EXPLOSIVES MANAGEMENT PLAN

KENO HILL SILVER DISTRICT MINING OPERATIONS

FEBRUARY 2019

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

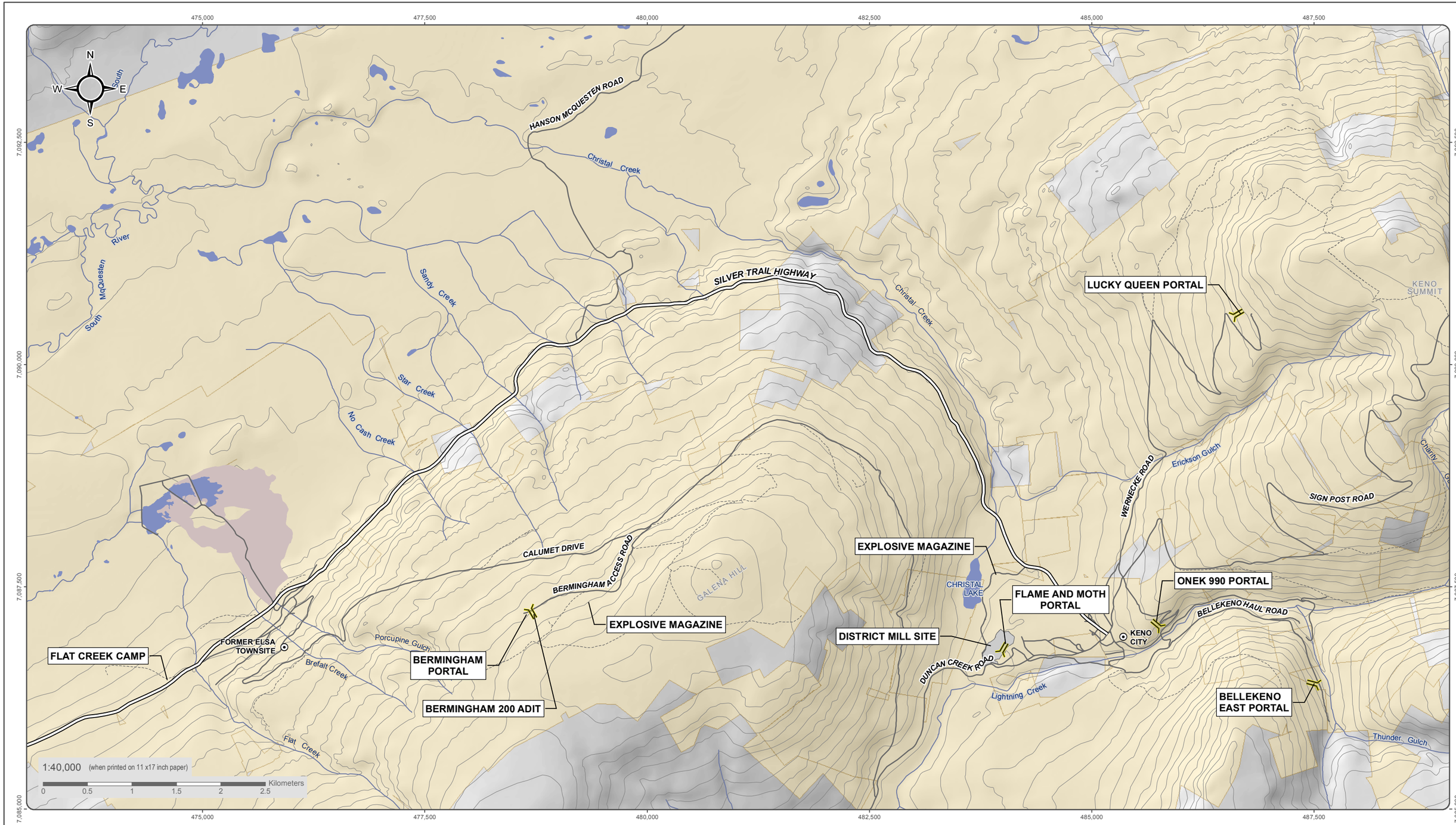
1 INTRODUCTION

Alexco Keno Hill Mining Corp. (AKHM) continues to develop the mineral resources of the Keno Hill Silver District. Alexco proposes to bring the Bermingham deposit into production to provide a sustainable ore feed to the Keno District Mill, supplemented by the additional mines already permitted in the district including Flame and Moth, Bellekeno, Lucky Queen and Onek. The Bermingham deposit is a new discovery situated on Galena Hill adjacent to the historic Bermingham mines. This document serves as the Explosives Management Plan as a requirement for the Alexco Keno Hill Mining Corp. (AKHM) Quartz Mining License.

The Bermingham deposit is within the historic Keno Hill Silver District (KHSD), located in central Yukon Territory. The closest town outside of Keno City is Mayo, located on the Stewart River, approximately 55 km to the south. Mayo is accessible from Whitehorse via a 460 km all weather road; the town is also serviced by Mayo airport, which is located just to the north. A gravel road leads from Mayo to the project areas. Historically, the KHSD was linked by river route to the outside world; since 1950 the all-weather Silver Trail Highway, which was also used for transporting the ore, has been the main link.

Explosives will be used in mining operations at the each of the mine site. Onsite manufacturing will not be required for this underground mining project. Within the District, explosives will be trucked to the site and stored in approved magazines as shown in Figure 1-1. Explosives use, transport, handling, storage and disposal is governed by the Yukon *Occupational Health and Safety Act* Blasting Regulations and Occupational Health & Safety Regulations, and the *Transport of Dangerous Goods Act* and Regulations.

The blasting products will be both ammonium nitrate and fuel oil (ANFO) and stick powder as needed. Detonators will be non-electric and tied in with detonator cord. The explosive magazines will be located at appropriate distances away from the portals and other buildings as dictated by regulations. Explosives and detonators will be conveyed to the working headings on as need basis transported via approved day boxes. Excess explosives will be returned to the magazine at the end of the shift. A log book will be maintained in the magazine as required by regulations.



National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Satelite imagery obtained from Yukon Geomatics map service http://mapservices.gov.yk.ca/ArcGIS/services on February 2019

Datum: NAD 83; Map Projection: UTM Zone 8N

- Place of Interest
- Adit
- Alexco/ERDC Quartz Claims
- Tailings Area
- Waterbody
- Watercourse
- Silver Trail Highway
- Other Road
- Limited-Use Road

AKHM

ALEXCO ENVIRONMENTAL GROUP

ALEXCO KENO HILL MINING CORP.
BERMINGHAM

FIGURE 1-1

KENO HILL SILVER DISTRICT MINING OPERATIONS AREA OVERVIEW

FEBRUARY 2019

D:\Projects\AllProjects\Keno_Area_Mines\ALL-SITES\02-Map\01_Overview\01-Property Overview\01-District_WideOverview_20190212.mxd
(Last edited by: amadashevska 12/02/2019/10:11 AM)

2 APPLICABLE LEGISLATION AND EXPLOSIVES PERMITS REQUIRED

2.1 APPLICABLE LEGISLATION FOR EXPLOSIVES MANAGEMENT

The federal and territorial laws and regulations have the authority to control the use of explosives within Canada and Yukon. AKHM will implement the best management practices to meet or exceed the required laws and regulations. Table 2-1 provides the relevant *Acts*, regulations and guidelines applicable to explosives management.

Table 2-1 Relevant Federal and Yukon *Acts* and Regulations for Explosives Management

	Yukon	Federal
Acts	*Dangerous Goods Transportation Act (RSY 2002, c.50)*	*Explosives Act (RSC 1985 c.E-17)*
	Occupational Health and Safety Act (RSY 2002, c.159)	*Fisheries Act (RSC 1985, c. F-14)*
	Territorial Lands (Yukon) Act	*Transportation of Dangerous Goods Act, 1992 (SC 1992, c.34)*
Regulations	Dangerous Goods Transportation Regulations (OIC 1986/118)	Explosives Regulations (CRC, c. 599) Ammonium Nitrate and Fuel Oil Order (CRC, c. 598)
	Occupational Health and Safety Regulations (OIC 2006/178)	Metal Mining Effluent Regulations (SOR/ 2002-2222)
	Land Use Regulation	N/A
Guidelines	N/A	Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters
	N/A	Transportation of Dangerous Goods Regulations (SOR/2016-95)

2.2 EXPLOSIVES PERMITS/LICENSES REQUIRED

According to the Permit and Authorization Guide for Yukon Activities, various permits and licenses are required for explosives use. Table 2-2 provides the permits and licenses required for the explosives related activities.

Table 2-2 Relevant Federal and Yukon Legislation for Explosives Management

Project Related Activity	Authorization Required	Act/Regulation	Government Department and Branch	Contact Information
Use of more than 50 kg of explosives on Commissioner's land in any 30-day period	Land Use Permit	*Territorial Lands (Yukon) Act*, Land Use Regulation	Energy, Mines and Resources - Lands Branch	(867) 667-3173 land.use@gov.yk.ca
Overnight storage of explosives at any site other than a mine or quarry	Permit for use of explosives	*Explosives Act*	Natural Resources Canada - Minerals & Metals Sector	(604) 666-0366 www.nrcan.gc.ca/home
Explosives storage	Explosives Magazine Permit / Explosives Storage and Use Permit	*Explosives Act*	Yukon Workers' Compensation Health and Safety Board - Occupational Health & Safety	(867) 667-3726 www.wcb.yk.ca
Blasting – underground or surface	Underground and Surface authorization to conduct blasting in Yukon	Occupational Health and Safety Regulations Mine Safety Regulation 14.03 - 14.08	Yukon Workers' Compensation Health and Safety Board Occupational Health & Safety	(867) 667-3726 www.wcb.yk.ca
Temporary blasting	Temporary Blaster's Permit	Occupational Health and Safety Regulations Mine Safety Regulation 14.06	Yukon Workers' Compensation Health and Safety Board Occupational Health & Safety	(867) 667-3726 www.wcb.yk.ca
Blasting	Blasting Permit	Occupational Health and Safety Regulations Mine Safety Regulation	Yukon Workers' Compensation Health and Safety Board Occupational Health & Safety	(867) 667-3726 www.wcb.yk.ca
Handling, disposal, generation or storage of special (hazardous) wastes	Special Waste Permit	*Environment Act*, Special Waste Regulations	Environment - Environmental Programs	(867) 667-5683 envprot@gov.yk.ca
Remarks: Explosive Transportation Permit (ETP) is no longer required for the transport of more than 2000 kilograms of explosives.				

AKHM and the appointed mine development contractor (the contractor), if AKHM does not self perfor mining development, will work with the Explosives Safety and Security Branch (ESSB) of the Explosives Regulatory Division to obtain the necessary permits and licenses for explosives storage and use.

The contractor will be responsible for specific explosives management that includes supplying, transporting and storing blasting agents, and delivering explosives products to blast sites. AKHM will supervise the loading of the blast patterns by the contractor, and undertake pattern tie-ins. The objectives of the contract with the contractor are identified as follows:

- Specifying the scope of explosives operations and the AKHM and contractor's responsibilities;
- Establishing effective communication between the contractor and AKHM, including planned daily activities, inventory reports on explosives on-hand, regular meetings, and exchange of weekly reports;
- Identifying the access and egress control and security of the project (i.e., Key Control Plan - https://www.nrcan.gc.ca/explosives/resources/guidelines/13961); and
- Agreement to jointly develop the detailed Emergency Response Plan and Security Plan. The Emergency Response Plan will provide details on emergency responses to instances involving explosives and the materials used to manufacture explosives on-site. The Security Plan will address security measures for the project's explosives facilities.

3 EXPLOSIVES MANAGEMENT PLAN OBJECTIVES

The objectives of this plan are to ensure safety of employees and the protection of the environment. Numerous permits are required for the use and storage of explosives, which will be obtained prior to mining. This plan has been developed to define a protocol for safe storage, handling, disposal and monitoring of explosives during the undertaking of the Keno Hill Silver District Mining Operations. Relevant regulatory requirements have been incorporated as well.

4 TYPES OF EXPLOSIVES TO BE USED ON SITE

Various types of explosives will be used on site. **Appendix A** provides specific property information and safety data sheets of these items. In general:

4.1 AMMONIUM NITRATE AND FUEL OIL (ANFO)

Ammonium nitrate and fuel oil (ANFO) is one of the explosives to be used for the project. ANFO consists of a mixture of ammonium nitrate and fuel oil. The mixture will be 94% by weight porous, prilled ammonium nitrate that will act as an oxidizing agent and absorbent for the remaining 6% Fuel Oil. ANFO used will be manufactured off-site and received in 25 kg bags or 1000 kg totes.

4.2 EMULSION

Emulsion explosives will be considered for wet conditions. Emulsion is water resistant and can be blended with ANFO for a product that is better suited to variable weather conditions. Emulsion will be provided from off-site and received as cartridges in 25 kg boxes.

4.3 BOOSTER SENSITIVE EXPLOSIVE

DYNOMIX is a prilled ANFO mixture suitable for use in dry borehole conditions and will be used at the site. DYNOMIX has a shelf life of three months from date of manufacture when stored at temperatures between 17º C and 32º C (0º F and 90º F). Adequately sized cast booster or packaged explosive with a high detonation pressure will always be used to prime DYNOMIX.

4.4 NITROGLYCERIN DYNAMITE

Dynamite combines nitroglycerin with adsorbents and stabilizers, rendering it safe to use but retaining the powerful explosive properties of nitroglycerin. UNIMAX will be used at the site and is an extra gelatin dynamite formulated to consistently deliver high detonation velocity and excellent water resistance. DYNOSPLIT will also be used and is a specially formulated nitroglycerin dynamite designed for smooth wall, contour and/or trim blasting underground. Pre-packaged explosives will be kept on-site for small, selective blast requirements, such as fragmenting boulders and removal of high spots on the pit floor.

