Northeast Metropolitan Regional Vocational High School

100 Hemlock Road
Wakefield, MA

September 19, 2022
REV: 5/31/23

Prepared For:

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YOUR TRUSTED BREED
making it happen

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Sequence of Blasting

All blasting operations will be strictly coordinated with project management; construction site supervision and local AHJ. Emphasis will be on the safe and efficient fragmentation of the rock on this project without impact to the environment or surrounding structures. The initial Test Blast will be located in a centrally remote location from neighboring structures (see Test Blast Location Plan in the Annex). The location will enable the operation to determine ground transmission characteristics in a shallow cut area affording opportunity to refine design as the work approaches the existing structures. Experience has shown advantage to incorporating the following elements into our design strategy:

1. Linear energy dissipation over a long working face (spatial distribution).
2. Relief encouraged by shallow depth to width ratio design.
3. Air response and shot cast suppression by deliberate muck pile confinement of face.
4. Face confinement compensated by lateral and, if required, vertical delay sequencing.
5. Matting access enhanced by limiting shot depth to excavator reach. Reach maximized by mat placement from graded shot rock of the previous blast.

Hours of Operations

- Drilling and Blasting operations shall coincide with project construction work hours, Monday through Friday.
- Blasting cannot be conducted at times different from those announced in the blasting schedule except in emergency situations, such as electrical storms or public safety required unscheduled detonation.
- All blast events will be performed within the permit hours of 8AM – 4PM.

Neighbors providing contact information (email / phone) who request daily notification will be notified of blasting events. An informational document entitled “Facts About Blasting for Massachusetts Property Owners” has been developed by the Commonwealth of Massachusetts Department of Fire Services. It delineates key regulation and answers common questions about blasting (a copy is located in the Annex). A positive public relationship is essential to the successful build of any project. It is understood that good relationships are fostered by communication and trust. This is especially true when a project involves blasting.

Blast Monitoring

All blasts will be monitored by a Monitoring Operator who has been properly trained in the setup and use of seismic monitoring equipment. 527 CMR 1 65.9.14.3.4 requires all blasting operations to be monitored. 527 CMR 1 65.9.14.3 requires the seismograph to be placed at the nearest structure not owned or controlled by the project. For this project up to two (2) seismographs will be utilized.

Prior to commencement of blasting operations, permission to monitor will be sought from the home / facilities owner or representative. If access should be denied, as required by CMR1: 65.9.14.4.1. The AHJ will be notified, and an alternate accessible location on public or controlled property will be selected. To represent the ground and air response at the identified structure, the chosen location should best match the distance and direction to the structure. Placement, set-up and use of monitoring equipment will be as specified by the manufacturer and delineated in the **2020 ISEE Field Practice Guidelines for Blasting Seismographs**. These Guidelines (referenced in CMR1: 65 NFPA 495 11.1.4) were developed by a Standards Committee comprised of seismograph manufacturers, researchers, regulatory personnel and seismograph users. As stated in the opening page of the document. “The goal of the Field Practice Guidelines for Blasting Seismographs is to develop uniform and technically appropriate standards for seismograph performance. The intent is to improve accuracy and consistency in ground vibration and air wave measurement”. The above paragraph concludes with the statement, “Seismograph performance is affected by how the seismograph is built and how it is placed in the field”. In Part II, Ground Vibration Monitoring, particular emphasis is given to two critical factors: placement and coupling. The sensor must be placed within 10 ft of the structure, in undisturbed or soil matching sensor density. The sensor must couple effectively to the earth. Acceleration level and soil medium affect proper coupling. The guidelines spell out stepped levels of installation measures required to insure coupling. Collection of accurate data is not only expected from a compliance perspective but is instrumental in accurate evaluation of design performance. Post event, ground and air response data must be analyzed along with other shot performance indicators allowing blast design to be a dynamic process of design refinement. Monitoring equipment must meet the **ISEE performance Standards**.

Scheduling

By law, the blaster must limit his blast site access to personnel necessary to the drilling and blasting operation. He will need cooperation from other entities competing for the same footprint. Cost effective site management has recognized a value in dollars and overall schedule by planning and executing required blasting in advance of other competing construction activities. Specifications for green concrete in a blast area will often have a dramatic effect on productivity of both blasting and concrete work. The need to minimize the disruption of onsite or offsite activities by blast events must be balanced with the need to minimize the overall duration of disruption caused by the blast project. Safety must always take precedence over convenience. Our experience has shown a single blast event at a regularly scheduled time, provides the most manageable schedule for all involved. This is accomplished by incorporating a full day's work into a single blast event, at the end of the day (within the allowed window for blasting). However circumstances may present (proximity to structure and applicable limits) that will scale event size making a single blast event impractical. For example, if the limits of blast design, on average incorporated only 25% of one day's work, a single daily blast event would increase the duration of the blast project by a factor of four. The required ledge excavation; vibration limits, and proximity to structure will dictate a conservative shot design that may require up to three blast event windows per day.

