controls, practices and review processes as part of this plan when requested.

## 21. Blasting Responsibilities

Figure 3 indicates the responsibilities for the various tasks within a blasting quarry operation. Refer to **Appendix D** Section 29.

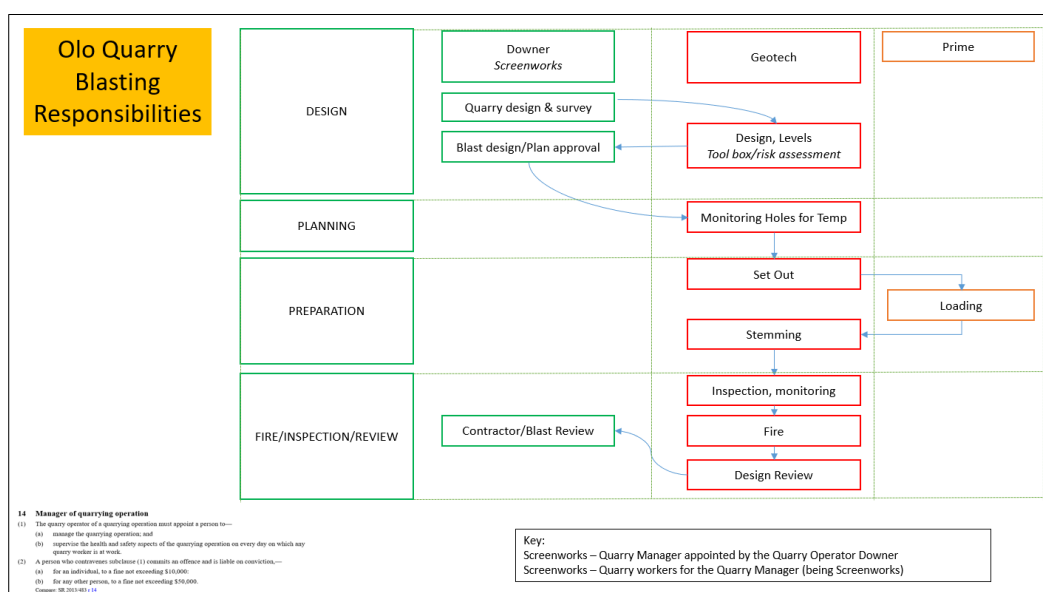


Figure 3: Olo Quarry Blasting Responsibilities

- **Approved Handler Competency:**  
Explosives Handlers Certificate of Competency
- **Person in Charge Competency:**  
Good knowledge of the legislation and standards governing the procurement, storage, transport and use of explosives at the quarry operation.
- **Shot Firer Competency:**  
Shot firer qualification or have completed formalised training in design.
- **Blast/Shot Designer Competency:**  
Shot firer qualification or have completed formalised training in design.

## 22. Induction and Training

All new personnel carrying out work must complete induction training before starting work. This induction training will be site-specific including:

- Explosive hazards and their identification
- Introduction to support plans
- Awareness of the contents of the PHMP
- Role and responsibilities in the PHMP
- Location of the PHMP and associated documentation (including how to access the PHMP and associated documentation)

The trainer must provide a hard copy summary of the induction training to the quarry worker. A copy of the personnel's training records will be held in the quarry site office. The trainer will keep copies of individual training and assists in coordination of training and ensure their training is up to date.

## 23. Emergency Procedures

Emergency preparedness and response to explosives at Olo Quarry will be managed in accordance with the **Site-Specific Emergency Plan**. Refer to **Appendix G** Section 32.

|  |  |
|--|--|
| <p><b>In the event of a fire or explosion near the dangerous goods areas</b></p> | <p>SECTION 5: Firefighting measures (refer to safety data sheets)<br/> <b>DO NOT FIGHT FIRE WHEN FIRE REACHES EXPLOSIVES.</b><br/> <b>DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS.</b></p> <ul style="list-style-type: none"> <li>• Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.</li> <li>• Can explode or detonate under fire conditions. Burning material may produce toxic vapors.</li> </ul> <p>Advice for firefighters</p> <ul style="list-style-type: none"> <li>• Protective equipment:</li> <li>• Wear self-contained respiratory protective device.</li> <li>• Wear fully protective suit.</li> <li>• Can explode under fire conditions.</li> <li>• Individual devices will randomly explode. Mass explosion of multiple devices is possible under certain conditions. Burning material may produce toxic and irritating vapours. In unusual cases, shrapnel may be thrown from exploding devices under containment</li> </ul> |
|--|--|

Emergency Services in the area will be informed of the materials that are held on site and will be provided with a copy of the Site-Specific Emergency Plan.

## 24. Audit

A competent person will review the PHMP at least once from the date it was approved for the term of the project.



The audit determines whether the quarry operations conform to the PHMP and whether the arrangements in the PHMP are adequate and correctly implemented.

The external audit may involve desktop and site verification examining adequacy and implementation of the PHMP, and compliance against it.

## **25. Records and Document Control**

All records will be kept in accordance with regulation 61.


This will include (but is not limited to) the following:


- All documentation, drawings and reports relevant to the quarry and explosive pattern and design
- A record of the manager's support rules
- Records of equipment, design drawings, modifications, and compatibility trials related to the PHMP
- Reviews of the PHMP and associated documents
- Risk assessments relevant to the PHMP
- Standard operating procedures and quarry operating procedures
- Compliance or noncompliance reports
- Incident investigation reports
- Audits
- Training records

Document control shall be carried out according to the quarry document control procedure which requires:

- The PHMP and related documented are located where they are accessible to all personnel
- All material related to the PHMP is clearly readable
- The PHMP and related procedures have review status, revision dates and page numbers
- All relevant persons have a copy of the current version of the PHMP and related procedures
- Obsolete copies of the PHMP are removed from the work place.
- The quarry operator shall provide records of any review of the PHMP to an inspector or health and safety representative if required.

## 26. Appendix A Risk Assessment

|   |  |               |               |             |          |
|---|--|---------------|---------------|-------------|----------|
|  | <b>Scope of Work:</b><br>Geotech have been engaged by Screenworks to out blasting activities at an operational quarry site known as Olo Quarry, Samoa. | <b>Author</b> | Keri Harrison | <b>Date</b> | 26/03/18 |
|---|--|---------------|---------------|-------------|----------|

| Reviewed By:              | Print Name     | Signature  | Date     | Revision | Approved By                             | Date |
|---------------------------|----------------|--|----------|----------|---|------|
| Health & Safety Manager:  | Keri Harrison  |  | 26/03/18 | 1.0      | Quarry Manager:                         |      |
| Quarry Manager:           | Nick Weekes    |  |          |          | <b>Signature:</b><br><b>Name of QM:</b> |      |
| Quarry Manager:           | Jamey Watson   |  |          |          |   |      |
| Plant Operator:           |                |  |          |          |   |      |
| Geotech Approved Handler: | Daniel Skilton |  |          |          |   |      |

|                        |               |                  |          |  |
|------------------------|---------------|------------------|----------|--|
| Review and Monitoring: | Keri Harrison | Date for Review: | 17/08/18 | If there is a change in work practice, hazard management or an incident, the Risk Assessment will be reviewed immediately. |
|------------------------|---------------|------------------|----------|--|

| Supporting Documents          |   | Permits to Work and/or Induction to Site                            |   | Basic Personal Protective Equipment             |   |   |   |                             |   |                              |   |              |   |
|-------------------------------|---|---|---|---|---|---|---|-----------------------------|---|------------------------------|---|--------------|---|
| Traffic Management Plan       | ✓ | Safety Data Sheets  | ✓ | Induction to the work site                      | □ | Hot Work  | □ | Hard Hat                    | ✓ | Hi-vis                       | ✓ | Safety Boots | ✓ |
| Safe Operating Procedures     | ✓ | Lock out padlock & danger/out of service tags                       | □ | Lifting plan (when required)                    | □ | Other:  | □ | Gloves                      | ✓ | Safety Glasses               | ✓ | Ear Muffs    | ✓ |
| BLAST01 – Blasting procedures |   | BLAST02 – drilling, temperature logging and charging over hot areas |   | BLAST03 – Blast guarding and warning procedures |   | BLAST05 – Management of the Explosives magazine |   | BLAST06 – Blow loading ANFO |   | BLAST07 – Lighting procedure |   |              |   |

| Equipment Required |   |   |   | Other     |   |   |
|--------------------|---|---|---|-----------|---|---|
| □                  | □ | □ | □ | Signage   | □ | □ |
| □                  | □ | □ | □ | Comments: |   |   |

| Steps | Task   | Potential hazards   | Consequence | Likelihood | Risk Rank | Controls   | Hierarchy E, I, M | Consequence | Likelihood | Risk Rank | Additional controls and recommendations  | Who will monitor the controls? |
|-------|--|---|-------------|------------|-----------|--|-------------------|-------------|------------|-----------|--|--------------------------------|
| 1.    | Staff briefing and discussion about the proposed works | Explosives  |             |            |           | Blast design/plan approval is prepared showing the extent of the blast areas and the roads that includes short considerations, geology of the area, blast design and environmental considerations. |                   |             |            |           | Tool box meeting before the activity occurs (followed up after the activity as well) | Approved Handler               |
|       |  | Procedures are not being followed or understood resulting in poor communication |             |            |           | Communication<br>Awareness of surroundings<br>Follow the site rules<br>Detailed work instructions<br>Establish the anchor points for the staff and the machinery                                   |                   |             |            |           | Supervised by shot firer   | Approved Handler               |
|       |  | Weather can cause visibility problems<br>Lightning                              |             |            |           | Maintain a watch on the weather conditions<br>Awareness of conditions<br>Lights/beacons are used when required   |                   |             |            |           | Lightning procedure  | Approved Handler               |
|       |  | Traffic interaction   |             |            |           | Communication with site supervisor and/or client<br>Follow the site rules<br>Safety exclusion zone to isolate the activity from other users of the site  |                   |             |            |           |  | Approved Handler               |
|       |  | Unfamiliar site   |             |            |           | Communication<br>Identify hazards on site such as other services, rock face and site access<br>Establish muster point and first aid site   |                   |             |            |           |  | Approved Handler               |
|       |  | Poor communication  |             |            |           | Pre-notification to external parties (community, residences)   |                   |             |            |           | Reliable, trained and competent persons  | Approved Handler               |
|       |  | Noise   |             |            |           | Wear ear protection  |                   |             |            |           |  | Approved Handler               |
| 2     | Drilling   | Fly rock, air blast, over pressure  |             |            |           | Correct drilling of blast designs will ensure this is significantly reduced  |                   |             |            |           | Shot firer to prepare and drill holes marked before drilling                         | Approved Handler               |
|       |  | Check holes are to depth and loadable - Blocked/flooded or heavy rain           |             |            |           | Redrill  |                   |             |            |           | Cover holes/use cones in holes   | Approved Handler               |

| Steps | Task     | Potential hazards   | Consequence | Likelihood | Risk Rank | Controls   | Hierarchy E, I, M | Consequence | Likelihood | Risk Rank | Additional controls and recommendations  | Who will monitor the controls? |
|-------|----------|---|-------------|------------|-----------|--|-------------------|-------------|------------|-----------|--|--------------------------------|
| 2     | Drilling | Using the drill unsafely could result in injury                                 |             |            |           | Do not remove any guards from the drill.<br>Ensure hands, fingers loose clothing and hair are kept clear of all moving parts and pinch points at all times.<br>Safe operating position and stay at the controls at all times when the drill is operating.<br>When moving the drill rig disconnect the air supply, only use appropriate tools, competent authorised Approved Handlers and certified equipment<br>Prestart check |                   |             |            |           | BLAST01 – Blasting procedures<br>BLAST02 – drilling, temperature logging and charging over hot areas | Approved Handler               |
|       |          | Procedures are not being followed or understood resulting in poor communication |             |            |           | Scale the site as required to remove any loose material that may be dislodged by ropes swiping across the face<br>Establish compressor site to allow for easy refuelling etc.<br>Competent personnel   |                   |             |            |           |  | Approved Handler               |
|       |          | Unauthorised persons  |             |            |           | Cone, signs and blast guards in place<br>Visual checking of the site<br>Signage<br>Vehicle identification<br>Safety exclusion zone<br>Access restrictions<br>Pre-notification to external parties (adjoining properties, residences and the community)   |                   |             |            |           | Communication plan<br>Site specific rescue plan including first aid and muster point                 | Approved Handler               |
|       |          | Noise   |             |            |           | Wear ear protection  |                   |             |            |           |  | Approved Handler               |



| Steps | Task               | Potential hazards  | Consequence | Likelihood | Risk Rank | Controls   | Hierarchy E, I, M | Consequence | Likelihood | Risk Rank | Additional controls and recommendations  | Who will monitor the controls? |
|-------|--------------------|--|-------------|------------|-----------|--|-------------------|-------------|------------|-----------|--|--------------------------------|
| 3     | Pick up explosives | Explosives need to be safely transported from the magazine to the designated area                    |             |            |           | Explosives shall be conveyed from the magazine to the shot in the designated explosives vehicle or other approved vehicle approved by the shot firer<br>Approved handlers<br>Competent personnel<br>Standard work practices (SWPs)<br>Smoking is not permitted<br>Fire extinguishers   |                   |             |            |           | Resource consent conditions<br>Principal Hazard Management Plan<br>Tool box meeting, health and safety meetings, weekly operation meetings and audits                              | Approved Handler               |
|       |                    | Explosives must be stored in accordance with HSNO and associated regulations                         |             |            |           | Approved handlers<br>Tracking of stock in and out of the magazine is kept and stored in the magazine<br>Security of the explosives in the magazine which only allows for restricted access (HASNO Act)<br>HSNO control zones<br>Inspections for safety and deterioration of stock<br>Check explosives for damage and report to the approved handler who will dispose of appropriately<br>PPE<br>Safety data sheets |                   |             |            |           | Drilling and charging procedure<br>Equipment is serviced on a regular basis<br>Fire extinguishers<br>Explosives transported in the correct amount<br>Certification of the magazine | Approved Handler               |
|       |                    | Environmental damage or personal injury if the incorrect explosive is identified or used incorrectly |             |            |           | Monitoring holes for temperature<br>Good Practice Guidelines (Health and Safety at Opencast Mines, Alluvial Mines and Quarries)  |                   |             |            |           | BLAST01 – Blasting procedures<br>BLAST02 – drilling, temperature logging and charging over hot areas   | Approved Handler               |

| Steps | Task                 | Potential hazards  | Consequence | Likelihood | Risk Rank | Controls   | Hierarchy E, I, M | Consequence | Likelihood | Risk Rank | Additional controls and recommendations   | Who will monitor the controls? |
|-------|----------------------|--|-------------|------------|-----------|--|-------------------|-------------|------------|-----------|---|--------------------------------|
| 3     | Pick up explosives   | Slips/trips/falls  |             |            |           | Blast design/plan approval is obtained that includes short considerations, geology of the area, blast design and environmental considerations.<br>Competent personnel<br>The floor of the magazine is kept clean of dirt, empty packages and explosives.<br>Spills are cleaned up immediately.<br>Awareness of conditions. |                   |             |            |           | Spill kit   | Approved Handler               |
|       |                      | Environmental damage if the incorrect explosive is identified or used incorrectly<br>Personal injury |             |            |           | Blast design/plan approval is obtained that includes short considerations, geology of the area, blast design and environmental considerations.   |                   |             |            |           | Monitoring holes for temperature<br>Good Practice Guidelines (Health and Safety at Opencast Mines, Alluvial Mines and Quarries) | Approved Handler               |
| 4     | Load the blast holes | Unauthorised persons   |             |            |           | Cone, signs and blast guards in place<br>Visual checking of the site<br>Signage<br>Vehicle identification<br>Safety exclusion zone<br>Access restrictions<br>Pre-notification to external parties (adjoining properties, residences and the community)   |                   |             |            |           | Communication plan<br>Site specific rescue plan including first aid and muster point  | Approved Handler               |
|       |                      | Lack of communication  |             |            |           | Radio communication<br>Tool box meeting, health and safety meetings, weekly operation meetings and audits<br>Pre-notification to external parties (adjoining properties, residences and the community)   |                   |             |            |           | Blast warning procedures  | Approved Handler               |
|       |                      | Slip/trip/fall   |             |            |           | Watch footing<br>PPE<br>Awareness of conditions  |                   |             |            |           |   | Approved Handler               |

| Steps | Task   | Potential hazards  | Consequence | Likelihood | Risk Rank | Controls   | Hierarchy E, I, M | Consequence | Likelihood | Risk Rank | Additional controls and recommendations  | Who will monitor the controls? |
|-------|--|--|-------------|------------|-----------|--|-------------------|-------------|------------|-----------|--|--------------------------------|
| 4     | Load the blast holes   | Weather  |             |            |           | Assessed on day of blast   |                   |             |            |           | BLAST07 – Lightning procedure  | Approved Handler               |
|       |  | Noise  |             |            |           | PPE  |                   |             |            |           | Follow resource consent conditions   | Approved Handler               |
|       |  | Equipment damage or property damage<br>Malfunction of equipment<br>Unsafe work practices |             |            |           | Competent short firer<br>Explosives shall be conveyed from the magazine to the shot in the designated explosives vehicle or other approved vehicle approved by the shot firer<br>Blast guarding and warning procedures<br>PPE<br>Good communication<br>Tool box meeting<br>Prestart check on equipment |                   |             |            |           | Record of stock in and out of the magazine is kept daily and stored in the magazine<br>Secured Geotech explosives magazine<br>Security of the container<br>Signage | Approved Handler               |
|       |  | Unauthorised traffic or personnel<br>Trucks crossing                                     |             |            |           | Correct signage and cones<br>Radio call ups  |                   |             |            |           | SW and MPA QMP   | Approved Handler               |
| 5     | Put stemming in on top of explosive<br><br>Tie in blast holes for firing | Unauthorised persons   |             |            |           | Cone, signs and blast guards in place<br>Visual check of the blast exclusion zone prior to any firing  |                   |             |            |           | Communications plan<br>Site specific rescue plan   | Approved Handler               |
|       |  | Lack of communication  |             |            |           | Radio communication<br>Tool box meeting<br>Safety exclusion zone<br>Blast warning signals  |                   |             |            |           | Blast guarding and warning procedures  | Approved Handler               |
|       |  | Slip/trip/fall from cliff edge   |             |            |           | Maintain 2 metres from any edge<br>PPE   |                   |             |            |           |  | Approved Handler               |
|       |  | Weather/lightning  |             |            |           | Assessed on day of blast<br>Awareness of conditions  |                   |             |            |           |  | Approved Handler               |
|       |  | Noise  |             |            |           | PPE  |                   |             |            |           | Follow resource consent and QMP  | Approved Handler               |

| Steps | Task  | Potential hazards   | Consequence | Likelihood | Risk Rank | Controls   | Hierarchy E, I, M | Consequence | Likelihood | Risk Rank | Additional controls and recommendations  | Who will monitor the controls? |
|-------|---|---|-------------|------------|-----------|--|-------------------|-------------|------------|-----------|--|--------------------------------|
| 5     | <b>Put stemming in on top of explosive</b><br><br><b>Tie in blast holes for firing</b>  | Equipment damage or property damage   |             |            |           | Competent shot firer<br>Blast guarding and warning procedures<br>PPE<br>Good communication<br>Tool box meeting   |                   |             |            |           | Resource consent and QMP   | Approved Handler               |
|       |   | Explosives cartage and placement  |             |            |           | Blast Ute is only with the shot firer  |                   |             |            |           |  | Approved Handler               |
|       |   | Manual handling   |             |            |           | Bends at knees<br>Two people lift when necessary   |                   |             |            |           |  | Approved Handler               |
|       |   | Loose down line with stemming or down liner not held at the top of the hole |             |            |           | Tie down, line off onto peg<br>Trained and experienced personnel   |                   |             |            |           | Shot firer to supervise  | Approved Handler               |
|       |   | Blast hole left out of the tie up and down line last in drill cutting       |             |            |           | Remove drill cutting from collar of holes  |                   |             |            |           | Shot firer to walk over and check all holes are tied into position               | Approved Handler               |
| 6     | <b>Fire Blasting</b>  | Personal injury   |             |            |           | Competent shot firer   |                   |             |            |           | Shot firer to walk over and check all holes are tied into position               | Approved Handler               |
|       |   | Unauthorised persons  |             |            |           | Visual check of the blast exclusion zone prior to any firing<br>Adequate road blocks and guards are in place at any road or access point to the blast exclusion zone during firing and until the all clear is given by the shot firer<br>Approved handler<br>All clear signals |                   |             |            |           | BLAST07 – Lighting procedure<br>Communications plan<br>Site specific rescue plan | Approved Handler               |
| 7     | <b>Post firing inspection and tidy up</b><br>Visual check of the plant or equipment area to make sure everyone is clear of the area prior to start up | Unstable ground   |             |            |           | Approach the blast area with caution   |                   |             |            |           | Shot firer to supervise  | Approved Handler               |

| Steps | Task                               | Potential hazards   | Consequence | Likelihood | Risk Rank | Controls   | Hierarchy E, I, M | Consequence | Likelihood | Risk Rank | Additional controls and recommendations  | Who will monitor the controls? |
|-------|------------------------------------|---|-------------|------------|-----------|--|-------------------|-------------|------------|-----------|--|--------------------------------|
| 7     | Post firing inspection and tidy up | Uninitiated charges   |             |            |           | Post blast inspection is carried out by the shot firer (approved handler)<br>Competent persons<br>Daily record of the shots charged at the completion of each shift<br>Record of stock in and out of the magazine is kept daily and stored in the magazine |                   |             |            |           | Unused explosives and detonators are returned to the magazine at the end of each day<br>Approved handler<br>Shot firer   | Approved Handler               |
|       |                                    | Communication   |             |            |           | Contractor/blast review  |                   |             |            |           |  | Approved Handler               |
|       |                                    | Post firing fumes   |             |            |           | Communication<br>Safety data sheets  |                   |             |            |           |  | Approved Handler               |
|       |                                    | Explosives (and associated items) must be stored in accordance with HSNO and associated regulations |             |            |           | Record of explosives and detonators in and out of the magazine is kept daily and stored in the magazine  |                   |             |            |           | Approved handler<br>Shot firer   | Approved Handler               |
|       |                                    | Equipment damage or property damage<br>Malfunction of equipment<br>Unsafe work practices            |             |            |           | Competent short firer<br>Explosives shall be conveyed from the shot to the magazine in the designated explosives vehicle or other approved vehicle approved by the shot firer<br>PPE   |                   |             |            |           | Record of explosives and detonators in and out of the magazine is kept daily and stored in the magazine<br>Secured Geotech explosives magazine<br>Security of the container<br>Signage | Approved Handler               |



## Review Schedule

This document will be reviewed by the **Health and Safety Manager** annually.

Any updates to the Risk Assessment will be undertaken by the **Health and Safety Manager** in conjunction with the **Directors** and **Operations Manager**. If there is a change in work practice, hazard management or an incident, the Risk Assessment will be reviewed immediately.

| Date     | Revision | Amendments   | Amended by                | Reviewed by                             |
|----------|----------|--|---------------------------|---|
| 26/03/18 | 1.0      | Draft risk assessment developed for review by Quarry Manager and Contractor Geotech (emailed 26/03/18) | Health and Safety Manager | Quarry Manager(s)<br>Contractor Geotech |
| 29/03/18 | 2.0      | Reviewed risk assessment reflecting an updated PHMP  | Health and Safety Manager | Client Downer                           |
|          | 3.0      |  |                           |   |
|          | 4.0      |  |                           |   |
|          | 5.0      |  |                           |   |
|          | 6.0      |  |                           |   |
|          | 7.0      |  |                           |   |

## **27. Appendix B Standard Operating Procedures**

*Site Environmental and Health and Safety Management Plan including the Inspection Check Sheet which can be found in the Quarry site office*

*Standard Operating Procedures*

*Geotech SOP*

*BLAST01 Blasting Procedures*

*BLAST02 Drilling, temperature logging and charging over hot areas*

*BLAST03 Blast guarding and warning procedure*

*BLAST05 Management of the magazine*

*BLAST07 Lightning procedure*

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**BLAST01 - BLASTING PROCEDURES****Objective**

The purpose of the blasting procedure is to provide consistent rules and procedures for effective and safe blasting.

**Scope**

This SWP affects all staff involved in Geotech blasting operations. It is intended as reference material for persons who are Approved Handlers for shot firing. It supports and should be read in conjunction with other Geotech blasting SWPs and other best practice information. It does not cover technical information or blasting practices for the wide variety of blasting applications, and is not intended as a replacement for formal training.

**Hazardous Substances and New Organisms (HASNO) Act 1996**

The HASNO Act was introduced to reform the law relating to the management of hazardous substances and new organisms in New Zealand. All explosives, initiation devices, storage and handling come under the HASNO Act and associated regulations. The relevant authority for the HASNO Act is ERMA New Zealand. The enforcement agency for places of work is WorkSafe New Zealand. Land Transport Safety Authority (NZTA) control transportation of explosives on roadways.

**Approved Handlers (Shot firers)**

The HASNO Act requires that all handlers and users of explosives have an Approved Handlers certificate. In this SWP, the term Shot firer is used interchangeably with the term Approved Handler in relation to the use of explosives.

Person permitted to fire blasts:

- Trained/qualified shot firers
- Appointed trainee Geotech shot firer under supervision

Person permitted to charge shots:

- Explosives may only be handled by persons over the age of 18 authorised by the Geotech shot firer or when undergoing training by an authorised person
- The Geotech shot firer in charge of any blasting operation shall ensure by the provision of training or re-training, that each person in the blast crew is adequately trained for the tasks they are required to perform, with respect to the particular blasting systems and materials being employed

All personnel regularly handling explosive (in any capacity) shall hold an Approved Handlers certificate.

**Explosives Standard Work Practices (SWPs)**

Geotech have a number of SWPs relating to blasting and the management of explosives. They include:

- BLAST01 – Blasting procedures

- BLAST02 - Drilling, temperature logging and charging over hot areas
- BLAST03 – Blast guarding and warning procedures
- BLAST05 – Management of the explosives magazine
- BLAST06 – Blow loading ANFO
- BLAST07 – Lightning procedure

### **Storage of explosives**

When not being used in a blast or being transported, all explosives and detonators will be securely stored under lock and key in a Geotech explosives magazine. Refer to BLAST05 – Management of the explosives magazine for additional information on storage, record keeping, reporting and disposal of explosives.

### **Transport of explosives**

Transport of explosives will meet the requirements of the Land Transport Rules for dangerous goods. Drivers will hold the appropriate license endorsements and vehicles will be marked as required by law. Additional information can be found on NZTA Factsheet 68 – Dangerous goods transported as tools-of-trade (<http://www.nzta.govt.nz/resources/factsheets/68/docs/68-dangerous-goods-tools-trade.pdf>).

### **Use of explosives**

The following safe practices are to be observed during priming and charging:

- Smoking is not permitted in a blast area or Geotech shot firers vehicle (or any other vehicle)
- Explosives shall be conveyed from the magazine to the shot in the designated explosives vehicle or other vehicle approved by the shot firer
- All unused explosives are to be returned to the magazine at the end of each day
- A record of stock in and out of the magazine is to be kept up to date daily and stored in the magazine

Every blasting operation must be conducted or directed by an Approved Handler (Shot firer) who control and is responsible for all aspects of the work. His/her authority covers all staff, workers and equipment in the areas known as the ‘blast zone’. In instances where there is more than one certified shot firer involved in the operation, Geotech will designate one shot firer responsible for conducting the shot firing. All other staff will support the shot firer in exercising his authority.

### **Access restrictions during blast set up**

Apart from vehicles directly engaged in charging activities, no other vehicle or personnel may pass within 10 metres of a charged hole, unless authorised by the Geotech shot firer.

Access to the blast area is to be restricted, by YELLOW cones or danger tape and by reflective warning signs placed at entry points.

Driving through cones or danger tape is not permitted and may result in disciplinary actions being taken.

### **Tying in of shots**

- The pattern shall be tied up using industry best practice and previous on-site experience

- Prior to initiating a shot, all surface connections made are to be visually inspected and the entire shot checked against the blast plan in a systematic manner, by the Geotech shot firer
- The Geotech shot firer shall ensure the recommended practices for particular initiation devices are carried out strictly in accordance with the manufacturer's instructions
- Geotech shot firers will NOT use 5-10gm detonating cord as a downline initiation device/system, where there is an alternative downline device/system available
- Shots will only be tied in immediately prior to initiation and only after blast guards have been positioned.

#### **Sleeping shots**

- No holes shall be left tied in at the end of any work day
- All charged holes belonging to one shot shall be fired within the number of days specified by the products technical data sheet
- Extensions beyond this time must have the permission of the Geotech shot firer, client and be within the sleep time of the product used

#### **During the course of charging**

- All charged holes are to be adequately stemmed immediately after charging
- No blast holes are to be tied together until prior to firing
- Access to the area is to be restricted and the area coned off with YELLOW cones and reflective warning signs

#### **Blasting in the hours of darkness**

- Blasting in the hours of darkness will occur only in the winter months where the blast time (approx 17.45pm-18.15pm) falls within the hours of darkness
- All blast guards must, 30mins before blast, meet the shot-firer to read & sign onto the blast JHA
- All blast guards must be in place at least 20 minutes prior (i.e. 5.30pm), which falls within daylight hours
- If a misfire occurs, the sleeping shot procedure is to be followed and the shot re-fired during daylight hours the following day

NOTE: Blasting in the hours of darkness requires additional test certificate (TC 4 no. 002). Any blasts that effect operational areas will be timed to minimise the time that personnel are required to be cleared from these areas.

#### **Drilling and loading procedures for packaged high explosives (HE)**

- Drilled according to blast plan
- Number holes from initiation point

#### **Hole charging method:**

- Lay out required explosive primer and det by hole
- Dip hole to confirm depth



- Load hole and confirm the explosive column is in full contact with the primer, then stemmed
- If the column height is wrong, top prime the hole with an additional primer (i.e. a booster and det)

Loading sequence:

- Load in the initiation sequence (thus if required those holes loaded can be shot)

#### **Loading procedure for bulk emulsion**

- Drilled according to the blast plan
- Bait holes with IE (det and primer)
- Geotech shot firer to confirm with the driver the explosive quantity and the type required
- Roll out hose from truck - confirm when ready with the operator
- Load holes along spacing rows from front to rear
- Leave holes approximately 15 minutes for gassing
- Check stemming heights prior to stemming - if correct then stem
- Emulsion quality assurance gassing conducted during loading and documented

#### **Blast pickets/firing**

- A blast plan/map shall be prepared showing the extent of the blast area. Any roads or access tracks to the site must be clearly noted.
- The blast plan map must show a 500m exclusion zone from the blast site. Blast guard locations must be identified on the blast plan map. While the blast exclusion zone can be assessed on a shot by shot basis (taking into account the typography and specific layout of the site, size of the blast, depths of the shots and the material being blasted) the minimum stand off distance for blast guards and personnel in front of the blast face must be 500m. Any observers must be positioned behind the blast face, at a safe distance of at least 250m.
- The Geotech shot firer will submit the blast plan map to the client prior to the blast, to ensure that all known site access possibilities have been addressed by the plan.
- The Geotech shot firer will ensure that all blast guards understand their positions, and their clearing run responsibilities, to ensure that all areas inside the blast zone are physically checked for personnel.
- When setting blast exclusion zones, the orientation and the size of the blast, the depths of the shots and the material being blasted must have been addressed and planned for.

**It is the Geotech shot firers responsibility to ensure all personnel within the blast zone are clear of the blast zone when firing.**

- The duty of the pickets is to ensure that all personnel are removed from the blast affected area and no-one is allowed back into the blast zone until the blast has been completed and the all clear advised
- Pickets are to be positioned to ensure all access ways within the blast zone are blocked, each picket is to position themselves in their vehicle so they can see all approaching traffic

- Before the pickets move into positions the Geotech shot firer will announce on the radio that there will be a blast in approximately 20 minutes
- Pickets move into their positions, the Geotech shot firer will announce on the radio that there will be a blast in approximately 15 minutes and all access points to the blast area are closed off & clearing runners start your clearing runs
- Before tying in the shot the shot firer will drive (with the siren on) or walk all of the blast area in a systematic way so as to confirm that the area is clear of people
- Blast pickets must not allow anyone into blast area during this time without permission of the shot-firer
- The Geotech shot firer will then ask the pickets in turn, if their access ways are secure. When the pickets have confirmed stating their name and location and that they are in position, the Geotech shot firer will commence tying in the shot.

#### **Shot firing**

- After tying in, the Geotech shot firer will then announce on the radio that the blast is about to take place. He will sound an air horn or siren three times on the radio before re-confirming pickets positions, then announcing "firing in 10 seconds"& counting down "5, 4, 3, 2, 1 now".
- The Geotech shot firer will wait until gasses have cleared, then visibly check the blast. When the Geotech shot firer is satisfied the blast area is safe, he will announce the ALL CLEAR, and request pickets to open their access ways.
- In the event of a misfire, the Geotech shot firer will ensure that all pickets remain in position. The Geotech shot firer will then follow the procedure for managing a misfire.
- Explosives shall be conveyed from the magazine to the shot in the designated explosive vehicles
- All unused explosives are to be returned to the magazine at the end of each day. A record of stock in and out of the magazine is to be kept.

#### **Lightning procedure**

For loaded shots, in the event of lightning in close proximity to the site, the blast exclusion zone of 500m for personnel and 200m for equipment is closed. Blast guards shall be put in place as per blast guarding procedure.

All persons must be withdrawn to outside the 500m exclusion zone. Once it is clear that the storm is receding the blast guards around the exclusion zone can stand down. All operations can resume.

## **BLASTING**

### **Blast Zone evacuation**

| Time                         | Action  | Responsibility |
|------------------------------|---|----------------|
| 30 minutes before blast time | Radio announcement to be made by Shot firer on appropriate channel. | Shot firer     |

### **Securing of Blast Exclusion Zone - Start 15 minutes before blast time. Radio announcement on channel 1**

| Step | Action  | Responsibility |
|------|---|----------------|
| 1    | Radio call to blast guards <i>"Blast guards please block your roads"</i>  | Shot firer     |
| 2    | <p>Blast guards shall close roads using a row of Yellow Cones placed across the road or accessway.</p> <p>Blast guards shall place their vehicle behind the row of cones so that they can see all approaching traffic.</p> <p>Blast guards shall prevent all persons from entering the Blast Exclusion Zone from this point in time until the All Clear is given.</p> | Blast guards   |
| 3    | Radio call to each blast guards in turn <i>"&lt;Name&gt;, &lt;Location&gt; are you in position and is it secure?"</i>   | Shot firer     |
| 4    | <p>Blast guard confirmation that position is secure <i>"&lt;Name&gt; at &lt;Location&gt;, in position and is it secure."</i></p> <p>If the position is NOT secure the pre-blast process shall stop and the Shot firer shall immediately investigate.</p>  | Blast guards   |
| 5    | The blast process shall not resume until the Shot firer is satisfied that the problem is rectified. The Radio confirmation process shall begin again at step 6.7.1  | Shot firer     |

### **Clearing Runs**

After the blast guards have closed their roads and confirmed their position is secure:

- The shot firer (and such approved clearing runners as have been pre-arranged) shall commence the clearing run(s).
- 4WD Vehicles used for clearing runs shall operate a blue flashing light and shall sound a siren continuously.
- If personnel or machinery are found in the exclusion zone the blast process shall be suspended, the personnel and or machinery removed from the exclusion zone and a serious incident report shall be initiated.