4.5 NON-ELECTRIC DETONATORS

Detonators will be non-electric and tied in with detonator cord. In this case, the initiation system is composed of a series of shock tubes connected to detonation devices. The shock tubes transmit shock waves to the non-electric detonators to initiate the blast. Non-electric Detonating System include the surface delay and in-hole detonator assembly, trunk-line assembly and lead-in line. The use of non-electric systems eliminates the danger of premature detonation owing to radio frequency energy or stray static electricity (e.g., wind, low humidity, plastic liners are sources of static electricity). Such systems can be used under all weather conditions, provide accurate surface and in-hole timing, and can be used in conjunction with lead-in line shock tube and detonating cord.

4.6 ELECTRIC DETONATORS

If warranted electronic detonation may also be considered to increase the accuracy of firing times and programmable detonation, if desired. The precision timing provided by electronic detonators may allow for a more uniform muck pile when conducting controlled pit blasting in different rock units. A more uniform muck pile will reduce processing costs and losses associated with the presence of oversized material and fines.

4.7 DETONATOR CORD

Detonating cord is a thin, flexible plastic tube filled with penta erythritol tetranitrate (PETN). Detonating cord may be used by the mine development contractor as a high speed fuse capable of detonating multiple charges almost simultaneously. This may be used to initiate pre-splitting blasts or for detonating large boulders simultaneously with the blast.

5 EXPLOSIVES QUANTITIES

The anticipated explosives required depends on how many and which mines Alexco has in operation. Estimated consumption for ANFO and stick product is 1.15 kg/t (2.3 lb/ton). Actual explosive quantities will vary depending on breakage effectiveness, rock type, rock hardness, explosives cost versus crushing costs, and overall refinements to mining operations. Actual explosives use will be reported as part of the QML annual report.

6 EXPLOSIVES STORAGE

Explosives are trucked to the site and stored in approved magazines as shown in Figure 1-1.. The explosive magazines are located away from any other infrastructure meeting the distance requirements under the *Explosives Act* and Regulations and the Quantity Distance Principles – User's Manual from the Explosives Regulatory Division (https://www.nrcan.gc.ca/explosives/resources/standards/9963). Locations of the explosive magazines are shown in Figure 1-1.

6.1 MAGAZINES

Four licensed magazines, constructed according to regulations, are located on site (i.e., two for explosives storage and two for detonator storage). The layout of the magazines is undertaken in line with explosive regulations and as such the following infrastructure are provided:

- Pre-constructed detonator magazine for detonators (IEDs) and shock tubes; and
- Powder magazine for boosters, cartridges and ANFO.

The explosive magazines are barricaded with rock berms and constructed 80 m apart allowing for 10,000 kg of storage in total in accordance with distance requirements for explosives storage facilities as specified in the *Federal Explosives Act* and Regulations and the Quantity Distance Principles – User's Manual from the Explosives Regulatory Division (https://www.nrcan.gc.ca/explosives/resources/standards/9963).

7 ONSITE HANDLING

All onsite handling, including operation of explosives magazine, will be completed by the mine development contractor. This qualified person will be required to use equipment designed for the handling and transport of such materials. And safe handling practices will apply to the handling and transport of explosives waste to the disposal site.

7.1 AUTHORIZED ACCESS

A Key Control Plan will be developed by the designated mine development contractor based on the federal requirement (https://www.nrcan.gc.ca/explosives/resources/guidelines/13961). In order to minimize any unauthorized access to the explosive magazines and storage areas, the plan will describe how security will be maintained and how access to explosives and raw material will be controlled. It will include the following:

- Every key to the magazine will be numbered;
- A person may only have possession of a key to the magazine if they are named in the plan;
- The number of people named in the will must not exceed the number necessary for the operation of the magazine;
- The lock on the magazine must be of a type for which keys can be obtained only from the lock's manufacturer or a certified locksmith designated by the manufacturer;
- If a key is lost or stolen, the lock must be immediately replaced; and
- Each key must be kept in a locked and secure location when it is not in the possession of a person named in the plan.

Access to the magazine and explosives storage areas will be restricted and only authorized personnel will be permitted to enter these areas. A register for the list of authorized personnel will be developed, and a daily sign-in/out log for persons entering the magazine will be maintained. The following are the type of personnel who will be permitted to enter the magazine and explosive storage areas:

- Appointed blasters;
- Mine development contractor employees (i.e., personnel required for explosive delivery and personnel involved in site maintenance);
- Blasting assistants;
- Security guards (external area only, no magazine access);
- Mine Manager;
- Mines or explosives inspectors; and
- RCMP.

7.2 HAZARDOUS MATERIALS MANAGEMENT

All personnel involved with handling explosives receive training on safe and appropriate use as per Workplace Hazardous Materials Information Systems Regulations (WHMIS) of the *Occupational Health and Safety Act*. Personnel will also be trained on spill containment and emergency procedures relevant to explosives and to general mine site operations.

All new employees receive an orientation at the Administration office and another orientation of the underground work site. Regular safety meetings with supervisors, safety officer and employees are mandated. Any changes in procedures, equipment, or hazards require immediate notification to employees.

All employees will follow OH&S Regulations and use appropriate personal protective equipment (PPE) as well as proper handling procedures when using hazardous materials. All employees are fully equipped with the proper PPE standard for working underground, taking into consideration hazards caused by noise level, airborne particulates and confined work space. PPE will include but not limited to the following:

- Goggles for eye protection;
- Appropriate coveralls;
- Impervious gloves;
- Boots; and
- Dust masks if required.

Underground contractors, Alexco personnel, and others must comply with the Yukon Territorial Government OH&S Regulations in addition to Alexco and contractor's in-house standards. A Safety Coordinator/Officer specific for the underground operation ensures that all workers are oriented to all aspects of the work site including hazard identification, personal protective equipment requirements, and that medical and health requirements are followed according to legislation. The Safety Coordinator/Officer position is also charged with ensuring continued training and skill development for all personnel.

Alexco's existing and approved Spill Contingency Plan and Hazardous Materials Management Plan have been updated for the Flame and Moth Mine and will be adhered to for the development project.

7.3 HOUSEKEEPING

For effectively managing explosives on site, it is important to follow the practices below:

- Keeping magazines and explosives storage areas clean and tidy on a daily basis (i.e., will not be used for any other storage);
- Removing and burning (or disposing in a safe manner) empty boxes used for explosive storage at the blast sites;
- Marinating the road access to the explosives magazines and storage areas in good condition regardless of the time of year; and
- Recording inventory levels on a weekly basis.

8 EXPLOSIVES DISPOSAL

Proper disposal of wastes generated at the blast sites will be required by the Yukon and Federal governments. AKHM is committed to the safe disposal of explosives when disposal is necessary and will work with the designated mine development contractor to develop a comprehensive management plan for the disposal of explosives waste. All explosives waste and explosives-contaminated material will be destroyed in a manner that does not increase the likelihood of an accidental ignition during or after the destruction. Explosives waste will be bagged, stored in magazines, and then taken to a specific underground location where it may be disposed of by blasting. To comply with regulations, AKHM and the designated mine development contractor will:

- Submit a list of the products that would be bagged (e.g., straight ANFO, straight water gel, or emulsions);
- Ensure the plastic bags used will be five inches or larger, and the exact size will be specified by the contractor once identified; and
- Place the bag into an UN-certified box approved under the Transportation of Dangerous Goods (TDG) Regulations (i.e., the product will be called Special A, Special B, or Special C, etc., and will be authorized). The products will not appear on the List of Authorized Explosives, but will be used only as a means of legitimizing storage and transportation).

8.1 TRANSPORTING EXPLOSIVES WASTE

AKHM or the explosives contractor will consult the manufacturer of any unused and damaged/deteriorated explosives, or the Explosive Regulatory Division prior to disposal in an effort to minimize the associated risks. For transporting to a destruction site, these explosives will be packaged according to the Transportation of Dangerous Goods Regulations. Potential damaged and/or deteriorated explosives related materials include the following:

- Intact emulsion explosives – Insensitivity and failure to shoot will likely increase by using stiff or crusty emulsion. Wetness on the outside of the film cartridge or segregation of the ingredients indicates that syneresis has occurred and the product will likely fail to detonate.
- Contaminated magazine floor – Leakage of fuel oil through the plastic of bagged ANFO is normally caused by prolonged storage. Depending on the severity of the leak, the contaminated floor sections may need to be replaced. Turning over bags of ANFO will be able to reduce oil migration and accumulation of oil on the bottom of the packaging.

8.2 DISPOSAL OF EXPLOSIVES WASTE

No abandoning and burying explosives will be allowed as there would be serious risk associated with any subsequent activity at the disposal site. Destruction by detonation underground will be used for explosives waste disposal.

According to the Explosives Regulatory Division, a minimum of two operators must be present during disposal of explosives or packaging that may be contaminated with explosives.

8.2.1 Destruction by Detonation

Destruction by detonation underground will served as the primary method of disposal. According to the Explosives Regulations, section 141, destructing explosives in boreholes is the best way to destroy industrial explosives and no license or certificate will be required in this manner. AKHM and the designated mine development contractor will follow the practices below:

- Destruction by detonation will be performed underground.
- Small amounts of explosives waste will be detonated in a blast hole as part of a production blast. They will be placed in the bore hole under the collar or stemming;
- The explosives to be destroyed and the other explosives will have similar properties (e.g., similar density and propensity to detonate);
- The presence of other explosives at the time of the ignition will not increase the likelihood of harm to people or property; and
- This disposal method will only be used if the explosives are still in good condition and can be transported to a production blast.

8.3 DISPOSAL OF EXPLOSIVE RELATED WASTE

Particular care must be exercised for different kinds of explosive related waste (if the above disposal methods are not applicable) including the following:

- Non-hazardous explosive related waste; and
- Non-hazardous packaging waste;

8.3.1 Disposal of Non-Hazardous Explosive Related Waste

Non-hazardous explosive related waste will include the following:

- Scrap Nonel tubing;
- Scrap copper wire;
- Blasting agents; and
- Precursors heavily contaminated with soil (i.e., blasting agents or precursors can only be classified as non-hazardous if they cannot detonate due to the amount of contamination; otherwise they should be placed into the bore hole and utilized for their manufactured/intended use).

A designated landfill will be used to dispose the non-hazardous explosive related waste. AKHM or the designated mine development contractor will provide the types and quantities of waste they are sending to the landfill facility.

8.3.2 Disposal of Non-Hazardous Packaging Waste

Here are the practices to dispose the non-hazardous packing waste:

- Boxes will be broken down and bags will be cut opened to provide for the highest degree of product removal before disposing of any non-hazardous containers;
- To facilitate product removal to the highest degree, tap the outside of the bag with a stick;
- Shipping name, identification number and hazard warning labels on the debris will be removed or obliterated. This will prevent any confusion on waste management due to prior hazardous materials labelling from the original packing; and
- Recycling of the packaging will be performed and disposed at the designated landfill.

9 BLASTING OPERATIONS

9.1 BLASTING PLANNING

All blasting activities will be planned by the holder of the Temporary Blaster's Permit and Blasting Permit as required by the Yukon Workers' Compensation Health and Safety Board. This will involve the planning for determining the quantities of explosives and accessories required for each blast by following the procedures and standards as identified in the Mine Development and Operation Plans and National Standard of Canada – Explosives-Quantity Distances (https://www.nrcan.gc.ca/explosives/resources/standards/9963). The practices below will be followed:

- Applicable dimensions will be applied based on the mine plan;
- The holder will be responsible for examining the area for blasting, misfires, unsafe face conditions above and below the bench to be blasted;
- Area, which the rock will be blasted, will be cleared of any infrastructure or personnel;
- Holes to be drilled according to the dimensions and the mine planning department instructions will be marked out;
- Proper amount of collar in each hole will be left;
- After drilling of the holes, the blaster will then measure the holes to ensure they are drilled correctly and for determining quantities of explosives and accessories;
- The blaster will plan the blast by calculating the appropriate amount of explosive, boosters, initiation systems components and other accessories;
- Mine specifications for loading perimeter holes for perimeter control will be followed;
- Stick powder will be loaded into blast holes using a loading stick of non-sparking material;
- The blasting site will be manned by a blasting assistant to ensure that no unauthorized person enters the site, or no other activity takes place at the site that could interfere with blasting procedures;
- Blasting accessories will be delivered to the blast in an approved explosive transportation vehicle, with appropriate warning decals;
- "LOADED FACE" and "DO NOT ENTER" sign will be hung across access to the drift before any holes are loaded;
- Bring only the required number of detonators to the face;
- The blaster will check the accessories are the correct quantities;
- Boosters and down the hole initiation systems will then be distributed to the holes;
- The blaster will commence with charging of the blast with help from blast assistants;
- If using pumped emulsion, the blaster will ensure that the emulsion is allowed to rise prior to closing the holes with stemming;
- Once the holes are charged and the emulsion has risen, the stemming will be placed into the holes;

- At this point, the blaster will contact the mining personnel for the evacuation of the mining area to begin;
- Once stemming is complete, the blaster will connect the down hole initiation system with trunk lines;
- The blaster will leave an assistant to guard the blast and then undertake a check on the progress of the evacuation, place guards at access points and lay the firing cable for initiation;
- A guard will also be placed at the far end of the firing cable;
- Once satisfied that the mining area is evacuated the blaster will return to the blast and place the initiating detonator, connect the firing cable to the detonator and leave to the far end (safe firing point);
- At the firing point, the blaster will make contact with all the guards at the mine access points to check that the area remains evacuated;
- The blaster will then sound an alarm and initiate the blast;
- Once the blast has been completed, the blaster will re-enter after the dust and smoke has dispersed;
- The blaster will check the blast for misfires and cut-offs and dangerous bench face conditions;
- If safe, the blaster will inform the mining crews that they can re-enter;
- If not safe, the blaster will take action by either; and
    - Re-firing misfired holes or cut-offs.
    - Marking any misfired holes and barricading the area as per regulations.
    - Supervising any process for making the area safe (bench face hazards).
- When loading is complete, return all unused explosives to the proper storage magazines and make required entries into the log books.

9.2 SAFETY PROCEDURES

For the safety of all personnel at site, safety precautions and procedures will be in place. While the Mine Manager/Supervisor holds senior authority over all personnel in the mine, blaster (i.e., permit holder) will have complete control over all blasting activities. The blaster will be responsible for the following:

- Effective communication with mine personnel prior to blast;
- Clearly defining safe distances from blast sites;
- Effective barricading of entrances to blast sites;
- Checking if the site is clear and connecting the initiating detonator, and then leaving the blast site last;
- Ensuring all blasting guards are in place and that all is clear prior to initiating the blast;
- Ensuring the alarm used will be designed to be heard by all personnel within 500 m of the blast to be executed;
- Checking if the area has been prepared to be blasted (e.g., a smooth floor will provide a safe work area for the drilling and blasting crew);

- Accessing and performing blast patterns that are in accordance to the engineers' design;
- Providing direction of specific drilling pattern and loading requirements (e.g., loading quantities) by following engineers' design;
- Noting and reporting any modifications due to field conditions; and
- Filing all paperwork for any explosives delivery including quantity information and each blast undertaken.

9.3 SAFETY TRAINING

Every employee including the designated mine development contractor working with explosives will be trained to carry out their duties at the mine site in a safe and lawful manner. A formal training program that covers the following topics will be provided:

- General safety induction;
- Identification of hazards, safety systems required for the handling, transport and disposal of explosives, and any other specific rules needed to protect workers and facilities;
- Safety-critical procedures and controls related to explosives;
- Use of personal protective equipment (PPE);
- Safety basis on why tasks are to be performed as specified;
- Emergency response;
- First aid;
- Documentation of training records (i.e., may be requested during inspections by Explosives Regulatory Division);
- Workplace Hazardous Materials Information System (WHMIS) (including the understanding of the Materials Safety Data Sheets);
- Transportation of Dangerous Goods; and
- Renewal of certification (i.e., expired more than five years after the date of certification, change in operating procedures or no relevant activity performed in the preceding twelve months).

Detailed Standard Operating Procedures (SOPs) from AKHM are in place for all blasting and explosives related activities to ensure a safe work environment for all Alexco personnel, contractors, and visitors. These procedures follow all legislative requirements as set out in the Yukon OH&S Regulations. Should SOPs change, training will be provided to those employees who will be implementing the revised procedures.

Training records, including the subjects covered in each course, will be retained by Safety Sync, which will notify the employee and their supervisor when refresher training is required. Training records will be made available for inspection to the regulatory agencies if requested. The contractor will keep the training records of its on-site staff.

9.4 EXPLOSIVES TRANSPORT EQUIPMENT

While on the road, ammonium nitrate is classified according to the requirements of the *Transportation of Dangerous Goods Act* and Regulations. Mine development contractor will transport the explosives (i.e., ammonium nitrate) to the blast site by following the practices below:

- Road vehicles used to store ammonium nitrate will meet Transport Canada and *Occupational Health and Safety Act* of Yukon requirements with regard to brakes, lights, etc., and mechanical fitness will be demonstrated, i.e., CMVSS;
- If road tankers or trailers are to be temporarily installed (i.e., a tanker or trailer is used for storage, not refilled on site, but replaced by another tanker or trailer), the wheels will be blocked, the king pin will be locked, and jacks will be used;
- If road tankers or trailers are used as a permanent installation (i.e., not temporarily installed as above, but refilled on site), the tires will be removed;
- Concrete or steel pads will be provided for dollies. At temporary locations, other solutions may be considered with the approval from Transport Canada;
- Placards will be displayed on the side of all explosives transporting equipment as per the Transportation of Dangerous Goods Shipping Regulations;
- A metering system will be equipped at the explosives blend vehicles. This will allow AKHM to reconcile the amount of explosives used with the amount of explosives delivered to site;
- For blasting accessories including detonators, delays, boosters and detonating cord, separate road vehicles than the ANFO one will be used; and
- The detonators and packaged explosives will be stored separately in closed metal containers lined with wood, or other suitable material. The container will be secured to the vehicle to prevent unintentional unloading during transport.

As required under the *Occupational Health and Safety Act* of Yukon, the following inspection on each explosives trucking vehicle will be perform:

- Fire extinguishers are filled and in working order;
- Electrical wiring is completely insulated and firmly secured;
- The fuel tank and feed lines have no leaks;
- The chassis, engine, pan and bottom of the conveyance are reasonably clean and free from surplus of oil and grease;
- The brakes and steering apparatus are in good condition; and
- The conveyance is in sound mechanical condition.

9.5 POTENTIAL ADVERSE WEATHER CONDITIONS

There is a potential to encounter any adverse weather conditions during blasting. Blaster and mine development contractor will follow the safety protocols below:

- Blaster will provide instructions on the best way to proceed based on the severity of the adverse weather condition;
- During an electrical storm, blasting will be prohibited, blast site will be evacuated, and electrical detonation equipment will be disconnected;
- During a snowstorm, explosives transport routes (i.e., roads between explosives storage areas and blast sites) will be cleared of snow in preparation for blasting activities to resume;
- During freshet and periods of heavy rainfall, explosives transport routes will be maintained to minimize any negative impact on road condition caused by soil erosion; and
- During foggy condition, adequate lighting will be required. This will be made available at the blasting site in preparation for this kind of situation. Explosives equipment will be equipped with proper high visibility equipment, and proper communication measures will be employed to alert mine personnel of the presence of explosives. The blasting pattern will be clearly marked, and control measures will be strictly enforced during the handling and connecting of detonation devices.

9.6 DUST, SMOKE AND FLY-ROCK

By-products in dust and smoke forms, including CO, CO_2 and NO_x in high concentrations, caused by blasting can have negative impacts on the environment. Concentrations of these by-products will be decreased by various factors including groundwater conditions, loading and blasting time length and/or manufacturing process. By-products in these gas forms will normally be dispersed quickly due to their physical characteristics.

In order to prevent site personnel from inhaling these highly concentrated gases, blaster will be responsible for the following:

- Assessing if the gases in concern have dispersed completely;
- Determining if the blasting area is safe to approach; and
- Providing instructions of the removal of guards in order to allow access to the blasting area.

Fly-rock resulted from blasting is another safety concern as it is potentially dangerous to personnel close to the blasting areas. In order to reduce the amount of fly-rock during blasting, the following practices will apply:

- Appropriate blast design and stemming height will be implemented;
- Material from the area prior to blasting will be removed (i.e., equipment parked in the blasting area will be re-located in order to prevent any damage by fly-rock or the concussion of the blast).
- Blaster will assess the potential and impact of fly-rock in every blast; and
- Blaster will determine the blasting danger zone, and to where guards and personnel will be evacuated.

9.7 MISFIRES

According to the Occupational Health and Safety Regulations Mine Safety Regulation Part 14 Blasting, blasting operations include the preparing, placing and firing of a charge, the handling of misfires, and the destroying of any explosive materials. Proper procedures will be in place at the blasting areas to prevent further impact from the misfires. The procedures have been developed based on the regulations and include the following:

- During face preparation and drilling, driller will thoroughly examine the face for misfires, cutoff holes, and remnants of blast holes (bootlegs). All remnants of blasted holes will be washed out and marked with paint;
- Any hole, regardless of length is to be treated as a misfire where;
    - The hole cannot be inspected.
    - The toe of the hole is not visible.
    - Any explosive products and components remain in the hole.
- When a misfire occurs, no personnel will return or be allowed to return to a blasted area, until:
    - A minimum of 30 minutes has elapsed when a misfire occurs or is suspected when using safety fuse, or
    - A minimum of 10 minutes has elapsed from the time the blasting cable was disconnected and short circuited when using electric or delay element detonators, or
    - At least 60 minutes has elapsed when a charge is known or suspected to be burning or where post detonation fumes exist.
- When there is evidence or suspicion of a misfired charge or undetonated explosive materials, only the minimum number of persons required to correct the hazard will be permitted in the blasted area;
- The blaster (i.e., permit holder) will provide instructions on handling any misfires;
- Other than the blaster, blaster's assistants will be available to assist in preparation, fixing or fire charges and handle misfires. The assistants;
    - Will be a qualified person, instructed in the safe handling of explosives.
    - Will remain under the full and direct control of the blaster.
    - Will be continuously visually monitored by the blaster who is responsible for the assistant's work.
- No person will use metallic equipment in the immediate vicinity of any explosive materials until after a blaster has directed the hand removal of as much broken material as possible;
- Metallic equipment will only be used to remove broken material if;
    - A blaster directs the use of the equipment.
    - The illumination of the area is adequate.
    - Precautions are taken to prevent injury to any person from accidental detonation.

- Blasters will ensure that they;
    - Count the number of shots exploding, when possible.
    - Report to the supervisor where it is believed that any shot did not fire.
    - Identify any misfired hole by inserting a conspicuous, non-metal marker at its outer end, or by roping the area off by any other manner approved by the blaster supervisor.
- Any charge that has been misfired will not be withdrawn, but blasted at a proper time and without delay;
- Where a mixture of ANFO has misfired, it will be washed out of the hole;
- A misfired hole on the surface will be clearly marked off for a distance of 8 m (26 ft.) around the collar of the hole; and
- Where an additional hole and charge are necessary for the blasting of a misfired charge on the surface, the blaster will;
    - Determine the location, direction and depth of any hole necessary for blasting the misfired charge and supervise its drilling.
    - Ensure that the hole being drilled is at least 1.5 m (5 ft.) from any part of the misfired charge.
    - Record in the daily examination and report book the location of any misfired shot remaining at the end of the shift.

9.8 GROUND VIBRATION

Blasting can result in damage to building structures and infrastructure due to potential ground vibration.

AKHM will follow proper procedures to keep vibration low from blasting to ensure that engineered structures (e.g., pond, mill and DSTF) will not be affected by such vibration. Ground vibrations were measured as first set of blasts for Flame and Moth to monitor potential vibration around the Mill.

9.9 INVENTORY MANAGEMENT

According to the *Explosives Act* and Regulations, a stock management system must be in place. Records of quantity of each explosive issued to the mine site including the dates of shipments and quantity of each explosive on-site will be maintained.

The following management practices will be implemented:

- Mine development contractor and AKHM will be responsible to perform weekly inventories at the explosives storage areas and magazines that store ammonium nitrate, emulsion, dynamite, boosters, delays, lead-in lines and detonating cords;
- The amounts of blasting materials used and remaining available will be provided to the Mine Manager on a daily and weekly basis; and

- Both the contractor and AKHM will keep records of the inventories and inspections, and provide weekly reports to Mine Manager.

9.10 RECORD KEEPING

As required by the regulatory and permitting requirements for explosives use, the following records will be maintained at the mine site:

- Blasting and explosives related permits and licences;
- Training records and certificates from blasting crew and mine development contractor;
- Records of the inventory inspections on the explosives storage facilities and magazines;
- Records of explosive withdrawals from explosives storage facilities and magazines;
- Design plans of the explosives storage areas and magazines;
- Records of the explosives delivery;
- Climate data for explosive storage facilities and magazines to ensure that temperature thresholds have not been exceeded;
- Blaster's log indicating the pre-blast loading details and results of the post-blast site inspection (i.e., date, blast number, blast layout, explosive quantities used and name of person initiating the blast); and
- Records of any disposal of explosives.

9.11 SPILL CONTAINMENT

The Alexco Spill Contingency Plan has been developed any spill management at the mine site. Additionally, AKHM will require an explosives-specific spill contingency plan and standard operating procedures from the contractor. This plan will indicate the manner of containing and disposing of any spilled explosives and/or affected soil, and be incorporated as part of the Alexco Spill Contingency Plan.

AKHM will keep the explosives storage facilities and magazines clean, dry and free from grit at all times, and clean up any spillage immediately. Shelves and floors will be kept free of broken explosive packages or spilled explosives, and when necessary, treated with a suitable neutralizing agent to remove all traces of explosive substances.

In case of explosives escaped into the environment, AKHM will assess the spill containment action required. There are two mechanisms by which explosives can contaminate water around the mine: spillage during loading and leaching of the blasting agents in wet blast holes. The following practices will be implemented to retain the spill:

- Any spillage occurring during the loading process will be contained and cleaned up before travelling to blast area;
- AKHM will determine and monitor water quality monitoring locations to evaluate the downstream effect of explosives use; and

- Water samples will be collected and analyzed to ensure all water leaving the mine site is in accordance with the most current water use license.

9.11.1 Nitrates and Ammonia Management

Nitrates and ammonia are present in the explosives. AKHM is aware that nitrates and ammonia are normally the compounds of greatest concern for water quality degradation. Nitrates can be directly toxic to aquatic life or they can indirectly affect aquatic life through decreasing dissolved oxygen concentrations in water or causing eutrophication. Ammonia can affect pH and temperature, and increase toxicity level in water.