- Final checks and firing of blast – Start 5 minutes before blast time. Radio announcement on channel 1

| Step | Action   | Responsibility |
|------|--|----------------|
| 1    | Radio announcement by shot firer <i>"Attention all units, blasting is about to take place in &lt;location&gt;, please observe radio silence during this period"</i>  | Shot firer     |
| 2    | Radio call to each blast guard: <i>"&lt;Name&gt;, &lt;Location&gt; are you in position and secure?"</i>  | Shot firer     |
| 3    | Each blast guard shall confirm that position is secure <i>"&lt;Name&gt; at &lt;Location&gt;, in position and secure."</i> If the position is NOT secure the blast process shall stop and the shot firer shall immediately investigate. | Blast guard    |
| 4    | The blast process shall not resume until the shot firer is satisfied that the problem is rectified. The radio confirmation process shall begin again at step 6.9.1   |                |
| 5    | Radio announcement by shot firer <i>"Attention all units, blasting is about to take place in &lt;location&gt;"</i><br><br>Shot firer sounds siren and transmits over the radio.  | Shot firer     |
| 6    | Shot firer repeats blast guard checks and responses steps 2 to 5.  | Shot firer     |
| 7    | Radio announcement by shot firer <i>"Attention all units &lt;Shot firer company&gt; are firing a blast in the &lt;location&gt; in ten (10) seconds"</i>  | Shot firer     |
| 8    | Shot firer initiates the blast immediately. <i>(Counter last 5, 4, 3, 2, 1 Now Firing)</i>   | Shot firer     |

#### **6.10 Post blast inspection and All Clear**

After the blast is fired:

- Blast guards must wait in their positions.
- The Shot firer shall wait until gases and fumes have cleared before approaching the blast area.
- The Shot firer will visually check the blast area to confirm that it has initiated and that there are no environmental problems.
- If the blast fails to initiate the Shot firer shall keep all Blast guards in position until the Blast Area is secure. The Shot firer shall then follow the SWP for Managing a Misfire.
- When the Shot firer is satisfied the blast area is safe he will announce on the radio *"<Shot firer Company> have an All Clear at <location>, blast guards you may open your roads"*
- The Shot firer shall walk the complete blast area to ensure that all holes have successfully initiated. If a Misfire is discovered the Shot firer shall then follow the SWP for Managing a Misfire.

**Misfire procedures**

- If the cause of the misfire is not obvious, the Geotech shot firer shall wait a minimum of (5) Minutes or more at their discretion before making an inspection
- If the misfire is to be attended to immediately, the Geotech shot firer shall notify the guards to hold their position.

The Geotech shot firer must then treat the misfire in accordance with the following procedures:

- If the misfire occurs in the hours of darkness, then the Sleeping Shot Procedure is to be followed and the shot refired the following day.

In the case of non electric initiation:

- Replace the surface line to the point at which the misfire occurred and refire.

In the case of electric initiation:

- Shunt the shot firing line at the blasting machine
- Disconnect the detonator and check firing line continuity. If the appropriate circuit exists, place an electric detonator at the point at which the misfire occurred and refire.
- Blast area clearance for the initiation of misfires shall take account of any necessary increase of clearance radius in accordance with the potential for fly rock.

If the initiation is successful:

- The Geotech shot firer shall make an inspection and announce that the shot area is clear. The guards may now stand down from their positions.

If the initiation is unsuccessful:

- If the hole can be located, stemming and product is to be washed out of the hole. Water will dissolve anfo, disperse destroy emulsion.
- Packaged product that is found after a blast is to be removed by the shot firer.
- Product that is "dead pressed" shall be disposed of. Useable product will be distributed through the next blast using that product.
- If a misfired hole cannot be located due to intense blast induced ground movement the best approximate location is to be coned off. An excavation plan to the satisfaction of the mine manager or his delegated authority shall be developed and executed. During excavation minimal personnel shall be present and consist of, but not be limited to a shot firer, spotter and machine operator.
- Clearly identify the location of the misfire by barricading and / or designate a sleeping shot. Put up signs to restrict entry.
- A plan for dealing with the misfire must be developed and approved by the shot firer / client.

If the misfire is discovered by an excavator:

- The excavator operator must stop working immediately and notify the Shot firer.

- The shot firer must cone the area off and examine the scene to assess the best course of action and provide a plan for dealing with the misfire, approved by the Mine Manager.

The shot firer will treat the misfire in accordance with the previously mentioned procedures.

- Sleeping shot
- Replace surface line / refire
- Blast area clearance

If successful, inspect area again; announce shot successful and guards to stand down. If unsuccessful, wash product out of hole and any packaged product found is to be removed by the shot firer

An evacuation plan approved by the Mine Manager or delegated authority developed and executed.

### **Record of shots**

- The Geotech shot firer shall keep a daily record of the shots charged at the completion of their shift
- A Geotech shot firer shall record the following details on Form – DAB – Blast design and inspection record:
  - The number of holes charged
  - Total weights and type of explosive loaded
  - Location of sleeping shots
  - Plan / sketch of all shots

### **Handling of explosives**

Initiating explosives such as detonators may be transported by a vehicle which contains the packaged explosives provided they are placed in separate compartments.

### **Security**

- The Geotech shot firer in charge of blasting shall be responsible for the security of all Geotech magazines and their contents
- The Geotech shot firer shall ensure that the magazines are kept in good order, clean and free of flammable materials or defects
- The Geotech shot firer shall ensure that the locks on magazines are in good working order and that the keys to the magazine can always be accounted for
- Explosive stocks are to be managed such that old stocks do not accumulate (i.e. rotation of stock)
- The Geotech shot firer will perform an explosive stock take once a month to ensure all explosives are accounted for
- The Geotech shot firer shall immediately notify the client (who in turn may notify the Police) upon the discovery of any loss or suspected loss of any explosive material

**Revision history and effective date**

**Document owner:** Health and Safety Manager  
**Document reviewer:** Blast Supervisor  
**Controlled document:** Yes  
**Date of approval for use:** Existing document (v.5)

**Amendments**

| <b>Date amendments approved</b> | <b>Amendment details/reason</b>   | <b>Amended by</b> | <b>Reviewed by</b> | <b>Version</b> |
|---------------------------------|---|-------------------|--------------------|----------------|
| 4 April 2015                    | Updated format, added document control and revision history.  | Lisa Hankey       | Chris Morris       | v.6            |
| 27 February 2016                | Reviewed following incident investigation. Documented de facto 500m standoff/ exclusion zone, and requirements for blast observers. | Lisa Dickson      | Ant Black          | v.7            |



**BLAST GUARD INDUCTION FORM**

Name of Employee: \_\_\_\_\_

Name of Inductor: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor: YES / NO (circle) Name of Employer: \_\_\_\_\_

Location: \_\_\_\_\_

**KEY POINTS**

Employee Initial

Blast guard positions/ locations

Blast times

Guard to be in position 5 minutes prior to position secured

**BLAST GUARD DUTIES** Who has control of the blast guard position while blasting is taking place?

Who is the blast controller?

Who may pass through a blast guard position whilst the blast is taking place?

What are the blast guard duties?

Why must a blast siren be used?

When may the blast guard leave their position?

What is meant by the ALL CLEAR?

Who is allowed to give the ALL CLEAR?

**COMMENTS:** \_\_\_\_\_

By signing this induction, I the undersigned, am satisfied that the supervisor who conducted this induction has instructed me sufficiently to safely carry out my activities. I further agree to carry out any activities in compliance with the guidelines stated during the induction. I will notify my supervisor should any hazards be noted, I am unsure of any aspect, or I am involved in any incident/ accident)

Inductee's signature: \_\_\_\_\_

Inductee's name (print): \_\_\_\_\_ Date: \_\_\_\_\_

**BLAST01 - ASSESSMENT PAPER**

|                     |  |                     |  |
|---------------------|--|---------------------|--|
| Trainees name:      |  | Trainers name:      |  |
| Trainees signature: |  | Trainers signature: |  |

The trainee is required to answer all questions correctly in order to be deemed to have adequate understanding of the SWP. The trainer/assessor shall re-train/re-assess on incorrect answers.

**Question 1. Who is permitted to fire blasts?**

|    |  |    |                       |
|----|--|----|-----------------------|
| a. | All staff with Explosive Handlers Certificate. | c. | Appointed Shot-firers |
| b. | Blast Guards                                   | d. | All of the above      |

**Question 2. What safe practises should be observed during priming and charging?**

- 1.
- 2.
- 3.

**Question 3. Blasting in the hours of darkness will occur only in the winter months where the blast time is approx 17.45-18.15 pm.**

|      |                          |       |                          |
|------|--------------------------|-------|--------------------------|
| True | <input type="checkbox"/> | False | <input type="checkbox"/> |
|------|--------------------------|-------|--------------------------|

**Question 4. Tying in of shots should-**

|    |   |    |  |
|----|---|----|--|
| a. | Follow industry best practise.                      | c. | Follow the manufacturers instructions. |
| b. | Include visibly inspecting all surface connections. | d. | All of the above.                      |

**Question 5. All sleeping shots should be left tied in at the end of the day.**

|      |                          |       |                          |
|------|--------------------------|-------|--------------------------|
| True | <input type="checkbox"/> | False | <input type="checkbox"/> |
|------|--------------------------|-------|--------------------------|

**Question 6. All holes drilled should be according to the blast plan.**

|      |                          |       |                          |
|------|--------------------------|-------|--------------------------|
| True | <input type="checkbox"/> | False | <input type="checkbox"/> |
|------|--------------------------|-------|--------------------------|

**Question 7. Blast guards**

|    |  |    |   |
|----|--|----|---|
| a. | Must not allow anyone into the blast area.       | c. | Must confirm their name, position and the area is secure. |
| b. | Leave immediately after the shot has been fired. | d. | (a) and (c)   |

**Question 8. The Geotech Shot-firer shall record which details in a file?**

|    |                              |    |                             |
|----|------------------------------|----|-----------------------------|
| a. | The number of holes charged. | c. | Location of sleeping shots. |
| b. | Plan / sketch of all shots.  | d. | All of the above.           |

**Question 9. What should an excavator operator do if he discovers a misfire?**

- 1.
- 2.
- 3.

| ASSESSMENT RECORD               |       |                      |
|---------------------------------|-------|----------------------|
| Trainees signature:             | Date: | Assessors name:      |
| NOT YET COMPETENT               | Date: | Assessors signature: |
| COMPETENT AT TIME OF ASSESSMENT | Date: | Assessors signature: |

## **BLAST02 - Drilling, temperature logging and charging over hot areas**

### **Objective**

To provide a standard work practice for drilling, temperature logging, priming, loading and stemming when working over hot areas. Hot areas are defined as areas where the temperature is greater than 55° Celsius, up to 120° Celsius. This SWP identified and mitigates hazards and risks associated with this process.

Hot areas usually result from historic underground mining operations, where historic workings can contain gas or fire hazards. Some previously mined areas will have a long history of underground fires. Hot areas can also result from geothermal activity. This SWP does not specifically look at hazards or risks associated with geothermal drilling.

### **Personal protective equipment / Special equipment**

- Hard hats
- High visibility clothing
- Protective footwear
- Safety glasses
- Gloves
- Gas monitors/detectors
- Oxybox or SR50A (60Min) Self Rescuer
- Fit for purpose and calibrated temperature measuring equipment
- Temperature trending sheets
- Blast loading sheet and plan
- Fit for purpose explosives and initiation systems

### **Key hazards**

- Injury due to falling into underground voids
- Injury and loss of equipment due to ground collapse
- Exposure to toxic gases contained in holes and cavities
- Exposure to heat and steam emitted from holes and cavities
- Exposure to and injury from open fire and hot rock
- Escalation of underground fire
- Hydrogen/Water gas/Explosion
- Environmental hazards – water contamination

| Key hazards and controls associated with drill and blast over hot areas |   |
|---|---|
| Key hazards   | Controls  |
| Slip, trip or fall due to terrain or collapse of voids                  | <ul style="list-style-type: none"> <li>• Appropriate footwear</li> <li>• Set up worksite keeping in mind operational paths in work area and known void areas</li> </ul> |

|   |   |
|---|---|
| Exposure to heat, steam and toxic gases from voids/cavities | <ul style="list-style-type: none"> <li>• All staff to be gas/voids inducted</li> <li>• All staff to be gas/voids inducted</li> <li>• Appropriate PPE and equipment to be worn at all times, including gloves, eye protection and gas detectors</li> <li>• Work with care around holes/cavities</li> <li>• Oxybox or self rescuer to be on site</li> </ul> |
| Burns from working around hot holes                         | <ul style="list-style-type: none"> <li>• Gloves to be worn when working in hot areas and during temperature logging</li> <li>• All holes over hot areas to be marked (as per SWP)</li> </ul>  |
| Interaction with other people/plant                         | <ul style="list-style-type: none"> <li>• Good site control – awareness of environment and other operations</li> <li>• Secure operational area to ensure safety of staff and others in the vicinity</li> </ul>   |
| Premature or unexpected explosive performance               | <ul style="list-style-type: none"> <li>• Ensure blast expectation is within the product range</li> <li>• Only qualified and experienced staff to be used, following accepted procedures</li> </ul>  |

### Standard work practice

This standard work practice (SWP) applies to all drilling and charging of explosives over hot areas, on all project sites. In addition to the SWP, a site specific job hazard analysis (JHA) or similar safety plan must be completed to identify and mitigate any hazards or risks specific to the operating environment and location. Any client requirements must also be taken into account.

### Step 1 – Drilling

Responsibility: Project Manager, Shotfirer, Drill and Blast Crew

The Project Manager and Shotfirer must determine the order in which holes are to be drilled so that drilling of known or suspected hot areas is controlled. Drilling through fault planes or zones is to be avoided. If these areas cannot be avoided then they are to be drilled last. This will be determined by the Project Manager.

Gas bags are to be used to seal hot and high temperature holes until the day of loading. If any hazardous conditions are identified during drilling, then contact the Shotfirer and record it on the driller log sheet.

### Step 2 - Label holes, measure hole depths and complete re-drills

Responsibility: Shotfirer, Drill and Blast Crew

The Shotfirer checks that the holes have been drilled within one metre of the designed location. Any holes drilled outside of specification are to be noted. Shotfirer places a survey peg with the hole number at each hole.

Drill and Blast Crew measure depths of holes and record depth on the blast loading sheet. Identify any short holes, closed holes and holes that require back filling.

All holes out of specification (incorrect location or incorrect depth) shall be reported to the Shotfirer. Shotfirer determines if out of spec holes are to be redrilled and instructs Drill and Blast Crew to re-drill any identified holes.

### **Step 3 - Determine load and fire day**

Responsibility: Project Manager, Shotfirer, Authorised Temperature Loggers

The Project Manager and/or Shotfirer will assess alternatives before proceeding to load hot or extreme temperature holes, including infusion with water and not loading at all. The Project Manager and the Shotfirer will determine the expected loading and firing day, taking into account the following criteria.

- An estimate of the drilling time based on historical drilling performance in similar ground
- The number of holes in the blast design
- The area to be drilled and the drill availability

Allow sufficient time to carry out the temperature trending requirements of these procedures.

Checking the long range weather forecast for the expected day of loading and firing. Conditions that can prevent the firing of a shot include:

- Electrical storm
- Heavy rainfall
- Major frontal activity
- Low visibility

The Shotfirer communicates proposed loading and firing day to the Blast Crew. The Shotfirer monitors drilling progress and instructs the Authorised Temperature Loggers when to commence measuring and recording the temperature of the holes.

### **Important Note:**

A minimum of one measurement is to be taken per hour for a minimum of three hours. These readings establish a trend. Loading must commence no longer than one hour after temperature trending is completed. If this does not occur, a further trending process must take place.

In addition, loading must be completed and the blast fired no more than four hours after loading commences,

OR

Minimum of three measurements are to be taken at least four hours apart over a twelve hour period (day1).

A further reading is to be taken at twelve hours after the third reading (day2) and compared with the extrapolated trend line (to four hours after firing time) as taken on day 1.

If the temperature is below this trend line, loading can commence. Loading must commence within four hours of day 2 temperature assessment. In addition, loading must be completed and the blast fired no more than four hours after loading commences.

### **Step 4a - Temperature measurement method 1, Sequence 1**

Responsibilities: Authorised Temperature Loggers, Shotfirer, Drill and Blast Crew

A pattern containing a single known hot or extreme temperature hole must be temperature logged and treated in accordance with this procedure.

Temperature trending is to be carried out with reference to Australian Standard AS 2187.2 Explosives – Storage and Use Part 2: Use of explosives Section 12.6.2.

Only authorised temperature loggers are to carry out temperature measurement of blast holes.

Authorised temperature loggers cannot start temperature measuring until at least one hour after drilling the hole in the pattern has been completed due to the cooling effect of water, foam and air used in drilling.

Before using a thermocouple the authorised temperature loggers carrying out the measuring will conduct a hot water test. The level of accuracy of a thermocouple is taken to be  $\pm 1^{\circ}$  Celsius.

The thermocouple must be capable of measuring in the expected temperature range and be routinely calibrated and maintained. This is the responsibility of the Shotfirer. Gloves must be worn during temperature measuring.

The time and date of temperature measuring must be recorded in the temperature column of the blast load sheet refer Appendix 4 – Example Blast Load Sheet.

The thermocouple must be lowered to the bottom of the hole and left there for a sufficient time to give a steady reading. The head of the thermocouple must be held in close proximity to the blast hole wall to minimize inaccuracy caused by measuring air temperature rather than wall temperatures.

Slowly withdraw the thermocouple lead so that the temperature along the entire length of the hole is checked and record the highest reading. If a hot spot is encountered pause for a sufficient length of time to give a steady reading. Record the estimated position of the highest temperature down the hole in the temperature column of the blast load sheet.

The blast load sheet, including temperature measurements must be returned to the Shotfirer.

- Holes less than  $55^{\circ}$  Celsius (COLD) must be marked using a GREEN flag.
- Holes from  $55^{\circ}$  Celsius and less than  $120^{\circ}$  Celsius (HOT) must be marked using a YELLOW flag.
- Holes greater than  $120^{\circ}$  Celsius (Extreme) must be marked using a RED flag.

All extreme temperature holes must be reported to the Shotfirer at the completion of temperature measuring. The Shotfirer will then inspect all extreme temperature holes to determine the method of hole treatment:

- Gas Bag off
- Water infusion
- Hole abandonment (hole to be backfilled with stemming or drill cuttings)

A fit for purpose gas bag must be used. Gas bags are labeled with their temperature rating – the highest rating being  $140^{\circ}$  Celsius. The collar temperature must be checked before using a gas bag. If Extreme/Red temperature hole has collar temperature greater than  $120^{\circ}$  Celsius then place a large rock at the collar and pack with drill cuttings and/or clay. The objective is to prevent or reduce the ingress of oxygen into the hole. If in doubt, refer any queries to the Project Manager.



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**Step 4b - Temperature measurement method 2, Sequence 1**

Responsibilities: Authorised Temperature Loggers, Shotfirer, Drill and Blast Crew

A pattern containing a single Hot or Extreme temperature hole must be temperature logged and treated in accordance with this procedure.

Temperature trending is to be carried out with reference to Australian Standard AS 2187.2 Explosives – Storage and Use Part 2: Use of Explosives Section 12.6.2.

Only authorised temperature loggers are to carry out temperature measurement of blast holes.

Authorised temperature loggers cannot start temperature measuring until at least one hour after drilling the hole in the pattern has been completed due to the cooling effect of water, foam and air used in the drilling.

Before using a thermocouple the authorised temperature loggers carrying out the measuring will conduct a hot water test as outlined in the procedure SOP – Calibration and Maintenance of Thermocouples. The level of accuracy of a thermocouple is taken to be  $\pm 1^{\circ}$  Celsius.

The thermocouple must be capable of measuring in the expected temperature range and be routinely calibrated and maintained in accordance with SOP – Calibration and Maintenance of Thermocouples. This is the responsibility of the Shotfirer.

Gloves must be worn during temperature measuring. The time and date of temperature measuring must be recorded in the temperature column of the blast load sheet.

The thermocouple must be lowered to the bottom of the hole and left there for a sufficient time to give a steady reading. The head of the thermocouple must be held in close proximity to the blast hole wall to minimize inaccuracy caused by measuring air temperature rather than wall temperatures.

Slowly withdraw the thermocouple lead so that the temperature along the entire length of the hole is checked and record the highest reading. If a hot spot is encountered pause for a sufficient length of time to give a steady reading. Record the estimated position of the highest temperature down the hole in the temperature column of the blast load sheet.

The blast load sheet, including temperature measurements must be returned to the Shotfirer.

- Holes less than  $55^{\circ}$  Celsius (COLD) must be marked using a GREEN flag.
- Holes from  $55^{\circ}$  Celsius and less than  $120^{\circ}$  Celsius (HOT) must be marked using a YELLOW flag.
- Holes greater than  $120^{\circ}$  Celsius (Extreme) must be marked using a RED flag.

All Extreme temperature holes must be reported to the Shotfirer at the completion of temperature measuring.

The Shotfirer will then inspect all Extreme temperature holes to determine the method of hole treatment:

- Gas Bag off
- Water infusion
- Hole abandonment (hole to be backfilled with stemming or drill cuttings)

A fit for purpose gas bag must be used. Gas bags are labeled with their temperature rating – the highest rating being 140° Celsius. The collar temperature must be checked before using a gas bag. If Extreme/Red temperature hole has collar temperature greater than 120° Celsius then place a large rock at the collar and pack with drill cuttings and/or clay. The objective is to prevent or reduce the ingress of oxygen into the hole. If in doubt, refer any queries to the Project Manager.

#### **Step 4c - Temperature Measurement Method 1, Sequence 2**

Responsibilities: Authorised Temperature Loggers, Drill and Blast Crew, Shotfirer

Hole temperature measurements are undertaken a minimum of one hour after the first reading as per Step 4a) of the procedure (Temperature Measurement Sequence 1) by Authorised Temperature Loggers.

A minimum of three readings need to be taken.

The blast must be loaded and fired within four hours of commencing loading.

Loading must commence within four hours of completing the temperature trend procedure. If this does not occur, an additional trend sequence will be undertaken.

The Shotfirer will review the temperature measurements and trends and categorise them as follows:

- STABLE Holes with a rise in temperature of  $< 5^{\circ}$  Celsius over a three reading period.
- UNSTABLE Holes with a rise in temperature of  $> 5^{\circ}$  Celsius over a three reading period.

Any hole whose temperature has risen into the next temperature category must have its flag changed to the correct colour as per step 3 of this procedure (temperature Measurement – Sequence 1) by Authorised Temperature Loggers.

#### **Step 4d - Temperature Measurement Method 2, Sequence 4**

Responsibilities: Authorised Temperature Loggers, Blast Crew, Shotfirer

Hole temperatures are taken a minimum of four hours after first reading, as per step 4b) of the procedure (Temperature Measurement Sequence 1) by authorised temperature loggers.

A minimum of three readings need to be taken with each being at least four hours apart (day 1).

A further reading is to be at least twelve hours after the third reading (day2) and compared with the extrapolated trend line (to four hours after firing time) as taken on Day 1. If the temperature is below this trend line, loading can commence. Loading must commence within four hours of Day 2 temperature assessment. In addition, loading must be completed and the blast fired no more than four hours after loading commences.

Loading must commence within four hours of Day 2 temperature assessment. If this does not occur, an additional temperature trend (either method 1 or 2) must be undertaken.

The shotfirer will review the temperature measurements and trends and categorise them as follows:

- STABLE – Holes with a rise in temperature of  $> 5^{\circ}$  Celsius over a three reading period.
- UNSTABLE – Holes with a rise in temperature of  $\geq 5^{\circ}$  Celsius over a three reading period.

---

Any hole whose temperature has risen into the next temperature category must have its flag changed to the correct colour as per step 3 of this procedure (Temperature Measurement – Sequence 1) by authorised temperature loggers.

### **Step 5- Selection of explosives and initiation systems**

Responsibilities: Project Manager, Shotfirer

Hole temperatures and trends are to be used by the Shotfirer in determining whether a hole is to be loaded and in selecting explosive product to be used.

Using trend data projected forward, Shotfirer determines the expected hole temperature four hours after firing. This temperature projection point is used to select the explosive product to be used according to the following criteria:

For STABLE holes, if the expected hole temperature determined in point 2 above  $\leq 120^{\circ}$  Celsius, the Shotfirer marks the blast sheet to indicate that the hole must NOT BE LOADED UNLESS IT STABILISES PRIOR TO LOADING.




If the expected hole temperature determined in point 2 above is  $> 120^{\circ}$  Celsius, the Project Manager marks the load sheet to indicate that the hole MUST NOT BE LOADED and instructs the Shotfirer to change the colour of the flag at the hole collar to Red and backfill or seal the hole in accordance with Step 4 of this procedure.

The following specifications are to be used to determine appropriate explosive product and initiation systems for hole temperatures projected forward four hours after time of firing.

The products selected may change on the loading day depending on the final hole temperatures and further projection trending.

For HOT temperature holes with temperature from  $55^{\circ}$  Celsius and less than  $120^{\circ}$  Celsius:

- Use either Xtreme bulk or AMEST packaged explosive product.
- Use Fortis Boosters with RDX detonating cord downline.
- Use Bunch Dets to connect the RDX detonating cord to the standard Nonel surface and trunk line delays.
- Packaged product sleep time is not to exceed four hours
- Bulk product sleep time is not to exceed four hours.
- Extreme temperature holes greater than  $120^{\circ}$  Celsius are not to be loaded
- The Shotfirer estimates and orders the quantities and types of bulk products required for the blast

|   | Category Name | Temperature Range | Product          |
|---|---------------|-------------------|------------------|
|  | Cold          | 0°C – 54°C        | Any              |
|  | Hot           | 55°C – 119°C      | Xtreme/Amest     |
|  | Extreme       | >120°             | Not to be loaded |

### Step 6 – Pre-blast site inspection and hazard management

Responsibilities of: Project Manager, Shotfirer

The Shotfirer will conduct an inspection of the blast area and if necessary will conduct a risk assessment to manage additional hazards or changed conditions. The Shotfirer checks that controls will effectively reduce hazards.

### Step 7- Prepare and issue load sheet and tie-in plan

Responsibilities: Shotfirer

The Shotfirer with assistance from the Project Manager prepares a load sheet and tie-in sequence plan for the Shotfirer detailing:

- The initiation system for each hole
- Blast hole design locations
- Location of all verified underground workings of area to be blasted
- High risk areas following data sources:
  - Fracture
  - Height above workings
  - Height of underground voids
  - Type of strata
  - Thickness of strata
  - Drilling records
  - Previous blasts adjacent to the area
- Existence of and any hot and extreme temperature holes using following data sources:
  - All hole temperature measurement taken
  - Temperature trend data extrapolated to the firing time
  - Drillers record sheets
  - Previous blasts adjacent to the area
- Type and quantity of package explosive to be used for each hole having considered hole temperature trend and expected hole temperature.

### **Step 8 - Conduct final weather check**

Responsibility of: Shofirer

Conduct a second weather check to review if any electrical storm activity is present on the day of the loading and firing. If electrical storm activity is forecast on the day of firing, the size of the blast is to be curtailed to ensure firing prior to storm activity.

### **Step 9 - Pre-loading checklist and set up**

Responsibilities of: Shotfirer, Drill and Blast Crew

Review data provided by the Shotfirer and check that all items listed on the Shotfirer's Pre-loading Checklist have been addressed prior to commencing final temperature logging and loading. The Shotfirer will complete and sign a checklist for each blast.

Secure and barricade the blast area using blast signs and witches hats. Minimum clearance distance between operating machinery is as follows:

- Operating drill – 10 metres
- Operating mining equipment – 10 metres

### **Step 10 - Final temperature measurements**

Responsibilities of: Project Manager, Shotfirer, Authorised Temperature Loggers

The Shotfirer will use the Shotfirer's Loading and Firing Checklist to assist with critical elements of the loading and firing procedure and will complete and sign a checklist for each blast.

An Authorised Temperature Logger must measure the temperature of all holes prior to loading.

Any hole with a temperature over 54C will deem the whole shot to be loaded and blasted as a hot rock shot. The Project Manager will approve the shot.

Monitoring of gas levels in areas adjacent to UNSTABLE holes can assist in identification of increasing temperatures. There is a good correlation between increases in carbon monoxide levels and potential for adverse temperature rises. Any sudden rise in gas levels must be reported to the Shotfirer and/or Project Manager.

Temperature measuring shall be carried out as per Step 4 of the procedure.

The temperature measurements will be returned to the Shotfirer who will trend the hole temperatures, checking the classification of holes as STABLE or UNSTABLE, paying particular attention to holes whose temperature has risen  $\geq 5^{\circ}$  Celsius.

A final blast load sheet will be issued by the Project Manager or Shotfirer with all holes marked as either:

- Not to be loaded
- To be loaded – Product

---

**Step 11 - Prime and load blast holes with bulk explosive**

Responsibilities of: Shotfirer, Drill and Blast Crew

The Shotfirer will identify holes to be loaded, type and quantity of product to be used according to the signed blast load sheet as supplied by Project Manager. Before commencing loading, confirm depth of hole using dipping tape.

Measure depth of holes prior to priming and identify and record short holes, closed holes and holes to be backfilled. Place accessories next to each hole, not interfering with traffic flow. During priming, check accessories for damage. Remove and report any damaged explosives to the Shotfirer immediately. Primer must be raised a minimum of 500mm from bottom of hole and be fully immersed in the bulk product. Where possible, the hole must be primed in the top 2 metres of the bulk explosive column.

Check downlines are firmly secured at collar using the timber stake in drill chips. If no drill chips exist, downline is attached to a rock secured at the collar. Check tails of downlines are coiled around stake or rock. Place stake or rock in position as per loading sequence, so that the MMU and the stemming truck traffic are on the opposite side of the hole. Follow correct handling procedures as required by Mines Regulations and New Zealand Standards.

Identify holes to be loaded, type and quantity of bulk product to be used as per loading sheet. Communicate the loading sequence to blast crew.

Spot the MMU into position as per loading sequence plan, ensuring auger is positioned over the hole. Load holes as per loading sheet, taking care to avoid damage to downlines.

Pull booster up into product and position correctly in explosives column. Before commencing loading, confirm depth of hole using dipping tape. The maximum charge per hole must not exceed the quantity stated on the load sheet.

**Step 12 - Prime and load blast holes with packaged explosives.**

Responsibilities of: Shotfirer, Drill and Blast Crew

The Shotfirer will identify holes to be loaded, type and quantity of product to be used according to the signed blast sheet (refer Appendix 4) as supplied by Project Manager. Before commencing loading, confirm depth of hole using dipping tape. During priming, check accessories and packaged explosives for damage. Remove and report any damaged explosives to the Shotfirer immediately.

Place a Pyromex booster next to each hole, not interfering with traffic flow. Place a peg in the drill chips and in position as per loading sequence. Use of packaged explosive only. Place booster at least 1.2 metres off the floor (if conditions allow). Pyromex boosters are able to be placed in the blast hole in one of two ways:

- Slitting the existing packaged explosive as shown in figure 1 in Appendix 8 or:

- 
- Using plastic shells purchased from Orica and used as shown in figure 2 in Appendix 8.

Lower the booster on top of the explosives column and attach RDX cord to peg using half hitch. Check downlines are firmly secured at collar. Load all but the last 3 metres of product into the hole as per loading sheet, taking care to avoid damage to downlines.

Using the measured hole depth and then comparison of the aggregate packaged explosive length with the top of the explosive column will determine if decoupling has / may have occurred. If this has occurred or is suspected of occurring, top priming must be used in addition to the bottom priming. No additional packaged explosive will be used in the hole if there is a lower column height than expected. Load the remaining product to correct column height as per load sheet.

The maximum charge per hole must not exceed the quantity stated on the load sheet.

Follow correct handling procedures are required by Mines Regulation and New Zealand Standards.

### **Step 13 - Stem blast holes**

Responsibilities of: Shotfirer, Drill and Blast Crew, Stemming Truck Operator

The Shotfirer will identify holes that are ready for stemming and instruct the Drill and Blast Crew as to when to commence stemming. Only approved stemming product is to be used.

### **Step 14 - Surface temperature checks**

Responsibilities of: Shotfirer, Drill and Blast Crew

Using a hand held infra-red temperature gun, measure the surface temperature gun, measure the surface temperature at the collar of each blast hole.

Where the temperature at the surface exceeds 70° Celsius, a layer of insulation must be placed on the surface to protect the initiation system at that location, or the lines are raised off the ground surface.

The insulation layer can be any suitable non-conducting material.

### **Step 15 - Tie-In shot**

Responsibilities of: Shotfirer, Drill and Blast Crew

Connect Bunch Dets to RDX cord and leave RDX cord attached to peg. Check that peg is firmly secured in drill cuttings. Minimise the length of exposed RDX detonating cord by trimming excess.

When all holes are connected, the Shotfirer will commence the tie-in of surface lines at appropriate stand off distances from any continuing operations. No tie-in is to be closer than 10 metres from mining operations and 10 metres from loading activities.

Surface tie-in must be in accordance with signed tie-in sheet as supplied by the Shotfirer (refer Appendix 5). Any non-standard blasts must be signed off by the Project Manager.

When all holes are tied-in the Shotfirer will check all holes have RDX cord connected to a surface Bunch Det which are in turn connected to surface lines. Follow Geotech blasting procedures.



### **Step 16 - Premature detonation**

Responsibilities of: Shotfirer, Drill and Blast Crew

It is important to remember that explosives may detonate prematurely under confinement if exposed to higher temperatures than their product specification allows. Any abnormal indicators such as steam or fumes before or after loading must be monitored for any signs of rapid escalation in temperature. In the event of any loaded hole smoking or fuming excessively or erratically or there is evidence of stemming slump, all personnel must be removed from the pit until any sign of chemical activity has completely ceased.

The Shotfirer shall co-ordinate sentries and communicate with the Drill and Blast Crew and workforce throughout the duration of the pit clearance. The re-entry time shall be designated by the Project Manager in consultation with the Shotfirer.

### **Step 17 - Sleep times**

Responsibilities of: Shotfirer, Drill and Blast Crew

No sleep time is planned. All shots must be fired within a maximum of four hours after loading commences.