Practices used to minimize nitrates and ammonia losses to the environment are described below:

- Blasts will be designed to maximize efficiency of blasting agents in order to prevent any nitrates and ammonia losses;
- Blast hole liners will be used even when minimal amounts of water are present. If there is excessive water, blasters will use emulsion instead;
- Holes will not be loaded with blasting agents until necessary in order minimize the sleep time in between loading and detonation;
- Spilled ANFO will be collected and disposed of in the same manner as other explosives waste produced on site;
- Loading sites will be kept clean by shovelling spilled ANFO into the nearest blast hole for detonation. ANFO spills outside of these active blasting areas will be cleaned up immediately;
- Cleanup is best performed with dry ammonium nitrate;
- Manage and limit contact with snow and water, with particular anticipation of spring thaw/freshet period; and
- Disposal of spill material and any impacted rock pad material will be dealt with appropriately, which could include placing within a blast pattern prior to initiation.

9.12 WET HOLES CHARGED WITH EMULSION

Where water is encountered in blast holes, emulsion explosive will be used to prevent dissolving of explosive in water and will detonate under water. Any emulsion spilled during charging of blast holes will be disposed of in the blast holes, prior to blasting, such that it will be destroyed during blasting.

9.13 REVIEW AND IMPROVEMENT

AKHM will work with the blasting crew and contractor closely to select products and produce blast designs that prove to be the most efficient and environmentally stable. The guidance outlined in this plan will be implemented to minimize the impacts of using explosives (i.e., ammonium nitrate-based blasting agents). Periodic review and improvement on blasting practices will be applied based on the changes and updates on industry best practices, and observed water quality. Water quality will be monitored by following the current

AKHM Monitoring Surveillance and Reporting Plan in place. AKHM will consult the regulatory authorities for any modification on the original practices as stated in the permits.

APPENDIX A – EXPLOSIVES PROPERTY INFORMATION AND SAFETY DATA SHEETS

DYNOMIX™

Technical Information

NITROGEN PRODUCTS

Booster Sensitive Explosive

Product Description

DYNOMIX is a prilled ammonium nitrate/fuel oil explosive mixture suitable for use in dry borehole conditions. It is available packaged in a variety of sizes and types of bags or delivered in bulk. For bulk delivery, it can be premixed and delivered to overhead storage bins, mixed on-site with stationary equipment and loaded into blast hole delivery trucks or mixed as it is loaded down-the-hole with specialized mobile equipment. DYNOMIX is used for quarry, surface mining, construction and underground blasting operations.

Application Recommendations

- DYNOMIX is not recommended for wet blasthole conditions and is not for use in ground containing reactive sulphides. Consult your Dyno Nobel representative regarding applications involving borehole dewatering and plastic borehole liners
- DYNOMIX is suitable for use in ground with a temperature range of 0°C to 55°C (32°F to 131°F). For applications in ground with temperatures outside this range contact your Dyno Nobel representative
- The loading density of DYNOMIX is subject to change (i.e., density poured from a bag differs from pneumatically placed or mobile equipment delivered densities). Typical application loading densities are: 0. 82 to 0.83 g/cc (poured 3 in to 5 in); 0.90 to 0.95 g/cc (pneumatic 1 in to 2 in) and 0.85 to 0.87 g/cc (bulk truck delivered 3 in to 17½ in)
- DYNOMIX has a shelf life of 3 months from date of manufacture when stored at temperatures between -17° C and 32° C (0° F and 90° F)
- **ALWAYS** use an adequately sized cast booster or packaged explosive with a high detonation pressure to prime DYNOMIX

Properties

SDS #1009

	Poured	Pneumatic
Density (g/cc) Avg	0.82	0.95
Energy[a] cal/g (cal/cc)	880 (720)	880 (720)
Relative Weight Strength[b]	1.00	1.00
Relative Bulk Strength[b]	1.00	1.16
Velocity[c] m/sec (ft/sec)	3,900 (12,800)	3,900 (12,800)
Detonation Pressure[c] (Kbars)	31	31
Gas Volume[a] (moles/kg)	43	43
Water Resistance	None	None
Fume Class	IME1	IME1
Minimum Hole Diameter (mm)	75	25

[a] All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™, the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values

[b] ANFO = 1.00 @ 0.82 g/cc

[c] Confined @ 150 mm (6 in) diameter

Hazardous Shipping Description

Explosive, Blasting, Type B, 1.5D, UN 0331, II OR
Ammonium Nitrate, Fuel Oil Mixture, 1.5D, NA 0331, II

See Product Disclaimer on page 2

DYNO Dyno Nobel

Groundbreaking Performance™

DYNOMIX™

Technical Information

Application Recommendations (continued)

- When two primers are necessary, place one near the bottom and one near the top of the main charge in the borehole. Additional primers should be used whenever the blaster feels that separations or blockages may have occurred as the borehole is being loaded. It is imperative that all primers in the borehole be either threaded onto a detonating cord downline or upline or be individually primed with a detonator connected to the blast circuit at the surface
- Use of detonating cord in boreholes with DYNOMIX can cause loss of energy, especially where high coreload detonating cords are used in smaller diameter holes. High coreload detonating cords may initiate DYNOMIX at low order. Where detonating cord is used to initiate Nonel SL detonators, use lowest recommended coreload detonating cord

Transportation, Storage and Handling

- DYNOMIX contains a high percentage of industrial-grade ammonium nitrate prills which are susceptible to breakage from temperature cycling, humidity and mechanical handling. Temperature cycling and humidity may cause packaged product to harden and material stored in bulk bins to increase in fines, cake and lump. Inventory should **ALWAYS** be rotated by using the oldest product first. Bulk bins should be emptied and cleaned routinely to prevent build up on walls
- For recommended good practices in transporting, storing, handling and using this product, see the Safety Library Publications of the Institute of Makers of Explosives
- Explosives must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations

TYPICAL LOADING DENSITIES AND RATES OF DETONATION (poured)

Borehole Diameter		Typical Weight Per Foot Of Borehole		Typical Detonation Velocity (confined)	
mm	in	kg	lbs	mps	fps
32	1¼	0.22	0.5	2,900	9,500
50	2	0.55	1.2	3,300	10,700
75	3	1.1	2.5	3,300	10,900
100	4	2.0	4.5	3,600	11,800
125	5	3.2	7.0	3,800	12,400
150	6	4.7	10.4	3,900	12,800
187	7⅜	7.1	15.7	4,000	13,100
230	9	10.6	23.4	4,100	13,400
270	10⅝	15.2	33.4	4,100	13,600
311	12¼	20.2	44.4	4,200	13,700
350	13¾	25.4	55.9	4,200	13,700
380	15	30.2	66.5	4,200	13,800

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500, Salt Lake City, Utah 84121 USA
Phone 800-732-7534 Fax 801-328-6452 Web www.dynonobel.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: dnna.hse@am.dynonobel.com
www.dynonobel.com

SDS #: 1009
Date: 05/15/2015
Supersedes: 12/20/2012

Product Identifier
Product Form: Mixture
Product Name: ANFO

Other Means of Identification
Product Class: ANFO, Bulk or Packaged
Trade Names:

ANFO
DYNOMIX™
DYNOMIX™ (U.G.)
DYNOMIX™ WR
DYNOMIX™ HD
FRAGMAX®
FRAGPAK™ SD
WATERBLOCK™
DYNOMIX™ WATERBLOCK™

Intended Use of the Product
Industrial applications

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)

Expl. 1.5	H205
Eye Irrit. 2A	H319
Carc. 2	H351
STOT RE 2	H373

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS07 GHS08

Signal Word (GHS-US) : Danger
Hazard Statements (GHS-US) : H205 - May mass explode in fire.
H319 - Causes serious eye irritation.
H351 - Suspected of causing cancer.
H373 - May cause damage to organs through prolonged or repeated exposure.

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 combustible materials.
P221 - Take any precaution to avoid mixing with combustible materials.
P240 - Ground/bond container and receiving equipment. Consult manufacturer for detailed guidance on appropriate grounding/bonding.
P260 - Do not breathe dust, mist, vapors.
P264 - Wash hands, forearms and exposed areas thoroughly after handling.
P273 - Avoid release to the environment.
P280 - Wear eye protection, protective clothing, protective gloves.
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.
P314 - Get medical advice/attention if you feel unwell.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Do NOT attempt to fight fire.
P370+P380 - In case of fire: Evacuate area.
P372 - Explosion risk in case of fire.
P373 - DO NOT fight fire when fire reaches explosives.
P401 - Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555..
P405 - Store locked up.
P501 - Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Other Hazards

Hazards Not Otherwise Classified (HNOC): 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	89 - 95	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Fuels, diesel, no. 2	(CAS No) 68476-34-6	4 - 7	Flam. Liq. 3, H226 Acute Tox. 4 (Inhalation:dust,mist), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304 Aquatic Acute 3, H402 Aquatic Chronic 2, H411
Guar gum	(CAS No) 9000-30-0	< 0.1, 0.1 - 1, 1 - 5, 5 - 6	Comb. Dust

More than one of the ranges of concentration prescribed by Controlled Products Regulations has been used where necessary, due to varying composition.
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 deminimus 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: Remove to fresh air and keep at rest in a position comfortable for breathing. Obtain medical attention if breathing difficulty persists.

Skin Contact: Remove contaminated clothing and wash before reuse. Gently wash with plenty of soap and water.

Eye Contact: Rinse cautiously with water for at least 15 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. Immediately call a POISON CENTER or doctor/physician.

Most Important Symptoms and Effects Both Acute and Delayed

General: May cause serious eye irritation. Contains material suspected of causing cancer. May cause damage to organs through prolonged or repeated exposure.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause serious eye irritation.

Ingestion: Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms: Contains material suspected of causing cancer. May cause damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If ingested, causes methemoglobenemia – emergency response should treat appropriately, such as by intravenous administration of methylene blue.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES.

Unsuitable Extinguishing Media: 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.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

Explosion Hazard: Explosion risk in case of fire. This product is an explosive with mass detonation hazard. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Reactivity: Stable under normal conditions. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Advice for Firefighters

Firefighting Instructions: 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.

Hazardous Combustion Products: Carbon Monoxide (CO) and Nitrogen Oxides (NOx)

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 (vapor, mist, dust).

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: Stop release if safe to do so. Eliminate ignition sources. 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 to prevent migration and entry into sewers or streams. Do not use combustible absorbents and do not mix with other materials.
Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate Federal, State and local regulations.
Reference to Other Sections
See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling
General: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and forearms thoroughly after handling. Do not eat, drink or smoke when using this product.
Conditions for Safe Storage, Including Any Incompatibilities
Technical Measures: Contact manufacturer for appropriate grounding/bonding guidance. Comply with applicable regulations.
Storage Conditions: Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555. Store in a dry, cool and well-ventilated place. Keep/Store away from direct sunlight, extremely high or low temperatures, heat sources, ignition sources. Keep container closed when not in use. Store locked up.
Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Zinc. Copper and its alloys. Organic materials. Combustible materials.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters
For substances listed in section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), NIOSH (REL), or OSHA (PEL).

Fuels, diesel, no. 2 (68476-34-6)		
USA ACGIH	ACGIH TWA (mg/m³)	100 mg/m³ (inhalable fraction and vapor)
USA ACGIH	ACGIH chemical category	Skin - potential significant contribution to overall exposure by the cutaneous route, Confirmed Animal Carcinogen with Unknown Relevance to Humans
Alberta	OEL TWA (mg/m³)	100 mg/m³
British Columbia	OEL TWA (mg/m³)	100 mg/m³ (aerosol, inhalable, and vapour)
Manitoba	OEL TWA (mg/m³)	100 mg/m³ (inhalable fraction and vapor)
Newfoundland & Labrador	OEL TWA (mg/m³)	100 mg/m³ (inhalable fraction and vapor)
Nova Scotia	OEL TWA (mg/m³)	100 mg/m³ (inhalable fraction and vapor)
Ontario	OEL TWA (mg/m³)	100 mg/m³ (inhalable fraction and vapor)
Prince Edward Island	OEL TWA (mg/m³)	100 mg/m³ (inhalable fraction and vapor)
Saskatchewan	OEL STEL (mg/m³)	150 mg/m³ (vapour)
Saskatchewan	OEL TWA (mg/m³)	100 mg/m³ (vapour)

Exposure Controls
Appropriate Engineering Controls: Emergency eye wash fountains and safety showers are recommended if exposure is likely. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.
Personal Protective Equipment: Gloves. Protective eyewear. Protective clothing. If insufficient ventilation, wear

respiratory protection.

Materials for Protective Clothing: General work clothing to avoid skin contact.
Hand Protection: Wear chemically resistant protective gloves if exposure is likely.
Eye Protection: Wear suitable eye protection.
Skin and Body Protection: Wear suitable protective clothing.
Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations are expected to exceed exposure limits.
Environmental Exposure Controls: Do not allow the product to be released into the environment.
Consumer Exposure Controls: Do not eat, drink or smoke during use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	Pale, oil-covered prills
Odor	:	Fuel oil
Odor Threshold	:	Not available
pH	:	Not available
Evaporation Rate	:	< 1 (butyl acetate = 1)
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	> 120 °F (> 49 °C)
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	:	< 5 mm Hg @ 75 °F (23.9 °C)
Relative Vapor Density at 20 °C	:	> 1 (air = 1)
Density	:	0.8 - 1.05 g/cc bulk density
Specific Gravity	:	Not available
Solubility	:	In Water: Ammonium Nitrate component completely soluble
Partition Coefficient: N-Octanol/Water	:	Not available
Viscosity	:	Not available
Explosive properties	:	Explosive; fire, blast or projection hazard
Explosion Data – Sensitivity to Mechanical Impact	:	Not expected to present an explosion hazard due to mechanical impact.
Explosion Data – Sensitivity to Static Discharge	:	Not expected to present an explosion hazard due to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials. Contact with organic material or combustible material may cause an explosive situation.
Chemical Stability: Stable under recommended handling and storage conditions (see section 7). 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 or low temperatures. Heat. Sparks. Open flame. Overheating.
Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Zinc. Copper and its alloys. Organic materials. Combustible materials.
Hazardous Decomposition Products: Carbon monoxide. Nitrogen oxides.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product
Acute Toxicity: Not classified
LD50 and LC50 Data: Not available
Skin Corrosion/Irritation: Not classified
Serious Eye Damage/Irritation: Causes serious eye irritation.
Respiratory or Skin Sensitization: Not classified
Germ Cell Mutagenicity: Not classified
Teratogenicity: Not classified
Carcinogenicity: Contains an ingredient 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: Not classified
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: May cause serious eye irritation.
Symptoms/Injuries After Ingestion: Ingestion is likely to be harmful or have adverse effects. Overexposure to this material may result in methemoglobinemia. Methemoglobinemia decreases the blood's ability to carry oxygen and results in symptoms such as dizziness, drowsiness, headache, shortness of breath, blue skin and lips, rapid heart rate, unconsciousness, and possibly death.
Chronic Symptoms: Contains an ingredient suspected of causing cancer. May cause damage to organs through prolonged or repeated exposure.
Information on Toxicological Effects - Ingredient(s)
LD50 and LC50 Data:

Fuels, diesel, no. 2 (68476-34-6)	
LD50 Oral Rat	18.7 - 24.9 ml/kg
LD50 Dermal Rabbit	> 4300 mg/kg
ATE US (dust, mist)	3.60 mg/l/4h
Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h
Guar gum (9000-30-0)	
LD50 Oral Rat	6770 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecology - General: This material is hazardous to the aquatic environment. Keep out of sewers and waterways.
Ecology - Water: Harmful to aquatic life with long lasting effects.

Fuels, diesel, no. 2 (68476-34-6)	
LC50 Fish 1	57 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Persistence and Degradability Not available
Bioaccumulative Potential

Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

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: 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

In Accordance with DOT
Proper Shipping Name : AMMONIUM NITRATE-FUEL OIL MIXTURE containing only prilled ammonium nitrate and fuel oil
Hazard Class : 1.5D
Identification Number : NA0331
Label Codes : 1.5D

Packing Group : II
ERG Number : 112

In Accordance with IMDG
Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE B (AGENT, BLASTING, TYPE B)
Hazard Class : 1
Identification Number : UN0331
Label Codes : 1.5D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y

In Accordance with IATA
Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE B
Identification Number : UN0331
Hazard Class : 1
Label Codes : 1.5D
ERG Code (IATA) : 1L

In Accordance with TDG
Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE B
Packing Group : II
Hazard Class : 1.5D
Identification Number : UN0331
Label Codes : 1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

ANFO

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Delayed (chronic) health hazard Sudden release of pressure hazard Fire hazard

Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Guar gum (9000-30-0)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Fuels, diesel, no. 2 (68476-34-6)

U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - California - Safer Consumer Products - Initial List of Candidate Chemicals and Chemical Groups
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term

Ammonium nitrate (6484-52-2)

U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)
U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
RTK - U.S. - Massachusetts - Right To Know List
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
RTK - U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
RTK - U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term

Guar gum (9000-30-0)

U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term

Fuels, diesel, no. 2 (68476-34-6)

U.S. - New Jersey - Right to Know Hazardous Substance List

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

Canadian Regulations

ANFO	
WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

ANFO	
WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**
Fuels, diesel, no. 2 (68476-34-6)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class B Division 3 - Combustible Liquid Class D Division 2 Subdivision A - Very toxic material causing other toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects Class D Division 1 Subdivision B - Toxic material causing immediate and serious toxic effects
Ammonium nitrate (6484-52-2)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Guar gum (9000-30-0)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
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:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 4
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Aquatic Chronic 2	Hazardous to the aquatic environment - Chronic Hazard Category 2
Aquatic Chronic 3	Hazardous to the aquatic environment - Chronic Hazard Category 3
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Comb. Dust	May form combustible dust concentrations in air
Expl. 1.5	Explosive Category 1.5
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 3	Flammable liquids Category 3
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
H205	May mass explode in fire
H272	May intensify fire; oxidizer
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
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

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800

Disclaimer

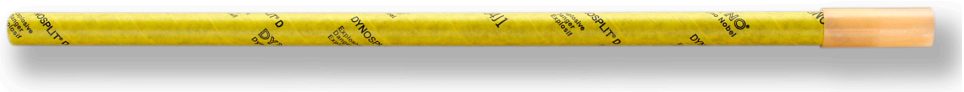
Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, the information contained herein, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR 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.

Dyno Nobel SDS

DYNOSPLIT®

Technical Information

Nitroglycerin Dynamite



Product Description

DYNOSPLIT is a specially formulated nitroglycerin dynamite packaged in rigid 600 mm (24 in) long paper cartridges available in either 19 or 22 mm (¾ or ⅞ in) diameters. A plastic or paper coupler, attached to one end, allows easy assembly into a continuous length. DYNOSPLIT is designed for pre-splitting or cushion blasting in surface operations and for smooth wall, contour or trim blasting underground.

Application Recommendations

- Minimum detonating cord is 5.3 g/m (25 gr/ft).
- Minimum detonator is No. 8 strength.
- Minimum temperature is -40°C (-40°F).
- Linear charge weight:
  D = 22 mm (⅞ in) diameter = 0.57 kg/m (0.38 lbs/ft)
  D1 = 22 mm (⅞ in) diameter = 0.42 kg/m (0.28 lbs/ft)

- **ALWAYS** trace columns over 2 m (6 ft) long with detonating cord securely attached to each cartridge.
- **ALWAYS** decouple the explosive charge when presplitting; that is, select larger borehole diameters to reduce borehole pressure. In surface applications, always stem to minimize air blast and plug the borehole above the explosive column to prevent stemming from filling the air/water space. In underground drifting applications, plug the borehole after the explosive column to prevent the explosive column from being ejected out of the borehole during detonation of the drift round.

Properties

SDS #1019

		D[e]	D1**
Diameter	(in)	⅞	⅞
Density	(g/cc) Avg	1.40	0.82
Energy[a]	(cal/g)	995	930
	(cal/cc)	1,440	940
Relative Weight Strength[a]		1.13	1.05
Relative Bulk Strength[a,b]		2.00	1.30
Velocity	(m/s)	2,700[d]	1,875
	(ft/s)	8,900[d]	6,150
Detonation Pressure	(Kbars)	26[d]	7[d]
Gas Volume[a]	(moles/kg)	32	38
Water Resistance	(@ 12 ft)	24 hrs	8 hrs
Fume Class		IME1 & NRCan1[e]	**Not for use underground
Maximum Water Depth		8 m (25 ft)	

[a] All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.
[b] ANFO = 1.00 @ 0.82 g/cc
[d] Unconfined @ 22 mm (⅞ in) diameter
[e] Dynosplit D is IME1 and is approved by Natural Resources Canada as Fume Class 1.

Hazardous Shipping Description
Explosive, Blasting, Type A, 1.1D, UN 0081 II

See Product Disclaimer on page 2

DYNO Dyno Nobel
Groundbreaking Performance™

DYNOSPLIT®

Technical Information

Transportation, Storage and Handling

- DYNOSPLIT must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
- For maximum shelf-life, dynamite must be stored in cool, dry and well-ventilated magazines. Dynamite inventory should always be rotated by using the oldest materials first. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Decoupled Borehole Pressure (psi)

Product Diameter (in)	Borehole Diameter (in)				
	1 ⅞	2 ½	2 ¾	3	3 ½
⅞[a]	27,600	13,064	10,196	8,132	5,447
⅞[b]	--	72,732	56,768	45,275	30,325
⅞[a]	9,576	4,533	2,821	2,821	1,890
⅞[b]	--	52,849	32,897	32,897	22,034

Diameter x Length		Linear Charge Weight		Qty / Case	Nominal Case Weight	
mm	in	kg/m	lbs/ft		kg	lbs
22 x 600	⅞ x 24	0.57	0.38	60	19.5	43.2
22 x 600	⅞ x 24	0.42	0.28	60	19.5	34.8

[a] DYNOSPLIT alone.
[b] DYNOSPLIT with detonating cord trace along its length.

D
D1

- Diameter as labeled is nominal inside diameter. Actual outside diameter is 20mm (0.79 in) for 19 mm (¾ in) and 23 mm (0.90) for 22 mm (⅞ in).
- Note: All weights are approximate.

Case Dimensions

67 x 35 x 12 cm 26½ x 13¾ x 4¾ in

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500, Salt Lake City, Utah 84121 USA
Phone 800-732-7534 Fax 801-328-6452 Web www.dynonobel.com

Safety Data Sheet

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

Printing date 20.11.2015 Revision: 20.11.2015

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

· **1.1 Product identifier**

· **Trade name: Dynamite**

· **Article Unique Manufacturer SDS Number:** 1019

· **Other product identifiers:**
D-GEL™ 1000
RED H®B
DYNOSPLIT D®
STONECUTTER™
DYNOSPLIT D-1®
UNIGEL®
DYNOMAX PRO™
UNIMAX®
IP: 724
VIBROGEL®: 1, 3
Oil Well Explosive 80%
Z POWDER™

· **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 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(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
Product is a sealed package as delivered. Exposure to contents is unlikely when stored and used according to manufacturer's instructions. Adverse health effects are not expected from normal storage and use.
See Section 4 for hazards involving old or improperly stored materials.

· **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 statements**
H201 Explosive; mass explosion hazard.

· **Precautionary statements**

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P230	Keep wetted.
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:**
EUH209 Can become highly flammable in use.

(Contd. on page 3)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(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

· **HMIS Long Term Health Hazard Substances**
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.

· **Dangerous components:**	
CAS: 6484-52-2 EINECS: 229-347-8	ammonium nitrate Xi R36; O R8
	Ox. Sol. 3, H272 Eye Irrit. 2, H319
CAS: 628-96-6 EINECS: 211-063-0 Index number: 603-032-00-9	ethylene dinitrate / nitroglycol T+ R26/27/28; E R3 R33
	Unst. Expl., H200 Acute Tox. 2, H300; Acute Tox. 1, H310; Acute Tox. 2, H330 STOT RE 2, H373

(Contd. on page 4)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 3)

CAS: 7631-99-4 EINECS: 231-554-3	sodium nitrate Xn R22; Xi R36; O R8
	Ox. Sol. 2, H272 Eye Irrit. 2, H319
CAS: 55-63-0 EINECS: 200-240-8 Index number: 603-034-00-X	glycerol trinitrate / nitroglycerin T+ R26/27/28; E R3; N R51/53 R33
	Unst. Expl., H200 Acute Tox. 2, H300; Acute Tox. 1, H310; Acute Tox. 2, H330 STOT RE 2, H373 Aquatic Chronic 2, H411 Flam. Liq. 2, H225
CAS: 9004-70-0 EC number: 603-037-0	Nitrocellulose, colloided, granular E R3
	Expl. 1.1, H201
CAS: 7704-34-9 EINECS: 231-722-6 Index number: 016-094-00-1	sulfur Xi R38
	Skin Irrit. 2, H315

· **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:**
This is a packaged product that will not result in exposure to the contents under normal conditions of use. In the event of exposure, administer first aid appropriate for symptoms present.
· **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.
Adverse health effects are not reasonably expected from normal use of product. Symptoms listed below may occur from handling of old or improperly stored materials.
Headache

(Contd. on page 5)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 4)

Dizziness
Cramp
Dilation of pupils
Methaemoglobinaemia
Profuse sweating
Vision disorders.
Disorientation

· **Hazards**
Danger of blast or crush-type injuries.
Adverse health effects are not reasonably expected from normal use of product. Hazards listed below may occur from handling of old or improperly stored materials.
Danger of disturbed cardiac rhythm.
Danger of convulsion.
Toxic if swallowed, in contact with skin or if inhaled.
May cause damage to organs through prolonged or repeated exposure.

· **4.3 Indication of any immediate medical attention and special treatment needed**
Contains organic nitrates. Consult literature for specific antidotes.
May produce a vasodilatory effect.
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.

(Contd. on page 6)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 5)

SECTION 6: Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Use respiratory protective device against the effects of fumes/dust/aerosol.
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:**
Protect from humidity and water.
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.

(Contd. on page 7)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 6)

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:**

628-96-6 ethylene dinitrate / nitroglycol

PEL (USA)	Ceiling limit: 1 mg/m³, 0,2 ppm Skin
REL (USA)	Short-term value: 0,1 mg/m³ Skin
TLV (USA)	Long-term value: 0,31 mg/m³, 0,05 ppm Skin
EL (Canada)	Long-term value: 0,05 ppm Skin
EV (Canada)	Long-term value: 0,31 mg/m³, 0,05 ppm Skin

55-63-0 glycerol trinitrate / nitroglycerin

PEL (USA)	Ceiling limit: 2 mg/m³, 0,2 ppm Skin
REL (USA)	Short-term value: 0,1 mg/m³ Skin
TLV (USA)	Long-term value: 0,46 mg/m³, 0,05 ppm Skin
EL (Canada)	Long-term value: 0,05 ppm Skin
EV (Canada)	Long-term value: 0,5 mg/m³, 0,05 ppm Skin

· **DNELs** No further relevant information available.
· **PNECs** No further relevant information available.
· **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.
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:**

Protective gloves

(Contd. on page 8)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 7)

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:**	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):**	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.