### **Step 18 - Proceed to firing procedure**

Responsibilities of: Shotfirer

Proceed to Geotech blasting procedures (for cold ground).

### **Step 19 - Misfire**

Responsibilities of : Shotfirer, Project Manager

The shotfirer must maintain pit clearance and sentries until the situation has been assessed and a risk management plan has been developed.

In the event of a misfire, a risk assessment to manage the misfire must be carried out taking into account the following:

- The exposure time of the explosives in the hole and the risk of extending the time beyond the recommended sleep times.
- Minimise the personnel on the bench to those directly involved with the management of the misfire.
- Establish an exclusion zone around the misfire area for activities not directly associated with the recovery of the misfire.

- Establishing an observer (from safe distance) to monitor any abnormal behaviour of the misfire and surrounding area such as smoke, fumes, heat, haze and fire.
- Develop an emergency evacuation plan and communicate it to all personnel managing the misfire.
- Standard misfire procedures may be applicable if explosives exposure time is within suppliers recommended sleep times
- Water may be used to wash out the misfire area though care must be taken as exposure of water to elevated temperatures may result in the generation of hot water and steam. Bunch Dets must not be exposed to temperatures over 70° Celsius.

The explosive supplier must be contacted and informed of the situation and, where possible, be involved in the risk assessment and management of the misfire. All charging of other hot ground blasts must cease until the misfire is managed. The Shotfirer must inform the Project Manager of the situation.

### **Step 20 – End of shift**

At the end of shift:

- Drillers shall sign out of the log sheet
- Drillers shall file all “Take 5” and JHA documents in appropriate place
- Drillers shall ensure they have recorded all results in record book/log

### **References**

Legislative Requirements for Shotfirers, blast crews and Magazine Keepers  
Stockton Alliance Mine Rules  
Geotech blasting procedures  
Muswellbrook Coal Company (MCC) shotfiring and explosives systems  
MSDS for all Orica explosives products and initiation systems  
Australian Standard AS 2187.2  
Stockton Alliance Health and Safety Management System  
Stockton Alliance Underground Void Hazard Controls  
Stockton Alliance Personal Gas Detector Use SWP  
Stockton Alliance Probe Drilling SWP  
Stockton Alliance Drill Hole Standpipe and Capping SWP

### **Definitions**

Cold holes – Holes where temperature is less than 55° Celsius  
Hot temperature holes – Holes where temperature is from 55° to 120° Celsius  
Extreme temperature holes – Holes where temperature is above 120° Celsius

**AN** – Ammonium Nitrate

**DFO** – Diesel Fuel Oil

**ANFO** – Explosive product created by blending AN and DFO and only suitable for loading cold holes

**AMEST** – Orica explosive (or equivalent) packaged product similar to ANFO but suitable for loading holes less than 120° Celsius. The term AMEST is used in this procedure to refer to the packaged variant of the extreme product range.

**Emulsion** – A colloid in which small particles of one liquid (eg AN) are dispersed in another (eg Fuel Oil) and are suspended in a stable position by an emulsifier.

**RDX** – Hot temperature blasting cord used down the hole, rated up to 145° Celsius for one hundred hours.

**Pyromex** – Hot temperature blasting booster used down the hole, rated up to 150° Celsius for eight hours.

**Nonel Det and Tube** – Non-electric detonation system which can be used on the surface, rated to 70° Celsius.

**Bunch Det** – Nonel and detonator suitable for connecting RDX to surface lines at the hole collar (on the surface), rated to 70° Celsius.

**Thermocouple** – Instrument used to measure the temperature in a blast hole in conjunction with digital thermometer capable of measuring in a specified temperature range.

**Temperature Trend** – A series of temperature readings plotted to scale on a graph which can then be extrapolated to four hours beyond the time of firing to either determine the stability of the temperature in one hour increments or the predicted temperature at the time of firing.

Important Note: One of two temperatures trends methods are to be used.

1. A minimum of one measurement is to be taken per hour for a minimum of three hours. These readings establish a trend. Loading must commence no longer than one hour after trending is completed. If this does not occur, a further trending process must take place. In addition, loading must be completed and the blast fired no more than four hours after loading commences. OR
2. A minimum of three measurements are to be taken at least four hours apart over a twelve hour period (day 1). A further reading is to be taken at twelve hours after the third reading (day 2) and compared with the extrapolated trend line (to four hours after firing time) as taken on day 1. If the temperature is below this trend line, loading can commence. Loading must commence within four hours of the day 2 temperature assessment. In addition, loading must be completed and the blast fired no more than four hours after loading commences.

**Stable Temperature** – A temperature rise of less than 5° Celsius per three hour period as determined by the temperature trend.

**Blast Crew** – Personnel holding current New Zealand Explosive Handling Licences and who are handling, transporting and using explosives.

**Shotfirer** – Site appointed person holding a current statutory Approved Handler Test Certificate.

**Xtreme** – Orica explosive product similar to ANFO but suitable for loading holes less than 120° Celsius. The term Xtreme is used in this procedure to refer to the AN variant of the Xtreme range and not the Fortan and Fortis Xtreme products.

**Authorised temperature Loggers** – Personnel who have been familiarised through a Toolbox talk with the temperature logging of Hot, High and Extreme temperature holes in accordance with this procedure.

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**LTIFR** – Lost Time Injury Frequency Rate.

**Revision history and effective date**

**Document owner:** Health and Safety Manager  
**Document reviewer:** Blast Supervisor  
**Controlled document:** Yes  
**Date of approval for use:** Existing document (v.2)

Amendments

| Date amendments approved | Amendment details/reason  | Amended by  | Reviewed by  | Version |
|--------------------------|---|-------------|--------------|---------|
| 27 March 2015            | Updated format, added document control and revision history.          | Lisa Hankey | Chris Morris | v.3     |
| 5 June 2015              | Reviewed prior to project work. Key hazards and controls table added. | Lisa Hankey | Ant Black    | v.4     |

**BLAST02 – ASSESSMENT PAPER**

|                            |  |                            |  |
|----------------------------|--|----------------------------|--|
| <b>Trainees name:</b>      |  | <b>Trainers name:</b>      |  |
| <b>Trainees signature:</b> |  | <b>Trainers signature:</b> |  |

The trainee is required to answer all questions correctly in order to be deemed to have adequate understanding of the SWP. The trainer/assessor shall re-train/re-assess on incorrect answers.

**Question 1. What colour flag should be used on holes ranging in temperature from 55° Celsius to 120° Celsius (HOT holes)?**

|    |        |    |       |
|----|--------|----|-------|
| a. | Yellow | c. | Green |
| b. | Blue   | d. | Black |

**Question 2. Name five key hazards associated with undertaking this task.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**Question 3. A temperature rise of less than 5° Celsius per three hour period is a stable temperature.**

|                                  |                                   |
|----------------------------------|-----------------------------------|
| a) True <input type="checkbox"/> | b) False <input type="checkbox"/> |
|----------------------------------|-----------------------------------|

**Question 4. One of two temperature trend methods can be used. What are they?**

|    |   |    |   |
|----|---|----|---|
| a. | A minimum of one measurement per hour for a minimum of three hours      | c. | A minimum of three measurements taken at least every four hours over a twelve hour period |
| b. | A minimum of one measurement every twelve hours over a three day period | d. | A minimum of one measurement every three hours over a twelve hour period.                 |

**Question 5. The Project Manager and/or Shotfirer will assess alternatives before proceeding to load Hot or Extreme temperature holes.**

|                                  |                                   |
|----------------------------------|-----------------------------------|
| a) True <input type="checkbox"/> | b) False <input type="checkbox"/> |
|----------------------------------|-----------------------------------|

**Question 6. Extreme temperature holes greater than 120° can be loaded at any time prior to blasting.**

|                                  |                                   |
|----------------------------------|-----------------------------------|
| a) True <input type="checkbox"/> | b) False <input type="checkbox"/> |
|----------------------------------|-----------------------------------|

**Question 7. Some high risk areas following data sources are:**

|    |                              |    |                       |
|----|------------------------------|----|-----------------------|
| a. | Type and thickness of strata | c. | Height above workings |
| b. | Height of underground voids  | d. | All of the above      |

**Question 8. What is the temperature range of hot holes?**

|    |             |    |              |
|----|-------------|----|--------------|
| a. | 20° – 54° C | c. | 55° – 119° C |
| b. | >120° C     | d. | 0° – 20° C   |

**Question 9. Packaged product sleep time is not to exceed four hours.**

|                                  |                                   |
|----------------------------------|-----------------------------------|
| a) True <input type="checkbox"/> | b) False <input type="checkbox"/> |
|----------------------------------|-----------------------------------|

| ASSESSMENT RECORD               |       |                      |
|---------------------------------|-------|----------------------|
| Trainees signature:             | Date: | Assessors name:      |
| NOT YET COMPETENT               | Date: | Assessors signature: |
| COMPETENT AT TIME OF ASSESSMENT | Date: | Assessors signature: |

## **BLAST03 – BLAST GUARDING AND WARNING PROCEDURES**

### **Objective**

To provide a standard work practice for the safe management of blast warning and perimeter controls to ensure no people are in, or can enter the blast zone in any circumstance.

### **Scope**

These guidelines apply to all staff involved in Geotech blast operations, and perimeter controls apply to any staff or observers in proximity of blast operations.

### **Standards for blast perimeters and warning procedures**

The person responsible for the firing of the shot needs to determine the location or distance from the shot of the guarded perimeter. This should be determined from a risk assessment taking into consideration technical concerns, the blast zone, and any known hazards in the shot or the environment. Geotech standard is for a minimum 500m exclusion zone for all areas adjacent to or forward of the blast zone, or areas where there is any practical risk of fly rock. Where a center-type lift blast is undertaken (where there is no free face), a circular exclusion zone of at least 500m must be adopted.

While a 500m exclusion zone is the Geotech standard, there is ability for the shotfirer to determine the exclusion zone on a shot by shot basis. The exclusion zone must take into account the orientation and the size of the blast, the depths of the shots and the material being blasted, and must ensure that any personnel on site, or observing the blast, are in a location safe from risk of flyrock or debris. Any observers must be positioned behind the blast face, at a safe distance of at least 250m.

Persons in the vicinity of the blasting area will be warned and withdrawn to a safe area before firing the shot. They will not return until the all clear has been given. It is the responsibility of the shot firer to ensure all personnel within the blast zone are clear of the blast zone before firing.

Adequate roadblocks and/or warning signs, or where necessary blast guards, shall be placed at access ways to prevent unauthorized vehicles or people entering the blast area or exclusion zone. Blast guards will be positioned to ensure all access ways within the blast zone are blocked and to prevent access to the blast zone until the blast has been completed and the all clear given. All means of entry to the blasting area need to have guards or effective barricades to prevent unauthorized access.

A blast plan map will be present on site, showing any roads or access into the site, the blast exclusion zone, and all blast guard locations. Blast guards must visually site the map during the blast briefing.

### **Blast guards**

The blast guard is required to understand where their location is and the sequence of events that will take place while the shot is being fired. Each blast guard is to position themselves in their vehicle so they can see all approaching traffic. Prior to giving the radio call "in position and secure", they must:



- Have the access coned off (sufficient cones that the road is blocked off, DANGER NO ENTRY BLASTING IN PROGRESS sign in place)
- Be in position to see any approaching traffic
- Have a blue and orange light flashing
- Have completed a clearing run to visually confirm no person or machine is in the danger zone
- Be in clear radio contact with the blast controller
- Have viewed a sufficient standoff zone to guarantee non radio equipped people cannot stray into the firing zone, in the time between the clearing run and initiation

Blast guards must have signed the blast guarding form.

### Warnings

1. The Geotech shot firer will announce on the radio that there will be a blast in approximately 20 minutes.
2. Blast guards will move into positions.
3. Geotech shot firer will announce that there will be a blast in 15 minutes and that all access points to the blast areas are closed off.
4. Shot firer will instruct clearing runners to start the clearing runs.
5. Before tying in the shot the shot firer will drive (with the siren on) or walk all of the blast area in a systematic way so as to confirm that the area is clear of people.
6. Blast guards will prevent access to the blast area. No one will enter without specific permission from the shot firer.
7. Shot firer will ask the blast guards in turn to confirm that their access ways are secure.
8. Shot firer will announce that the blast is about to take place.
9. Air horn or siren will be sounded three times.
10. Blast guards will be asked to reconfirm.
11. Firing announcement ("Firing in 10 seconds and counting down, 5-4-3-2-1-now").
12. Once the shot firer is satisfied the blast area is safe, he will announce the all clear.
13. Shot firer will request blast guards to open access ways.

### Revision history and effective date

**Document owner:** Health and Safety Manager  
**Document reviewer:** Blast Supervisor  
**Controlled document:** Yes  
**Date of approval for use:** Existing document (v.1)

### Amendments

| Date amendments approved | Amendment details/reason  | Amended by   | Reviewed by  | Version |
|--------------------------|---|--------------|--------------|---------|
| 24 October 2014          | Biennial review. Updated format, added document control and revision history.   | Lisa Hankey  | Chris Morris | v.2     |
| 27 February 2017         | Reviewed as part of incident investigation. Geotech de facto 500m standoff/ exclusion zone standard has been documented, along with rules for blast observers | Lisa Dickson | Ant Black    | v.3     |

**BLAST GUARDING FORM**

Name of Employee: \_\_\_\_\_

Name of Inductor: \_\_\_\_\_ Date: \_\_\_\_\_

**Personal Protective Equipment**

- Hard Hat
- Safety Glasses
- High Visibility Clothing
- Safety Footwear

**Aim of blast guards: To ensure no people are in, or can enter the blast zone in any circumstance.**

Prior to giving the radio call "in position and secure" each blast guard must be:-

- Absolutely satisfied all blast guard requirements have been fulfilled.
- In the correct and agreed position.
- Have the access coned off (sufficient cones that the road is blocked off, DANGER NO ENTRY BLASTING IN PROGRESS sign in place).
- Be in position to see any approaching traffic.
- Have a blue and orange light flashing.
- Have completed a clearing run to visually confirm no person or machine is in the danger zone.
- Be in clear radio contact with the blast controller.
- Have viewed a sufficient standoff zone to guarantee non radio equipped people cannot stray into the firing zone, in the time between the clearing run and initiation.

I confirm I have been inducted and understood the above procedures.

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Date: \_\_\_\_\_

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## **BLAST05 – MANAGEMENT OF THE MAGAZINE**

### **Objective**

To provide guidelines and rules for the management of Geotech explosives magazines and storage of explosives when not being used.

### **Scope**

These guidelines and rules apply to all Geotech explosives magazines. They relate to the storage of explosives when they are not being used in a blast or being transported. These guidelines are intended to provide reference material for persons who are already Approved Handlers for shotfiring. It does not cover technical information or blasting practices and provides only basic information on the management of the magazine.

### **Training and competency standards**

The person in charge of the magazine will be trained and competent, and will hold a current Approved Handlers certificate. The person in charge of the magazine has specific duties including:

- Ensuring only authorized person have access to the magazine
- Ensuring that the magazine is secured at all times
- Ensuring that the magazine key is in the care of an authorized person, or is locked in a secure location
- Ensure that explosives stock levels are within the license limits
- Manage stock rotation
- Manage all documentation and record keeping as outlined in this SWP
- Maintain the magazine in the correct condition

### **Standards for management of the magazine – Rules and housekeeping**

Magazines will be managed in accordance to the requirements of the Hazardous Substances and New Organisms (HASNO) Act 1996. Magazine rules for the operation of the magazine are to be displayed inside the magazine in a prominent position. A template for magazine rules is included with this SWP. Magazine rules will include license capacity of the magazine, security procedures, housekeeping rules and details of who to contact for maintenance approvals.

The floor of the magazine should be kept clean of dirt, empty packaging and explosives. Spillages of explosives must be cleaned up and properly disposed of immediately. It is the responsibility of the magazine keeper to maintain the magazine in correct condition.

### **Standards for management of the magazine – Record keeping**

Approved Handlers must keep accurate and updated records of magazine stocks. The records should include:

- The description including name and quantity of each item stored in the magazine
- Quantity of each item removed for a daily job
- Quantity of each item returned upon completion of a job
- Running total of quantity of stocks on site

Regular stock takes should be completed to confirm that no explosive has been lost or stolen. Empty explosives boxes should have the hazard diamond removed and be safely destroyed or disposed of. They must not be used to contain other objects.

#### **Theft or loss of explosive**

On detecting theft or any unaccountable shortage of explosives, the person in charge of the magazine is required to advise the site senior executive immediately.

#### **Disposal of surplus and defective explosives**

Explosives that are considered defective, or surplus to requirements must be rendered permanently explosively inert, legally transferred to another competent person, or disposed of in a safe manner, in compliance with the HASNO Act. The method of destruction will depend on the nature of the explosive and its hazard.

In the event where any cartridge, or part of a cartridge, of explosives is found after shot-firing, it should be inserted into another blasthole in such a manner that it will be completely destroyed when the later shot is fired.

A faulty detonator should be disposed of by inserting it into a primer in another blast in a manner that ensures it will be completely destroyed when the shot is fired.

#### **Revision history and effective date**

**Document owner:** Health and Safety Manager  
**Document reviewer:** Blast Supervisor  
**Controlled document:** Yes  
**Date of approval for use:** Existing document (v.1)

#### **Amendments**

| <b>Date amendments approved</b> | <b>Amendment details/reason</b>  | <b>Amended by</b> | <b>Reviewed by</b> | <b>Version</b> |
|---------------------------------|--|-------------------|--------------------|----------------|
| 14 April 2015                   | Biennial review. Changed name from Magazine Rules to Management of the Magazine. Updated format, added training and competency standards, housekeeping, record keeping and disposal. Document control and revision history also added. | Lisa Hankey       | Chris Morris       | v.2            |

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## **MAGAZINE RULES**

MAGAZINE RULES FOR GEOTECH MAGAZINE NO: \_\_\_\_\_

DANGEROUS GOODS LICENCE NO: \_\_\_\_\_

LICENCE CAPACITY OF THIS MAGAZINE IS: \_\_\_\_\_  
(THIS STORAGE LIMIT MUST NOT BE EXCEEDED AT ANY TIME)

1. This magazine shall be used only for the storage of explosives and not as a working place for other purposes.
2. High explosives must not be kept in the same magazine as detonators.
3. This magazine shall be kept securely closed and locked when not in use.
4. Maintenance work must not be carried out on this magazine except with the approval of \_\_\_\_\_ Tel No: \_\_\_\_\_
5. This magazine must be kept clean and free from rubbish such as bags, empty cartons, rags and other waste.
6. The floor must be kept clean. A broom shall be provided.
7. Cases must not be stacked more than 2 metres high and must be clear of wall ventilators.
8. Old stock must be used first. Stock that is not useable due to damage or age must not be allowed to remain in this magazine.
9. Loose explosive cartridges or detonators must not be left exposed in the magazine. Any loose plugs or detonators must be re-packed in the carton or placed in a special receptacle and disposed of as soon as possible.
10. Steel tools shall not be used to open packages in the magazine.
11. Dry undergrowth or combustible materials must not be allowed on the ground within 8 metres of the magazine.
12. The magazine shall be closed and locked during thunderstorms.
13. The earth connections shall be checked for electrical continuity at least every twelve months.
14. Not more than 1 ton of explosives shall be stored for every 2 square metres of floor space.
15. Smoking is not allowed. No matches or cigarettes lighters are to be brought into this magazine.
16. All explosives must be kept in their original container or special receptacle.
17. No person affected by drugs or alcohol, or under 16 years of age shall be allowed in the magazine.
18. All stock movements in and out shall be recorded in the stock record book.
19. All mobile phones and radios must be switched OFF within 8 metres of a magazine storing electric detonators

## **BLAST07 – Lightning procedure**

### **Objective**

The purpose of this procedure is to provide guidelines for the safe storage, handling and use of explosives at Geotech operations during lightning in the immediate area. Risks must be managed with controls in place to ensure the safety of all people at the site.

### **Scope**

These guidelines discuss specific requirement in the even of lightning within 16km of blasting operations.

### **Guidelines for safe handling of explosives in the event of lightning**

The risk of lightning strike causing an unplanned detonation must be considered whilst preparing for a blast and during blasting. The primary considerations in the prevention of lightning strike causing an unplanned detonation shall include, but are not limited to:

- Monitoring of weather conditions prior to loading activities commencing
- Procedures for cessation of blasting activities when lightning observed in the area
- The requirement of personnel to move outside the exclusion zone when lightning is a danger

Weather conditions must be monitored. If there is any likelihood of a thunderstorm in the immediate area, or within 16 km of the site, then the direction of the storm should be assessed to ascertain if lightning poses a danger. If the storm is not moving towards the site, blasting work can continue. If the storm is moving towards the site, then the following lightning detector warning system alarms must be used (when the following distances are recorded):

- 0 – 5 km      Red light
- 5 - 16 kms    Amber light
- 16 – 30 kms   Blue light
- 30 – 60 kms   Green light

Magazines must be closed and locked during thunderstorms within 16km.

### **Actions for loaded blast holes in the event of lightning**

- Treat as a sleeping shot
- Shotfirer to call all staff to evacuate the area
- Everyone within the exclusion zone must evacuate
- Blast guards deployed to their locations with a 500 m exclusion zone
- Magazines must be locked down with a 500 m exclusion zone enforced for other than transiting traffic.

**Revision history and effective date**


**Document owner:** Health and Safety Manager  
**Document reviewer:** Blast Supervisor  
**Controlled document:** Yes  
**Date of approval for use:** Existing document (v.1)

**Amendments**

| <b>Date amendments approved</b> | <b>Amendment details/reason</b>   | <b>Amended by</b> | <b>Reviewed by</b> | <b>Version</b> |
|---------------------------------|---|-------------------|--------------------|----------------|
| 14 April 2015                   | Biennial review. Updated format, added document control and revision history. | Lisa Hankey       | Chris Morris       | v.2            |

## 28. Appendix C Notice of Blasting

### *Notice of Blasting – Sample Only*

|   |   |
|---|---|
| <p>Samoa: Faleolo International Airport: Design &amp; Construct<br/>Physical Works: Pavements, Drainage &amp; Service Infrastructure</p>  |  |
| <h3>Olo Quarry</h3> <h3>Notice of Blasting</h3>   |   |
| <p><b>To Mulifanua Community Members &amp; Nearby Residents:</b></p>  |   |
| <p>Olo Quarry is now operational and producing aggregate for the Faleolo International Airport Runway Resurfacing Project. Heavy machinery is working throughout the quarry and it is not safe for pedestrians to go inside the quarry area. Residents are requested to keep clear of the site. We especially ask parents to warn their children to stay clear of Olo Quarry. Security is present on site 24/7.</p> |   |
| <p>Pedestrians and residents vehicles are still able to use the quarry access route but are asked to take care as heavy vehicles also use the route. Speed limit and warning signs have been placed along the route.</p>  |   |
| <p><b>This is to inform Community Members, Churches &amp; Schools, that blasting is programmed for:</b></p>   |   |
| <p><u>Monday</u></p>  | <p><u>16 April</u> at <u>2:00 PM</u></p>  |
| <p>_____</p>  | <p>_____</p>  |
| <p>_____</p>  | <p>_____</p>  |
| <p>_____</p>  | <p>_____</p>  |
| <p>The following safety measures apply:</p>   |   |
| <p>Ten minutes before the blast a warning siren will sound.</p>   |   |
| <p>30 seconds before the blast the warning siren will sound again.</p>  |   |
| <p>After the blast a loud hailer will give an All Clear signal.</p>   |   |
| <p>Traffic on the quarry access route will be stopped and held at checkpoints clear of the quarry until the All Clear signal is given.</p>  |   |
| <p>Quarry staff will retire to a safe distance.</p>   |   |
| <p><b>If you have any queries or concerns you can contact:</b></p>  |   |
| <p>Downer NZ on 77 05002 or 77 05003 or <a href="mailto:craig.smart@downer.co.nz">craig.smart@downer.co.nz</a></p>  |   |
| <p>SAA/SAIP Ms Ruseta Taaloga on 7502602 or 44330 or <a href="http://www.saip.ws/">http://www.saip.ws/</a></p>  |   |
| <p>Also <a href="mailto:ruseta.taaloga@saip.ws">ruseta.taaloga@saip.ws</a> or <a href="mailto:moli.latu@saip.ws">moli.latu@saip.ws</a></p>  |   |



## 29. Appendix D Qualifications

Shot firer and approved handler qualifications

### Individual Training Summary By Name

**Daniel Skilton**

Department: Operations  
ID Code: DS  
Job Title: Drill & Blast

#### Certificates

■ Certificate / License Expired  
■ Due within 14 days

| <u>Certificates / Licences</u> | <u>Expires</u> | <u>Susp. To</u> |
|--------------------------------|----------------|-----------------|
| Approved Handlers 2372         | 17/02/2020     |                 |
| Storage                        |                |                 |
| Transport                      |                |                 |
| Use                            |                |                 |
| Drivers Licence DF78241        | 24/10/2024     |                 |
| 1- Light                       |                |                 |
| 2-Medium Rigid                 |                |                 |
| 4- Heavy Rigid                 |                |                 |
| 5- Heavy Combo                 |                |                 |

#### Training

■ History, no longer a requirement   ■ Training topic required for job type  
■ Training overdue  
■ Due within 14 days

| <u>Training Topic</u>                                | <u>Procedure</u> | <u>Ver.</u> | <u>Lev.</u> | <u>Comp. Date Last Provided</u> | <u>Freq. Mths</u> | <u>Date Next Due</u> | <u>Days Until</u> | <u>Date on Course</u> | <u>Employee Initials</u> |
|--|------------------|-------------|-------------|---------------------------------|-------------------|----------------------|-------------------|-----------------------|--------------------------|
| Annual Medical                                       |                  |             |             | 20/02/2017                      | 12                | 20/02/2018           | 8                 |                       |                          |
| Approved Handler Certificate                         |                  |             |             | 20/02/2015                      | 60                | 20/02/2020           | 738               |                       |                          |
| Approved Handlers Cert (AH2) Detonation              |                  |             |             | 26/01/2010                      |                   |                      |                   |                       |                          |
| Approved Handlers Cert (AH6)                         |                  |             |             | 26/01/2010                      |                   |                      |                   |                       |                          |
| Canterbury Civil Site Safe                           |                  |             |             | 22/07/2014                      |                   |                      |                   |                       |                          |
| Chainsaws  |                  |             |             | 29/05/2009                      |                   |                      |                   |                       |                          |
| ConstructSafe Tier 1                                 |                  |             |             | 19/09/2017                      |                   |                      |                   |                       |                          |
| Controlled Substance Licence                         |                  |             |             | 22/08/2013                      |                   |                      |                   |                       |                          |
| Fall Arrest Working At Heights                       |                  |             |             | 10/07/2010                      |                   |                      |                   |                       |                          |
| Fire Fighting  |                  |             |             | 22/04/2010                      |                   |                      |                   |                       |                          |
| First Aid  |                  |             |             | 9/02/2017                       | 24                | 9/02/2019            | 362               |                       |                          |
| Gas Level 2 Induction                                |                  |             |             | 20/02/2015                      |                   |                      |                   |                       |                          |
| Induction - Strongman                                |                  |             |             | 24/10/2014                      |                   |                      |                   |                       |                          |
| L1 Basic Traffic Controller Cert                     |                  |             |             | 26/02/2015                      |                   |                      |                   |                       |                          |
| Operate A Chainsaw                                   |                  |             |             | 25/02/2015                      |                   |                      |                   |                       |                          |
| SWP : BLAST01 Blasting Procedures                    |                  |             |             | 19/11/2013                      |                   |                      |                   |                       |                          |
| SWP : BLAST02 Drilling, T. Logging, Charge Hot Areas |                  |             |             | 20/02/2015                      |                   |                      |                   |                       |                          |
| SWP : BLAST03 Blast Guarding                         |                  |             |             | 18/11/2013                      |                   |                      |                   |                       |                          |
| SWP : BLAST05 Magazine Rules                         |                  |             |             | 18/11/2013                      |                   |                      |                   |                       |                          |
| SWP : BLAST07 Lightning Procedure                    |                  |             |             | 18/11/2013                      |                   |                      |                   |                       |                          |
| SWP : BLAST06 Blow Loading ANFO                      |                  |             |             | 18/11/2013                      |                   |                      |                   |                       |                          |
| SWP : GDST01 Industrial Rope Access                  |                  |             |             | 18/11/2013                      |                   |                      |                   |                       |                          |
| SWP : GDST02 Working At Heights                      |                  |             |             | 22/06/2012                      |                   |                      |                   |                       |                          |
| SWP : GDST03 Grouted Cable Bolts & Tendons           |                  |             |             | 18/11/2013                      |                   |                      |                   |                       |                          |
| SWP : GDST07 Ropes Training & Site Inspection        |                  |             |             | 18/11/2013                      |                   |                      |                   |                       |                          |
| SWP : HS&EM03 Control Of Energy, Isolation, Tag Out  |                  |             |             | 20/02/2015                      |                   |                      |                   |                       |                          |
| SWP : HS&EM04 Emergency Procedures                   |                  |             |             | 20/02/2015                      |                   |                      |                   |                       |                          |
| SWP : HS&EM05 Fire Protection & Prevention           |                  |             |             | 20/02/2015                      |                   |                      |                   |                       |                          |
| SWP : HS&EM06 First Aid Facilities                   |                  |             |             | 20/02/2015                      |                   |                      |                   |                       |                          |

## Individual Training Summary By Name

|   |       |            |   |    |       |
|---|-------|------------|---|----|-------|
| Use a truck loader crane to lift and place loads  | 16617 | 8/08/2017  | 3 | 15 | _____ |
| Manage first aid in emergency situations  | 6400  | 9/02/2017  | 3 | 2  | _____ |
| Provide first aid   | 6401  | 9/02/2017  | 2 | 1  | _____ |
| Provide resuscitation level 2   | 6402  | 9/02/2017  | 1 | 1  | _____ |
| Demonstrate knowledge of the Code of Practice relating to chainsaw use                        | 6916  | 24/03/2015 | 2 | 5  | _____ |
| Demonstrate knowledge and skills for driving on a road for endorsement W (wheels)             | 16701 | 2/09/2014  | 3 | 3  | _____ |
| Demonstrate knowledge and skills for driving on a road for endorsement R (rollers)            | 16702 | 2/09/2014  | 3 | 3  | _____ |
| Demonstrate knowledge and skills for driving on a road for endorsement T (tracks)             | 16703 | 2/09/2014  | 3 | 3  | _____ |
| Protect health and safety in the workplace  | 497   | 11/12/2013 | 1 | 1  | _____ |
| Use safety harness when working at height   | 23229 | 11/12/2013 | 3 | 4  | _____ |
| Conduct safety checks prior to equipment usage at an extractives site                         | 8922  | 29/06/2012 | 2 | 2  | _____ |
| Identify the causes of back injury and methods to prevent back injuries in the workplace      | 17592 | 29/06/2012 | 3 | 4  | _____ |
| Safely shut down and isolate machines and equipment   | 2401  | 29/06/2012 | 3 | 3  | _____ |
| Suppress fire with hand extinguishers and fixed hose reels                                    | 3271  | 30/04/2012 | 2 | 1  | _____ |
| Explain principles of fire science  | 4647  | 30/04/2012 | 2 | 1  | _____ |
| Wear and operate breathing apparatus in general emergencies                                   | 3272  | 15/10/2009 | 3 | 3  | _____ |
| Operate a chainsaw  | 6917  | 29/05/2009 | 3 | 5  | _____ |
| Demonstrate basic knowledge and ability required to work in an underground mine               | 7146  | 26/05/2009 | 2 | 6  | _____ |
| Fill in a form  | 3483  | 25/05/2009 | 1 | 4  | _____ |
| Carry out pre-drive vehicle checks on a heavy motor vehicle, start it up, and shut it down    | 15158 | 25/05/2009 | 2 | 4  | _____ |
| Operate a rigid vehicle to meet the requirements for a full Class 4 driver licence            | 17576 | 25/05/2009 | 3 | 7  | _____ |
| Employ fall arrest systems on building and construction sites                                 | 15757 | 20/06/2008 | 3 | 4  | _____ |
| Outline the legal and operational requirements of mining and blasting for an approved handler | 20333 | 26/05/2008 | 4 | 10 | _____ |
| Demonstrate knowledge of storing explosives for use in extractive industries                  | 21152 | 26/05/2008 | 4 | 10 | _____ |
| Demonstrate knowledge of explosives and their properties                                      | 17694 | 26/05/2008 | 2 | 2  | _____ |
| Demonstrate knowledge fatigue management, work time, & driver logbook requirements.           | 24089 | 21/02/2008 | 1 | 2  | _____ |
| Operate a motor vehicle to meet the requirements for a full Class 2 driver licence            | 17574 | 21/02/2008 | 3 | 7  | _____ |
| Read and assess texts to gain knowledge   | 2989  | 1/12/2006  | 2 | 4  | _____ |
| Select materials and establish processes for a manufacturing task                             | 7525  | 23/11/2006 | 2 | 4  | _____ |
| Carry out an acid-base volumetric analysis  | 90306 | 3/11/2006  | 2 | 3  | _____ |
| Solve simple quantitative chemical problems   | 90763 | 13/09/2006 | 2 | 2  | _____ |
| Carry out qualitative analysis  | 90305 | 9/05/2006  | 2 | 3  | _____ |
| Use statistical methods and information   | 90193 | 4/11/2005  | 1 | 3  | _____ |
| Interpret information presented in tables, diagrams, and graphs to answer given questions     | 18988 | 18/10/2005 | 1 | 2  | _____ |
| Carry out a practical science investigation with direction                                    | 90186 | 18/10/2005 | 1 | 4  | _____ |
| Describe aspects of biology   | 90188 | 16/09/2005 | 1 | 5  | _____ |
| Develop a technological solution to address a given brief                                     | 90045 | 8/06/2005  | 1 | 6  | _____ |

### Competency Key

- 1 Training
- 2 Supervision
- 3 Competent
- 4 Trainer



INDEPENDENT CONSULTANCY SERVICES LTD

**TEST CERTIFICATE****Approved Handler****Certificate Number: AH000012-2372****Replaces certificate AH1572**

Issued pursuant to Section 82 of the Hazardous Substances and New Organisms Act 1996

Issue date: **18th February 2015**Expiry date: **17th February 2020**

Name:

***Daniel Rex Skilton***Date of Birth: **23/09/89****Residential contact details:**49B Caledonian Road  
Westport

Telephone: (021) 298 5374

**Work contact details:**Geotech Ltd  
PO Box 76  
Charleston  
(03) 280 8603

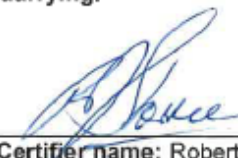
This certificate is issued in accordance with Regulation 5 of the Hazardous Substances and New Organisms (Personnel Qualifications) Regulations 2001. This certifies that the handler has met the relevant requirements for the substances and lifecycles specified below:

**Substances/Classes****Explosives – Blasting**  
(Classes 1.1B, 1.1D & 1.4S)**Lifecycles****Use, Storage & Transport****Conditions:**

- 1) Unless surrendered or revoked beforehand, this certificate shall remain in force until the expiry date above and may be renewed thereafter by an authorised test certifier.
- 2) This certificate must be produced at the request of an enforcement officer appointed under the HSNO Act 1996.