(Contd. on page 9)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 8)

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.
Contact with acids releases toxic gases.
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
Nitrogen oxides
Hydrocarbons

SECTION 11: Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values relevant for classification:**		
6484-52-2 ammonium nitrate		
Oral	LD50	2217 mg/kg (rat)
55-63-0 glycerol trinitrate / nitroglycerin		
Oral	LD50	115 mg/kg (mouse)
		105 mg/kg (rat)

(Contd. on page 10)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 9)

Dermal	LD50	29 mg/kg (rat) 280 mg/kg (rabbit)

· **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.
Adverse health effects are not reasonably expected from normal use of product. Hazards listed below may occur from handling of old or improperly stored materials.
Toxic if swallowed, in contact with skin or if inhaled.
· **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.
· **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.

(Contd. on page 11)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 10)

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

SECTION 14: Transport information

· **14.1 UN-Number**	
· **DOT, ADR, IMDG**	UN0081
· **IATA**	FORBIDDEN
· **14.2 UN proper shipping name**	
· **DOT, IMDG**	EXPLOSIVE, BLASTING, TYPE A
· **ADR**	0081 EXPLOSIVE, BLASTING, TYPE A
· **IATA**	FORBIDDEN
· **14.3 Transport hazard class(es)**	

· **DOT**

· **Class**	1.1
· **Label**	1.1

· **ADR, IMDG**

· **Class**	1.1
· **Label**	1.1D
· **IATA**	
· **Class**	FORBIDDEN
· **14.4 Packing group**	
· **DOT, ADR, IMDG**	II
· **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-S,B-Y
· **Segregation groups**	Ammonium compounds
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.

· **Transport/Additional information:**

· **ADR**	
· **Tunnel restriction code**	1

(Contd. on page 12)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 11)

· **IMDG**	
· **Limited quantities (LQ)**	0
· **Excepted quantities (EQ)**	Code: E0 Not permitted as Excepted Quantity
· **IATA**	FORBIDDEN.
· **UN "Model Regulation":**	UN0081, EXPLOSIVE, BLASTING, TYPE A, 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**

· **Section 355 (extremely hazardous substances):**	
None of the ingredients are listed.	
· **Section 313 (Specific toxic chemical listings):**	
6484-52-2	ammonium nitrate
55-63-0	glycerol trinitrate / nitroglycerin
· **TSCA (Toxic Substances Control Act):**	
All ingredients are listed.	

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients are listed.
· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients are listed.
· **Chemicals known to cause developmental toxicity:**
None of the ingredients are listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients are listed.
· **IARC (International Agency for Research on Cancer)**
None of the ingredients are listed.
· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients are listed.
· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients are listed.

(Contd. on page 13)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 12)

· **Canada**
· **Canadian Domestic Substances List (DSL)**
Some components are listed on the NDSL.

All ingredients are listed.
· **Canadian Ingredient Disclosure list (limit 0.1%)**
None of the ingredients are listed.
· **Canadian Ingredient Disclosure list (limit 1%)**

628-96-6	ethylene dinitrate / nitroglycol
7631-99-4	sodium nitrate

· **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.

· **Relevant phrases**

H200	Unstable explosives.
H201	Explosive; mass explosion hazard.
H225	Highly flammable liquid and vapour.
H272	May intensify fire; oxidiser.
H300	Fatal if swallowed.
H310	Fatal in contact with skin.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.
R22	Harmful if swallowed.

(Contd. on page 14)

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

Printing date 20.11.2015 Revision: 20.11.2015

Trade name: Dynamite

(Contd. of page 13)

R26/27/28 Very toxic by inhalation, in contact with skin and if swallowed.
R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R33 Danger of cumulative effects.
R36 Irritating to eyes.
R38 Irritating to skin.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R8 Contact with combustible material may cause fire.

· **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. Liq. 2: Flammable liquids, Hazard Category 2
Ox. Sol. 2: Oxidising Solids, Hazard Category 2
Ox. Sol. 3: Oxidising Solids, Hazard Category 3
Acute Tox. 2: Acute toxicity, Hazard Category 2
Acute Tox. 1: Acute toxicity, Hazard Category 1
Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2
Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2
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

UNIMAX®

Extra Gelatin Nitroglycerin Dynamite

Technical Information

Product Description

UNIMAX is an extra gelatin dynamite formulated to consistently deliver high detonation velocity and excellent water resistance. UNIMAX is designed to satisfy the vast majority of explosive applications in hard rock and may be used as the main explosive charge where high density and energy is required or as a primer for ANFO.

Application Recommendations

- UNIMAX is an excellent primer for Dynomix (ANFO), Dynomix-WR (WR ANFO) or other detonator sensitive packaged product and can be used as a secondary primer in hard seams or at the top of the explosive column.
- Minimum diameter is 25 mm (1 in).
- Minimum detonator is No. 8 strength.
- Storage at elevated temperatures and/or high humidity for 1 to 6 months can reduce the performance of Unimax depending on the diameter. Consult your Dyno Nobel representative for specific recommendations.
- Dynamites are susceptible to sympathetic detonation when applied in very wet conditions where boreholes are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for recommendations where these conditions exist.

Properties

SDS #1019

Density	(g/cc) Avg	1.51
Energy[a]	(cal/g)	1,055
	(cal/cc)	1,510
Relative Weight Strength[a]		1.20
Relative Bulk Strength[a,b]		2.10
Velocity[c]	(m/s)	5,300
	(ft/s)	17,400
Detonation Pressure[c]	(Kbars)	106
Gas Volume[a]	(moles/kg)	32
Water Resistance		Excellent
Fume Class		IME1 & NRCan1[d]

[a] All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.
[b] ANFO = 1.00 @ 0.82 g/cc
[c] Unconfined @ 50 mm (2 in) diameter.
[d] Approved by Natural Resources Canada as Fume Class 1.

Hazardous Shipping Description
Explosive, Blasting, Type A, 1.1D, UN 0081 II

See Product Disclaimer on page 2

DYNO Dyno Nobel
Groundbreaking Performance™

UNIMAX®

Technical Information

Transportation, Storage and Handling

- UNIMAX must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
- For maximum shelf-life, dynamite must be stored in cool, dry and well-ventilated magazines. Dynamite inventory should always be rotated by using the oldest materials first. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Packaging

Diameter x Length		Quantity / Case	Case Type	Nominal Case Weight	
mm	in			kg	lbs
25 x 200	1 x 8	140	DA	20.4	44.8
32 x 200	1 1/4 x 8	88	DA	20.0	44.0
32 x 400	1 1/4 x 16	44	DA	20.0	44.0
40 x 200	1 1/2 x 8	60	DA	19.4	42.6
40 x 400	1 1/2 x 16	30	DA	20.5	45.0
50 x 200	2 x 8	34	DB	19.3	42.5
50 x 400[a]	2 x 16[a]	17	DB	19.3	42.5
60 x 400[a]	2 1/4 x 16[a]	13	DA	18.1	39.8
65 x 400[a]	2 1/2 x 16[a]	10	DB	18.6	41.0
75 x 200	3 x 8	16	DE	19.9	43.7
75 x 400[a]	3 x 16[a]	8	DE	20.4	44.8

[a] Avaliable in spiral tube shell with tapered end.

- Note: all weights are approximate.
- Product density is 1.50 g/cc for package diameters less than 50 mm (2 in). Use cartridge count to determine actual explosive charge weight.
- UNIMAX is available in a wide variety of sizes. Custom sizes are subject to surcharge and may require longer than usual lead times.

**Available upon request. Check with your Dyno Nobel representative should you have any questions.

Case Dimensions

DA	45 x 34 x 17 cm	17¾ x 13⅜ x 6⅜ in
DB	45 x 34 x 15 cm	17⅞ x 13⅜ x 5⅞ in
DE	45 x 34 x 17 cm	17⅝ x 13 5/16 x 6¾ in

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500, Salt Lake City, Utah 84121 USA
Phone 800-732-7534 Fax 801-328-6452 Web www.dynonobel.com

Safety Data Sheet

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

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)**

Health = 1
Fire = 0
Reactivity = 4

Not available.

· **HMIS-ratings (scale 0 - 4)**

Health = *0
Fire = 0
Reactivity = 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 EINECS: 201-084-3 Index number: 603-035-00-5	pentaerythritol tetranitrate (PETN) E R3 Unst. Expl., H200
CAS: 13424-46-9 EINECS: 236-542-1 Index number: 082-003-00-7	lead diazide T Repr. Cat. 1, 3 R61; Xn R62-20/22; E R3; N R50/53 R33 Unst. Expl., H200 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7439-92-1 EINECS: 231-100-4	lead T Repr. Cat. 1 R60-61-48/23/25; N R50/53 Repr. 1A, H360FD; STOT RE 1, H372 Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 7440-21-3 EINECS: 231-130-8	silicon F R11 Flam. Sol. 2, H228
CAS: 7782-49-2 EINECS: 231-957-4 Index number: 034-001-00-2	selenium T R23/25 R33-53 Acute Tox. 3, H301; Acute Tox. 3, H331 STOT RE 2, H373 Aquatic Chronic 4, H413
CAS: 1314-41-6 EINECS: 215-235-6 Index number: 082-001-00-6	orange lead T Repr. Cat. 1, 3 R61; Xn R62-20/22; N R50/53 R33 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 13463-67-7 EINECS: 236-675-5	titanium dioxide 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 EINECS: 233-660-5 Index number: 056-002-00-7	barium chromate Xn R20/22 Carc. 1A, H350 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7758-97-6 EINECS: 231-846-0 Index number: 082-004-00-2	lead chromate T Carc. Cat. 2, Repr. Cat. 1, 3 R45-61; Xn R62; N R50/53 R33 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 7727-43-7 EINECS: 231-784-4	barium sulphate, natural substance with a Community workplace exposure limit
CAS: 7778-74-7 EINECS: 231-912-9 Index number: 017-008-00-5	potassium perchlorate Xn R22; O R9 Ox. Sol. 1, H271 Acute Tox. 4, H302
CAS: 61790-53-2	Diatomaceous earth (Silica-Amorphous) substance with a Community workplace exposure limit
CAS: 7439-98-7 EINECS: 231-107-2	molybdenum substance with a Community workplace exposure limit
CAS: 7440-33-7 EINECS: 231-143-9	tungsten substance with a Community workplace exposure limit
CAS: 7429-90-5 EINECS: 231-072-3 Index number: 013-001-00-6	aluminium powder (pyrophoric) F R15-17 Pyr. Sol. 1, H250; Water-react. 2, H261
CAS: 7440-36-0 EINECS: 231-146-5	antimony substance with a Community workplace exposure limit
CAS: 2691-41-0 EINECS: 220-260-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) T R24; Xn R22; E R2 Expl. 1.1, H201 Acute Tox. 3, H301; Acute Tox. 3, H311
CAS: 4682-03-5	diazodinitro phenol (DDNP) Xi R36/38; Xi R43; E R3 Unst. Expl., H200 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.

(Contd. on page 6)

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 5)

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.

(Contd. on page 7)

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 6)

· **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.

(Contd. on page 8)

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 7)

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/m³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ as Pb;*8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ as Pb; IARC 2A, R
7439-92-1 lead	
PEL (USA)	Long-term value: 0,05* mg/m³ *see 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ *8-hr TWA,excl. lead arsenate;See PocketGuideApp.C
TLV (USA)	Long-term value: 0,05* mg/m³ *and inorganic compounds, as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ R; IARC 2B
EV (Canada)	Long-term value: 0,05 mg/m³ as Pb, Skin (organic compounds)
7440-21-3 silicon	
PEL (USA)	Long-term value: 15* 5** mg/m³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ *total dust **respirable fraction
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust;**respirable fraction
EV (Canada)	Long-term value: 10 mg/m³ total dust

(Contd. on page 9)

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 8)

7782-49-2 selenium	
PEL (USA)	Long-term value: 0,2 mg/m³ as Se
REL (USA)	Long-term value: 0,2 mg/m³ as Se
TLV (USA)	Long-term value: 0,2 mg/m³ as Se
EL (Canada)	Long-term value: 0,1 mg/m³
EV (Canada)	Long-term value: 0,2 mg/m³
1314-41-6 orange lead	
PEL (USA)	Long-term value: 0,05 mg/m³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ as Pb;*8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ as Pb; IARC 2A, R
EV (Canada)	Long-term value: 0,05 mg/m³ as Pb, Skin (organic compounds)
13463-67-7 titanium dioxide	
PEL (USA)	Long-term value: 15* mg/m³ *total dust
REL (USA)	See Pocket Guide App. A
TLV (USA)	Long-term value: 10 mg/m³ withdrawn from NIC
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust;**respirable fraction; IARC 2B
EV (Canada)	Long-term value: 10 mg/m³ total dust
10294-40-3 barium chromate	
PEL (USA)	Long-term value: 0,005* mg/m³ Ceiling limit: 0,1** mg/m³ *as Cr(VI) **as CrO3; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,01 mg/m³ as Cr
EL (Canada)	Long-term value: 0,01 mg/m³ as Cr; ACGIH A1 IARC 1

(Contd. on page 10)

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 9)