**Special conditions:**

- 1) The certificate is limited to handlers in control of class 1 explosives in **Surface Mining & Quarrying**.

  
**Test Certifier name: Robert John Storrie**  
**Test Certifier registration no: TST00012**PO Box 17-556  
Sumner, Christchurch  
Phone: (03) 326 3101  
Fax: (03) 326 3102  
Mobile: 027 269 0601  
E-mail: rob@ics.co.nz

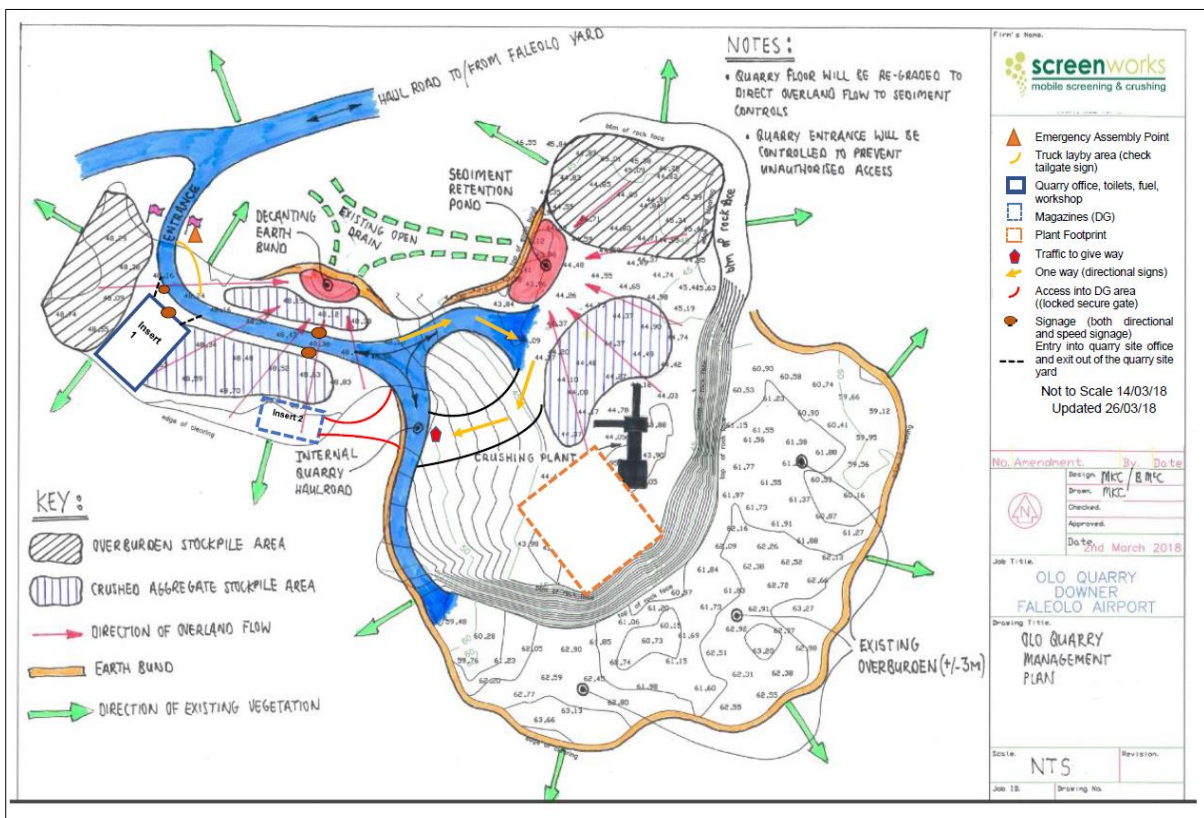
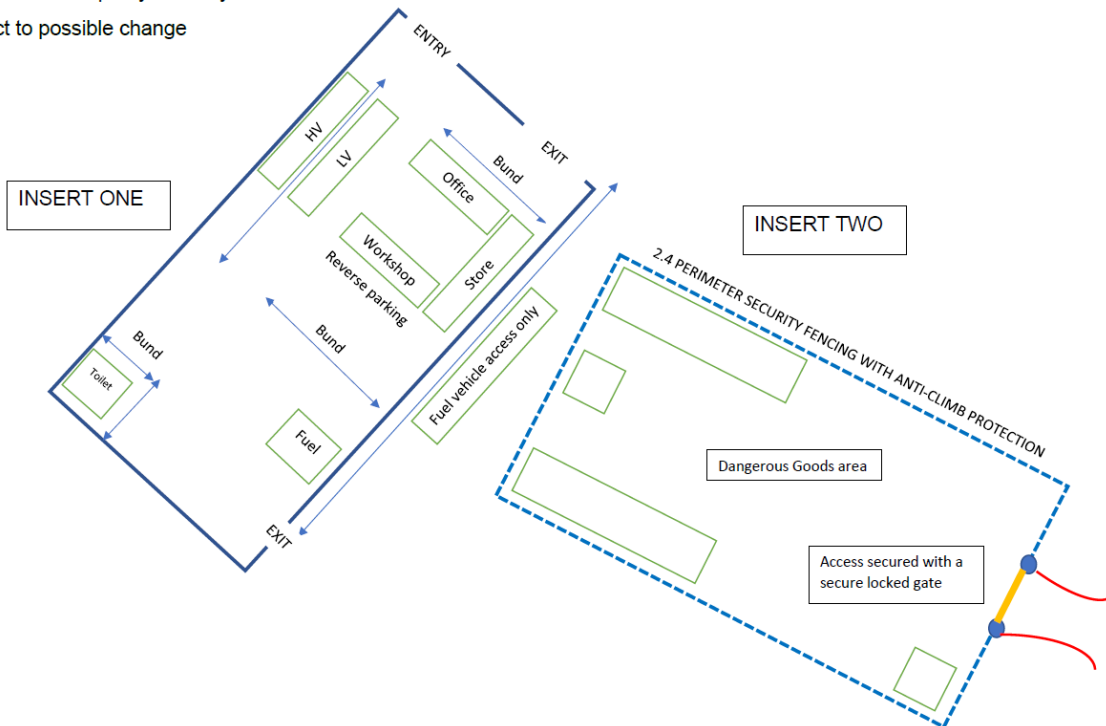
### 30. Appendix E Dangerous Goods Area

*Dangerous goods area (Not to scale)*

**Not to Scale:**

Indicative of the quarry site only

Subject to possible change



### **31. Appendix F SDS**

#### *Safety Data Sheets*

*1122 NONEL® Non-electric Delay Detonators 1.1 0029*

*1122 NONEL® Non-electric Delay Detonators 1.1 0360*

*1122 NONEL® Non-electric Delay Detonators 1.4B*

*Cast Boosters*

*Bulk Emulsion*

**Safety Data Sheet**  
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

1122 NONEL® Non-electric Delay Detonators 1.1 0029 pages 2-23

1122 NONEL® Non-electric Delay Detonators 1.1 0360 pages 24-45

1122 NONEL® Non-electric Delay Detonators 1.4B pages 46-66



# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 22.05.2015

Revision: 22.05.2015

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

- **1.1 Product identifier**
- **Trade name:** **NONEL® Non-electric Delay Detonators**
- **Article number:** 1122
- **Other product identifiers:**
  - NONEL® MS
  - NONEL® EZ DET®
  - NONEL® MS ARCTIC
  - NONEL® EZTL™
  - NONEL® LP NONEL®
  - EZ DRIFTER®
  - NONEL® SL
  - NONEL® SUPER
  - NONEL® TD
  - NONEL® MS CONNECTOR
  - NONEL® TWINPLEX™
  - NONEL® STARTER
- **1.2 Relevant identified uses of the substance or mixture and uses advised against**
  - No further relevant information available.
- **Application of the substance / the mixture**
  - Explosive product.
  - Commercial blasting applications
- **1.3 Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**
  - Dyno Nobel Inc.
  - 2795 East Cottonwood Parkway, Suite 500
  - Salt Lake City, Utah 84121
  - Phone: 801-364-4800
  - Fax: 801-321-6703
  - E-Mail: dnna.hse@am.dynonobel.com
- **1.4 Emergency telephone number:**
  - CHEMTREC
  - 1-800-424-9300 (US/Canada)
  - +01 703-527-3887 (International)

## SECTION 2: Hazards identification

- **2.1 Classification of the substance or mixture**
- **Classification according to Regulation (EC) No 1272/2008**
  - Classifications listed also are applicable to the OSHA GHS Hazard Communication Standard (29CFR1910.1200).



exploding bomb

Expl. 1.1 H201 Explosive; mass explosion hazard.

(Contd. on page 2)

# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 22.05.2015

Revision: 22.05.2015

Trade name: **NONEL® Non-electric Delay Detonators**

(Contd. of page 1)

- **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**



E; Explosive

R2: Risk of explosion by shock, friction, fire or other sources of ignition.

- **Information concerning particular hazards for human and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

- **Classification system:**

The classification is according to the latest editions of the EU-lists, and extended by company and literature data.

The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

- **Additional information:**

There are no other hazards not otherwise classified that have been identified.

0 percent of the mixture consists of component(s) of unknown toxicity

- **2.2 Label elements**

- **Labelling according to Regulation (EC) No 1272/2008**

The product is additionally classified and labelled according to the Globally Harmonized System within the United States (GHS).

The product is classified and labelled according to the CLP regulation.

- **Hazard pictograms**



GHS01

- **Signal word** Danger

- **Hazard-determining components of labelling:**

potassium perchlorate

pentaerythritol tetranitrate (PETN)

- **Hazard statements**

H201 Explosive; mass explosion hazard.

- **Precautionary statements**

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P250 Do not subject to grinding/shock/friction.

P264 Wash thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P240 Ground/bond container and receiving equipment.

P270 Do not eat, drink or smoke when using this product.

P373 DO NOT fight fire when fire reaches explosives.

P370+P380 In case of fire: Evacuate area.

P372 Explosion risk in case of fire.

P401 Store in accordance with local/regional/national/international regulations.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

- **Additional information:**

EUH208 Contains diazodinitro phenol (DDNP). May produce an allergic reaction.

(Contd. on page 3)



# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

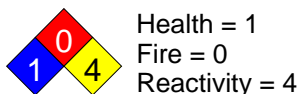
Printing date 22.05.2015

Revision: 22.05.2015

Trade name: **NONEL® Non-electric Delay Detonators**

(Contd. of page 2)

- **Hazard description:**
- **WHMIS-symbols:**  
Explosive products are not classified under WHMIS.  
Not hazardous under WHMIS.
- **NFPA ratings (scale 0 - 4)**



Not available.

- **HMIS-ratings (scale 0 - 4)**



Not available

## · HMIS Long Term Health Hazard Substances

|            |                       |
|------------|-----------------------|
| 13424-46-9 | lead diazide          |
| 7439-92-1  | lead                  |
| 13463-67-7 | titanium dioxide      |
| 7758-97-6  | lead chromate         |
| 7778-74-7  | potassium perchlorate |

- **2.3 Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Explosive Product Notice**

**PREVENTION OF ACCIDENTS IN THE USE OF EXPLOSIVES** - The prevention of accidents in the use of explosives is a result of careful planning and observance of the best known practices. The explosives user must remember that he is dealing with a powerful force and that various devices and methods have been developed to assist him in directing this force. He should realize that this force, if misdirected, may either kill or injure both him and his fellow workers.

**WARNING** - All explosives are dangerous and must be carefully handled and used following approved safety procedures either by or under the direction of competent, experienced persons in accordance with all applicable federal, state, and local laws, regulations, or ordinances. If you have any questions or doubts as to how to use any explosive product, **DO NOT USE IT** before consulting with your supervisor, or the manufacturer, if you do not have a supervisor. If your supervisor has any questions or doubts, he should consult the manufacturer before use.

(Contd. on page 4)

# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 22.05.2015

Revision: 22.05.2015

Trade name: **NONEL® Non-electric Delay Detonators**

(Contd. of page 3)

## SECTION 3: Composition/information on ingredients


























### • 3.2 Mixtures

#### • Description:

Mixture of substances listed below with nonhazardous additions.

Some delay periods may contain potassium perchlorate. Those that do contain between from about 4 to a maximum of approximately 60 mg perchlorate per detonator.

#### • Dangerous components:

|  |   |
|--|---|
| CAS: 78-11-5<br>EINECS: 201-084-3<br>Index number: 603-035-00-5    | pentaerythritol tetranitrate (PETN)<br> E R3<br> Unst. Expl., H200  |
| CAS: 13424-46-9<br>EINECS: 236-542-1<br>Index number: 082-003-00-7 | lead diazide<br> T Repr. Cat. 1, 3 R61;  Xn R62-20/22;  E R3;  N R50/53<br>R33<br> Unst. Expl., H200<br> Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410<br> Acute Tox. 4, H302; Acute Tox. 4, H332 |
| CAS: 7439-92-1<br>EINECS: 231-100-4                                | lead<br> T Repr. Cat. 1 R60-61-48/23/25;  N R50/53<br> Repr. 1A, H360FD; STOT RE 1, H372<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410   |
| CAS: 7440-21-3<br>EINECS: 231-130-8                                | silicon<br> F R11<br> Flam. Sol. 2, H228  |
| CAS: 7782-49-2<br>EINECS: 231-957-4<br>Index number: 034-001-00-2  | selenium<br> T R23/25<br>R33-53<br> Acute Tox. 3, H301; Acute Tox. 3, H331<br> STOT RE 2, H373<br>Aquatic Chronic 4, H413  |
| CAS: 1314-41-6<br>EINECS: 215-235-6<br>Index number: 082-001-00-6  | orange lead<br> T Repr. Cat. 1, 3 R61;  Xn R62-20/22;  N R50/53<br>R33<br> Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410<br> Acute Tox. 4, H302; Acute Tox. 4, H332  |
| CAS: 13463-67-7<br>EINECS: 236-675-5                               | titanium dioxide<br>substance with a Community workplace exposure limit   |

(Contd. on page 5)

# Safety Data Sheet

























according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 22.05.2015

Revision: 22.05.2015

**Trade name: NONEL® Non-electric Delay Detonators**

(Contd. of page 4)

|  |  |
|--|--|
| CAS: 10294-40-3<br>EINECS: 233-660-5<br>Index number: 056-002-00-7 | barium chromate<br> Xn R20/22<br> Carc. 1A, H350<br> Acute Tox. 4, H302; Acute Tox. 4, H332   |
| CAS: 7758-97-6<br>EINECS: 231-846-0<br>Index number: 082-004-00-2  | lead chromate<br> T Carc. Cat. 2, Repr. Cat. 1, 3 R45-61;  Xn R62;  N R50/53 R33<br> Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410 |
| CAS: 7727-43-7<br>EINECS: 231-784-4                                | barium sulphate, natural<br>substance with a Community workplace exposure limit  |
| CAS: 7778-74-7<br>EINECS: 231-912-9<br>Index number: 017-008-00-5  | potassium perchlorate<br> Xn R22;  O R9<br> Ox. Sol. 1, H271<br> Acute Tox. 4, H302  |
| CAS: 61790-53-2  | Diatomaceous earth (Silica-Amorphous)<br>substance with a Community workplace exposure limit   |
| CAS: 7439-98-7<br>EINECS: 231-107-2                                | molybdenum<br>substance with a Community workplace exposure limit  |
| CAS: 7440-33-7<br>EINECS: 231-143-9                                | tungsten<br>substance with a Community workplace exposure limit  |
| CAS: 7429-90-5<br>EINECS: 231-072-3<br>Index number: 013-001-00-6  | aluminium powder (pyrophoric)<br> F R15-17<br> Pyr. Sol. 1, H250; Water-react. 2, H261   |
| CAS: 7440-36-0<br>EINECS: 231-146-5                                | antimony<br>substance with a Community workplace exposure limit  |
| CAS: 2691-41-0<br>EINECS: 220-260-0                                | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)<br> T R24;  Xn R22;  E R2<br> Expl. 1.1, H201<br> Acute Tox. 3, H301; Acute Tox. 3, H311                                     |
| CAS: 4682-03-5   | diazodinitro phenol (DDNP)<br> Xi R36/38;  Xi R43;  E R3<br> Unst. Expl., H200<br> Skin Irrit. 2, H315; Eye Irrit. 2, H319; Skin Sens. 1, H317                                      |

**SVHC**

|            |               |
|------------|---------------|
| 13424-46-9 | lead diazide  |
| 1314-41-6  | orange lead   |
| 7758-97-6  | lead chromate |

**Additional information:**

For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.  
For the wording of the listed risk phrases refer to section 16.

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## SECTION 4: First aid measures

- **4.1 Description of first aid measures**
- **General information:**  
Immediately remove any clothing soiled by the product.  
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
- **After inhalation:**  
Unlikely route of exposure.  
Supply fresh air; consult doctor in case of complaints.
- **After skin contact:**  
Generally the product does not irritate the skin.  
Wash with soap and water.  
If skin irritation is experienced, consult a doctor.
- **After eye contact:**  
Remove contact lenses if worn.  
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
- **After swallowing:**  
Rinse out mouth and then drink plenty of water.  
Do not induce vomiting; call for medical help immediately.
- **4.2 Most important symptoms and effects, both acute and delayed** Blast injury if mishandled.
- **Hazards**  
Danger of blast or crush-type injuries.  
Harmful if swallowed.  
Danger of disturbed cardiac rhythm.
- **4.3 Indication of any immediate medical attention and special treatment needed**  
Medical supervision for at least 48 hours.  
Product may produce physical injury if mishandled. Treatment of these injuries should be based on the blast and compression effects.

## SECTION 5: Firefighting measures

- **5.1 Extinguishing media**
- **Suitable extinguishing agents:** DO NOT fight fire when fire reaches explosives.
- **For safety reasons unsuitable extinguishing agents:** None.
- **5.2 Special hazards arising from the substance or mixture**  
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. Can explode or detonate under fire conditions. Burning material may produce toxic vapors. It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.  
Explosive; mass explosion hazard.
- **5.3 Advice for firefighters**
- **Protective equipment:**  
Wear self-contained respiratory protective device.  
Wear fully protective suit.

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• **Additional information**

Eliminate all ignition sources if safe to do so.

Flammability Classification: (defined by 29 CFR 1910.1200) Explosive. Can explode under fire conditions. Individual devices will randomly explode. Mass explosion of multiple devices is possible under certain conditions. Burning material may produce toxic and irritating vapors. In unusual cases, shrapnel may be thrown from exploding devices under containment. See 2012 Emergency response Guidebook for further information.

## SECTION 6: Accidental release measures

• **6.1 Personal precautions, protective equipment and emergency procedures**

Remove persons from danger area.

Ensure adequate ventilation

Wear protective clothing.

Protect from heat.

Evacuate area.

Isolate area and prevent access.

• **6.2 Environmental precautions:** No special measures required.

• **6.3 Methods and material for containment and cleaning up:**

Pick up mechanically.

Send for recovery or disposal in suitable receptacles.

Dispose unusable material as waste according to item 13.

• **6.4 Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

## SECTION 7: Handling and storage

• **7.1 Precautions for safe handling**

Open and handle receptacle with care.

Handle with care. Avoid jolting, friction and impact.

Use only in well ventilated areas.

Do not subject to grinding/shock/friction.

• **Information about fire - and explosion protection:**

Protect from heat.

Prevent impact and friction.

Emergency cooling must be available in case of nearby fire.

• **7.2 Conditions for safe storage, including any incompatibilities**

• **Storage:**

• **Requirements to be met by storerooms and receptacles:**

Store in a cool location.

Avoid storage near extreme heat, ignition sources or open flame.

• **Information about storage in one common storage facility:** Store away from foodstuffs.

• **Further information about storage conditions:**

Store under lock and key and with access restricted to technical experts or their assistants only.

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Keep away from heat.

· **7.3 Specific end use(s)** No further relevant information available.

## SECTION 8: Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

### · 8.1 Control parameters

· **Ingredients with limit values that require monitoring at the workplace:**

#### **13424-46-9 lead diazide**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; See 29 CFR 1910,1025               |
| REL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>as Pb;*8-hr TWA; See Pocket Guide App. C |
| TLV (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; BEI                                |
| EL (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; IARC 2A, R                         |

#### **7439-92-1 lead**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>*see 29 CFR 1910,1025                              |
| REL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>*8-hr TWA,excl. lead arsenate;See PocketGuideApp.C |
| TLV (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>*and inorganic compounds, as Pb; BEI               |
| EL (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>R; IARC 2B  |
| EV (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb, Skin (organic compounds)                     |

#### **7440-21-3 silicon**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 15* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction |
| REL (USA)   | Long-term value: 10* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction |
| TLV (USA)   | TLV withdrawn   |
| EL (Canada) | Long-term value: 10* 3** mg/m <sup>3</sup><br>*total dust;**respirable fraction |
| EV (Canada) | Long-term value: 10 mg/m <sup>3</sup><br>total dust                             |

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**7782-49-2 selenium**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 0,2 mg/m <sup>3</sup><br>as Se |
| REL (USA)   | Long-term value: 0,2 mg/m <sup>3</sup><br>as Se |
| TLV (USA)   | Long-term value: 0,2 mg/m <sup>3</sup><br>as Se |
| EL (Canada) | Long-term value: 0,1 mg/m <sup>3</sup>          |
| EV (Canada) | Long-term value: 0,2 mg/m <sup>3</sup>          |

**1314-41-6 orange lead**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; See 29 CFR 1910,1025               |
| REL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>as Pb;*8-hr TWA; See Pocket Guide App. C |
| TLV (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; BEI                                |
| EL (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; IARC 2A, R                         |
| EV (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb, Skin (organic compounds)           |

**13463-67-7 titanium dioxide**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 15* mg/m <sup>3</sup><br>*total dust                                    |
| REL (USA)   | See Pocket Guide App. A  |
| TLV (USA)   | Long-term value: 10 mg/m <sup>3</sup><br>withdrawn from NIC                              |
| EL (Canada) | Long-term value: 10* 3** mg/m <sup>3</sup><br>*total dust;**respirable fraction; IARC 2B |
| EV (Canada) | Long-term value: 10 mg/m <sup>3</sup><br>total dust                                      |

**10294-40-3 barium chromate**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,005* mg/m <sup>3</sup><br>Ceiling limit: 0,1** mg/m <sup>3</sup><br>*as Cr(VI) **as CrO <sub>3</sub> ; see 29 CFR 1910,1026 |
| REL (USA)   | Long-term value: 0,0002 mg/m <sup>3</sup><br>as Cr; See Pocket Guide Apps. A and C   |
| TLV (USA)   | Long-term value: 0,01 mg/m <sup>3</sup><br>as Cr   |
| EL (Canada) | Long-term value: 0,01 mg/m <sup>3</sup><br>as Cr; ACGIH A1 IARC 1  |

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**7758-97-6 lead chromate**

|             |  |
|-------------|--|
| IOELV (EU)  | Long-term value: 2 mg/m <sup>3</sup><br>as Cr  |
| PEL (USA)   | Long-term value: 0,005* mg/m <sup>3</sup><br>Ceiling limit: 0,1** mg/m <sup>3</sup><br>*as Cr(VI) **as CrO <sub>3</sub> ; see 29 CFR 1910,1026 |
| REL (USA)   | Long-term value: 0,0002 mg/m <sup>3</sup><br>as Cr; See Pocket Guide Apps. A and C   |
| TLV (USA)   | Long-term value: 0,05* 0,012** mg/m <sup>3</sup><br>*as Pb; BEI ; **as Cr  |
| EL (Canada) | Long-term value: 0,05* 0,012** mg/m <sup>3</sup><br>ACIGH A2, IARC 2A; R; *as Pb; **as Cr  |
| EV (Canada) | Long-term value: 0,012* 0,05** mg/m <sup>3</sup><br>*as Cr, **as Pb  |

**7727-43-7 barium sulphate, natural**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 15* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction  |
| REL (USA)   | Long-term value: 10* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction  |
| TLV (USA)   | Long-term value: 5* mg/m <sup>3</sup><br>*inhalable fraction; E                  |
| EL (Canada) | Long-term value: 10* 3** mg/m <sup>3</sup><br>*total dust, **respirable fraction |
| EV (Canada) | Long-term value: 10 mg/m <sup>3</sup><br>total dust                              |

**61790-53-2 Diatomaceous earth (Silica-Amorphous)**

|             |  |
|-------------|--|
| PEL (USA)   | 20mppcf or 80mg/m <sup>3</sup> /%SiO <sub>2</sub>                                  |
| REL (USA)   | Long-term value: 6 mg/m <sup>3</sup><br>See Pocket Guide App. C                    |
| TLV (USA)   | TLV withdrawn  |
| EL (Canada) | Long-term value: 4* 1,5** mg/m <sup>3</sup><br>*total, **respirable                |
| EV (Canada) | Long-term value: 10* 3** mg/m <sup>3</sup><br>uncalcined; *inhalable; **respirable |

**7439-98-7 molybdenum**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 15* mg/m <sup>3</sup><br>*Total dust   |
| TLV (USA)   | Long-term value: 10* 3** mg/m <sup>3</sup><br>as Mo; *inhalable fraction ** respirable fraction |
| EL (Canada) | Long-term value: 3* 10** mg/m <sup>3</sup><br>as Mo; *respirable **inhalable                    |

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|             |   |
|-------------|---|
| EV (Canada) | Long-term value: 10* 3** 0,5*** mg/m <sup>3</sup><br>metal, insol. compd.: *inh; **resp; sol. compd.: ***resp |
|-------------|---|

**7440-33-7 tungsten**

|             |   |
|-------------|---|
| PEL (USA)   | and insoluble compounds, as We  |
| REL (USA)   | Short-term value: 10 mg/m <sup>3</sup><br>Long-term value: 5 mg/m <sup>3</sup><br>as W  |
| TLV (USA)   | Short-term value: 10 mg/m <sup>3</sup><br>Long-term value: 5 mg/m <sup>3</sup><br>as W  |
| EL (Canada) | Short-term value: 10 mg/m <sup>3</sup><br>Long-term value: 5 mg/m <sup>3</sup><br>as W  |
| EV (Canada) | Short-term value: 10* 3** mg/m <sup>3</sup><br>Long-term value: 5* 1** mg/m <sup>3</sup><br>(as tungsten; compds.: *water-insol.; **water-sol.) |

**7429-90-5 aluminium powder (pyrophoric)**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 15*, 15** mg/m <sup>3</sup><br>*Total dust; ** Respirable fraction              |
| REL (USA)   | Long-term value: 10* 5** mg/m <sup>3</sup><br>as Al*Total dust**Respirable/pyro powd./welding f. |
| TLV (USA)   | Long-term value: 1* mg/m <sup>3</sup><br>as Al; *as respirable fraction                          |
| EL (Canada) | Long-term value: 1,0 mg/m <sup>3</sup><br>respirable, as Al                                      |
| EV (Canada) | Long-term value: 5 mg/m <sup>3</sup><br>aluminium-containing (as aluminium)                      |

**7440-36-0 antimony**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
| REL (USA)   | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
| TLV (USA)   | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
| EL (Canada) | Long-term value: 0,5 mg/m <sup>3</sup>          |
| EV (Canada) | Long-term value: 0,5 mg/m <sup>3</sup>          |

- **DNELs** No further relevant information available.
- **PNECs** No further relevant information available.

**Ingredients with biological limit values:****13424-46-9 lead diazide**

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|                                   |  |
|-----------------------------------|--|
| BEI (USA)                         | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead   |
| <b>7439-92-1 lead</b>             |  |
| BEI (USA)                         | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead<br><br>10 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead (women of child bearing potential)                  |
| <b>1314-41-6 orange lead</b>      |  |
| BEI (USA)                         | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead   |
| <b>10294-40-3 barium chromate</b> |  |
| BEI (USA)                         | 25 µg/L<br>Medium: urine<br>Time: end of shift at end of workweek<br>Parameter: Total chromium (fume)<br><br>10 µg/L<br>Medium: urine<br>Time: increase during shift<br>Parameter: Total chromium (fume) |
| <b>7758-97-6 lead chromate</b>    |  |
| BEI (USA)                         | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead<br><br>10 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead (women of child bearing potential)                  |

• **Additional information:** The lists valid during the making were used as basis.

• **8.2 Exposure controls**

• **Personal protective equipment:**

• **General protective and hygienic measures:**

The usual precautionary measures are to be adhered to when handling chemicals.

Keep away from foodstuffs, beverages and feed.

Immediately remove all soiled and contaminated clothing.

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Wash hands before breaks and at the end of work.

Avoid contact with the eyes and skin.

• **Respiratory protection:**

Not required under normal conditions of use.

Respiratory protection may be required after product use.

• **Protection of hands:**

Wear gloves for the protection against mechanical hazards according to NIOSH or EN 388.

• **Material of gloves**

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

• **Penetration time of glove material**

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

• **Eye protection:**



Safety glasses

Face protection

• **Body protection:** Impervious protective clothing

• **Limitation and supervision of exposure into the environment**

No further relevant information available.

• **Risk management measures**

Organizational measures should be in place for all activities involving this product.

## SECTION 9: Physical and chemical properties

• **9.1 Information on basic physical and chemical properties**

• **General Information**

• **Appearance:**

Form:

Solid material

Colour:

According to product specification

• **Odour:**

Characteristic

• **Odour threshold:**

Not determined.

• **pH-value:**

Not applicable.

• **Change in condition**

Melting point/Melting range:

Not Determined.

Boiling point/Boiling range:

Undetermined.

• **Flash point:**

Not applicable.

• **Flammability (solid, gaseous):**

Explosive; mass explosion hazard.

• **Auto/Self-ignition temperature:**

Not determined.

• **Decomposition temperature:**

Not determined.

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- **Self-igniting:** Product is not self-igniting.
- **Danger of explosion:** Risk of explosion by shock, friction, fire or other sources of ignition.
- **Explosion limits:**
  - Lower:** Not determined.
  - Upper:** Not determined.
- **Vapour pressure:** Not applicable.
- **Density:** Not determined.
- **Relative density** Not determined.
- **Vapour density** Not applicable.
- **Evaporation rate** Not applicable.
- **Solubility in / Miscibility with water:** Variable, dependent upon product composition and packaging.
- **Partition coefficient (n-octanol/water):** Not determined.
- **Viscosity:**
  - Dynamic:** Not applicable.
  - Kinematic:** Not applicable.
- **9.2 Other information** No further relevant information available.

## SECTION 10: Stability and reactivity

- **10.1 Reactivity**
- **10.2 Chemical stability**
- **Thermal decomposition / conditions to be avoided:**  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- **10.3 Possibility of hazardous reactions**  
Danger of explosion.  
Toxic fumes may be released if heated above the decomposition point.
- **10.4 Conditions to avoid** No further relevant information available.
- **10.5 Incompatible materials:** No further relevant information available.
- **10.6 Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Hydrocarbons  
Nitrogen oxides  
Chlorine compounds  
Leadoxide vapour  
Bariumoxide vapour  
Toxic metal oxide smoke  
Danger of forming toxic pyrolysis products.

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## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity:

#### LD/LC50 values relevant for classification:

##### 7439-92-1 lead

Oral LD50 &gt;2000 mg/kg (rat)

##### 7782-49-2 selenium

Oral LD50 6700 mg/kg (rat)

##### 7758-97-6 lead chromate

Oral LD50 12000 mg/kg (mouse)

#### Primary irritant effect:

##### on the skin:

Not a skin irritant in unused form. Vapors/particles from used product are possibly irritating to skin.

##### on the eye:

Not an eye irritant in unused form. Vapors/particles from used product are possibly irritating to eyes.

#### Sensitisation: No sensitising effects known.

#### Subacute to chronic toxicity: No further relevant information available.

#### Additional toxicological information:

The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:

Harmful

#### Acute effects (acute toxicity, irritation and corrosivity):

Danger of blast or crush-type injuries.

Harmful if swallowed.

#### Repeated dose toxicity: No further relevant information available.

## SECTION 12: Ecological information

### 12.1 Toxicity

#### Aquatic toxicity: No further relevant information available.

#### 12.2 Persistence and degradability No further relevant information available.

#### 12.3 Bioaccumulative potential No further relevant information available.

#### 12.4 Mobility in soil No further relevant information available.

#### Additional ecological information:

#### General notes:

Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water

Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

#### 12.5 Results of PBT and vPvB assessment

##### PBT: Not applicable.

##### vPvB: Not applicable.

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- **12.6 Other adverse effects** No further relevant information available.

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## SECTION 13: Disposal considerations

- **13.1 Waste treatment methods**

- **Recommendation**

Must not be disposed together with household garbage. Do not allow product to reach sewage system. Damaged materials pose a danger to anyone in the immediate area; consult experts for disposal of damaged products.

The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. Residual materials should be treated as hazardous.

- **Uncleaned packaging:**

- **Recommendation:** Disposal must be made according to official regulations.

## SECTION 14: Transport information

- **14.1 UN-Number**

- **DOT, ADR, IMDG**

- **IATA**

UN0029

FORBIDDEN

- **14.2 UN proper shipping name**

- **DOT, IMDG**

- **ADR**

- **IATA**

DETONATORS, NON-ELECTRIC

0029 DETONATORS, NON-ELECTRIC

FORBIDDEN

- **14.3 Transport hazard class(es)**

- **DOT**



- **Class**

1.1

- **Label**

1.1

- **ADR, IMDG**



- **Class**

1.1

- **Label**

1.1B

- **IATA**

- **Class**

FORBIDDEN

- **14.4 Packing group**

- **DOT, ADR, IMDG**

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- |  |                   |
|--|-------------------|
| · IATA   | FORBIDDEN         |
| · 14.5 Environmental hazards:  |                   |
| · Marine pollutant:  | Yes               |
| · Special marking (IATA):  | FORBIDDEN BY AIR. |
| · 14.6 Special precautions for user  | Not applicable.   |
| · EMS Number:  | F-B,S-X           |
| · 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code | Not applicable.   |
| · Transport/Additional information:  |                   |

- |                            |  |
|----------------------------|--|
| · ADR                      |  |
| · Limited quantities (LQ)  | 0  |
| · Excepted quantities (EQ) | Code: E0<br>Not permitted as Excepted Quantity |
| · Tunnel restriction code  | 1  |

- |                            |  |
|----------------------------|--|
| · IMDG                     |  |
| · Limited quantities (LQ)  | 0  |
| · Excepted quantities (EQ) | Code: E0<br>Not permitted as Excepted Quantity |

- |                          |  |
|--------------------------|--|
| · IATA                   | FORBIDDEN.                                 |
| · UN "Model Regulation": | UN0029, DETONATORS, NON-ELECTRIC, 1.1B, II |

## SECTION 15: Regulatory information

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
- United States (USA)
- SARA

### · Section 355 (extremely hazardous substances):

None of the ingredients are listed.