7758-97-6 lead chromate	
IOELV (EU)	Long-term value: 2 mg/m³ as Cr
PEL (USA)	Long-term value: 0,005* mg/m³ Ceiling limit: 0,1** mg/m³ *as Cr(VI) **as CrO3; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,05* 0,012** mg/m³ *as Pb; BEI ; **as Cr
EL (Canada)	Long-term value: 0,05* 0,012** mg/m³ ACIGH A2, IARC 2A; R; *as Pb;**as Cr
EV (Canada)	Long-term value: 0,012* 0,05** mg/m³ *as Cr, **as Pb
7727-43-7 barium sulphate, natural	
PEL (USA)	Long-term value: 15* 5** mg/m³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ *total dust **respirable fraction
TLV (USA)	Long-term value: 5* mg/m³ *inhalable fraction; E
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust, **respirable fraction
EV (Canada)	Long-term value: 10 mg/m³ total dust
61790-53-2 Diatomaceous earth (Silica-Amorphous)	
PEL (USA)	20mppcf or 80mg/m3 /%SiO2
REL (USA)	Long-term value: 6 mg/m³ See Pocket Guide App. C
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 4* 1,5** mg/m³ *total, **respirable
EV (Canada)	Long-term value: 10* 3** mg/m³ uncalcined; *inhalable;**respirable
7439-98-7 molybdenum	
PEL (USA)	Long-term value: 15* mg/m³ *Total dust
TLV (USA)	Long-term value: 10* 3** mg/m³ as Mo; *inhalable fraction ** respirable fraction
EL (Canada)	Long-term value: 3* 10** mg/m³ as Mo; *respirable **inhalable

(Contd. on page 11)

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 10)

EV (Canada)	Long-term value: 10* 3** 0,5*** mg/m³ 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/m³ Long-term value: 5 mg/m³ as W
TLV (USA)	Short-term value: 10 mg/m³ Long-term value: 5 mg/m³ as W
EL (Canada)	Short-term value: 10 mg/m³ Long-term value: 5 mg/m³ as W
EV (Canada)	Short-term value: 10* 3** mg/m³ Long-term value: 5* 1** mg/m³ (as tungsten; compds.:*water-insol.;**water-sol.
7429-90-5 aluminium powder (pyrophoric)	
PEL (USA)	Long-term value: 15*; 15** mg/m³ *Total dust; ** Respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ as Al*Total dust**Respirable/pyro powd./welding f.
TLV (USA)	Long-term value: 1* mg/m³ as Al; *as respirable fraction
EL (Canada)	Long-term value: 1,0 mg/m³ respirable, as Al
EV (Canada)	Long-term value: 5 mg/m³ aluminium-containing (as aluminium)
7440-36-0 antimony	
PEL (USA)	Long-term value: 0,5 mg/m³ as Sb
REL (USA)	Long-term value: 0,5 mg/m³ as Sb
TLV (USA)	Long-term value: 0,5 mg/m³ as Sb
EL (Canada)	Long-term value: 0,5 mg/m³
EV (Canada)	Long-term value: 0,5 mg/m³

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

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

(Contd. on page 12)

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 11)

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

(Contd. on page 13)

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 12)

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.

(Contd. on page 14)

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 13)

· **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.

(Contd. on page 15)

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 14)

SECTION 11: Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values relevant for classification:**		
7439-92-1 lead		
Oral	LD50	>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.

(Contd. on page 16)

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 15)

· **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** UN0029
· **IATA** FORBIDDEN
· **14.2 UN proper shipping name**
· **DOT, IMDG** DETONATORS, NON-ELECTRIC
· **ADR** 0029 DETONATORS, 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** II

(Contd. on page 17)

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 16)

· **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
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** 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.

(Contd. on page 18)

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 17)

· **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

(Contd. on page 19)

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 18)

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

(Contd. on page 20)

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 19)

· **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.

(Contd. on page 21)

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 20)

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: Pyorphoric 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 - AcuteHazard, 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

(Contd. on page 22)

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 21)

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

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**

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.

(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)

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.

(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)

· **Dangerous components:**

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

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

(Contd. on page 6)

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 5)

· **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.

(Contd. on page 7)

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 6)

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.

(Contd. on page 8)

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 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/m³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ as Pb;*8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ as Pb; IARC 2A, R
7439-92-1 lead	
PEL (USA)	Long-term value: 0,05* mg/m³ *see 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ *8-hr TWA,excl. lead arsenate;See PocketGuideApp.C
TLV (USA)	Long-term value: 0,05* mg/m³ *and inorganic compounds, as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ R; IARC 2B
EV (Canada)	Long-term value: 0,05 mg/m³ as Pb, Skin (organic compounds)
7440-21-3 silicon	
PEL (USA)	Long-term value: 15* 5** mg/m³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ *total dust **respirable fraction
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust;**respirable fraction
EV (Canada)	Long-term value: 10 mg/m³ total dust
7782-49-2 selenium	
PEL (USA)	Long-term value: 0,2 mg/m³ as Se
REL (USA)	Long-term value: 0,2 mg/m³ as Se
TLV (USA)	Long-term value: 0,2 mg/m³ as Se
EL (Canada)	Long-term value: 0,1 mg/m³
EV (Canada)	Long-term value: 0,2 mg/m³

(Contd. on page 9)

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 8)

1314-41-6 orange lead	
PEL (USA)	Long-term value: 0,05 mg/m³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ as Pb;*8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ as Pb; IARC 2A, R
EV (Canada)	Long-term value: 0,05 mg/m³ as Pb, Skin (organic compounds)
13463-67-7 titanium dioxide	
PEL (USA)	Long-term value: 15* mg/m³ *total dust
REL (USA)	See Pocket Guide App. A
TLV (USA)	Long-term value: 10 mg/m³ withdrawn from NIC
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust;**respirable fraction; IARC 2B
EV (Canada)	Long-term value: 10 mg/m³ total dust
10294-40-3 barium chromate	
PEL (USA)	Long-term value: 0,005* mg/m³ Ceiling limit: 0,1** mg/m³ *as Cr(VI) **as CrO3; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,01 mg/m³ as Cr
EL (Canada)	Long-term value: 0,01 mg/m³ as Cr; ACGIH A1 IARC 1
7758-97-6 lead chromate	
IOELV (EU)	Long-term value: 2 mg/m³ as Cr
PEL (USA)	Long-term value: 0,005* mg/m³ Ceiling limit: 0,1** mg/m³ *as Cr(VI) **as CrO3; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,05* 0,012** mg/m³ *as Pb; BEI ; **as Cr

(Contd. on page 10)

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 9)

EL (Canada)	Long-term value: 0,05* 0,012** mg/m³ ACIGH A2, IARC 2A; R; *as Pb;**as Cr
EV (Canada)	Long-term value: 0,012* 0,05** mg/m³ *as Cr, **as Pb
7727-43-7 barium sulphate, natural	
PEL (USA)	Long-term value: 15* 5** mg/m³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ *total dust **respirable fraction
TLV (USA)	Long-term value: 5* mg/m³ *inhalable fraction; E
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust, **respirable fraction
EV (Canada)	Long-term value: 10 mg/m³ total dust
61790-53-2 Diatomaceous earth (Silica-Amorphous)	
PEL (USA)	20mppcf or 80mg/m3 /%SiO2
REL (USA)	Long-term value: 6 mg/m³ See Pocket Guide App. C
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 4* 1,5** mg/m³ *total, **respirable
EV (Canada)	Long-term value: 10* 3** mg/m³ uncalcined; *inhalable;**respirable
7439-98-7 molybdenum	
PEL (USA)	Long-term value: 15* mg/m³ *Total dust
TLV (USA)	Long-term value: 10* 3** mg/m³ as Mo; *inhalable fraction ** respirable fraction
EL (Canada)	Long-term value: 3* 10** mg/m³ as Mo; *respirable **inhalable
EV (Canada)	Long-term value: 10* 3** 0,5*** mg/m³ 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/m³ Long-term value: 5 mg/m³ as W

(Contd. on page 11)

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 10)

TLV (USA)	Short-term value: 10 mg/m³ Long-term value: 5 mg/m³ as W
EL (Canada)	Short-term value: 10 mg/m³ Long-term value: 5 mg/m³ as W
EV (Canada)	Short-term value: 10* 3** mg/m³ Long-term value: 5* 1** mg/m³ (as tungsten; compds.:*water-insol.;**water-sol.
7429-90-5 aluminium powder (pyrophoric)	
PEL (USA)	Long-term value: 15*; 15** mg/m³ *Total dust; ** Respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ as Al*Total dust**Respirable/pyro powd./welding f.
TLV (USA)	Long-term value: 1* mg/m³ as Al; *as respirable fraction
EL (Canada)	Long-term value: 1,0 mg/m³ respirable, as Al
EV (Canada)	Long-term value: 5 mg/m³ aluminium-containing (as aluminium)
7440-36-0 antimony	
PEL (USA)	Long-term value: 0,5 mg/m³ as Sb
REL (USA)	Long-term value: 0,5 mg/m³ as Sb
TLV (USA)	Long-term value: 0,5 mg/m³ as Sb
EL (Canada)	Long-term value: 0,5 mg/m³
EV (Canada)	Long-term value: 0,5 mg/m³

· **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 Medium: blood Time: not critical Parameter: Lead

(Contd. on page 12)

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 11)

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

(Contd. on page 13)

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 12)

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.

(Contd. on page 14)

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 13)

· **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.

(Contd. on page 15)

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 14)

SECTION 11: Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values relevant for classification:**		
7439-92-1 lead		
Oral	LD50	>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.

(Contd. on page 16)

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 15)

· **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** II

(Contd. on page 17)

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 16)

· **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 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**	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

(Contd. on page 18)

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 17)

· **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

(Contd. on page 19)

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 18)

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

(Contd. on page 20)

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 19)

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.

(Contd. on page 21)

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 20)

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: Pyorphoric 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 - AcuteHazard, 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

(Contd. on page 22)

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 21)

· **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

NONEL® LP 1.4B

Technical Information

Nonelectric Long Period Delay Detonator

Product Description

NONEL® nonelectric delay detonator LP units consist of a length of yellow shock tube with a High Strength detonator attached to one end and the other end sealed. A blue J-hook, with pad-printed delay period, is affixed near the sealed end, providing easy means of connection to detonating cord. Easy-to-read, color-coded delay tags display the delay number and nominal firing time prominently.

NONEL LP units are designed to provide in-hole delay time for underground (non-coal) and special construction blasting applications that require long delay times to improve relief and fragmentation (such as drift development, raise and shaft work, as well as slope and tunnel blast rounds). They are typically used with detonating cord, but can also be used with NONEL EZTL™, and NONEL TD detonators for additional timing flexibility.

Application Recommendations

For detailed application recommendations, **ALWAYS** request a copy of Dyno Nobel's *Product Manual: NONEL® and PRIMACORD®* from your Dyno Nobel representative.

- **ALWAYS** use the plastic J-hook when using a detonating cord trunkline to tie-in NONEL LP nonelectric delay detonators. A minimum 3 g/m (18 gr/ft) detonating cord trunkline is required for use with the J-hook.

Properties

SDS #1122

Net Explosive Content per 100 units 0.0885 kg
0.1951 lbs

Period / Delay Time (msec)	Delay Tag Color	Period / Delay Time (msec)	Delay Tag Color
0 /0	Pink	10 / 3500	Green
1 / 500	White	11 / 3900	Yellow
2 / 800	Lt Blue	12 / 4400	Red
3 / 1100	Orange	13 / 4900	White
4 / 1400	Green	14 / 5400	Lt Blue
5 / 1700	Yellow	15 / 5900	Orange
6 / 2000	Red	16 / 6500	Green
7 / 2300	White	17 / 7200	Yellow
8 / 2700	Lt Blue	18 / 8000	Red
9 / 3100	Orange		

Hazardous Shipping Description

Detonator assemblies, nonelectric,
1.4B, UN 0361 PG II

See Product Disclaimer on page 2

DYNO Dyno Nobel

Groundbreaking Performance™

NONEL® LP 1.4B

Technical Information

Application Recommendations (continued)

- **ALWAYS** ensure the shock tube is connected at right angles to the detonating cord trunkline and that the shock tube leads returning to the hole collar do not cross over or lay near any detonating cord trunkline. If the detonating cord touches the shock tube or is closer than 6 inches (15 cm), the shock tube may be damaged and misfires may result.
- **ALWAYS** connect detonating cord using approved knots and tight connections. Place detonating cord hook-ups in closed loops and use with cross-ties.
- **NEVER** put more than 20 NONEL LP delays per bunch. A minimum 5 g/m (25 gr/ft) detonating cord is required for bunch blasting.
- **NEVER** cut or trim seals from the shock tube of a NONEL LP delay. If shock tubing is cut or is suspected of being cut or damaged during loading, always reprime the borehole using a new unit of the same delay period.
- **NEVER** drive any equipment over the shock tube or detonating cord. Whenever charging from a maneuverable basket, platform or boom, always make sure that no shock tube or detonating cord is entangled or can become entangled.
- **ALWAYS** make sure that no shock tube or detonating cord can be pinched between the basket, platform or boom and the face, ribs, back or floor. Rupturing or damaging shock tube or detonating cord may cause misfires.
- Where NONEL LP detonator lead lengths permit, bunch blasting provides the most efficient means of hooking up rounds in drifts, tunnels, shafts and raises.

Transportation, Storage and Handling

- NONEL LP must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (3 years), NONEL LP must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives.

Packaging

Length		Case Type	Quantity / Case
m	ft		
3.5	12	D*	60
4.5	16	D*	45
6	20	D*	45
7	24	D*	45

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.

* Always shipped with 2 cases strapped together. Case dimension width doubles.

Case Dimensions

Detpak (D)	44 x 22 x 25 cm	17 ½ x 8 ¾ x 10 in

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500, Salt Lake City, Utah 84121 USA
Phone 800-732-7534 Fax 801-328-6452 Web www.dynonobel.com

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

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.

(Contd. on page 2)

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

(Contd. of page 1)

· **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.