### · Section 313 (Specific toxic chemical listings):

|            |                               |
|------------|-------------------------------|
| 13424-46-9 | lead diazide                  |
| 7439-92-1  | lead                          |
| 7782-49-2  | selenium                      |
| 1314-41-6  | orange lead                   |
| 10294-40-3 | barium chromate               |
| 7758-97-6  | lead chromate                 |
| 7727-43-7  | barium sulphate, natural      |
| 7429-90-5  | aluminium powder (pyrophoric) |
| 7440-36-0  | antimony                      |

### · TSCA (Toxic Substances Control Act):

All ingredients are listed.

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· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**

|            |                  |
|------------|------------------|
| 13424-46-9 | lead diazide     |
| 7439-92-1  | lead             |
| 1314-41-6  | orange lead      |
| 13463-67-7 | titanium dioxide |
| 10294-40-3 | barium chromate  |
| 7758-97-6  | lead chromate    |

· **Chemicals known to cause reproductive toxicity for females:**

|            |                 |
|------------|-----------------|
| 7439-92-1  | lead            |
| 10294-40-3 | barium chromate |
| 7758-97-6  | lead chromate   |

· **Chemicals known to cause reproductive toxicity for males:**

|            |                 |
|------------|-----------------|
| 7439-92-1  | lead            |
| 10294-40-3 | barium chromate |
| 7758-97-6  | lead chromate   |

· **Chemicals known to cause developmental toxicity:**

|            |                 |
|------------|-----------------|
| 13424-46-9 | lead diazide    |
| 7439-92-1  | lead            |
| 10294-40-3 | barium chromate |
| 7758-97-6  | lead chromate   |

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**

|            |  |                                      |
|------------|--|--------------------------------------|
| 13424-46-9 | lead diazide   | B2                                   |
| 7439-92-1  | lead   | B2                                   |
| 7782-49-2  | selenium   | D                                    |
| 1314-41-6  | orange lead  | B2                                   |
| 10294-40-3 | barium chromate  | A(inh), D(oral), K/L(inh), CBD(oral) |
| 7758-97-6  | lead chromate  | K                                    |
| 7727-43-7  | barium sulphate, natural                               | D, CBD(inh), NL(oral)                |
| 7778-74-7  | potassium perchlorate                                  | NL                                   |
| 2691-41-0  | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) | D                                    |

· **IARC (International Agency for Research on Cancer)**

|            |                  |    |
|------------|------------------|----|
| 13424-46-9 | lead diazide     | 2A |
| 7439-92-1  | lead             | 2B |
| 7782-49-2  | selenium         | 3  |
| 1314-41-6  | orange lead      | 2A |
| 13463-67-7 | titanium dioxide | 2B |

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|            |                                       |   |
|------------|---------------------------------------|---|
| 10294-40-3 | barium chromate                       | 1 |
| 7758-97-6  | lead chromate                         | 1 |
| 61790-53-2 | Diatomaceous earth (Silica-Amorphous) | 3 |

· **TLV (Threshold Limit Value established by ACGIH)**

|            |                               |    |
|------------|-------------------------------|----|
| 13424-46-9 | lead diazide                  | A3 |
| 7439-92-1  | lead                          | A3 |
| 1314-41-6  | orange lead                   | A3 |
| 13463-67-7 | titanium dioxide              | A4 |
| 10294-40-3 | barium chromate               | A1 |
| 7758-97-6  | lead chromate                 | A2 |
| 7439-98-7  | molybdenum                    | A3 |
| 7429-90-5  | aluminium powder (pyrophoric) | A4 |

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

|            |                  |  |
|------------|------------------|--|
| 13463-67-7 | titanium dioxide |  |
| 10294-40-3 | barium chromate  |  |
| 7758-97-6  | lead chromate    |  |

· **Canada**

· **Canadian Domestic Substances List (DSL)**

Some components are listed on the NDSL.

All ingredients are listed.

· **Canadian Ingredient Disclosure list (limit 0.1%)**

|            |                 |  |
|------------|-----------------|--|
| 7439-92-1  | lead            |  |
| 7782-49-2  | selenium        |  |
| 10294-40-3 | barium chromate |  |
| 7758-97-6  | lead chromate   |  |

· **Canadian Ingredient Disclosure list (limit 1%)**

|           |                               |  |
|-----------|-------------------------------|--|
| 7439-98-7 | molybdenum                    |  |
| 7440-33-7 | tungsten                      |  |
| 7429-90-5 | aluminium powder (pyrophoric) |  |
| 7440-36-0 | antimony                      |  |

· **Other regulations, limitations and prohibitive regulations**

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

· **Substances of very high concern (SVHC) according to REACH, Article 57**

|            |               |  |
|------------|---------------|--|
| 13424-46-9 | lead diazide  |  |
| 1314-41-6  | orange lead   |  |
| 7758-97-6  | lead chromate |  |

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· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

## SECTION 16: Other information

### Disclaimer

Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, the information contained herein, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. The information contained herein is provided for reference purposes only and is intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product or information. Under no circumstances shall either Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

### · Relevant phrases

|        |  |
|--------|--|
| H200   | Unstable explosives.   |
| H201   | Explosive; mass explosion hazard.  |
| H228   | Flammable solid.   |
| H250   | Catches fire spontaneously if exposed to air.                            |
| H261   | In contact with water releases flammable gases.                          |
| H271   | May cause fire or explosion; strong oxidiser.                            |
| H301   | Toxic if swallowed.  |
| H302   | Harmful if swallowed.  |
| H311   | Toxic in contact with skin.  |
| H315   | Causes skin irritation.  |
| H317   | May cause an allergic skin reaction.                                     |
| H319   | Causes serious eye irritation.   |
| H331   | Toxic if inhaled.  |
| H332   | Harmful if inhaled.  |
| H350   | May cause cancer.  |
| H360Df | May damage the unborn child. Suspected of damaging fertility.            |
| H360FD | May damage fertility. May damage the unborn child.                       |
| H372   | Causes damage to organs through prolonged or repeated exposure.          |
| H373   | May cause damage to organs through prolonged or repeated exposure.       |
| H400   | Very toxic to aquatic life.  |
| H410   | Very toxic to aquatic life with long lasting effects.                    |
| H413   | May cause long lasting harmful effects to aquatic life.                  |
| R11    | Highly flammable.  |
| R15    | Contact with water liberates extremely flammable gases.                  |
| R17    | Spontaneously flammable in air.  |
| R2     | Risk of explosion by shock, friction, fire or other sources of ignition. |
| R20/22 | Harmful by inhalation and if swallowed.                                  |
| R22    | Harmful if swallowed.  |
| R23/25 | Toxic by inhalation and if swallowed.                                    |
| R24    | Toxic in contact with skin.  |

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- R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.
- R33 Danger of cumulative effects.
- R36/38 Irritating to eyes and skin.
- R43 May cause sensitisation by skin contact.
- R45 May cause cancer.
- R48/23/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
- R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R53 May cause long-term adverse effects in the aquatic environment.
- R60 May impair fertility.
- R61 May cause harm to the unborn child.
- R62 Possible risk of impaired fertility.
- R9 Explosive when mixed with combustible material.

## Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonised System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

EINECS: European Inventory of Existing Commercial Chemical Substances

ELINCS: European List of Notified Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

PNEC: Predicted No-Effect Concentration (REACH)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

Expl. 1.1: Explosives, Division 1.1

Unst. Expl.: Explosives, Unstable explosives

Flam. Sol. 2: Flammable solids, Hazard Category 2

Pyr. Sol. 1: Pyrophoric Solids, Hazard Category 1

Water-react. 2: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 2

Ox. Sol. 1: Oxidising Solids, Hazard Category 1

Acute Tox. 3: Acute toxicity, Hazard Category 3

Acute Tox. 4: Acute toxicity, Hazard Category 4

Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2

Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2

Skin Sens. 1: Sensitisation - Skin, Hazard Category 1

Carc. 1A: Carcinogenicity, Hazard Category 1A

Carc. 1B: Carcinogenicity, Hazard Category 1B

Repr. 1A: Reproductive toxicity, Hazard Category 1A

Repr. 1A: Reproductive toxicity, Hazard Category 1A

STOT RE 1: Specific target organ toxicity - Repeated exposure, Hazard Category 1

STOT RE 2: Specific target organ toxicity - Repeated exposure, Hazard Category 2

Aquatic Acute 1: Hazardous to the aquatic environment - Acute Hazard, Category 1

Aquatic Chronic 1: Hazardous to the aquatic environment - Chronic Hazard, Category 1

Aquatic Chronic 4: Hazardous to the aquatic environment - Chronic Hazard, Category 4

## Sources

SDS Prepared by:

ChemTel Inc.

1305 North Florida Avenue

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Tampa, Florida USA 33602-2902  
Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573  
Website: [www.chemtelinc.com](http://www.chemtelinc.com)

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## SECTION 1: Identification of the substance/mixture and of the company/undertaking

- **1.1 Product identifier**
- **Trade name: NONEL® Non-electric Delay Detonators**
- **Article number: 1122**
- **Other product identifiers:**  
 NONEL® MS  
 NONEL® EZ DET®  
 NONEL® MS ARCTIC  
 NONEL® EZTL™  
 NONEL® LP NONEL®  
 EZ DRIFTER®  
 NONEL® SL  
 NONEL® SUPER  
 NONEL® TD  
 NONEL® MS CONNECTOR  
 NONEL® TWINPLEX™  
 NONEL® STARTER
- **1.2 Relevant identified uses of the substance or mixture and uses advised against**  
 No further relevant information available.
- **Application of the substance / the mixture**  
 Explosive product.  
 Commercial blasting applications
- **1.3 Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**  
 Dyno Nobel Inc.  
 2795 East Cottonwood Parkway, Suite 500  
 Salt Lake City, Utah 84121  
 Phone: 801-364-4800  
 Fax: 801-321-6703  
 E-Mail: dnna.hse@am.dynonobel.com
- **1.4 Emergency telephone number:**  
 CHEMTREC  
 1-800-424-9300 (US/Canada)  
 +01 703-527-3887 (International)

## SECTION 2: Hazards identification

- **2.1 Classification of the substance or mixture**
- **Classification according to Regulation (EC) No 1272/2008**  
 Classifications listed also are applicable to the OSHA GHS Hazard Communication Standard (29CFR1910.1200).



exploding bomb

Expl. 1.1 H201 Explosive; mass explosion hazard.

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• **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**

 Xn; Harmful

R22: Harmful if swallowed.

 E; Explosive

R2: Risk of explosion by shock, friction, fire or other sources of ignition.

• **Information concerning particular hazards for human and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

• **Classification system:**

The classification is according to the latest editions of the EU-lists, and extended by company and literature data.

The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

• **Additional information:**

There are no other hazards not otherwise classified that have been identified.

0 percent of the mixture consists of component(s) of unknown toxicity

• **2.2 Label elements**

• **Labelling according to Regulation (EC) No 1272/2008**

The product is additionally classified and labelled according to the Globally Harmonized System within the United States (GHS).

The product is classified and labelled according to the CLP regulation.

• **Hazard pictograms**



GHS01

• **Signal word** Danger

• **Hazard-determining components of labelling:**

potassium perchlorate

pentaerythritol tetranitrate (PETN)

• **Hazard statements**

H201 Explosive; mass explosion hazard.

• **Precautionary statements**

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P250 Do not subject to grinding/shock/friction.

P264 Wash thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P240 Ground/bond container and receiving equipment.

P270 Do not eat, drink or smoke when using this product.

P373 DO NOT fight fire when fire reaches explosives.

P370+P380 In case of fire: Evacuate area.

P372 Explosion risk in case of fire.

P401 Store in accordance with local/regional/national/international regulations.

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P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

• **Additional information:**

EUH208 Contains diazodinitro phenol (DDNP). May produce an allergic reaction.

• **Hazard description:**

• **WHMIS-symbols:** Explosive products are not classified under WHMIS.

• **NFPA ratings (scale 0 - 4)** Not available.

• **HMIS-ratings (scale 0 - 4)** Not available

• **HMIS Long Term Health Hazard Substances**

|            |                       |
|------------|-----------------------|
| 13424-46-9 | lead diazide          |
| 7439-92-1  | lead                  |
| 13463-67-7 | titanium dioxide      |
| 7758-97-6  | lead chromate         |
| 7778-74-7  | potassium perchlorate |

• **2.3 Other hazards**

• **Results of PBT and vPvB assessment**

• **PBT:** Not applicable.

• **vPvB:** Not applicable.

• **Explosive Product Notice**

PREVENTION OF ACCIDENTS IN THE USE OF EXPLOSIVES - The prevention of accidents in the use of explosives is a result of careful planning and observance of the best known practices. The explosives user must remember that he is dealing with a powerful force and that various devices and methods have been developed to assist him in directing this force. He should realize that this force, if misdirected, may either kill or injure both him and his fellow workers.

WARNING - All explosives are dangerous and must be carefully handled and used following approved safety procedures either by or under the direction of competent, experienced persons in accordance with all applicable federal, state, and local laws, regulations, or ordinances. If you have any questions or doubts as to how to use any explosive product, DO NOT USE IT before consulting with your supervisor, or the manufacturer, if you do not have a supervisor. If your supervisor has any questions or doubts, he should consult the manufacturer before use.

## SECTION 3: Composition/information on ingredients

• **3.2 Mixtures**

• **Description:**

Mixture of substances listed below with nonhazardous additions.

Some delay periods may contain potassium perchlorate. Those that do contain between from about 4 to a maximum of approximately 60 mg perchlorate per detonator.

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





















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**· Dangerous components:**

|  |  |
|--|--|
| CAS: 78-11-5<br>EINECS: 201-084-3<br>Index number: 603-035-00-5    | pentaerythritol tetranitrate (PETN)<br> E R3<br> Unst. Expl., H200   |
| CAS: 13424-46-9<br>EINECS: 236-542-1<br>Index number: 082-003-00-7 | lead diazide<br> T Repr. Cat. 1, 3 R61;  Xn R62-20/22;  E R3;  N R50/53<br>R33<br> Unst. Expl., H200<br> Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410<br> Acute Tox. 4, H302; Acute Tox. 4, H332 |
| CAS: 7439-92-1<br>EINECS: 231-100-4                                | lead<br> T Repr. Cat. 1 R60-61-48/23/25;  N R50/53<br> Repr. 1A, H360FD; STOT RE 1, H372<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410  |
| CAS: 7440-21-3<br>EINECS: 231-130-8                                | silicon<br> F R11<br> Flam. Sol. 2, H228   |
| CAS: 7782-49-2<br>EINECS: 231-957-4<br>Index number: 034-001-00-2  | selenium<br> T R23/25<br>R33-53<br> Acute Tox. 3, H301; Acute Tox. 3, H331<br> STOT RE 2, H373<br>Aquatic Chronic 4, H413   |
| CAS: 1314-41-6<br>EINECS: 215-235-6<br>Index number: 082-001-00-6  | orange lead<br> T Repr. Cat. 1, 3 R61;  Xn R62-20/22;  N R50/53<br>R33<br> Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410<br> Acute Tox. 4, H302; Acute Tox. 4, H332   |
| CAS: 13463-67-7<br>EINECS: 236-675-5                               | titanium dioxide<br>substance with a Community workplace exposure limit  |
| CAS: 10294-40-3<br>EINECS: 233-660-5<br>Index number: 056-002-00-7 | barium chromate<br> Xn R20/22<br> Carc. 1A, H350<br> Acute Tox. 4, H302; Acute Tox. 4, H332   |
| CAS: 7758-97-6<br>EINECS: 231-846-0<br>Index number: 082-004-00-2  | lead chromate<br> T Carc. Cat. 2, Repr. Cat. 1, 3 R45-61;  Xn R62;  N R50/53<br>R33<br> Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373<br> Aquatic Acute 1, H400; Aquatic Chronic 1, H410  |

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|   |   |
|---|---|
| CAS: 7727-43-7<br>EINECS: 231-784-4                               | barium sulphate, natural<br>substance with a Community workplace exposure limit   |
| CAS: 7778-74-7<br>EINECS: 231-912-9<br>Index number: 017-008-00-5 | potassium perchlorate<br> Xn R22;  O R9<br> Ox. Sol. 1, H271<br> Acute Tox. 4, H302   |
| CAS: 61790-53-2   | Diatomaceous earth (Silica-Amorphous)<br>substance with a Community workplace exposure limit  |
| CAS: 7439-98-7<br>EINECS: 231-107-2                               | molybdenum<br>substance with a Community workplace exposure limit   |
| CAS: 7440-33-7<br>EINECS: 231-143-9                               | tungsten<br>substance with a Community workplace exposure limit   |
| CAS: 7429-90-5<br>EINECS: 231-072-3<br>Index number: 013-001-00-6 | aluminium powder (pyrophoric)<br> F R15-17<br> Pyr. Sol. 1, H250; Water-react. 2, H261  |
| CAS: 7440-36-0<br>EINECS: 231-146-5                               | antimony<br>substance with a Community workplace exposure limit   |
| CAS: 2691-41-0<br>EINECS: 220-260-0                               | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)<br> T R24;  Xn R22;  E R2<br> Expl. 1.1, H201<br> Acute Tox. 3, H301; Acute Tox. 3, H311   |
| CAS: 4682-03-5  | diazodinitro phenol (DDNP)<br> Xi R36/38;  Xi R43;  E R3<br> Unst. Expl., H200<br> Skin Irrit. 2, H315; Eye Irrit. 2, H319; Skin Sens. 1, H317 |

**SVHC**

|            |               |
|------------|---------------|
| 13424-46-9 | lead diazide  |
| 1314-41-6  | orange lead   |
| 7758-97-6  | lead chromate |

**Additional information:**

For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.  
For the wording of the listed risk phrases refer to section 16.

**SECTION 4: First aid measures****4.1 Description of first aid measures****General information:**

Immediately remove any clothing soiled by the product.

Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.

**After inhalation:**

Unlikely route of exposure.

Supply fresh air; consult doctor in case of complaints.

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- **After skin contact:**  
Generally the product does not irritate the skin.  
Wash with soap and water.  
If skin irritation is experienced, consult a doctor.
- **After eye contact:**  
Remove contact lenses if worn.  
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
- **After swallowing:**  
Rinse out mouth and then drink plenty of water.  
Do not induce vomiting; call for medical help immediately.
- **4.2 Most important symptoms and effects, both acute and delayed** Blast injury if mishandled.
- **Hazards**  
Danger of blast or crush-type injuries.  
Harmful if swallowed.  
Danger of disturbed cardiac rhythm.
- **4.3 Indication of any immediate medical attention and special treatment needed**  
Medical supervision for at least 48 hours.  
Product may produce physical injury if mishandled. Treatment of these injuries should be based on the blast and compression effects.

## SECTION 5: Firefighting measures

- **5.1 Extinguishing media**
- **Suitable extinguishing agents:** DO NOT fight fire when fire reaches explosives.
- **For safety reasons unsuitable extinguishing agents:** None.
- **5.2 Special hazards arising from the substance or mixture**  
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. Can explode or detonate under fire conditions. Burning material may produce toxic vapors. It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.  
Explosive; mass explosion hazard.
- **5.3 Advice for firefighters**
- **Protective equipment:**  
Wear self-contained respiratory protective device.  
Wear fully protective suit.
- **Additional information**  
Eliminate all ignition sources if safe to do so.  
Flammability Classification: (defined by 29 CFR 1910.1200) Explosive. Can explode under fire conditions. Individual devices will randomly explode. Mass explosion of multiple devices is possible under certain conditions. Burning material may produce toxic and irritating vapors. In unusual cases, shrapnel may be thrown from exploding devices under containment. See 2012 Emergency response Guidebook for further information.

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## SECTION 6: Accidental release measures

### · 6.1 Personal precautions, protective equipment and emergency procedures

Remove persons from danger area.

Ensure adequate ventilation

Wear protective clothing.

Protect from heat.

Evacuate area.

Isolate area and prevent access.

### · 6.2 Environmental precautions: No special measures required.

### · 6.3 Methods and material for containment and cleaning up:

Pick up mechanically.

Send for recovery or disposal in suitable receptacles.

Dispose unusable material as waste according to item 13.

### · 6.4 Reference to other sections

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

## SECTION 7: Handling and storage

### · 7.1 Precautions for safe handling

Open and handle receptacle with care.

Handle with care. Avoid jolting, friction and impact.

Use only in well ventilated areas.

Do not subject to grinding/shock/friction.

### · Information about fire - and explosion protection:

Protect from heat.

Prevent impact and friction.

Emergency cooling must be available in case of nearby fire.

### · 7.2 Conditions for safe storage, including any incompatibilities

#### · Storage:

#### · Requirements to be met by storerooms and receptacles:

Store in a cool location.

Avoid storage near extreme heat, ignition sources or open flame.

#### · Information about storage in one common storage facility: Store away from foodstuffs.

#### · Further information about storage conditions:

Store under lock and key and with access restricted to technical experts or their assistants only.

Keep away from heat.

### · 7.3 Specific end use(s) No further relevant information available.

## SECTION 8: Exposure controls/personal protection

### · Additional information about design of technical facilities: No further data; see item 7.

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· **8.1 Control parameters**· **Ingredients with limit values that require monitoring at the workplace:****13424-46-9 lead diazide**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; See 29 CFR 1910,1025               |
| REL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>as Pb;*8-hr TWA; See Pocket Guide App. C |
| TLV (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; BEI                                |
| EL (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; IARC 2A, R                         |

**7439-92-1 lead**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>*see 29 CFR 1910,1025                              |
| REL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>*8-hr TWA,excl. lead arsenate;See PocketGuideApp.C |
| TLV (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>*and inorganic compounds, as Pb; BEI               |
| EL (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>R; IARC 2B  |
| EV (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb, Skin (organic compounds)                     |

**7440-21-3 silicon**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 15* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction |
| REL (USA)   | Long-term value: 10* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction |
| TLV (USA)   | TLV withdrawn   |
| EL (Canada) | Long-term value: 10* 3** mg/m <sup>3</sup><br>*total dust;**respirable fraction |
| EV (Canada) | Long-term value: 10 mg/m <sup>3</sup><br>total dust                             |

**7782-49-2 selenium**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 0,2 mg/m <sup>3</sup><br>as Se |
| REL (USA)   | Long-term value: 0,2 mg/m <sup>3</sup><br>as Se |
| TLV (USA)   | Long-term value: 0,2 mg/m <sup>3</sup><br>as Se |
| EL (Canada) | Long-term value: 0,1 mg/m <sup>3</sup>          |
| EV (Canada) | Long-term value: 0,2 mg/m <sup>3</sup>          |

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**1314-41-6 orange lead**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; See 29 CFR 1910,1025               |
| REL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>as Pb;*8-hr TWA; See Pocket Guide App. C |
| TLV (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; BEI                                |
| EL (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; IARC 2A, R                         |
| EV (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb, Skin (organic compounds)           |

**13463-67-7 titanium dioxide**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 15* mg/m <sup>3</sup><br>*total dust                                    |
| REL (USA)   | See Pocket Guide App. A  |
| TLV (USA)   | Long-term value: 10 mg/m <sup>3</sup><br>withdrawn from NIC                              |
| EL (Canada) | Long-term value: 10* 3** mg/m <sup>3</sup><br>*total dust;**respirable fraction; IARC 2B |
| EV (Canada) | Long-term value: 10 mg/m <sup>3</sup><br>total dust                                      |

**10294-40-3 barium chromate**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,005* mg/m <sup>3</sup><br>Ceiling limit: 0,1** mg/m <sup>3</sup><br>*as Cr(VI) **as CrO <sub>3</sub> ; see 29 CFR 1910,1026 |
| REL (USA)   | Long-term value: 0,0002 mg/m <sup>3</sup><br>as Cr; See Pocket Guide Apps. A and C   |
| TLV (USA)   | Long-term value: 0,01 mg/m <sup>3</sup><br>as Cr   |
| EL (Canada) | Long-term value: 0,01 mg/m <sup>3</sup><br>as Cr; ACGIH A1 IARC 1  |

**7758-97-6 lead chromate**

|            |  |
|------------|--|
| IOELV (EU) | Long-term value: 2 mg/m <sup>3</sup><br>as Cr  |
| PEL (USA)  | Long-term value: 0,005* mg/m <sup>3</sup><br>Ceiling limit: 0,1** mg/m <sup>3</sup><br>*as Cr(VI) **as CrO <sub>3</sub> ; see 29 CFR 1910,1026 |
| REL (USA)  | Long-term value: 0,0002 mg/m <sup>3</sup><br>as Cr; See Pocket Guide Apps. A and C   |
| TLV (USA)  | Long-term value: 0,05* 0,012** mg/m <sup>3</sup><br>*as Pb; BEI ; **as Cr  |

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|   |   |
|---|---|
| EL (Canada)   | Long-term value: 0,05* 0,012** mg/m <sup>3</sup><br>ACIGH A2, IARC 2A; R; *as Pb; **as Cr                     |
| EV (Canada)   | Long-term value: 0,012* 0,05** mg/m <sup>3</sup><br>*as Cr, **as Pb   |
| <b>7727-43-7 barium sulphate, natural</b>               |   |
| PEL (USA)   | Long-term value: 15* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction                               |
| REL (USA)   | Long-term value: 10* 5** mg/m <sup>3</sup><br>*total dust **respirable fraction                               |
| TLV (USA)   | Long-term value: 5* mg/m <sup>3</sup><br>*inhalable fraction; E   |
| EL (Canada)   | Long-term value: 10* 3** mg/m <sup>3</sup><br>*total dust, **respirable fraction                              |
| EV (Canada)   | Long-term value: 10 mg/m <sup>3</sup><br>total dust   |
| <b>61790-53-2 Diatomaceous earth (Silica-Amorphous)</b> |   |
| PEL (USA)   | 20mppcf or 80mg/m <sup>3</sup> /%SiO <sub>2</sub>   |
| REL (USA)   | Long-term value: 6 mg/m <sup>3</sup><br>See Pocket Guide App. C   |
| TLV (USA)   | TLV withdrawn   |
| EL (Canada)   | Long-term value: 4* 1,5** mg/m <sup>3</sup><br>*total, **respirable   |
| EV (Canada)   | Long-term value: 10* 3** mg/m <sup>3</sup><br>uncalcined; *inhalable; **respirable                            |
| <b>7439-98-7 molybdenum</b>                             |   |
| PEL (USA)   | Long-term value: 15* mg/m <sup>3</sup><br>*Total dust   |
| TLV (USA)   | Long-term value: 10* 3** mg/m <sup>3</sup><br>as Mo; *inhalable fraction ** respirable fraction               |
| EL (Canada)   | Long-term value: 3* 10** mg/m <sup>3</sup><br>as Mo; *respirable **inhalable                                  |
| EV (Canada)   | Long-term value: 10* 3** 0,5*** mg/m <sup>3</sup><br>metal, insol.comp.d.: *inh; **resp; sol.comp.d.: ***resp |
| <b>7440-33-7 tungsten</b>                               |   |
| PEL (USA)   | and insoluble compounds, as We  |
| REL (USA)   | Short-term value: 10 mg/m <sup>3</sup><br>Long-term value: 5 mg/m <sup>3</sup><br>as W                        |

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|             |  |
|-------------|--|
| TLV (USA)   | Short-term value: 10 mg/m <sup>3</sup><br>Long-term value: 5 mg/m <sup>3</sup><br>as W   |
| EL (Canada) | Short-term value: 10 mg/m <sup>3</sup><br>Long-term value: 5 mg/m <sup>3</sup><br>as W   |
| EV (Canada) | Short-term value: 10* 3** mg/m <sup>3</sup><br>Long-term value: 5* 1** mg/m <sup>3</sup><br>(as tungsten; compds.: *water-insol.; **water-sol. |

**7429-90-5 aluminium powder (pyrophoric)**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 15*, 15** mg/m <sup>3</sup><br>*Total dust; ** Respirable fraction              |
| REL (USA)   | Long-term value: 10* 5** mg/m <sup>3</sup><br>as Al*Total dust**Respirable/pyro powd./welding f. |
| TLV (USA)   | Long-term value: 1* mg/m <sup>3</sup><br>as Al; *as respirable fraction                          |
| EL (Canada) | Long-term value: 1,0 mg/m <sup>3</sup><br>respirable, as Al                                      |
| EV (Canada) | Long-term value: 5 mg/m <sup>3</sup><br>aluminium-containing (as aluminium)                      |

**7440-36-0 antimony**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
| REL (USA)   | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
| TLV (USA)   | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
| EL (Canada) | Long-term value: 0,5 mg/m <sup>3</sup>          |
| EV (Canada) | Long-term value: 0,5 mg/m <sup>3</sup>          |

- **DNELs** No further relevant information available.
- **PNECs** No further relevant information available.

• **Ingredients with biological limit values:****13424-46-9 lead diazide**

|           |  |
|-----------|--|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead |
|-----------|--|

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**7439-92-1 lead**

|           |   |
|-----------|---|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead                                    |
|           | 10 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead (women of child bearing potential) |

**1314-41-6 orange lead**

|           |  |
|-----------|--|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead |
|-----------|--|

**10294-40-3 barium chromate**

|           |   |
|-----------|---|
| BEI (USA) | 25 µg/L<br>Medium: urine<br>Time: end of shift at end of workweek<br>Parameter: Total chromium (fume) |
|           | 10 µg/L<br>Medium: urine<br>Time: increase during shift<br>Parameter: Total chromium (fume)           |

**7758-97-6 lead chromate**

|           |   |
|-----------|---|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead                                    |
|           | 10 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead (women of child bearing potential) |

• **Additional information:** The lists valid during the making were used as basis.

• **8.2 Exposure controls**

• **Personal protective equipment:**

• **General protective and hygienic measures:**

The usual precautionary measures are to be adhered to when handling chemicals.  
Keep away from foodstuffs, beverages and feed.  
Immediately remove all soiled and contaminated clothing.  
Wash hands before breaks and at the end of work.  
Avoid contact with the eyes and skin.

• **Respiratory protection:**

Not required under normal conditions of use.

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Respiratory protection may be required after product use.

• **Protection of hands:**

Wear gloves for the protection against mechanical hazards according to NIOSH or EN 388.

• **Material of gloves**

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

• **Penetration time of glove material**

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

• **Eye protection:**



Safety glasses

Face protection

• **Body protection:** Impervious protective clothing

• **Limitation and supervision of exposure into the environment**

No further relevant information available.

• **Risk management measures**

Organizational measures should be in place for all activities involving this product.

## SECTION 9: Physical and chemical properties

• **9.1 Information on basic physical and chemical properties**

• **General Information**

• **Appearance:**

Form:

Solid material

Colour:

According to product specification

• **Odour:**

Characteristic

• **Odour threshold:**

Not determined.

• **pH-value:**

Not applicable.

• **Change in condition**

Melting point/Melting range:

Not Determined.

Boiling point/Boiling range:

Undetermined.

• **Flash point:**

Not applicable.

• **Flammability (solid, gaseous):**

Explosive; mass explosion hazard.

• **Auto/Self-ignition temperature:**

Not determined.

• **Decomposition temperature:**

Not determined.

• **Self-igniting:**

Product is not self-igniting.

• **Danger of explosion:**

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

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- **Explosion limits:**
  - Lower:** Not determined.
  - Upper:** Not determined.
- **Vapour pressure:** Not applicable.
- **Density:** Not determined.
- **Relative density** Not determined.
- **Vapour density** Not applicable.
- **Evaporation rate** Not applicable.
- **Solubility in / Miscibility with water:** Variable, dependent upon product composition and packaging.
- **Partition coefficient (n-octanol/water):** Not determined.
- **Viscosity:**
  - Dynamic:** Not applicable.
  - Kinematic:** Not applicable.
- **9.2 Other information** No further relevant information available.

## SECTION 10: Stability and reactivity

- **10.1 Reactivity**
- **10.2 Chemical stability**
- **Thermal decomposition / conditions to be avoided:**  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- **10.3 Possibility of hazardous reactions**  
Danger of explosion.  
Toxic fumes may be released if heated above the decomposition point.
- **10.4 Conditions to avoid** No further relevant information available.
- **10.5 Incompatible materials:** No further relevant information available.
- **10.6 Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Hydrocarbons  
Nitrogen oxides  
Chlorine compounds  
Leadoxide vapour  
Bariumoxide vapour  
Toxic metal oxide smoke  
Danger of forming toxic pyrolysis products.

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## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity:

#### LD/LC50 values relevant for classification:

##### 7439-92-1 lead

Oral LD50 &gt;2000 mg/kg (rat)

##### 7782-49-2 selenium

Oral LD50 6700 mg/kg (rat)

##### 7758-97-6 lead chromate

Oral LD50 12000 mg/kg (mouse)

#### Primary irritant effect:

##### on the skin:

Not a skin irritant in unused form. Vapors/particles from used product are possibly irritating to skin.

##### on the eye:

Not an eye irritant in unused form. Vapors/particles from used product are possibly irritating to eyes.

#### Sensitisation: No sensitising effects known.

#### Subacute to chronic toxicity: No further relevant information available.

#### Additional toxicological information:

The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:

Harmful

#### Acute effects (acute toxicity, irritation and corrosivity):

Danger of blast or crush-type injuries.

Harmful if swallowed.

#### Repeated dose toxicity: No further relevant information available.

## SECTION 12: Ecological information

### 12.1 Toxicity

#### Aquatic toxicity: No further relevant information available.

#### 12.2 Persistence and degradability No further relevant information available.

#### 12.3 Bioaccumulative potential No further relevant information available.

#### 12.4 Mobility in soil No further relevant information available.

#### Additional ecological information:

#### General notes:

Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water

Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

#### 12.5 Results of PBT and vPvB assessment

##### PBT: Not applicable.

##### vPvB: Not applicable.

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- **12.6 Other adverse effects** No further relevant information available.

## SECTION 13: Disposal considerations

### • 13.1 Waste treatment methods

#### • Recommendation

Must not be disposed together with household garbage. Do not allow product to reach sewage system. Damaged materials pose a danger to anyone in the immediate area; consult experts for disposal of damaged products.

The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. Residual materials should be treated as hazardous.

#### • Uncleaned packaging:

- **Recommendation:** Disposal must be made according to official regulations.

## SECTION 14: Transport information

### • 14.1 UN-Number

#### • DOT, ADR, IMDG

UN0360

#### • IATA

FORBIDDEN

### • 14.2 UN proper shipping name

#### • DOT, IMDG

DETONATOR ASSEMBLIES, NON-ELECTRIC

#### • ADR

0360 DETONATOR ASSEMBLIES, NON-ELECTRIC

#### • IATA

FORBIDDEN

### • 14.3 Transport hazard class(es)

#### • DOT



#### • Class

1.1

#### • Label

1.1

#### • ADR, IMDG



#### • Class

1.1

#### • Label

1.1B

#### • IATA

#### • Class

FORBIDDEN

### • 14.4 Packing group

#### • DOT, ADR, IMDG

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|  |  |
|--|--|
| · IATA   | FORBIDDEN  |
| · 14.5 Environmental hazards:  |  |
| · Marine pollutant:  | No   |
| · Special marking (IATA):  | FORBIDDEN BY AIR.                                    |
| · 14.6 Special precautions for user  | Not applicable.                                      |
| · EMS Number:  | F-B,S-X  |
| · Segregation groups   | Perchlorates   |
| · 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code | Not applicable.                                      |
| · Transport/Additional information:  |  |
| · ADR  |  |
| · Limited quantities (LQ)  | 0  |
| · Excepted quantities (EQ)   | Code: E0<br>Not permitted as Excepted Quantity       |
| · Tunnel restriction code  | 1  |
| · IMDG   |  |
| · Limited quantities (LQ)  | 0  |
| · Excepted quantities (EQ)   | Code: E0<br>Not permitted as Excepted Quantity       |
| · IATA   | FORBIDDEN.   |
| · UN "Model Regulation":   | UN0360, DETONATOR ASSEMBLIES, NON-ELECTRIC, 1.1B, II |

## SECTION 15: Regulatory information

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
- United States (USA)
- SARA

### · Section 355 (extremely hazardous substances):

None of the ingredients are listed.

### · Section 313 (Specific toxic chemical listings):

|            |                               |
|------------|-------------------------------|
| 13424-46-9 | lead diazide                  |
| 7439-92-1  | lead                          |
| 7782-49-2  | selenium                      |
| 1314-41-6  | orange lead                   |
| 10294-40-3 | barium chromate               |
| 7758-97-6  | lead chromate                 |
| 7727-43-7  | barium sulphate, natural      |
| 7429-90-5  | aluminium powder (pyrophoric) |
| 7440-36-0  | antimony                      |

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· **TSCA (Toxic Substances Control Act):**

All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**

13424-46-9 lead diazide

7439-92-1 lead

1314-41-6 orange lead

13463-67-7 titanium dioxide

10294-40-3 barium chromate

7758-97-6 lead chromate

· **Chemicals known to cause reproductive toxicity for females:**

7439-92-1 lead

10294-40-3 barium chromate

7758-97-6 lead chromate

· **Chemicals known to cause reproductive toxicity for males:**

7439-92-1 lead

10294-40-3 barium chromate

7758-97-6 lead chromate

· **Chemicals known to cause developmental toxicity:**

13424-46-9 lead diazide

7439-92-1 lead

10294-40-3 barium chromate

7758-97-6 lead chromate

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**

13424-46-9 lead diazide

B2

7439-92-1 lead

B2

7782-49-2 selenium

D

1314-41-6 orange lead

B2

10294-40-3 barium chromate

A(inh), D(oral), K/L(inh), CBD(oral)

7758-97-6 lead chromate

K

7727-43-7 barium sulphate, natural

D, CBD(inh), NL(oral)

7778-74-7 potassium perchlorate

NL

2691-41-0 octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)

D

· **IARC (International Agency for Research on Cancer)**

13424-46-9 lead diazide

2A

7439-92-1 lead

2B

7782-49-2 selenium

3

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|            |                                       |    |
|------------|---------------------------------------|----|
| 1314-41-6  | orange lead                           | 2A |
| 13463-67-7 | titanium dioxide                      | 2B |
| 10294-40-3 | barium chromate                       | 1  |
| 7758-97-6  | lead chromate                         | 1  |
| 61790-53-2 | Diatomaceous earth (Silica-Amorphous) | 3  |

· **TLV (Threshold Limit Value established by ACGIH)**

|            |                               |    |
|------------|-------------------------------|----|
| 13424-46-9 | lead diazide                  | A3 |
| 7439-92-1  | lead                          | A3 |
| 1314-41-6  | orange lead                   | A3 |
| 13463-67-7 | titanium dioxide              | A4 |
| 10294-40-3 | barium chromate               | A1 |
| 7758-97-6  | lead chromate                 | A2 |
| 7439-98-7  | molybdenum                    | A3 |
| 7429-90-5  | aluminium powder (pyrophoric) | A4 |

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

|            |                  |
|------------|------------------|
| 13463-67-7 | titanium dioxide |
| 10294-40-3 | barium chromate  |
| 7758-97-6  | lead chromate    |

· **Canada**

· **Canadian Domestic Substances List (DSL)**

Some components are listed on the NDSL.

All ingredients are listed.

· **Canadian Ingredient Disclosure list (limit 0.1%)**

|            |                 |
|------------|-----------------|
| 7439-92-1  | lead            |
| 7782-49-2  | selenium        |
| 10294-40-3 | barium chromate |
| 7758-97-6  | lead chromate   |

· **Canadian Ingredient Disclosure list (limit 1%)**

|           |                               |
|-----------|-------------------------------|
| 7439-98-7 | molybdenum                    |
| 7440-33-7 | tungsten                      |
| 7429-90-5 | aluminium powder (pyrophoric) |
| 7440-36-0 | antimony                      |

· **Other regulations, limitations and prohibitive regulations**

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

· **Substances of very high concern (SVHC) according to REACH, Article 57**

|            |              |
|------------|--------------|
| 13424-46-9 | lead diazide |
| 1314-41-6  | orange lead  |

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7758-97-6 | lead chromate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

## SECTION 16: Other information

### Disclaimer

Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, the information contained herein, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. The information contained herein is provided for reference purposes only and is intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product or information. Under no circumstances shall either Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

### · Relevant phrases

|        |  |
|--------|--|
| H200   | Unstable explosives.   |
| H201   | Explosive; mass explosion hazard.  |
| H228   | Flammable solid.   |
| H250   | Catches fire spontaneously if exposed to air.                            |
| H261   | In contact with water releases flammable gases.                          |
| H271   | May cause fire or explosion; strong oxidiser.                            |
| H301   | Toxic if swallowed.  |
| H302   | Harmful if swallowed.  |
| H311   | Toxic in contact with skin.  |
| H315   | Causes skin irritation.  |
| H317   | May cause an allergic skin reaction.                                     |
| H319   | Causes serious eye irritation.   |
| H331   | Toxic if inhaled.  |
| H332   | Harmful if inhaled.  |
| H350   | May cause cancer.  |
| H360Df | May damage the unborn child. Suspected of damaging fertility.            |
| H360FD | May damage fertility. May damage the unborn child.                       |
| H372   | Causes damage to organs through prolonged or repeated exposure.          |
| H373   | May cause damage to organs through prolonged or repeated exposure.       |
| H400   | Very toxic to aquatic life.  |
| H410   | Very toxic to aquatic life with long lasting effects.                    |
| H413   | May cause long lasting harmful effects to aquatic life.                  |
| R11    | Highly flammable.  |
| R15    | Contact with water liberates extremely flammable gases.                  |
| R17    | Spontaneously flammable in air.  |
| R2     | Risk of explosion by shock, friction, fire or other sources of ignition. |
| R20/22 | Harmful by inhalation and if swallowed.                                  |
| R22    | Harmful if swallowed.  |

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- R23/25 Toxic by inhalation and if swallowed.  
 R24 Toxic in contact with skin.  
 R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.  
 R33 Danger of cumulative effects.  
 R36/38 Irritating to eyes and skin.  
 R43 May cause sensitisation by skin contact.  
 R45 May cause cancer.  
 R48/23/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.  
 R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.  
 R53 May cause long-term adverse effects in the aquatic environment.  
 R60 May impair fertility.  
 R61 May cause harm to the unborn child.  
 R62 Possible risk of impaired fertility.  
 R9 Explosive when mixed with combustible material.

**Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)  
 IMDG: International Maritime Code for Dangerous Goods  
 DOT: US Department of Transportation  
 IATA: International Air Transport Association  
 GHS: Globally Harmonised System of Classification and Labelling of Chemicals  
 ACGIH: American Conference of Governmental Industrial Hygienists  
 EINECS: European Inventory of Existing Commercial Chemical Substances  
 ELINCS: European List of Notified Chemical Substances  
 CAS: Chemical Abstracts Service (division of the American Chemical Society)  
 NFPA: National Fire Protection Association (USA)  
 HMIS: Hazardous Materials Identification System (USA)  
 WHMIS: Workplace Hazardous Materials Information System (Canada)  
 DNEL: Derived No-Effect Level (REACH)  
 PNEC: Predicted No-Effect Concentration (REACH)  
 LC50: Lethal concentration, 50 percent  
 LD50: Lethal dose, 50 percent  
 Expl. 1.1: Explosives, Division 1.1  
 Unst. Expl.: Explosives, Unstable explosives  
 Flam. Sol. 2: Flammable solids, Hazard Category 2  
 Pyr. Sol. 1: Pyrophoric Solids, Hazard Category 1  
 Water-react. 2: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 2  
 Ox. Sol. 1: Oxidising Solids, Hazard Category 1  
 Acute Tox. 3: Acute toxicity, Hazard Category 3  
 Acute Tox. 4: Acute toxicity, Hazard Category 4  
 Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2  
 Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2  
 Skin Sens. 1: Sensitisation - Skin, Hazard Category 1  
 Carc. 1A: Carcinogenicity, Hazard Category 1A  
 Carc. 1B: Carcinogenicity, Hazard Category 1B  
 Repr. 1A: Reproductive toxicity, Hazard Category 1A  
 STOT RE 1: Specific target organ toxicity - Repeated exposure, Hazard Category 1  
 STOT RE 2: Specific target organ toxicity - Repeated exposure, Hazard Category 2  
 Aquatic Acute 1: Hazardous to the aquatic environment - Acute Hazard, Category 1  
 Aquatic Chronic 1: Hazardous to the aquatic environment - Chronic Hazard, Category 1  
 Aquatic Chronic 4: Hazardous to the aquatic environment - Chronic Hazard, Category 4

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**· Sources**

SDS Prepared by:

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Website: [www.chemtelinc.com](http://www.chemtelinc.com)

# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
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## SECTION 1: Identification of the substance/mixture and of the company/undertaking

- **1.1 Product identifier**
- **Trade name:** **NONEL® Non-electric Delay Detonators**
- **Article number:** 1122
- **Other product identifiers:**  
 NONEL® MS  
 NONEL® EZ DET®  
 NONEL® MS ARCTIC  
 NONEL® EZTL™  
 NONEL® LP NONEL®  
 EZ DRIFTER®  
 NONEL® SL  
 NONEL® SUPER  
 NONEL® TD  
 NONEL® MS CONNECTOR  
 NONEL® TWINPLEX™  
 NONEL® STARTER
- **1.2 Relevant identified uses of the substance or mixture and uses advised against**  
 No further relevant information available.
- **Application of the substance / the mixture**  
 Explosive product.  
 Commercial blasting applications
- **1.3 Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**  
 Dyno Nobel Inc.  
 2795 East Cottonwood Parkway, Suite 500  
 Salt Lake City, Utah 84121  
 Phone: 801-364-4800  
 Fax: 801-321-6703  
 E-Mail: dnna.hse@am.dynonobel.com
- **1.4 Emergency telephone number:**  
 CHEMTREC  
 1-800-424-9300 (US/Canada)  
 +01 703-527-3887 (International)

## SECTION 2: Hazards identification

- **2.1 Classification of the substance or mixture**
- **Classification according to Regulation (EC) No 1272/2008**  
 Classifications listed also are applicable to the OSHA GHS Hazard Communication Standard (29CFR1910.1200).



exploding bomb

Expl. 1.4 H204 Fire or projection hazard.

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- **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**

R5: Heating may cause an explosion.

- **Information concerning particular hazards for human and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

- **Classification system:**

The classification is according to the latest editions of the EU-lists, and extended by company and literature data.

The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

- **Additional information:**

There are no other hazards not otherwise classified that have been identified.

0 percent of the mixture consists of component(s) of unknown toxicity

- **2.2 Label elements**

- **Labelling according to Regulation (EC) No 1272/2008**

The product is additionally classified and labelled according to the Globally Harmonized System within the United States (GHS).

The product is classified and labelled according to the CLP regulation.

- **Hazard pictograms**



GHS01

- **Signal word** Warning

- **Hazard-determining components of labelling:**

diazodinitro phenol (DDNP)

pentaerythritol tetranitrate (PETN)

octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)

lead diazide

orange lead

- **Hazard statements**

H204 Fire or projection hazard.

- **Precautionary statements**

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P250 Do not subject to grinding/shock/friction.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P240 Ground/bond container and receiving equipment.

P373 DO NOT fight fire when fire reaches explosives.

P370+P380 In case of fire: Evacuate area.

P372 Explosion risk in case of fire.

P401 Store in accordance with local/regional/national/international regulations.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

- **Additional information:**

EUH201 Contains lead. Should not be used on surfaces liable to be chewed or sucked by children.

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- **Hazard description:**
- **WHMIS-symbols:** Explosive products are not classified under WHMIS.
- **NFPA ratings (scale 0 - 4)** Not available.
- **HMIS-ratings (scale 0 - 4)** Not available

**HMIS Long Term Health Hazard Substances**

|            |                       |
|------------|-----------------------|
| 13424-46-9 | lead diazide          |
| 7439-92-1  | lead                  |
| 13463-67-7 | titanium dioxide      |
| 7758-97-6  | lead chromate         |
| 7778-74-7  | potassium perchlorate |

- **2.3 Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Explosive Product Notice**



PREVENTION OF ACCIDENTS IN THE USE OF EXPLOSIVES - The prevention of accidents in the use of explosives is a result of careful planning and observance of the best known practices. The explosives user must remember that he is dealing with a powerful force and that various devices and methods have been developed to assist him in directing this force. He should realize that this force, if misdirected, may either kill or injure both him and his fellow workers.

WARNING - All explosives are dangerous and must be carefully handled and used following approved safety procedures either by or under the direction of competent, experienced persons in accordance with all applicable federal, state, and local laws, regulations, or ordinances. If you have any questions or doubts as to how to use any explosive product, DO NOT USE IT before consulting with your supervisor, or the manufacturer, if you do not have a supervisor. If your supervisor has any questions or doubts, he should consult the manufacturer before use.

## SECTION 3: Composition/information on ingredients

- **3.2 Mixtures**
- **Description:** Mixture of substances listed below with nonhazardous additions.

**Dangerous components:**

|                            |   |
|----------------------------|---|
| CAS: 78-11-5               | pentaerythritol tetranitrate (PETN)   |
| EINECS: 201-084-3          |  E R3              |
| Index number: 603-035-00-5 |  Unst. Expl., H200 |

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|  |  |
|--|--|
| CAS: 13424-46-9<br>EINECS: 236-542-1<br>Index number: 082-003-00-7 | lead diazide<br><br><br><br><br>                                   |
| CAS: 7439-92-1<br>EINECS: 231-100-4                                | lead<br><br><br>   |
| CAS: 7440-21-3<br>EINECS: 231-130-8                                | silicon<br><br>  |
| CAS: 2691-41-0<br>EINECS: 220-260-0                                | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)<br><br><br> |
| CAS: 7782-49-2<br>EINECS: 231-957-4<br>Index number: 034-001-00-2  | selenium<br><br><br><br><br>                                       |
| CAS: 1314-41-6<br>EINECS: 215-235-6<br>Index number: 082-001-00-6  | orange lead<br><br><br><br>  |
| CAS: 10294-40-3<br>EINECS: 233-660-5<br>Index number: 056-002-00-7 | barium chromate<br><br><br>  |
| CAS: 7758-97-6<br>EINECS: 231-846-0<br>Index number: 082-004-00-2  | lead chromate<br><br><br>  |
| CAS: 4682-03-5   | diazodinitro phenol (DDNP)<br><br><br>                             |
| CAS: 7440-36-0<br>EINECS: 231-146-5                                | antimony<br>substance with a Community workplace exposure limit    |

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|   |   |
|---|---|
| CAS: 7440-33-7<br>EINECS: 231-143-9                               | tungsten<br>substance with a Community workplace exposure limit   |
| CAS: 7429-90-5<br>EINECS: 231-072-3<br>Index number: 013-001-00-6 | aluminium powder (pyrophoric)<br> F R15-17<br> Pyr. Sol. 1, H250; Water-react. 2, H261  |
| CAS: 7439-98-7<br>EINECS: 231-107-2                               | molybdenum<br>substance with a Community workplace exposure limit   |
| CAS: 61790-53-2   | Diatomaceous earth (Silica-Amorphous)<br>substance with a Community workplace exposure limit  |
| CAS: 7778-74-7<br>EINECS: 231-912-9<br>Index number: 017-008-00-5 | potassium perchlorate<br> Xn R22;  O R9<br> Ox. Sol. 1, H271<br> Acute Tox. 4, H302 |
| CAS: 7727-43-7<br>EINECS: 231-784-4                               | barium sulphate, natural<br>substance with a Community workplace exposure limit   |
| <b>SVHC</b>   |   |
| 13424-46-9  | lead diazide  |
| 1314-41-6   | orange lead   |
| 7758-97-6   | lead chromate   |

**Additional information:**

For the wording of the listed risk phrases refer to section 16.

For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

**SECTION 4: First aid measures****4.1 Description of first aid measures****General information:** No special measures required.**After inhalation:**

Unlikely route of exposure.

Supply fresh air; consult doctor in case of complaints.

**After skin contact:**

Generally the product does not irritate the skin.

Wash with soap and water.

If skin irritation is experienced, consult a doctor.

**After eye contact:**

Remove contact lenses if worn.

Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

**After swallowing:**

Unlikely route of exposure.

Do not induce vomiting; call for medical help immediately.

**4.2 Most important symptoms and effects, both acute and delayed** Blast injury if mishandled.**Hazards** Danger of blast or crush-type injuries.

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· **4.3 Indication of any immediate medical attention and special treatment needed**

Product may produce physical injury if mishandled. Treatment of these injuries should be based on the blast and compression effects.

### SECTION 5: Firefighting measures

· **5.1 Extinguishing media**

· **Suitable extinguishing agents:** DO NOT fight fire when fire reaches explosives.

· **For safety reasons unsuitable extinguishing agents:** None.

· **5.2 Special hazards arising from the substance or mixture**

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. Can explode or detonate under fire conditions. Burning material may produce toxic vapors. It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Fire or projection hazard.

Product may explode if burned in confined space. Individual cartridges may explode. Mass explosion of many cartridges at once is unlikely.

· **5.3 Advice for firefighters**

· **Protective equipment:**

Wear self-contained respiratory protective device.

Wear fully protective suit.

· **Additional information**

Eliminate all ignition sources if safe to do so.

Flammability Classification: (defined by 29 CFR 1910.1200) Explosive. Can explode under fire conditions. Individual devices will randomly explode. Will not mass explode if multiple devices are involved. Burning material may produce toxic and irritating vapors. In unusual cases, shrapnel may be thrown from exploding devices under containment. See 2008 Emergency response Guidebook for further information.

### SECTION 6: Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**

Wear protective clothing.

Ensure adequate ventilation

Protect from heat.

· **6.2 Environmental precautions:**

Do not allow to enter sewers/ surface or ground water.

Inform respective authorities in case of seepage into water course or sewage system.

· **6.3 Methods and material for containment and cleaning up:**

Pick up mechanically.

Send for recovery or disposal in suitable receptacles.

Dispose unusable material as waste according to item 13.

· **6.4 Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

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See Section 13 for disposal information.

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### SECTION 7: Handling and storage

- **7.1 Precautions for safe handling**  
Handle with care. Avoid jolting, friction and impact.  
Use only in well ventilated areas.  
Do not subject to grinding/shock/friction.
- **Information about fire - and explosion protection:**  
Protect from heat.  
Emergency cooling must be available in case of nearby fire.
- **7.2 Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by storerooms and receptacles:**  
Store in a cool location.  
Avoid storage near extreme heat, ignition sources or open flame.
- **Information about storage in one common storage facility:** Store away from foodstuffs.
- **Further information about storage conditions:**  
Store in cool, dry conditions in well sealed receptacles.  
Keep away from heat.
- **7.3 Specific end use(s)** No further relevant information available.

### SECTION 8: Exposure controls/personal protection

- **Additional information about design of technical facilities:** No further data; see item 7.
- **8.1 Control parameters**

#### · **Ingredients with limit values that require monitoring at the workplace:**

##### **13424-46-9 lead diazide**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; See 29 CFR 1910,1025               |
| REL (USA)   | Long-term value: 0,05* mg/m <sup>3</sup><br>as Pb;*8-hr TWA; See Pocket Guide App. C |
| TLV (USA)   | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; BEI                                |
| EL (Canada) | Long-term value: 0,05 mg/m <sup>3</sup><br>as Pb; IARC 2A, R                         |

##### **7439-92-1 lead**

|           |  |
|-----------|--|
| PEL (USA) | Long-term value: 0,05* mg/m <sup>3</sup><br>*see 29 CFR 1910,1025                                |
| REL (USA) | Long-term value: 0,05* mg/m <sup>3</sup><br>*8-hr TWA, excl. lead arsenate; See PocketGuideApp.C |

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TLV (USA) Long-term value: 0,05\* mg/m<sup>3</sup>  
\*and inorganic compounds, as Pb; BEI

EL (Canada) Long-term value: 0,05 mg/m<sup>3</sup>  
R; IARC 2B

EV (Canada) Long-term value: 0,05 mg/m<sup>3</sup>  
as Pb, Skin (organic compounds)

**7440-21-3 silicon**

PEL (USA) Long-term value: 15\* 5\*\* mg/m<sup>3</sup>  
\*total dust \*\*respirable fraction

REL (USA) Long-term value: 10\* 5\*\* mg/m<sup>3</sup>  
\*total dust \*\*respirable fraction

TLV (USA) TLV withdrawn

EL (Canada) Long-term value: 10\* 3\*\* mg/m<sup>3</sup>  
\*total dust; \*\*respirable fraction

EV (Canada) Long-term value: 10 mg/m<sup>3</sup>  
total dust

**7782-49-2 selenium**

PEL (USA) Long-term value: 0,2 mg/m<sup>3</sup>  
as Se

REL (USA) Long-term value: 0,2 mg/m<sup>3</sup>  
as Se

TLV (USA) Long-term value: 0,2 mg/m<sup>3</sup>  
as Se

EL (Canada) Long-term value: 0,1 mg/m<sup>3</sup>

EV (Canada) Long-term value: 0,2 mg/m<sup>3</sup>

**1314-41-6 orange lead**

PEL (USA) Long-term value: 0,05 mg/m<sup>3</sup>  
as Pb; See 29 CFR 1910,1025

REL (USA) Long-term value: 0,05\* mg/m<sup>3</sup>  
as Pb; \*8-hr TWA; See Pocket Guide App. C

TLV (USA) Long-term value: 0,05 mg/m<sup>3</sup>  
as Pb; BEI

EL (Canada) Long-term value: 0,05 mg/m<sup>3</sup>  
as Pb; IARC 2A, R

EV (Canada) Long-term value: 0,05 mg/m<sup>3</sup>  
as Pb, Skin (organic compounds)

**13463-67-7 titanium dioxide**

PEL (USA) Long-term value: 15\* mg/m<sup>3</sup>  
\*total dust

REL (USA) See Pocket Guide App. A

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- TLV (USA) Long-term value: 10 mg/m<sup>3</sup>  
withdrawn from NIC
- EL (Canada) Long-term value: 10\* 3\*\* mg/m<sup>3</sup>  
\*total dust; \*\*respirable fraction; IARC 2B
- EV (Canada) Long-term value: 10 mg/m<sup>3</sup>  
total dust

**10294-40-3 barium chromate**

- PEL (USA) Long-term value: 0,005\* mg/m<sup>3</sup>  
Ceiling limit: 0,1\*\* mg/m<sup>3</sup>  
\*as Cr(VI) \*\*as CrO<sub>3</sub>; see 29 CFR 1910,1026
- REL (USA) Long-term value: 0,0002 mg/m<sup>3</sup>  
as Cr; See Pocket Guide Apps. A and C
- TLV (USA) Long-term value: 0,01 mg/m<sup>3</sup>  
as Cr
- EL (Canada) Long-term value: 0,01 mg/m<sup>3</sup>  
as Cr; ACGIH A1 IARC 1

**7758-97-6 lead chromate**

- IOELV (EU) Long-term value: 2 mg/m<sup>3</sup>  
as Cr
- PEL (USA) Long-term value: 0,005\* mg/m<sup>3</sup>  
Ceiling limit: 0,1\*\* mg/m<sup>3</sup>  
\*as Cr(VI) \*\*as CrO<sub>3</sub>; see 29 CFR 1910,1026
- REL (USA) Long-term value: 0,0002 mg/m<sup>3</sup>  
as Cr; See Pocket Guide Apps. A and C
- TLV (USA) Long-term value: 0,05\* 0,012\*\* mg/m<sup>3</sup>  
\*as Pb; BEI ; \*\*as Cr
- EL (Canada) Long-term value: 0,05\* 0,012\*\* mg/m<sup>3</sup>  
ACGIH A2, IARC 2A; R; \*as Pb; \*\*as Cr
- EV (Canada) Long-term value: 0,012\* 0,05\*\* mg/m<sup>3</sup>  
\*as Cr, \*\*as Pb

**7727-43-7 barium sulphate, natural**

- PEL (USA) Long-term value: 15\* 5\*\* mg/m<sup>3</sup>  
\*total dust \*\*respirable fraction
- REL (USA) Long-term value: 10\* 5\*\* mg/m<sup>3</sup>  
\*total dust \*\*respirable fraction
- TLV (USA) Long-term value: 5\* mg/m<sup>3</sup>  
\*inhalable fraction; E
- EL (Canada) Long-term value: 10\* 3\*\* mg/m<sup>3</sup>  
\*total dust, \*\*respirable fraction
- EV (Canada) Long-term value: 10 mg/m<sup>3</sup>  
total dust

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**61790-53-2 Diatomaceous earth (Silica-Amorphous)**

- PEL (USA) 20mppcf or 80mg/m<sup>3</sup> /%SiO<sub>2</sub>
- REL (USA) Long-term value: 6 mg/m<sup>3</sup>  
See Pocket Guide App. C
- TLV (USA) TLV withdrawn
- EL (Canada) Long-term value: 4\* 1,5\*\* mg/m<sup>3</sup>  
\*total, \*\*respirable
- EV (Canada) Long-term value: 10\* 3\*\* mg/m<sup>3</sup>  
uncalcined; \*inhalable; \*\*respirable

**7439-98-7 molybdenum**

- PEL (USA) Long-term value: 15\* mg/m<sup>3</sup>  
\*Total dust
- TLV (USA) Long-term value: 10\* 3\*\* mg/m<sup>3</sup>  
as Mo; \*inhalable fraction \*\* respirable fraction
- EL (Canada) Long-term value: 3\* 10\*\* mg/m<sup>3</sup>  
as Mo; \*respirable \*\*inhalable
- EV (Canada) Long-term value: 10\* 3\*\* 0,5\*\*\* mg/m<sup>3</sup>  
metal, insol.comp.d.: \*inh; \*\*resp; sol.comp.d.: \*\*\*resp

**7440-33-7 tungsten**

- PEL (USA) and insoluble compounds, as We
- REL (USA) Short-term value: 10 mg/m<sup>3</sup>  
Long-term value: 5 mg/m<sup>3</sup>  
as W
- TLV (USA) Short-term value: 10 mg/m<sup>3</sup>  
Long-term value: 5 mg/m<sup>3</sup>  
as W
- EL (Canada) Short-term value: 10 mg/m<sup>3</sup>  
Long-term value: 5 mg/m<sup>3</sup>  
as W
- EV (Canada) Short-term value: 10\* 3\*\* mg/m<sup>3</sup>  
Long-term value: 5\* 1\*\* mg/m<sup>3</sup>  
(as tungsten; compds.: \*water-insol.; \*\*water-sol.)

**7429-90-5 aluminium powder (pyrophoric)**

- PEL (USA) Long-term value: 15\*; 15\*\* mg/m<sup>3</sup>  
\*Total dust; \*\* Respirable fraction
- REL (USA) Long-term value: 10\* 5\*\* mg/m<sup>3</sup>  
as Al\*Total dust\*\*Respirable/pyro powd./welding f.
- TLV (USA) Long-term value: 1\* mg/m<sup>3</sup>  
as Al; \*as respirable fraction
- EL (Canada) Long-term value: 1,0 mg/m<sup>3</sup>  
respirable, as Al

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|             |   |
|-------------|---|
| EV (Canada) | Long-term value: 5 mg/m <sup>3</sup><br>aluminium-containing (as aluminium) |
|-------------|---|

**7440-36-0 antimony**

|           |   |
|-----------|---|
| PEL (USA) | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
|-----------|---|

|           |   |
|-----------|---|
| REL (USA) | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
|-----------|---|

|           |   |
|-----------|---|
| TLV (USA) | Long-term value: 0,5 mg/m <sup>3</sup><br>as Sb |
|-----------|---|

|             |  |
|-------------|--|
| EL (Canada) | Long-term value: 0,5 mg/m <sup>3</sup> |
|-------------|--|

|             |  |
|-------------|--|
| EV (Canada) | Long-term value: 0,5 mg/m <sup>3</sup> |
|-------------|--|

- **DNELs** No further relevant information available.
- **PNECs** No further relevant information available.

· **Ingredients with biological limit values:****13424-46-9 lead diazide**

|           |  |
|-----------|--|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead |
|-----------|--|

**7439-92-1 lead**

|           |   |
|-----------|---|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead                                    |
|           | 10 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead (women of child bearing potential) |

**1314-41-6 orange lead**

|           |  |
|-----------|--|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead |
|-----------|--|

**10294-40-3 barium chromate**

|           |   |
|-----------|---|
| BEI (USA) | 25 µg/L<br>Medium: urine<br>Time: end of shift at end of workweek<br>Parameter: Total chromium (fume) |
|           | 10 µg/L<br>Medium: urine<br>Time: increase during shift<br>Parameter: Total chromium (fume)           |

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**7758-97-6 lead chromate**

|           |   |
|-----------|---|
| BEI (USA) | 30 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead                                    |
|           | 10 µg/100 ml<br>Medium: blood<br>Time: not critical<br>Parameter: Lead (women of child bearing potential) |

- **Additional information:** The lists valid during the making were used as basis.
  - **8.2 Exposure controls**
  - **Personal protective equipment:**
  - **General protective and hygienic measures:**  
The usual precautionary measures are to be adhered to when handling chemicals.  
Keep ignition sources away - Do not smoke.  
Keep away from foodstuffs, beverages and feed.  
Wash hands before breaks and at the end of work.
  - **Respiratory protection:**  
Not required under normal conditions of use.  
Respiratory protection may be required after product use.
  - **Protection of hands:**  
Wear gloves for the protection against mechanical hazards according to NIOSH or EN 388.
  - **Material of gloves**  
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
  - **Penetration time of glove material**  
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
  - **Eye protection:**  
Face protection
- 

Safety glasses
- **Body protection:** Impervious protective clothing
  - **Limitation and supervision of exposure into the environment**  
No further relevant information available.
  - **Risk management measures**  
Organizational measures should be in place for all activities involving this product.

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## SECTION 9: Physical and chemical properties

- **9.1 Information on basic physical and chemical properties**
- **General Information**
- **Appearance:**
  - Form: Solid material
  - Colour: According to product specification
- **Odour:** Odourless
- **Odour threshold:** Not determined.
- **pH-value:** Not applicable.
- **Change in condition**
  - Melting point/Melting range: Not Determined.
  - Boiling point/Boiling range: Undetermined.
- **Flash point:** Not applicable.
- **Flammability (solid, gaseous):** Fire or projection hazard.
- **Auto/Self-ignition temperature:** Not determined.
- **Decomposition temperature:** Not determined.
- **Self-igniting:** Product is not self-igniting.
- **Danger of explosion:** Heating may cause an explosion.
- **Explosion limits:**
  - Lower: Not determined.
  - Upper: Not determined.
- **Vapour pressure:** Not applicable.
- **Density:** Not determined.
- **Relative density** Not determined.
- **Vapour density** Not applicable.
- **Evaporation rate** Not applicable.
- **Solubility in / Miscibility with water:** Variable, dependent upon product composition and packaging.
- **Partition coefficient (n-octanol/water):** Not determined.
- **Viscosity:**
  - Dynamic: Not applicable.
  - Kinematic: Not applicable.
- **9.2 Other information** No further relevant information available.

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### SECTION 10: Stability and reactivity

- **10.1 Reactivity**
- **10.2 Chemical stability**
- **Thermal decomposition / conditions to be avoided:**  
No decomposition if used and stored according to specifications.  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- **10.3 Possibility of hazardous reactions**  
Danger of explosion.  
Toxic fumes may be released if heated above the decomposition point.  
Reacts violently with oxidising agents.
- **10.4 Conditions to avoid** Keep ignition sources away - Do not smoke.
- **10.5 Incompatible materials:** No further relevant information available.
- **10.6 Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Hydrocarbons  
Leadoxide vapour  
Bariumoxide vapour  
Toxic metal oxide smoke  
Chlorine compounds  
Danger of forming toxic pyrolysis products.  
Nitrogen oxides

### SECTION 11: Toxicological information

- **11.1 Information on toxicological effects**
- **Acute toxicity:**

- **LD/LC50 values relevant for classification:**

#### 7439-92-1 lead

Oral LD50 &gt;2000 mg/kg (rat)

#### 7782-49-2 selenium

Oral LD50 6700 mg/kg (rat)

#### 7758-97-6 lead chromate

Oral LD50 12000 mg/kg (mouse)

- **Primary irritant effect:**
- **on the skin:**  
Not a skin irritant in unused form. Vapors/particles from used product are possibly irritating to skin.
- **on the eye:**  
Not an eye irritant in unused form. Vapors/particles from used product are possibly irritating to eyes.
- **Sensitisation:** No sensitising effects known.
- **Subacute to chronic toxicity:** No further relevant information available.
- **Acute effects (acute toxicity, irritation and corrosivity):** Danger of blast or crush-type injuries.
- **Repeated dose toxicity:**  
Contains known or suspect carcinogens when inhaled. Product is in non-inhalable form and is nonclassifiable as a carcinogen.

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· **CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction):**

Contains known or suspect carcinogens when inhaled. Product is in non-inhalable form and is non-classifiable as a carcinogen.

### SECTION 12: Ecological information

· **12.1 Toxicity**

· **Aquatic toxicity:** Toxic for aquatic organisms

· **12.2 Persistence and degradability** No further relevant information available.

· **12.3 Bioaccumulative potential** May be accumulated in organism

· **12.4 Mobility in soil** No further relevant information available.

· **Ecotoxicological effects:**

· **Remark:** Toxic for fish

· **Additional ecological information:**

· **General notes:**

Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water

Do not allow product to reach ground water, water course or sewage system, even in small quantities.

Danger to drinking water if even extremely small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

The product contains heavy metals. Avoid transfer into the environment. Specific preliminary treatments are necessary

Toxic for aquatic organisms

Due to available data on eliminability/decomposition and bioaccumulation potential prolonged term damage of the environment can not be excluded.