(Contd. on page 3)

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

(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

· **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 EINECS: 201-084-3 Index number: 603-035-00-5	pentaerythritol tetranitrate (PETN) E R3 Unst. Expl., H200

(Contd. on page 4)

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

(Contd. of page 3)

CAS: 13424-46-9 EINECS: 236-542-1 Index number: 082-003-00-7	lead diazide T Repr. Cat. 1, 3 R61; Xn R62-20/22; E R3; N R50/53 R33
	Unst. Expl., H200 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7439-92-1 EINECS: 231-100-4	lead T Repr. Cat. 1 R60-61-48/23/25; N R50/53
	Repr. 1A, H360FD; STOT RE 1, H372 Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 7440-21-3 EINECS: 231-130-8	silicon F R11
	Flam. Sol. 2, H228
CAS: 2691-41-0 EINECS: 220-260-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) T R24; Xn R22; E R2
	Expl. 1.1, H201 Acute Tox. 3, H301; Acute Tox. 3, H311
CAS: 7782-49-2 EINECS: 231-957-4 Index number: 034-001-00-2	selenium T R23/25 R33-53
	Acute Tox. 3, H301; Acute Tox. 3, H331 STOT RE 2, H373 Aquatic Chronic 4, H413
CAS: 1314-41-6 EINECS: 215-235-6 Index number: 082-001-00-6	orange lead T Repr. Cat. 1, 3 R61; Xn R62-20/22; N R50/53 R33
	Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 10294-40-3 EINECS: 233-660-5 Index number: 056-002-00-7	barium chromate Xn R20/22
	Carc. 1A, H350 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7758-97-6 EINECS: 231-846-0 Index number: 082-004-00-2	lead chromate T Carc. Cat. 2, Repr. Cat. 1, 3 R45-61; Xn R62; N R50/53 R33
	Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 4682-03-5	diazodinitro phenol (DDNP) Xi R36/38; Xi R43; E R3
	Unst. Expl., H200 Skin Irrit. 2, H315; Eye Irrit. 2, H319; Skin Sens. 1, H317
CAS: 7440-36-0 EINECS: 231-146-5	antimony 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 02.11.2015 Revision: 02.11.2015

Trade name: NONEL® Non-electric Delay Detonators

(Contd. of page 4)

CAS: 7440-33-7 EINECS: 231-143-9	tungsten substance with a Community workplace exposure limit
CAS: 7429-90-5 EINECS: 231-072-3 Index number: 013-001-00-6	aluminium powder (pyrophoric) F R15-17 Pyr. Sol. 1, H250; Water-react. 2, H261
CAS: 7439-98-7 EINECS: 231-107-2	molybdenum substance with a Community workplace exposure limit
CAS: 61790-53-2	Diatomaceous earth (Silica-Amorphous) substance with a Community workplace exposure limit
CAS: 7778-74-7 EINECS: 231-912-9 Index number: 017-008-00-5	potassium perchlorate Xn R22; O R9 Ox. Sol. 1, H271 Acute Tox. 4, H302
CAS: 7727-43-7 EINECS: 231-784-4	barium sulphate, natural substance with a Community workplace exposure limit

· **SVHC**

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.

(Contd. on page 6)

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

(Contd. of page 5)

· **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.

(Contd. on page 7)

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

(Contd. of page 6)

See Section 13 for disposal information.

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/m³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ as Pb;*8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ as Pb; IARC 2A, R

7439-92-1 lead

PEL (USA)	Long-term value: 0,05* mg/m³ *see 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ *8-hr TWA,excl. lead arsenate;See PocketGuideApp.C

(Contd. on page 8)

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

(Contd. of page 7)

TLV (USA)	Long-term value: 0,05* mg/m³ *and inorganic compounds, as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ R; IARC 2B
EV (Canada)	Long-term value: 0,05 mg/m³ as Pb, Skin (organic compounds)

7440-21-3 silicon

PEL (USA)	Long-term value: 15* 5** mg/m³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ *total dust **respirable fraction
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust;**respirable fraction
EV (Canada)	Long-term value: 10 mg/m³ total dust

7782-49-2 selenium

PEL (USA)	Long-term value: 0,2 mg/m³ as Se
REL (USA)	Long-term value: 0,2 mg/m³ as Se
TLV (USA)	Long-term value: 0,2 mg/m³ as Se
EL (Canada)	Long-term value: 0,1 mg/m³
EV (Canada)	Long-term value: 0,2 mg/m³

1314-41-6 orange lead

PEL (USA)	Long-term value: 0,05 mg/m³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m³ as Pb;*8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m³ as Pb; IARC 2A, R
EV (Canada)	Long-term value: 0,05 mg/m³ as Pb, Skin (organic compounds)

13463-67-7 titanium dioxide

PEL (USA)	Long-term value: 15* mg/m³ *total dust
REL (USA)	See Pocket Guide App. A

(Contd. on page 9)

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

(Contd. of page 8)

TLV (USA)	Long-term value: 10 mg/m³ withdrawn from NIC
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust;**respirable fraction; IARC 2B
EV (Canada)	Long-term value: 10 mg/m³ total dust

10294-40-3 barium chromate

PEL (USA)	Long-term value: 0,005* mg/m³ Ceiling limit: 0,1** mg/m³ *as Cr(VI) **as CrO3; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,01 mg/m³ as Cr
EL (Canada)	Long-term value: 0,01 mg/m³ as Cr; ACGIH A1 IARC 1

7758-97-6 lead chromate

IOELV (EU)	Long-term value: 2 mg/m³ as Cr
PEL (USA)	Long-term value: 0,005* mg/m³ Ceiling limit: 0,1** mg/m³ *as Cr(VI) **as CrO3; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,05* 0,012** mg/m³ *as Pb; BEI ; **as Cr
EL (Canada)	Long-term value: 0,05* 0,012** mg/m³ ACIGH A2, IARC 2A; R; *as Pb;**as Cr
EV (Canada)	Long-term value: 0,012* 0,05** mg/m³ *as Cr, **as Pb

7727-43-7 barium sulphate, natural

PEL (USA)	Long-term value: 15* 5** mg/m³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m³ *total dust **respirable fraction
TLV (USA)	Long-term value: 5* mg/m³ *inhalable fraction; E
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust, **respirable fraction
EV (Canada)	Long-term value: 10 mg/m³ total dust

(Contd. on page 10)

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

(Contd. of page 9)

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

PEL (USA) 20mppcf or 80mg/m3 /%SiO2

REL (USA) Long-term value: 6 mg/m³
See Pocket Guide App. C

TLV (USA) TLV withdrawn

EL (Canada) Long-term value: 4* 1,5** mg/m³
*total, **respirable

EV (Canada) Long-term value: 10* 3** mg/m³
uncalcined; *inhalable;**respirable

7439-98-7 molybdenum

PEL (USA) Long-term value: 15* mg/m³
*Total dust

TLV (USA) Long-term value: 10* 3** mg/m³
as Mo; *inhalable fraction ** respirable fraction

EL (Canada) Long-term value: 3* 10** mg/m³
as Mo; *respirable **inhalable

EV (Canada) Long-term value: 10* 3** 0,5*** mg/m³
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/m³
Long-term value: 5 mg/m³
as W

TLV (USA) Short-term value: 10 mg/m³
Long-term value: 5 mg/m³
as W

EL (Canada) Short-term value: 10 mg/m³
Long-term value: 5 mg/m³
as W

EV (Canada) Short-term value: 10* 3** mg/m³
Long-term value: 5* 1** mg/m³
(as tungsten; compds.:*water-insol.;**water-sol.

7429-90-5 aluminium powder (pyrophoric)

PEL (USA) Long-term value: 15*; 15** mg/m³
*Total dust; ** Respirable fraction

REL (USA) Long-term value: 10* 5** mg/m³
as Al*Total dust**Respirable/pyro powd./welding f.

TLV (USA) Long-term value: 1* mg/m³
as Al; *as respirable fraction

EL (Canada) Long-term value: 1,0 mg/m³
respirable, as Al

(Contd. on page 11)

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

(Contd. of page 10)

EV (Canada)	Long-term value: 5 mg/m³ aluminium-containing (as aluminium)
7440-36-0 antimony	
PEL (USA)	Long-term value: 0,5 mg/m³ as Sb
REL (USA)	Long-term value: 0,5 mg/m³ as Sb
TLV (USA)	Long-term value: 0,5 mg/m³ as Sb
EL (Canada)	Long-term value: 0,5 mg/m³
EV (Canada)	Long-term value: 0,5 mg/m³

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

(Contd. on page 12)

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

(Contd. of page 11)

7758-97-6 lead chromate	
BEI (USA)	30 µg/100 ml Medium: blood Time: not critical Parameter: Lead 10 µg/100 ml Medium: blood Time: not critical 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.

(Contd. on page 13)

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

(Contd. of page 12)

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.

(Contd. on page 14)

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

(Contd. of page 13)

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	>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.

(Contd. on page 15)

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

(Contd. of page 14)

· **CMR effects (carcinogenity, 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.
· **Ecotoxical 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.

(Contd. on page 16)

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

(Contd. of page 15)

SECTION 14: Transport information

· **14.1 UN-Number**
· **DOT, ADR, IMDG, IATA** UN0361
· **14.2 UN proper shipping name**
· **DOT** Detonator assemblies, non-electric
· **ADR** 0361 DETONATOR ASSEMBLIES, NONELECTRIC,
· **IMDG** DETONATOR ASSEMBLIES, NONELECTRIC,
· **IATA** DETONATOR ASSEMBLIES, NON-ELECTRIC
· **14.3 Transport hazard class(es)**

· **DOT, ADR, IMDG, IATA**

· **Class** 1.4
· **Label** 1.4B
· **14.4 Packing group**
· **DOT, ADR, IMDG, IATA** II
· **14.5 Environmental hazards:**
· **Marine pollutant:** No
· **Special marking (IATA):** Prohibited from Transport in Passenger Aircraft.

Cargo Aircraft Only.

· **14.6 Special precautions for user** Not applicable.
· **EMS Number:** F-B,S-X
· **Segregation groups** Lead and its compounds
· **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: EO
· **Tunnel restriction code** 2 (E)

· **IMDG**
· **Limited quantities (LQ)** 0
· **Excepted quantities (EQ)** Code: EO
· **UN "Model Regulation":** UN0361, DETONATOR ASSEMBLIES, NONELECTRIC,, 1.4B, II

(Contd. on page 17)

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

(Contd. of page 16)

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

(Contd. on page 18)

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

(Contd. of page 17)

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.

(Contd. on page 19)

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

(Contd. of page 18)

· **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
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.

(Contd. on page 20)

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

(Contd. of page 19)

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)

(Contd. on page 21)

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

(Contd. of page 20)

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: Pyorphoric 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 - AcuteHazard, 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
Tampa, Florida USA 33602-2902
Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573
Website: www.chemtelinc.com

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: Detonating Cord**

· **Article number:** 1126
· **Other product identifiers:**
PRIMALINE®
PRIMACORD®
PRIMASHEAR™
OPTICORD®
GEOSEIS®
LOW FLEX™
FIRELINE CORD
· **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.

· **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.

(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: Detonating Cord

(Contd. of page 1)

· **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 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.
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.

· **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**
None of the ingredients are listed.

(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: Detonating Cord

(Contd. of page 2)

· **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 EINECS: 201-084-3 Index number: 603-035-00-5	pentaerythritol tetranitrate (PETN) E R3 Unst. Expl., H200

· **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:** 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.

(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: Detonating Cord

(Contd. of page 3)

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.
· **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.

(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: Detonating Cord

(Contd. of page 4)

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.

· **8.1 Control parameters**
· **Ingredients with limit values that require monitoring at the workplace:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
· **DNELs** No further relevant information available.
· **PNECs** No further relevant information available.
· **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.
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.

(Contd. on page 6)

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: Detonating Cord

(Contd. of page 5)

· **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.

(Contd. on page 7)

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: Detonating Cord

(Contd. of page 6)

· **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
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.

(Contd. on page 8)

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: Detonating Cord

(Contd. of page 7)

· **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:** 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.
· **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.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

SECTION 14: Transport information

· **14.1 UN-Number**
· **DOT, ADR, IMDG** UN0065
· **IATA** FORBIDDEN
· **14.2 UN proper shipping name**
· **DOT, IMDG** CORD, DETONATING, FLEXIBLE
· **ADR** 0065 CORD, DETONATING, FLEXIBLE
· **IATA** FORBIDDEN

(Contd. on page 9)

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: Detonating Cord

(Contd. of page 8)

· **14.3 Transport hazard class(es)**

· **DOT**

· **Class**	1.1
· **Label**	1.1

· **ADR, IMDG**

· **Class**	1.1
· **Label**	1.1D

· **IATA**	
· **Class**	FORBIDDEN
· **14.4 Packing group**	
· **DOT, ADR, IMDG**	II
· **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
· **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**	FORBIDDEN.
· **UN "Model Regulation":**	UN0065, CORD, DETONATING, FLEXIBLE, 1.1D

(Contd. on page 10)

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: Detonating Cord

(Contd. of page 9)

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):**
None of the ingredients are listed.

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

78-11-5	pentaerythritol tetranitrate (PETN)

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.

· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients are listed.

· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity:**
None of the ingredients are listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients are listed.

· **IARC (International Agency for Research on Cancer)**
None of the ingredients are listed.

· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients are listed.

· **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%)**
None of the ingredients are listed.

· **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.

(Contd. on page 11)

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: Detonating Cord

(Contd. of page 10)

· **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.

· **Relevant phrases**

H200 Unstable explosives.

R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.

· **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

· **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