· **12.5 Results of PBT and vPvB assessment**

· **PBT:** Not applicable.

· **vPvB:** Not applicable.

· **12.6 Other adverse effects** No further relevant information available.

### SECTION 13: Disposal considerations

· **13.1 Waste treatment methods**

· **Recommendation**

Must not be disposed together with household garbage. Do not allow product to reach sewage system.

Damaged materials pose a danger to anyone in the immediate area; consult experts for disposal of damaged products.

The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. Residual materials should be treated as hazardous.

· **Uncleaned packaging:**

· **Recommendation:** Disposal must be made according to official regulations.

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### SECTION 14: Transport information

- 14.1 UN-Number
- DOT, ADR, IMDG, IATA
- 14.2 UN proper shipping name
- DOT
- ADR
- IMDG
- IATA
- 14.3 Transport hazard class(es)
- DOT, ADR, IMDG, IATA

UN0361

Detonator assemblies, non-electric  
0361 DETONATOR ASSEMBLIES, NONELECTRIC,  
DETONATOR ASSEMBLIES, NONELECTRIC,  
DETONATOR ASSEMBLIES, NON-ELECTRIC



- Class
- Label
- 14.4 Packing group
- DOT, ADR, IMDG, IATA
- 14.5 Environmental hazards:
- Marine pollutant:
- Special marking (IATA):

1.4

1.4B

II

No

Prohibited from Transport in Passenger Aircraft.



Cargo Aircraft Only.

- 14.6 Special precautions for user
- EMS Number:
- Segregation groups
- 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
- Transport/Additional information:

Not applicable.

F-B,S-X

Lead and its compounds

Not applicable.

- ADR
- Limited quantities (LQ)
- Excepted quantities (EQ)
- Tunnel restriction code

0

Code: EO

2 (E)

- IMDG
- Limited quantities (LQ)
- Excepted quantities (EQ)
- UN "Model Regulation":

0

Code: EO

UN0361, DETONATOR ASSEMBLIES,  
NONELECTRIC,, 1.4B, II

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### SECTION 15: Regulatory information

- **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
- **United States (USA)**
- **SARA**

- **Section 355 (extremely hazardous substances):**

None of the ingredients are listed.

- **Section 313 (Specific toxic chemical listings):**

13424-46-9 | lead diazide

7439-92-1 | lead

7782-49-2 | selenium

1314-41-6 | orange lead

10294-40-3 | barium chromate

7758-97-6 | lead chromate

7727-43-7 | barium sulphate, natural

7429-90-5 | aluminium powder (pyrophoric)

7440-36-0 | antimony

- **TSCA (Toxic Substances Control Act):**

All ingredients are listed.

- **Proposition 65 (California):**

- **Chemicals known to cause cancer:**

13424-46-9 | lead diazide

7439-92-1 | lead

1314-41-6 | orange lead

13463-67-7 | titanium dioxide

10294-40-3 | barium chromate

7758-97-6 | lead chromate

- **Chemicals known to cause reproductive toxicity for females:**

7439-92-1 | lead

10294-40-3 | barium chromate

7758-97-6 | lead chromate

- **Chemicals known to cause reproductive toxicity for males:**

7439-92-1 | lead

10294-40-3 | barium chromate

7758-97-6 | lead chromate

- **Chemicals known to cause developmental toxicity:**

13424-46-9 | lead diazide

7439-92-1 | lead

10294-40-3 | barium chromate

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7758-97-6 | lead chromate

· **Carcinogenic Categories**· **EPA (Environmental Protection Agency)**

|            |  |                                      |
|------------|--|--------------------------------------|
| 13424-46-9 | lead diazide   | B2                                   |
| 7439-92-1  | lead   | B2                                   |
| 7782-49-2  | selenium   | D                                    |
| 1314-41-6  | orange lead  | B2                                   |
| 10294-40-3 | barium chromate  | A(inh), D(oral), K/L(inh), CBD(oral) |
| 7758-97-6  | lead chromate  | K                                    |
| 7727-43-7  | barium sulphate, natural                               | D, CBD(inh), NL(oral)                |
| 7778-74-7  | potassium perchlorate                                  | NL                                   |
| 2691-41-0  | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) | D                                    |

· **IARC (International Agency for Research on Cancer)**

|            |                                       |    |
|------------|---------------------------------------|----|
| 13424-46-9 | lead diazide                          | 2A |
| 7439-92-1  | lead                                  | 2B |
| 7782-49-2  | selenium                              | 3  |
| 1314-41-6  | orange lead                           | 2A |
| 13463-67-7 | titanium dioxide                      | 2B |
| 10294-40-3 | barium chromate                       | 1  |
| 7758-97-6  | lead chromate                         | 1  |
| 61790-53-2 | Diatomaceous earth (Silica-Amorphous) | 3  |

· **TLV (Threshold Limit Value established by ACGIH)**

|            |                               |    |
|------------|-------------------------------|----|
| 13424-46-9 | lead diazide                  | A3 |
| 7439-92-1  | lead                          | A3 |
| 1314-41-6  | orange lead                   | A3 |
| 13463-67-7 | titanium dioxide              | A4 |
| 10294-40-3 | barium chromate               | A1 |
| 7758-97-6  | lead chromate                 | A2 |
| 7439-98-7  | molybdenum                    | A3 |
| 7429-90-5  | aluminium powder (pyrophoric) | A4 |

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

|            |                  |
|------------|------------------|
| 13463-67-7 | titanium dioxide |
| 10294-40-3 | barium chromate  |
| 7758-97-6  | lead chromate    |

· **Canada**· **Canadian Domestic Substances List (DSL)**

Some components are listed on the NDSL.

All ingredients are listed.

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· **Canadian Ingredient Disclosure list (limit 0.1%)**

|            |                 |
|------------|-----------------|
| 7439-92-1  | lead            |
| 7782-49-2  | selenium        |
| 10294-40-3 | barium chromate |
| 7758-97-6  | lead chromate   |

· **Canadian Ingredient Disclosure list (limit 1%)**

|           |                               |
|-----------|-------------------------------|
| 7439-98-7 | molybdenum                    |
| 7440-33-7 | tungsten                      |
| 7429-90-5 | aluminium powder (pyrophoric) |
| 7440-36-0 | antimony                      |

· **Other regulations, limitations and prohibitive regulations**

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

· **Substances of very high concern (SVHC) according to REACH, Article 57**

|            |               |
|------------|---------------|
| 13424-46-9 | lead diazide  |
| 1314-41-6  | orange lead   |
| 7758-97-6  | lead chromate |

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

### SECTION 16: Other information

**Disclaimer**

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· **Relevant phrases**

|      |   |
|------|---|
| H200 | Unstable explosives.                            |
| H201 | Explosive; mass explosion hazard.               |
| H228 | Flammable solid.                                |
| H250 | Catches fire spontaneously if exposed to air.   |
| H261 | In contact with water releases flammable gases. |
| H271 | May cause fire or explosion; strong oxidiser.   |
| H301 | Toxic if swallowed.                             |
| H302 | Harmful if swallowed.                           |

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**DYNO**  
Dyno Nobel

Groundbreaking Performance

## Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 02.11.2015

Revision: 02.11.2015

**Trade name: NONEL® Non-electric Delay Detonators**

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|           |  |
|-----------|--|
| H311      | Toxic in contact with skin.  |
| H315      | Causes skin irritation.  |
| H317      | May cause an allergic skin reaction.   |
| H319      | Causes serious eye irritation.   |
| H331      | Toxic if inhaled.  |
| H332      | Harmful if inhaled.  |
| H350      | May cause cancer.  |
| H360Df    | May damage the unborn child. Suspected of damaging fertility.  |
| H360FD    | May damage fertility. May damage the unborn child.   |
| H372      | Causes damage to organs through prolonged or repeated exposure.                                      |
| H373      | May cause damage to organs through prolonged or repeated exposure.                                   |
| H400      | Very toxic to aquatic life.  |
| H410      | Very toxic to aquatic life with long lasting effects.  |
| H413      | May cause long lasting harmful effects to aquatic life.  |
| R11       | Highly flammable.  |
| R15       | Contact with water liberates extremely flammable gases.  |
| R17       | Spontaneously flammable in air.  |
| R2        | Risk of explosion by shock, friction, fire or other sources of ignition.                             |
| R20/22    | Harmful by inhalation and if swallowed.  |
| R22       | Harmful if swallowed.  |
| R23/25    | Toxic by inhalation and if swallowed.  |
| R24       | Toxic in contact with skin.  |
| R3        | Extreme risk of explosion by shock, friction, fire or other sources of ignition.                     |
| R33       | Danger of cumulative effects.  |
| R36/38    | Irritating to eyes and skin.   |
| R43       | May cause sensitisation by skin contact.   |
| R45       | May cause cancer.  |
| R48/23/25 | Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed. |
| R50/53    | Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.     |
| R53       | May cause long-term adverse effects in the aquatic environment.                                      |
| R60       | May impair fertility.  |
| R61       | May cause harm to the unborn child.  |
| R62       | Possible risk of impaired fertility.   |
| R9        | Explosive when mixed with combustible material.  |

**Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)  
 IMDG: International Maritime Code for Dangerous Goods  
 DOT: US Department of Transportation  
 IATA: International Air Transport Association  
 GHS: Globally Harmonised System of Classification and Labelling of Chemicals  
 ACGIH: American Conference of Governmental Industrial Hygienists  
 EINECS: European Inventory of Existing Commercial Chemical Substances  
 ELINCS: European List of Notified Chemical Substances  
 CAS: Chemical Abstracts Service (division of the American Chemical Society)  
 NFPA: National Fire Protection Association (USA)  
 HMIS: Hazardous Materials Identification System (USA)  
 WHMIS: Workplace Hazardous Materials Information System (Canada)  
 DNEL: Derived No-Effect Level (REACH)

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**DYNO**  
Dyno Nobel

Groundbreaking Performance

# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 02.11.2015

Revision: 02.11.2015

**Trade name: NONEL® Non-electric Delay Detonators**

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PNEC: Predicted No-Effect Concentration (REACH)  
 LC50: Lethal concentration, 50 percent  
 LD50: Lethal dose, 50 percent  
 Expl. 1.1: Explosives, Division 1.1  
 Expl. 1.4: Explosives, Division 1.4  
 Unst. Expl.: Explosives, Unstable explosives  
 Flam. Sol. 2: Flammable solids, Hazard Category 2  
 Pyr. Sol. 1: Pyrophoric Solids, Hazard Category 1  
 Water-react. 2: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 2

Ox. Sol. 1: Oxidising Solids, Hazard Category 1  
 Acute Tox. 3: Acute toxicity, Hazard Category 3  
 Acute Tox. 4: Acute toxicity, Hazard Category 4  
 Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2  
 Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2  
 Skin Sens. 1: Sensitisation - Skin, Hazard Category 1  
 Carc. 1A: Carcinogenicity, Hazard Category 1A  
 Carc. 1B: Carcinogenicity, Hazard Category 1B  
 Repr. 1A: Reproductive toxicity, Hazard Category 1A  
 STOT RE 1: Specific target organ toxicity - Repeated exposure, Hazard Category 1  
 STOT RE 2: Specific target organ toxicity - Repeated exposure, Hazard Category 2  
 Aquatic Acute 1: Hazardous to the aquatic environment - Acute Hazard, Category 1  
 Aquatic Chronic 1: Hazardous to the aquatic environment - Chronic Hazard, Category 1  
 Aquatic Chronic 4: Hazardous to the aquatic environment - Chronic Hazard, Category 4

## · Sources

SDS Prepared by:  
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**DYNO**  
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Groundbreaking Performance

# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 22.05.2015

Revision: 22.05.2015

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

- **1.1 Product identifier**
- **Trade name: CAST BOOSTERS**
- **Article number:**  
No other identifiers  
1108
- **Other product identifiers:**  
DYN0® CORD SENSITIVE BOOSTERS - CS35, CS45, CS90, CS135  
TROJAN® SPARTAN®  
TROJAN® SPARTAN® Slider  
TROJAN® Stinger  
TROJAN® NB  
TROJAN® NB UNIVERSAL  
TROJAN® Twinplex  
TROJAN® SPARTAN® SR  
TROJAN® SPARTAN® Cone  
TROJAN® Ringprime  
TROJAN® SPARTAN® CSU
- **1.2 Relevant identified uses of the substance or mixture and uses advised against**  
No further relevant information available.
- **Application of the substance / the mixture**  
Explosive product.  
Commercial blasting applications
- **1.3 Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**  
Dyno Nobel Inc.  
2795 East Cottonwood Parkway, Suite 500  
Salt Lake City, Utah 84121  
Phone: 801-364-4800  
Fax: 801-321-6703  
E-Mail: dnna.hse@am.dynonobel.com
- **1.4 Emergency telephone number:**  
CHEMTREC  
1-800-424-9300 (US/Canada)  
+01 703-527-3887 (International)

## SECTION 2: Hazards identification

- **2.1 Classification of the substance or mixture**
- **Classification according to Regulation (EC) No 1272/2008**  
Classifications listed also are applicable to the OSHA GHS Hazard Communication Standard (29CFR1910.1200).



exploding bomb

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# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

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Trade name: CAST BOOSTERS

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Expl. 1.1 H201 Explosive; mass explosion hazard.

• **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**



E; Explosive

R2: Risk of explosion by shock, friction, fire or other sources of ignition.

• **Information concerning particular hazards for human and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

• **Classification system:**

The classification is according to the latest editions of the EU-lists, and extended by company and literature data.

The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

• **Additional information:**

There are no other hazards not otherwise classified that have been identified.

0 percent of the mixture consists of component(s) of unknown toxicity

• **2.2 Label elements**

• **Labelling according to Regulation (EC) No 1272/2008**

The product is additionally classified and labelled according to the Globally Harmonized System within the United States (GHS).

The product is classified and labelled according to the CLP regulation.

• **Hazard pictograms**



GHS01

• **Signal word** Danger

• **Hazard-determining components of labelling:**

pentaerythritol tetranitrate (PETN)

octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)

perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)

2,4,6-trinitrotoluene (TNT)

aluminium powder (pyrophoric)

• **Hazard statements**

H201 Explosive; mass explosion hazard.

• **Precautionary statements**

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P250 Do not subject to grinding/shock/friction.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P373 DO NOT fight fire when fire reaches explosives.

P370+P380 In case of fire: Evacuate area.

P372 Explosion risk in case of fire.

P401 Store in accordance with local/regional/national/international regulations.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

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# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

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Trade name: CAST BOOSTERS

(Contd. of page 2)

- **Hazard description:**
- **WHMIS-symbols:** Explosive products are not classified under WHMIS.
- **NFPA ratings (scale 0 - 4)** Not available.
- **HMIS-ratings (scale 0 - 4)** Not available

|  |
|--|
| <b>• HMIS Long Term Health Hazard Substances</b> |
|--|

|                                     |
|-------------------------------------|
| None of the ingredients are listed. |
|-------------------------------------|

- **2.3 Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Explosive Product Notice**












PREVENTION OF ACCIDENTS IN THE USE OF EXPLOSIVES - The prevention of accidents in the use of explosives is a result of careful planning and observance of the best known practices. The explosives user must remember that he is dealing with a powerful force and that various devices and methods have been developed to assist him in directing this force. He should realize that this force, if misdirected, may either kill or injure both him and his fellow workers.

WARNING - All explosives are dangerous and must be carefully handled and used following approved safety procedures either by or under the direction of competent, experienced persons in accordance with all applicable federal, state, and local laws, regulations, or ordinances. If you have any questions or doubts as to how to use any explosive product, DO NOT USE IT before consulting with your supervisor, or the manufacturer, if you do not have a supervisor. If your supervisor has any questions or doubts, he should consult the manufacturer before use.

## SECTION 3: Composition/information on ingredients

- **3.2 Mixtures**
- **Description:** Mixture of substances listed below with nonhazardous additions.

|                                |  |
|--------------------------------|--|
| <b>• Dangerous components:</b> |  |
|--------------------------------|--|

|  |   |
|--|---|
| CAS: 78-11-5<br>EINECS: 201-084-3<br>Index number: 603-035-00-5  | pentaerythritol tetranitrate (PETN)<br> E R3<br>-----<br> Unst. Expl., H200   |
| CAS: 118-96-7<br>EINECS: 204-289-6<br>Index number: 609-008-00-4 | 2,4,6-trinitrotoluene (TNT)<br> T R23/24/25;  E R2;  N R51/53<br>R33<br>-----<br> Expl. 1.1, H201<br> Acute Tox. 3, H301; Acute Tox. 3, H311; Acute Tox. 3, H331<br> STOT RE 2, H373<br> Aquatic Chronic 2, H411 |
| CAS: 7429-90-5   | aluminum metal<br> F R15<br>-----<br> Water-react. 1, H260  |

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# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
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**Trade name: CAST BOOSTERS**

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|                                     |   |
|-------------------------------------|---|
| CAS: 121-82-4<br>EINECS: 204-500-1  | perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)<br> T R25;  E R2<br>-----<br> Expl. 1.1, H201<br> Acute Tox. 3, H301   |
| CAS: 2691-41-0<br>EINECS: 220-260-0 | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)<br> T R24;  Xn R22;  E R2<br>-----<br> Expl. 1.1, H201<br> Acute Tox. 3, H301; Acute Tox. 3, H311 |

• **Additional information:**

For the wording of the listed risk phrases refer to section 16.

For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

## SECTION 4: First aid measures

• **4.1 Description of first aid measures**

• **General information:** No special measures required.

• **After inhalation:** Supply fresh air; consult doctor in case of complaints.

• **After skin contact:**

Generally the product does not irritate the skin.

Wash with soap and water.

If skin irritation is experienced, consult a doctor.

• **After eye contact:**

Remove contact lenses if worn.

Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

• **After swallowing:** Do not induce vomiting; call for medical help immediately.

• **4.2 Most important symptoms and effects, both acute and delayed** Blast injury if mishandled.

• **Hazards** Danger of blast or crush-type injuries.

• **4.3 Indication of any immediate medical attention and special treatment needed**

Product may produce physical injury if mishandled. Treatment of these injuries should be based on the blast and compression effects.

## SECTION 5: Firefighting measures

• **5.1 Extinguishing media**

• **Suitable extinguishing agents:** DO NOT fight fire when fire reaches explosives.

• **For safety reasons unsuitable extinguishing agents:** None.

• **5.2 Special hazards arising from the substance or mixture**

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. Can explode or detonate under fire conditions. Burning material may produce toxic vapors. It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Explosive; mass explosion hazard.

• **5.3 Advice for firefighters**

• **Protective equipment:**

Wear self-contained respiratory protective device.

Wear fully protective suit.

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# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
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Trade name: **CAST BOOSTERS**

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- **Additional information**

Eliminate all ignition sources if safe to do so.

Flammability Classification: (defined by 29 CFR 1910.1200) Explosive. Can explode under fire conditions. Individual devices will randomly explode. Mass explosion of multiple devices is possible under certain conditions. Burning material may produce toxic and irritating vapors. In unusual cases, shrapnel may be thrown from exploding devices under containment. See 2012 Emergency response Guidebook for further information.

## SECTION 6: Accidental release measures

- **6.1 Personal precautions, protective equipment and emergency procedures**

Evacuate area.

Wear protective clothing.

Ensure adequate ventilation

Keep away from ignition sources.

Protect from heat.

Isolate area and prevent access.

- **6.2 Environmental precautions:** No special measures required.

- **6.3 Methods and material for containment and cleaning up:**

Pick up mechanically.

Send for recovery or disposal in suitable receptacles.

Dispose unusable material as waste according to item 13.

- **6.4 Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

## SECTION 7: Handling and storage

- **7.1 Precautions for safe handling**

Open and handle receptacle with care.

Handle with care. Avoid jolting, friction and impact.

Use only in well ventilated areas.

Do not subject to grinding/shock/friction.

- **Information about fire - and explosion protection:**

Keep ignition sources away - Do not smoke.

Protect from heat.

Prevent impact and friction.

Emergency cooling must be available in case of nearby fire.

- **7.2 Conditions for safe storage, including any incompatibilities**

- **Storage:**

- **Requirements to be met by storerooms and receptacles:**

Store in a cool location.

Avoid storage near extreme heat, ignition sources or open flame.

- **Information about storage in one common storage facility:**

Store away from foodstuffs.

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according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
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Store away from oxidising agents.

- **Further information about storage conditions:**

Store under lock and key and with access restricted to technical experts or their assistants only.

Keep away from heat.

- **7.3 Specific end use(s)** No further relevant information available.

## SECTION 8: Exposure controls/personal protection

- **Additional information about design of technical facilities:** No further data; see item 7.

- **8.1 Control parameters**

- **Ingredients with limit values that require monitoring at the workplace:**

**118-96-7 2,4,6-trinitrotoluene (TNT)**

|             |   |
|-------------|---|
| PEL (USA)   | Long-term value: 1,5 mg/m <sup>3</sup><br>Skin  |
| REL (USA)   | Long-term value: 0,5 mg/m <sup>3</sup><br>Skin  |
| TLV (USA)   | Long-term value: 0,1 mg/m <sup>3</sup><br>Skin; BEI-M   |
| EL (Canada) | Long-term value: 0,1 mg/m <sup>3</sup><br>Skin  |
| EV (Canada) | Short-term value: 0,2 mg/m <sup>3</sup> , 0,02 ppm<br>Long-term value: 0,1 mg/m <sup>3</sup> , 0,01 ppm<br>Skin |

**7429-90-5 aluminum metal**

|             |  |
|-------------|--|
| PEL (USA)   | Long-term value: 15*, 15** mg/m <sup>3</sup><br>*Total dust; ** Respirable fraction              |
| REL (USA)   | Long-term value: 10* 5** mg/m <sup>3</sup><br>as Al*Total dust**Respirable/pyro powd./welding f. |
| TLV (USA)   | Long-term value: 1* mg/m <sup>3</sup><br>as Al; *as respirable fraction                          |
| EL (Canada) | Long-term value: 1,0 mg/m <sup>3</sup><br>respirable, as Al                                      |
| EV (Canada) | Long-term value: 5 mg/m <sup>3</sup><br>aluminium-containing (as aluminium)                      |

**121-82-4 perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)**

|           |   |
|-----------|---|
| REL (USA) | Short-term value: 3 mg/m <sup>3</sup><br>Long-term value: 1,5 mg/m <sup>3</sup><br>Skin |
| TLV (USA) | Long-term value: 0,5 mg/m <sup>3</sup><br>Skin  |

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Trade name: **CAST BOOSTERS**

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|             |  |
|-------------|--|
| EL (Canada) | Long-term value: 0,5 mg/m <sup>3</sup><br>Skin |
| EV (Canada) | Long-term value: 0,5 mg/m <sup>3</sup><br>Skin |

- **DNELs** No further relevant information available.
- **PNECs** No further relevant information available.

• **Ingredients with biological limit values:**

**118-96-7 2,4,6-trinitrotoluene (TNT)**

|           |   |
|-----------|---|
| BEI (USA) | 1,5 % of hemoglobin<br>Medium: blood<br>Time: during or end of shift<br>Parameter: Methemoglobin (background, nonspecific, semi-quantitative) |
|-----------|---|

- **Additional information:** The lists valid during the making were used as basis.
- **8.2 Exposure controls**
- **Personal protective equipment:**
- **General protective and hygienic measures:**  
The usual precautionary measures are to be adhered to when handling chemicals.  
Keep ignition sources away - Do not smoke.  
Keep away from foodstuffs, beverages and feed.  
Wash hands before breaks and at the end of work.
- **Respiratory protection:**  
Not required under normal conditions of use.  
Respiratory protection may be required after product use.
- **Protection of hands:**  
Wear gloves for the protection against mechanical hazards according to NIOSH or EN 388.  
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.  
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
- **Material of gloves**  
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
- **Penetration time of glove material**  
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
- **Eye protection:**  
Face protection



Safety glasses

- **Body protection:** Impervious protective clothing
- **Limitation and supervision of exposure into the environment**  
No further relevant information available.

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# Safety Data Sheet

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Trade name: CAST BOOSTERS

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· **Risk management measures**

Organizational measures should be in place for all activities involving this product.

## SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**

· **General Information**

· **Appearance:**

Form:

Solid material

Colour:

According to product specification

· **Odour:**

Odourless

· **Odour threshold:**

Not determined.

· **pH-value:**

Not applicable.

· **Change in condition**

Melting point/Melting range:

80 °C (176 °F) (trinitrotoluene)

Boiling point/Boiling range:

Undetermined.

· **Flash point:**

Not applicable.

· **Flammability (solid, gaseous):**

Explosive; mass explosion hazard.

· **Auto/Self-ignition temperature:**

Not determined.

· **Decomposition temperature:**

Not determined.

· **Self-igniting:**

Product is not self-igniting.

· **Danger of explosion:**

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

· **Explosion limits:**

Lower:

Not determined.

Upper:

Not determined.

· **Vapour pressure:**

Not applicable.

· **Density at 20 °C (68 °F):**

1,55 - 1,65 g/cm<sup>3</sup> (12,935 - 13,769 lbs/gal)

· **Relative density**

Not determined.

· **Vapour density**

Not applicable.

· **Evaporation rate**

Not applicable.

· **Solubility in / Miscibility with water:**

Variable, dependent upon product composition and packaging.

· **Partition coefficient (n-octanol/water):**

Not determined.

· **Viscosity:**

Dynamic:

Not applicable.

Kinematic:

Not applicable.

· **9.2 Other information**

No further relevant information available.

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# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
OSHA GHS

Printing date 22.05.2015

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Trade name: CAST BOOSTERS

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## SECTION 10: Stability and reactivity

- **10.1 Reactivity**
- **10.2 Chemical stability**
- **Thermal decomposition / conditions to be avoided:**  
No decomposition if used and stored according to specifications.  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- **10.3 Possibility of hazardous reactions**  
Danger of explosion.  
Toxic fumes may be released if heated above the decomposition point.
- **10.4 Conditions to avoid** Keep ignition sources away - Do not smoke.
- **10.5 Incompatible materials:** No further relevant information available.
- **10.6 Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Nitrogen oxides  
Hydrocarbons

## SECTION 11: Toxicological information

- **11.1 Information on toxicological effects**
- **Acute toxicity:**
- **LD/LC50 values relevant for classification:** None.
- **Primary irritant effect:**
- **on the skin:**  
Not a skin irritant in unused form. Vapors/particles from used product are possibly irritating to skin.
- **on the eye:**  
Not an eye irritant in unused form. Vapors/particles from used product are possibly irritating to eyes.
- **Sensitisation:** No sensitising effects known.
- **Subacute to chronic toxicity:** No further relevant information available.
- **Acute effects (acute toxicity, irritation and corrosivity):** Danger of blast or crush-type injuries.
- **Repeated dose toxicity:** No further relevant information available.

## SECTION 12: Ecological information

- **12.1 Toxicity**
- **Aquatic toxicity:** Toxic for aquatic organisms
- **12.2 Persistence and degradability** No further relevant information available.
- **12.3 Bioaccumulative potential** No further relevant information available.
- **12.4 Mobility in soil** No further relevant information available.
- **Ecotoxicological effects:**
- **Remark:** Toxic for fish
- **Additional ecological information:**
- **General notes:**  
Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water  
Do not allow product to reach ground water, water course or sewage system, even in small quantities.  
Danger to drinking water if even extremely small quantities leak into the ground.

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# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
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Also poisonous for fish and plankton in water bodies.

Toxic for aquatic organisms

Due to available data on eliminability/decomposition and bioaccumulation potential prolonged term damage of the environment can not be excluded.

- **12.5 Results of PBT and vPvB assessment**

- **PBT:** Not applicable.

- **vPvB:** Not applicable.

- **12.6 Other adverse effects** No further relevant information available.

## SECTION 13: Disposal considerations

- **13.1 Waste treatment methods**

- **Recommendation**

Must not be disposed together with household garbage. Do not allow product to reach sewage system.

Damaged materials pose a danger to anyone in the immediate area; consult experts for disposal of damaged products.

The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. Residual materials should be treated as hazardous.

- **Uncleaned packaging:**

- **Recommendation:** Disposal must be made according to official regulations.

## SECTION 14: Transport information

- **14.1 UN-Number**

- **DOT, ADR, IMDG**

- **IATA**

UN0042

FORBIDDEN

- **14.2 UN proper shipping name**

- **DOT, IMDG**

- **ADR**

- **IATA**

Boosters, without detonator

0042, BOOSTERS, WITHOUT DETONATOR

FORBIDDEN

- **14.3 Transport hazard class(es)**

- **DOT, ADR, IMDG**



- **Class**

1.1

- **Label**

1.1D

- **IATA**

- **Class**

FORBIDDEN

- **14.4 Packing group**

- **DOT, ADR, IMDG**

II

- **IATA**

FORBIDDEN

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- **14.5 Environmental hazards:**
- **Marine pollutant:** No
- **Special marking (IATA):** Prohibited from Transport in Passenger Aircraft.
- **14.6 Special precautions for user:** Not applicable.
- **EMS Number:** F-B,S-X
- **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.
- **Transport/Additional information:**
- **ADR**
- **Limited quantities (LQ):** 0
- **Excepted quantities (EQ):** Code: E0  
Not permitted as Excepted Quantity
- **Tunnel restriction code:** 1
- **IMDG**
- **Limited quantities (LQ):** 0
- **Excepted quantities (EQ):** Code: E0  
Not permitted as Excepted Quantity
- **IATA**
- **UN "Model Regulation":** FORBIDDEN.  
UN0042, BOOSTERS, WITHOUT DETONATOR,  
1.1D, II

## SECTION 15: Regulatory information

- **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
- **United States (USA)**
- **SARA**

|  |
|--|
| · <b>Section 355 (extremely hazardous substances):</b> |
|--|

|                                     |
|-------------------------------------|
| None of the ingredients are listed. |
|-------------------------------------|

|  |
|--|
| · <b>Section 313 (Specific toxic chemical listings):</b> |
|--|

|                            |
|----------------------------|
| 7429-90-5   aluminum metal |
|----------------------------|

|   |
|---|
| · <b>TSCA (Toxic Substances Control Act):</b> |
|---|

|                             |
|-----------------------------|
| All ingredients are listed. |
|-----------------------------|

|                                       |
|---------------------------------------|
| · <b>Proposition 65 (California):</b> |
|---------------------------------------|

|   |
|---|
| · <b>Chemicals known to cause cancer:</b> |
|---|

|  |
|--|
| 118-96-7   2,4,6-trinitrotoluene (TNT) |
|--|

|  |
|--|
| · <b>Chemicals known to cause reproductive toxicity for females:</b> |
|--|

|                                     |
|-------------------------------------|
| None of the ingredients are listed. |
|-------------------------------------|

|  |
|--|
| · <b>Chemicals known to cause reproductive toxicity for males:</b> |
|--|

|                                     |
|-------------------------------------|
| None of the ingredients are listed. |
|-------------------------------------|

|   |
|---|
| · <b>Chemicals known to cause developmental toxicity:</b> |
|---|

|                                     |
|-------------------------------------|
| None of the ingredients are listed. |
|-------------------------------------|

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# Safety Data Sheet

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- **Carcinogenic Categories**

- **EPA (Environmental Protection Agency)**

|           |  |   |
|-----------|--|---|
| 118-96-7  | 2,4,6-trinitrotoluene (TNT)                            | C |
| 121-82-4  | perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)           | C |
| 2691-41-0 | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) | D |

- **IARC (International Agency for Research on Cancer)**

|          |                             |   |
|----------|-----------------------------|---|
| 118-96-7 | 2,4,6-trinitrotoluene (TNT) | 3 |
|----------|-----------------------------|---|

- **TLV (Threshold Limit Value established by ACGIH)**

|           |  |    |
|-----------|--|----|
| 7429-90-5 | aluminum metal                               | A4 |
| 121-82-4  | perhydro-1,3,5-trinitro-1,3,5-triazine (RDX) | A4 |

- **NIOSH-Ca (National Institute for Occupational Safety and Health)**

None of the ingredients are listed.

- **Canada**

- **Canadian Domestic Substances List (DSL)**

All ingredients are listed.

- **Canadian Ingredient Disclosure list (limit 0.1%)**

None of the ingredients are listed.

- **Canadian Ingredient Disclosure list (limit 1%)**

|           |                             |
|-----------|-----------------------------|
| 118-96-7  | 2,4,6-trinitrotoluene (TNT) |
| 7429-90-5 | aluminum metal              |

- **Other regulations, limitations and prohibitive regulations**

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

- **Substances of very high concern (SVHC) according to REACH, Article 57**

None of the ingredients are listed.

- **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

## SECTION 16: Other information

### Disclaimer

Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, the information contained herein, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. The information contained herein is provided for reference purposes only and is intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product or information. Under no circumstances shall either Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

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# Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
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Trade name: **CAST BOOSTERS**

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**Relevant phrases**

- H200 Unstable explosives.
- H201 Explosive; mass explosion hazard.
- H260 In contact with water releases flammable gases which may ignite spontaneously.
- H301 Toxic if swallowed.
- H311 Toxic in contact with skin.
- H331 Toxic if inhaled.
- H373 May cause damage to organs through prolonged or repeated exposure.
- H411 Toxic to aquatic life with long lasting effects.
- R15 Contact with water liberates extremely flammable gases.
- R2 Risk of explosion by shock, friction, fire or other sources of ignition.
- R22 Harmful if swallowed.
- R23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
- R24 Toxic in contact with skin.
- R25 Toxic if swallowed.
- R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.
- R33 Danger of cumulative effects.
- R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)  
 IMDG: International Maritime Code for Dangerous Goods  
 DOT: US Department of Transportation  
 IATA: International Air Transport Association  
 GHS: Globally Harmonised System of Classification and Labelling of Chemicals  
 ACGIH: American Conference of Governmental Industrial Hygienists  
 EINECS: European Inventory of Existing Commercial Chemical Substances  
 ELINCS: European List of Notified Chemical Substances  
 CAS: Chemical Abstracts Service (division of the American Chemical Society)  
 NFPA: National Fire Protection Association (USA)  
 HMIS: Hazardous Materials Identification System (USA)  
 WHMIS: Workplace Hazardous Materials Information System (Canada)  
 DNEL: Derived No-Effect Level (REACH)  
 PNEC: Predicted No-Effect Concentration (REACH)  
 LC50: Lethal concentration, 50 percent  
 LD50: Lethal dose, 50 percent  
 Expl. 1.1: Explosives, Division 1.1  
 Unst. Expl.: Explosives, Unstable explosives  
 Water-react. 1: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 1

Acute Tox. 3: Acute toxicity, Hazard Category 3  
 STOT RE 2: Specific target organ toxicity - Repeated exposure, Hazard Category 2  
 Aquatic Chronic 2: Hazardous to the aquatic environment - Chronic Hazard, Category 2

**Sources**

SDS Prepared by:  
 ChemTel Inc.  
 1305 North Florida Avenue  
 Tampa, Florida USA 33602-2902  
 Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573  
 Website: [www.chemtelinc.com](http://www.chemtelinc.com)

# 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: [dнна.hse@am.dynonobel.com](mailto:dнна.hse@am.dynonobel.com) [www.dynonobel.com](http://www.dynonobel.com)

**SDS #:** 1052

**Date:** 05/15/2015

Supersedes: 12/15/2011

### Product Identifier

**Product Form:** Mixture

**Product Name:** Bulk Emulsion

### Other Means of Identification

#### Synonyms:

DYNO GOLD<sup>®</sup>

DYNO GOLD<sup>®</sup> LITE

EXTRAMITE 1000

RUG-1 (Canada Only)

TITAN<sup>®</sup> 1000

TITAN<sup>®</sup> 1000 GREEN

TITAN<sup>®</sup> 1000G

TITAN<sup>®</sup> 1000G GREEN

TITAN<sup>®</sup> XL1000

SMS 1116, 1116A, 1126P,

1136P, 1146P

TITAN<sup>®</sup> 2000

TITAN<sup>®</sup> 2000G

TITAN<sup>®</sup> PB 1000

TITAN<sup>®</sup> PB 2000

TITAN<sup>®</sup> PB 2000 HF

TITAN<sup>®</sup> SME 1000

TITAN<sup>®</sup> SME 1000 GREEN

TITAN<sup>®</sup> XL1000 GREEN

TITAN<sup>®</sup> HD

TITAN<sup>®</sup> SME 2000

DX5037

### Intended Use of the Product

Industrial blasting applications as emulsion explosive precursor

### 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)

Ox. Liq. 2

H272

Acute Tox. 4 (Oral)

H302

Skin Irrit. 2

H315

Carc. 2

H351

STOT RE 2

H373

Asp. Tox. 1

H304

Eye Irrit. 2B

H320

#### Label Elements

#### GHS-US Labeling

#### Hazard Pictograms (GHS-US)



#### Signal Word (GHS-US)

: Danger

#### Hazard Statements (GHS-US)

: H272 - May intensify fire; oxidizer

H302 - Harmful if swallowed

H315 - Causes skin irritation

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H351 - Suspected of causing cancer  
H373 - May cause damage to organs through prolonged or repeated exposure  
H304 - May be fatal if swallowed and enters airways  
H320 - Causes eye irritation

## Precautionary Statements (GHS-US)

: P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking  
P220 - Keep/Store away from clothing, combustible materials, combustibles  
P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles  
P233 - Keep container tightly closed  
P260 - Do not breathe dust, fume, mist, spray, vapors  
P264 - Wash exposed areas thoroughly after handling  
P270 - Do not eat, drink or smoke when using this product  
P273 - Avoid release to the environment  
P280 - Wear protective gloves/protective clothing/eye protection/face protection  
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
P302+P352 - IF ON SKIN: Wash with plenty of soap and water  
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P308+P313 - If exposed or concerned: Get medical advice/attention  
P332+P313 - If skin irritation occurs: Get medical advice/attention  
P362 - Take off contaminated clothing and wash before reuse  
P370+P378 - In case of fire: Use appropriate media to extinguish  
P403+P235 - Store in a well-ventilated place. Keep cool  
P405 - Store locked up  
P501 - Dispose of contents/container according to local, regional, national, and international regulations

## Other Hazards

**Hazards Not Otherwise Classified (HNOC):** Not available

**Other Hazards:** Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

## SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

### Mixture

| Name                  | Product identifier  | % (w/w)  | Ingredient Classification (GHS-US)                                   |
|-----------------------|---------------------|----------|--|
| Ammonium nitrate      | (CAS No) 6484-52-2  | 45 - 80  | Ox. Sol. 3, H272<br>Eye Irrit. 2A, H319                              |
| Calcium nitrate       | (CAS No) 10124-37-5 | 0.1 - 35 | Ox. Sol. 3, H272<br>Acute Tox. 4 (Oral), H302<br>Eye Dam. 1, H318    |
| Sodium nitrate        | (CAS No) 7631-99-4  | 0.1 - 18 | Ox. Sol. 3, H272<br>Acute Tox. 4 (Oral), H302<br>Eye Irrit. 2A, H319 |
| *Fuels, diesel, no. 2 | (CAS No) 68476-34-6 | 0.1 - 10 | Flam. Liq. 3, H226<br>Acute Tox. 4 (Inhalation), H332                |



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|   |                     |         |  |
|---|---------------------|---------|--|
|   |                     |         | Skin Irrit. 2, H315<br>Carc. 2, H351<br>STOT RE 2, H373<br>Asp. Tox. 1, H304 |
| Distillates, petroleum, chemically neutralized light naphthenic | (CAS No) 64742-35-4 | 0.1 - 6 | Asp. Tox. 1, H304  |

\* This ingredient is not used in GREEN-named products.

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).

Full text of H-phrases: see section 16

## SECTION 4 - FIRST AID MEASURES

### Description of First Aid Measures

**General:** Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

**Inhalation:** If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

**Skin Contact:** Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

**Eye Contact:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

**Ingestion:** Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.

### Most Important Symptoms and Effects Both Acute and Delayed

**General:** May be harmful if swallowed. May cause eye or skin irritation.

**Inhalation:** May cause respiratory irritation.

**Skin Contact:** May cause skin irritation.

**Eye Contact:** May cause eye irritation.

**Ingestion:** Likely to be harmful if swallowed.

**Chronic Symptoms:** Contains an ingredient which may cause cancer. Causes damage to organs through prolonged or repeated exposure.

### Indication of Any Immediate Medical Attention and Special Treatment Needed

If symptoms occur, seek medical attention.

## SECTION 5 - FIRE-FIGHTING MEASURES

### Extinguishing Media

**Suitable Extinguishing Media:** Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

**Unusual Fire and Explosion Hazards:** May explode or detonate under fire conditions. Burning material may produce toxic vapors.

**Unsuitable Extinguishing Media:** Not available

### Special Hazards Arising From the Substance or Mixture

In intense fires the emulsion can detonate from confinement or strong shocks. Evacuation of at least 1 mile is recommended if the emulsion is involved in a fire.

**Fire Hazard:** May intensify fire; oxidizer. Will burn if exposed to heat, and in addition, will accelerate the burning of other combustibles, resulting in more rapid spread of fire.

**Explosion Hazard:** Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

**Reactivity:** May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials.

### Advice for Firefighters

**Precautionary Measures Fire:** DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate

# Safety Data Sheet

all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

**Firefighting Instructions:** DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.

**Protection During Firefighting:** When controlling fire before involvement of explosives or explosive precursors, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.

**Hazardous Combustion Products:** Nitrogen oxides. Carbon oxides (CO, CO<sub>2</sub>). Ammonia.

**Other information:** Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

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

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

### Personal Precautions, Protective Equipment and Emergency Procedures

**General Measures:** Avoid all contact with skin, eyes, or clothing. Avoid breathing dust, mist, or spray. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Eliminate every possible source of ignition. Evacuate danger area.

#### For Non-Emergency Personnel

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

**Emergency Procedures:** Evacuate unnecessary personnel.

#### For Emergency Personnel

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

**Emergency Procedures:** Ventilate area.

### Environmental Precautions

Prevent entry to sewers and public waters.

### Methods and Material for Containment and Cleaning Up

**For Containment:** Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.

**Methods for Cleaning Up:** Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate state, federal and local regulations.

### Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection

## SECTION 7 - HANDLING AND STORAGE

### Precautions for Safe Handling

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

**Additional Hazards When Processed:** When heated to decomposition, emits toxic fumes. Do not puncture or incinerate containers.

**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.

### Conditions for Safe Storage, Including Any Incompatibilities

**Storage Conditions:** Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep /store away from combustible materials, extremely high or low temperatures, direct sunlight, ignition sources, incompatible materials.

**Incompatible Materials:** Corrosives, strong acids, strong bases and alkalis.

## SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

### Control Parameters

#### Exposure Controls

**Appropriate Engineering Controls:** Ensure all national/local regulations are observed. Ensure adequate ventilation, especially in confined areas.



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**Personal Protective Equipment:** Protective goggles. Gloves. Protective clothing.



**Materials for Protective Clothing:** Chemically resistant materials and fabrics.

**Hand Protection:** Wear chemically resistant protective gloves.

**Eye Protection:** Chemical goggles or face shield.

**Skin and Body Protection:** Not available.

**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                                    | : Liquid  |
| Appearance  | : Translucent to opaque viscous liquid.   |
| Odor  | : Fuel  |
| Odor Threshold                                    | : Not available   |
| pH  | : Not available   |
| Relative Evaporation Rate (butylacetate=1)        | : < 1   |
| 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   |
| Specific Gravity                                  | : 0.8 - 1.5 g/cc  |
| Solubility  | : Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.                       |
| Partition coefficient: n-octanol/water            | : Not available   |
| Viscosity   | : Not available   |
| Explosion Data – Sensitivity to Mechanical Impact | : Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts. |
| Explosion Data – Sensitivity to Static Discharge  | : Not sensitive to static discharge.  |

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## SECTION 10 - STABILITY AND REACTIVITY

**Reactivity:** May cause or intensify fire. May accelerate the burning of other combustible materials.

**Chemical Stability:** May intensify fire. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

**Possibility of Hazardous Reactions:** Hazardous polymerization will not occur.

**Conditions to Avoid:** Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

**Incompatible Materials:** Corrosives, strong acids, strong bases and alkalis.

**Hazardous Decomposition Products:** Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

## SECTION 11 - TOXICOLOGICAL INFORMATION

### Information on Toxicological Effects - Product

**Acute Toxicity:** Harmful if swallowed.

**LD50 and LC50 Data:** Not available

**Skin Corrosion/Irritation:** Causes skin irritation.

**Serious Eye Damage/Irritation:** Causes serious eye damage.

**Respiratory or Skin Sensitization:** Not classified

**Germ Cell Mutagenicity:** Not classified

**Teratogenicity:** Not available

**Carcinogenicity:** Suspected of causing cancer.

**Specific Target Organ Toxicity (Repeated Exposure):** May cause damage to organs through prolonged or repeated exposure.

**Reproductive Toxicity:** Not classified

**Specific Target Organ Toxicity (Single Exposure):** Not classified

**Aspiration Hazard:** May be fatal if swallowed and enters airways.

**Symptoms/Injuries After Inhalation:** May cause respiratory irritation.

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

**Symptoms/Injuries After Eye Contact:** Causes serious eye damage.

**Symptoms/Injuries After Ingestion:** May be harmful if swallowed. May be harmful if swallowed and enters airways.

Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.

**Chronic Symptoms:** May cause cancer. Causes damage to organs through prolonged or repeated exposure.

### Information on Toxicological Effects - Ingredient(s)

**LD50 and LC50 Data:**

#### Ammonium nitrate (6484-52-2)

|                     |                            |
|---------------------|----------------------------|
| LD50 Oral Rat       | 2217 mg/kg                 |
| LC50 Inhalation Rat | > 88.8 mg/l/4h             |
| ATE CLP (oral)      | 2217.000 mg/kg body weight |

#### Sodium nitrate (7631-99-4)

|                |                            |
|----------------|----------------------------|
| LD50 Oral Rat  | 1267 mg/kg                 |
| ATE CLP (oral) | 1267.000 mg/kg body weight |

#### Fuels, diesel, no. 2 (68476-34-6)

|                  |                |
|------------------|----------------|
| ATE CLP (vapors) | 11.000 mg/l/4h |
|------------------|----------------|

#### Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

|                    |              |
|--------------------|--------------|
| LD50 Oral Rat      | > 5000 mg/kg |
| LD50 Dermal Rabbit | > 2000 mg/kg |

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## SECTION 12: ECOLOGICAL INFORMATION

**Toxicity** Not classified

### Sodium nitrate (7631-99-4)

|              |   |
|--------------|---|
| LC50 Fish 1  | 2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])         |
| LC 50 Fish 2 | 994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static]) |

### Fuels, diesel, no. 2 (68476-34-6)

|             |   |
|-------------|---|
| LC50 Fish 1 | 35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through]) |
|-------------|---|

### Calcium nitrate (10124-37-5)

|             |  |
|-------------|--|
| LC50 Fish 1 | 10000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static]) |
|-------------|--|

### Persistence and Degradability

#### Bulk Emulsion

|                               |                  |
|-------------------------------|------------------|
| Persistence and Degradability | Not established. |
|-------------------------------|------------------|

### Sodium nitrate (7631-99-4)

|                               |                                 |
|-------------------------------|---------------------------------|
| Persistence and Degradability | Readily biodegradable in water. |
|-------------------------------|---------------------------------|

### Bioaccumulative Potential

#### Bulk Emulsion

|                           |                  |
|---------------------------|------------------|
| Bioaccumulative Potential | Not established. |
|---------------------------|------------------|

### Ammonium nitrate (6484-52-2)

|            |                               |
|------------|-------------------------------|
| BCF fish 1 | (no bioaccumulation expected) |
| Log Pow    | -3.1 (at 25 °C)               |

### Sodium nitrate (7631-99-4)

|                           |                                |
|---------------------------|--------------------------------|
| Log Pow                   | -3.8 (at 25 °C)                |
| Bioaccumulative Potential | Not expected to bioaccumulate. |

**Mobility in Soil** Not available

### Other Adverse Effects

**Other Information:** Avoid release to the environment.

## SECTION 13 – DISPOSAL CONSIDERATIONS

**Waste Treatment Methods:** Contact manufacturer for advice on proper disposal methods.

**Waste Disposal Recommendations:** Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

**Additional Information:** Clean up even minor leaks or spills if possible without unnecessary risk.

## SECTION 14 - TRANSPORT INFORMATION

### 14.1 In Accordance with DOT

|                       |                             |
|-----------------------|-----------------------------|
| Proper Shipping Name  | : AMMONIUM NITRATE EMULSION |
| Hazard Class          | : 5.1                       |
| Identification Number | : UN3375                    |
| Label Codes           | : 5.1                       |
| Packing Group         | : II                        |
| ERG Number            | : 140                       |



### 14.2 In Accordance with IMDG

|                       |                             |
|-----------------------|-----------------------------|
| Proper Shipping Name  | : AMMONIUM NITRATE EMULSION |
| Hazard Class          | : 5.1                       |
| Identification Number | : UN3375                    |
| Packing Group         | : II                        |

# Safety Data Sheet

Label Codes : 5.1  
 EmS-No. (Fire) : F-H  
 EmS-No. (Spillage) : S-Q



## 14.3 In Accordance with IATA

Proper Shipping Name : AMMONIUM NITRATE EMULSION  
 Identification Number : UN3375  
 Hazard Class : 5  
 Label Codes : 5.1  
 ERG Code (IATA) : 5L



## 14.4 In Accordance with TDG

No UN number exists for blasting intermediates for Transport Canada (use the following for Canadian shipments)

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E  
 Packing Group : II  
 Hazard Class : 1.5D  
 Identification Number : UN0332  
 Label Codes : 1.5D



## SECTION 15 - REGULATORY INFORMATION

### US Federal Regulations

#### Bulk Emulsion

#### SARA Section 311/312 Hazard Classes

Immediate (acute) health hazard  
 Reactive hazard  
 Delayed (chronic) health hazard  
 Fire hazard

#### Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Sodium nitrate (7631-99-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Calcium nitrate (10124-37-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

### US State Regulations

#### Ammonium nitrate (6484-52-2)

U.S. - Massachusetts - Right To Know List  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List  
 U.S. - Pennsylvania - RTK (Right to Know) List

#### Sodium nitrate (7631-99-4)

U.S. - Massachusetts - Right To Know List  
 U.S. - Pennsylvania - RTK (Right to Know) List

#### Fuels, diesel, no. 2 (68476-34-6)

U.S. - New Jersey - Right to Know Hazardous Substance List

#### Calcium nitrate (10124-37-5)

U.S. - New Jersey - Right to Know Hazardous Substance List

# Safety Data Sheet

## Canadian Regulations

### Bulk Emulsion

WHMIS Classification

**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

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** : 05/15/2015

**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:

|                           |   |
|---------------------------|---|
| Acute Tox. 4 (Inhalation) | Acute toxicity (inhalation) Category 4                            |
| Acute Tox. 4 (Oral)       | Acute toxicity (oral) Category 4                                  |
| Asp. Tox. 1               | Aspiration hazard Category 1                                      |
| Carc. 2                   | Carcinogenicity Category 2  |
| Eye Dam. 1                | Serious eye damage/eye irritation Category 1                      |
| Eye Irrit. 2A             | Serious eye damage/eye irritation Category 2A                     |
| Flam. Liq. 3              | Flammable liquids Category 3                                      |
| Ox. Liq. 2                | Oxidizing liquids Category 2                                      |
| Ox. Sol. 3                | Oxidizing solids Category 3                                       |
| Skin Irrit. 2             | Skin corrosion/irritation Category 2                              |
| STOT RE 2                 | Specific target organ toxicity (repeated exposure) Category 2     |
| H226                      | Flammable liquid and vapor  |
| H272                      | May intensify fire; oxidizer                                      |
| H302                      | Harmful if swallowed  |
| H304                      | May be fatal if swallowed and enters airways                      |
| H315                      | Causes skin irritation  |
| H318                      | Causes serious eye damage   |
| H319                      | Causes serious eye irritation                                     |
| H332                      | Harmful if inhaled  |
| H351                      | Suspected of causing cancer                                       |
| H373                      | May cause damage to organs through prolonged or repeated exposure |

### Party Responsible for the Preparation of This Document

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Salt Lake City, Utah 84121  
Phone: 801-364-4800

### Disclaimer

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Dyno Nobel SDS

## 32. Appendix G Emergency Plan

### Emergency Response Plan

|                         |   |
|-------------------------|---|
| Site Address            | Main West Coast Road  |
| Site GPS                | 13°51'24.4"S 172°02'01.1"W  |
| Emergency Assembly Area | At entrance to the quarry   |
| Quarry Manager is       | Nick Weekes Jamey Watson  |
| Nearest Medical Centre  | Faleolo Medical Centre, Main West Coast Road<br>Telephone: +685 42940 |
| Toilet location         | Behind quarry site office   |

#### Emergency signal

- Continual sounding of vehicle horns and or notification over Radio Telephone (where available)
- Alert others by shouting "Emergency.... emergency...emergency"
- Operators to liaise with Person in control of the place of work and ensure all contractors and visitors on site are directed to meet at assembly area
- Site Induction Register to be checked against those assembled.

#### In the event of a fire or explosion

- Ensure personal safety first.
- Alert others of fire by shouting or by RT (if available)
- Only attempt to control a fire with extinguishers if it is safe to do so.
- All electrical fires must be extinguished with dry powder or CO<sub>2</sub>.
- Only shut down plant if safe to do so.
- Move quickly but do not run. Evacuate to the assembly area and call fire service.
- Do not return to the scene until the All Clear is given.

#### In the event of a fire or explosion near the dangerous goods areas

- SECTION 5: Firefighting measures (refer to safety data sheets)  
**DO NOT FIGHT FIRE WHEN FIRE REACHES EXPLOSIVES.**  
**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.
  - Can explode or detonate under fire conditions. Burning material may produce toxic vapors.
- Advice for firefighters
- Protective equipment:
  - Wear self-contained respiratory protective device.
  - Wear fully protective suit.
  - Can explode under fire conditions.
  - Individual devices will randomly explode. Mass explosion of multiple devices is possible under certain conditions. Burning material may produce toxic and irritating vapours. In unusual cases, shrapnel may be thrown from exploding devices under containment

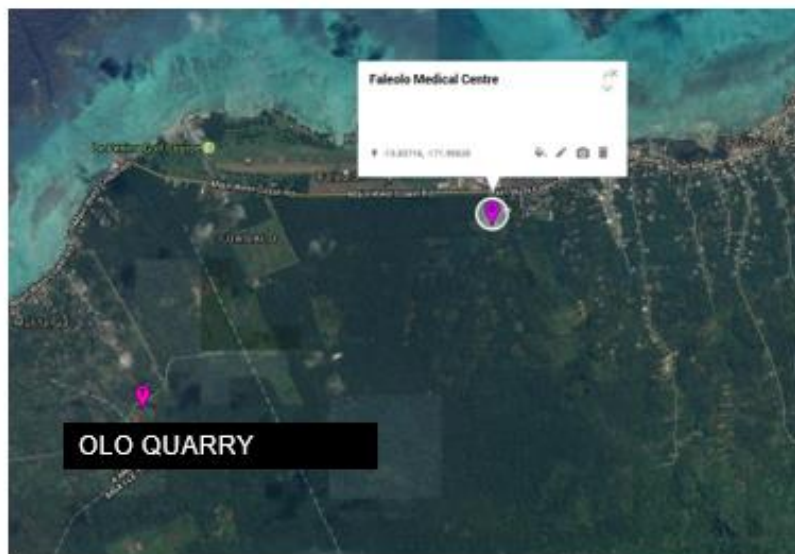
#### In the event of an earthquake and/or

- If inside, stay inside
- Or Stand next to a wall if inside building
- Stay away from glass or from falling objects



## Emergency Response Plan

|  |   |
|--|---|
| <b>In the event of a Tsunami</b>             | <ul style="list-style-type: none"> <li>• Or If outside stand clear of overhead lines</li> <li>• Evacuate to assembly area.</li> <li>• This site is evaluated to high ground, so it is not at risk of a tsunami. If driving on the access road, return to Olo Quarry.</li> <li>• Do not return to the scene until the All Clear is given.</li> </ul> |
| <b>In the event of a serious accident</b>    | <ul style="list-style-type: none"> <li>• Ensure personal safety</li> <li>• Assess emergency services required</li> <li>• Provide basic first aid until emergency services arrive</li> <li>• Shut down the plant if safe to do so</li> <li>• Evacuate rest of site to assembly area</li> <li>• Secure accident scene</li> </ul>                      |
| <b>Severe wind or storm</b>                  | <ul style="list-style-type: none"> <li>• Open a window on the side of the building away from the wind. This helps to relieve pressure.</li> <li>• Put tape across very large windows to stop shattering.</li> <li>• Don't go driving unless necessary.</li> <li>• Listen to the nearest operating radio for information.</li> </ul>                 |
| <b>In the event of electrocution</b>         | <ul style="list-style-type: none"> <li>• Ensure personal safety.</li> <li>• Isolate power is safe to do so.</li> <li>• Call emergency services.</li> <li>• Provide basic first aid until emergency services arrive</li> <li>• Evacuate rest of site to assembly area</li> <li>• Secure accident scene</li> </ul>                                    |
| <b>Guiding emergency services on arrival</b> | A person is to instruct someone to meet any emergency services at the site entrance (where possible)  |
| <b>Nearest Medical Centre</b>                | Faleolo Medical Centre, Main West Coast Road<br>Telephone: +685 42940   |





## Emergency Response Plan



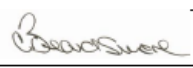




### 33. Appendix H Custom Records of Quantities

| IMO DANGEROUS GOODS DECLARATION   |  |  |   |
|---|--|--|---|
| This form meets the requirement of SOLAS 74 Chapter VII, regulation 5; MARPOL 73/78 ANNEX III, regulation 4 and the IMDG Code, General Introduction, section 9  |  |  |   |
| <b>Shipper/Consignor:</b><br>Prime Explosives Ltd, 198 Hanga Road<br>Lower Kaimals, Tauranga 3171<br>Ph: +64 7 577 2175 Fax +64 7 577 1277  |  | <b>Reference Numbers:</b><br>Booking Ref: PAKL018744<br>Container Number: BVIU21700-79   |   |
| <b>Consignee:</b><br>Brett Swain, Managing Director, Southern Screenworks Ltd<br>C/- Downer Ltd, Samoa Aviation Project, Faleolo Airport,<br>Main West Coast Road, Samoa<br>Ph: +64 274 353979  |  | <b>Carriers:</b><br>Pacific Forum Line   |   |
| <b>Container packing certificate/vehicle declaration</b><br><b>DECLARATION</b><br>It is declared that the packing of the container vehicle has been carried out in accordance with the General Introduction, IMDG Code, paragraph 5.4.2<br><b>TO BE COMPLETED FOR SHIPMENTS IN CONTAINERS OR VEHICLES</b>   |  | <b>Name/Status, company/organization of signatory</b><br>Charlie Beardmore, Managing Director, Prime Explosives Ltd<br>24 Tenth Avenue, Tauranga 3110<br>Ph 07 5771275 Fax 07 5771277  |   |
| <b>Ship's name &amp; voyage No</b><br>Southern Lily V424  |  | <b>Place and date</b><br>Port of Auckland, 13/03/2018  |   |
| <b>Port of Loading</b><br>Ports of Auckland, New Zealand. ETD: 13/03/2018   |  | <b>Signature on behalf of packer</b><br>   |   |
| <b>Port of Discharge</b><br>Apia, Samoa. ETA:   |  | <b>Instructions or other matter</b><br>Transit: Timaru Port  |   |
| <b>Transported on land by:</b><br>Priority Logistics<br>Driver: TBA<br>Phone: TBA   |  | <b>From:</b><br>Prime Explosives,<br>Licensed Magazine,<br>Lower Kaimals, Tauranga<br><b>To:</b><br>Ports of Auckland  |   |
| <b>Marks Nos, if applicable</b><br><b>identification or</b><br><b>registration numbers of</b><br><b>unit</b><br><b>Container Number:</b><br><br>1 x 17,500Lr ISO<br>Tank = 21,000kg<br>#BVIU21700-79  | <b>Number and kind of packaged (include basic</b><br><b>description and IMO Hazard, Class, UN, Packing group</b><br><b>(where assigned))</b><br><br>Ammonium Nitrate Emulsion, Class 5.1D,<br>UN3375, Packing Group II, ISO Tank | <b>Gross Mass (kg),</b><br><b>Net quantity/Mass</b><br><br>24,650kg<br>(incl 38,500kg for<br>Container)  | <b>Goods delivered as:</b><br>Break-Bulk-cargo<br>Unitized Cargo<br>Bulk-packages<br>Type of unit (container,<br>trailer, tank vehicle):<br>Open<br>Closed<br>Indicate above as appropriate<br>(This column maybe left empty<br>apart from the heading, in which<br>case insert appropriate<br>description) |
| <b>ADDITIONAL INFORMATION</b><br>(In certain circumstances special information/certificates are required, see IMDG code, General Introduction, paragraphs 9.7.1/9.7.2/9.2.1 and 9.10)   |  |  |   |
| <b>DECLARATION</b><br>I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked and labelled / placarded, and are in all respects in proper condition for transport according to the applicable international and national government regulations and legislation.<br><b>Signature:</b><br> |  | <b>Name/Status, Company/Organisation of Signatory:</b><br>Charlie Beardmore, Managing Director, Prime Explosives<br>24 Tenth Avenue, Tauranga 3110<br>Ph 07 5771275 Fax 07 5771277<br><b>Place and Date</b> Tauranga, 07/03/2018 |   |

# IMO DANGEROUS GOODS DECLARATION

This form meets the requirement of SOLAS 74 Chapter VII, regulation 5; MARPOL73/78 ANNEX III, regulation 4 and the IMDG Code, General introduction, section 9

|   |   |   |  |
|---|---|---|--|
| <b>Shipper/Consignor:</b><br>Prime Explosives Ltd, 198 Hanga Road<br>Lower Kaimais, Tauranga 3171<br>Ph: +64 7 577 2175 Fax +64 7 577 1277  |   | <b>Reference Numbers:</b><br>Booking Ref: PAKL018744<br>Container Number: RWN09694396   |  |
| <b>Consignee:</b><br>Brett Swain, Managing Director, Southern Screenworks Ltd<br>C/- Downer Ltd, Samoa Aviation Project, Faleolo Airport,<br>Main West Coast Road, Samoa<br>Ph: +64 274 353979  |   | <b>Carriers:</b><br>Pacific Forum Line  |  |
| <b>Container packing certificate/vehicle declaration</b><br><b>DECLARATION</b><br>It is declared that the packing of the container vehicle has been carried out in accordance with the General Introduction, IMDG Code, paragraph 5.4.2<br><b>TO BE COMPLETED FOR SHIPMENTS IN CONTAINERS OR VEHICLES</b>   |   | <b>Name/Status, company/organization of signatory</b><br>Clarrie Beardsmore, Managing Director, Prime Explosives Ltd<br>24 Tenth Avenue, Tauranga 3110<br>Ph 07 577 1275 Fax 07 577 1277  |  |
| <b>Ship's name &amp; voyage No</b><br>Southern Lily V424  |   | <b>Place and date</b><br>Port of Auckland, 13/03/2018   |  |
| <b>Port of Loading</b><br>Ports of Auckland, New Zealand. ETD: 13/03/2018   |   | <b>Signature on behalf of packer</b>    |  |
| <b>Port of Discharge</b><br>Apia, Samoa. ETA:   |   | <b>Instructions or other matter</b><br>Transit: Timaru Port   |  |
| <b>Transported on land by:</b><br>Prime Explosives, 198 Hanga Road<br>Main Driver: Mark Pearson, Phone: 021 724029<br>Co-Driver: Ken Pearson  |   | <b>From:</b><br>Prime Explosives,<br>Licensed Magazine,<br>Lower Kaimais, Tauranga  |  |
| <b>To:</b><br>Ports of Auckland   |   |   |  |
| <b>Marks Nos, if applicable</b><br>Identification or registration numbers of unit<br>Container Number:<br><br>23 x cases<br>(900 units)<br><br>Container No:<br>RWN09694396   | <b>Number and kind of packaged (Include basic description and IMO Hazard, Class, UN, Packing group (where assigned))</b><br><br>Boosters, Without detonators, Class 1.1D, UN0042, Packing Group II, F-B, S-X (368kg NEQ)<br><br>None of the above listed products are marine pollutants | <b>Gross Mass (kg) , Net quantity/Mass</b><br><br>368kg Nett NEQ<br>386.4kg Gross   | <b>Goods delivered as:</b><br>Break-Bulk-cargo<br>Unitized Cargo<br>Bulk-packages<br>Type of unit (container, trailer, tank vehicle):<br>Open<br>Closed<br>Indicate above as appropriate<br>(This column may be left empty apart from the heading, in which case insert appropriate description) |
| <b>ADDITIONAL INFORMATION</b><br>(In certain circumstances special information/certificates are required, see IMDG code, General Introduction, paragraphs 9.7, 1/9.7.2/9.9.1 and 9.10)  |   |   |  |
| <b>DECLARATION</b><br>I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked and labelled / placarded, and are in all respects in proper condition for transport according to the applicable international and national government regulations and legislation.<br><b>Signature:</b><br> |   | <b>Name/Status, Company/Organisation of Signatory:</b><br>Clarrie Beardsmore, Managing Director, Prime Explosives<br>24 Tenth Avenue, Tauranga 3110<br>Ph 07 577 1275 Fax 07 577 1277<br><b>Place and Date</b> Tauranga, 07/03/2018 |  |

| IMO DANGEROUS GOODS DECLARATION   |   |  |   |
|---|---|--|---|
| This form meets the requirement of SOLAS 74 Chapter VII, regulation 5; MARPOL73/78 ANNEX III, regulation 4 and the IMDG Code, General introduction, section 9   |   |  |   |
| <b>Shipper/Consignor:</b><br>Prime Explosives Ltd, 198 Hanga Road<br>Lower Kaimais, Tauranga 3171<br>Ph: +64 7 577 2175 Fax +64 7 5771277   |   | <b>Reference Numbers:</b><br>Booking Ref: PAKL018744<br>Container Number: RWN08001584  |   |
| <b>Consignee:</b><br>Brett Swain, Managing Director, Southern Screenworks Ltd<br>C/- Downer Ltd, Samoa Aviation Project, Faleolo Airport,<br>Main West Coast Road, Samoa<br>Ph: +64 274 353979  |   | <b>Carriers:</b><br>Pacific Forum Line   |   |
| <b>Container packing certificate/vehicle declaration</b><br><b>DECLARATION</b><br>It is declared that the packing of the container vehicle has been carried out in accordance with the General Introduction, IMDG Code, paragraph 5.4.2<br><b>TO BE COMPLETED FOR SHIPMENTS IN CONTAINERS OR VEHICLES</b>   |   | <b>Name/Status, company/organization of signatory</b><br>Clairie Beardsmore, Managing Director, Prime Explosives Ltd<br>24 Tenth Avenue, Tauranga 3110<br>Ph 07 577 1275 Fax 07 5771277  |   |
| <b>Ship's name &amp; voyage No</b><br>Southern Lily V424  |   | <b>Place and date</b><br>Port of Auckland, 13/03/2018  |   |
| <b>Port of Loading</b><br>Ports of Auckland, New Zealand. ETD: 13/03/2018   |   | <b>Signature on behalf of packer</b>   |   |
| <b>Port of Discharge</b><br>Apia, Samoa. ETA:   |   | <b>Instructions or other matter</b><br>Transit: Timaru Port  |   |
| <b>Transported on land by:</b><br>Priority Logistics<br>Driver: TBA<br>Phone: TBA   |   | <b>From:</b><br>Prime Explosives,<br>Licensed Magazine,<br>Lower Kaimais, Tauranga<br><b>To:</b><br>Ports of Auckland  |   |
| <b>Marks Nos, if applicable identification or registration numbers of unit</b><br><b>Container Number:</b><br>a) 18 x cases (300 units)<br>b) 4 x cases (240 units)<br>c) 11 x cases (660 units)<br>Container No: RWN08001584   | <b>Number and kind of packaged (include basic description and IMO Hazard, Class, UN, Packing group (where assigned))</b><br>Detonator Assemblies, Non-Electric, Class 1.4B, UN0361, Packing Group II, F-B, S-X<br>Detonator Assemblies, Non-Electric, Class 1.4B, UN0361, Packing Group II, F-B, S-X<br>Detonator Assemblies, Non-Electric, Class 1.4B, UN0361, Packing Group II, F-B, S-X<br>None of the above listed products are marine pollutants | <b>Gross Mass (kg) . Net quantity/Mass</b><br>66.6 net kg<br>9.84 net kg<br>27.06kg<br>Total: 0.936kg Nett NEQ 138.81kg Gross  | <b>Goods delivered as:</b><br>Break-Bulk-cargo<br>Utilized Cargo<br>Bulk-packages<br>Type of unit (container, trailer, tank vehicle):<br>Open<br>Closed<br>Indicate above as appropriate<br>(This column maybe left empty apart from the heading, in which case insert appropriate description) |
| <b>ADDITIONAL INFORMATION</b><br>(In certain circumstances special information/certificates are required, see IMDG code, General introduction, paragraphs 9.7.1/9.7.2/9.9.1 and 9.10)   |   |  |   |
| <b>DECLARATION</b><br>I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked and labelled / placarded, and are in all respects in proper condition for transport according to the applicable international and national government regulations and legislation.<br><b>Signature:</b><br> |   | <b>Name/Status, Company/Organisation of Signatory:</b><br>Clairie Beardsmore, Managing Director, Prime Explosives<br>24 Tenth Avenue, Tauranga 3110<br>Ph 07 577 1275 Fax 07 5771277<br><b>Place and Date</b> Tauranga, 07/03/2018 |   |