Some Rules of Thumb:

- Minimize blast events to the degree practical.
- If possible, seek event windows of mutual convenience (within technically achievable limits).
- Inflexible scheduling is invariably achieved at the expense of safety.
- Communicate. Establish representatives to coordinate blast event notification. Minimize links in chain of communication. Establish K.I.S.S. protocol. The blaster in charge should be focused on the safe execution of the blast plan and not wholly absorbed in a complicated notification sequence.

When the Blaster in Charge or the AHJ determines that the blast area security perimeter will include a roadway, pedestrian and vehicular traffic will be briefly interrupted for the event. The secured period will be similar to a traffic light sequence. Management will be coordinated with local AHJ.

Shot Cast Control

Matting, delay sequencing, backfill and berming will be used to control excessive amounts of rock movement. Shot rock will be used to construct a matting access platform that functions as a stable surface to safely and precisely place mats. The platform also serves to both contain horizontal displacement and as a footing support mats draped on grades. Placement and density of mats are based on existing / designed relief, berming and proximity to protected structure. Placement and density based on these metrics are determined by the blaster. Mats will be placed so as to protect all people and structures on, or surrounding the blast site and property. Heavy duty cabled rubber tire type blasting mats will be utilized on this project and will be approximately 10' x 20' in size; Rubber mat @ 10' x 20' x 38 lbs. / sf. = 7,600 lbs.

Blast Area Security, Warning Signs & Signals

The Blaster in Charge, along with site management, will develop a written Site Security Plan identifying as a minimum the blast area, equipment requiring removal, blast area access points, sentry locations, and designated "safe area(s)". Blast Area and Blast Signal Code signs will be posted per CMR 1, 65.9.8.4.1 requirements. Areas in which charged holes are awaiting firing shall be guarded, barricaded, and posted or flagged against unauthorized entry.

Each blast will be preceded by a security check of the affected area and then a series of warning signals. Communications will be made with job site management, local authority and neighbors as required to ensure the safest possible Blast Operations. All personnel in the vicinity closest to the blast area will be warned. A sign displaying the warning signal sequence will be conspicuously posted at the project. CMR1 requires the signal be audible at a distance of 250ft from blast site.

The warning signal sequence will be:

3 Audible Signal Pulses - 5 Minutes to Blast

2 Audible Signal Pulses - 1 Minute to Blast

1 Audible Signal pulse - All Clear

The blast site will be examined by the blaster prior to the ***all-clear*** signal to determine that it is safe to resume work. No blast will be fired until the area has been secured and determined safe.

Blaster Qualifications and Training

The "Blaster in Charge" on this job will be licensed in the State of MA and have received training in the safe use and handling of explosives. All employees handling explosives will have been granted Employee Possessor Clearance from the DOJ BATFE. All employees transporting explosives will have been granted an HME with USDHS TSA clearance. Blasters will have received training and be familiar with MSHA/OSHA Regulations, State Regulations, and Federal Regulations regarding construction site safety- including transportation, use, and handling of explosive materials. Prior to the commencement of initial work, an in depth, site specific **Job Hazard Analysis** will be developed by project and site management and thoroughly considered with all crew members. Daily site specific **Safety Meetings** are to be held on site by the job foreman. Contractor input and participation is encouraged. Safety Meeting records are retained by the Blasting Contractor.

Blaster training includes a formal program dedicated to the I.M.E. "Blasting; Best Practices" guidance document for the protection of surface and groundwater.

Licenses and Permits and Insurance

MD Drilling and Blasting will provide all required documentation to the Wakefield Fire Department, fully substantiating that the license, insurance, and bonding requirements for the transportation, use, and handling of explosives have been met.

Safe Limits for Ground and Air Response

Safe limits that have been adopted by industry and regulatory body alike were developed from 40 years of research done by US Bureau of Mines (USBM) and documented in the Bureau of Mines Report of Investigations 8507. These limits provide frequency based protection for sensitive construction materials (plaster) found in older and historic homes. The Safe Limit for old plaster is 0.50 in/s (below 10 Hz). One of the authors of RI 8507 and RI 8485, Dr. Siskind, stated 20 years later in his publication, "Vibrations from Blasting", "Research done since RI's 8485 and 8507 by the USBM and others has reaffirmed the conclusions from those studies even when the authors' intentions were to find exceptions (Siskind 1991)". In part the USBM research have with stood the scrutiny of time because the recommended levels produce strains less that those generate natural and man-made forces.

The "Safe Levels" for vibration from blasting that were developed in the RI 8507 study, are incorporated into BFPC 32A.01(C), CMR1: 65.9.1 and NFPA 495 11.2.1 (depicted below). This compliance curve is embedded in the compliance modules of blasting seismographs.

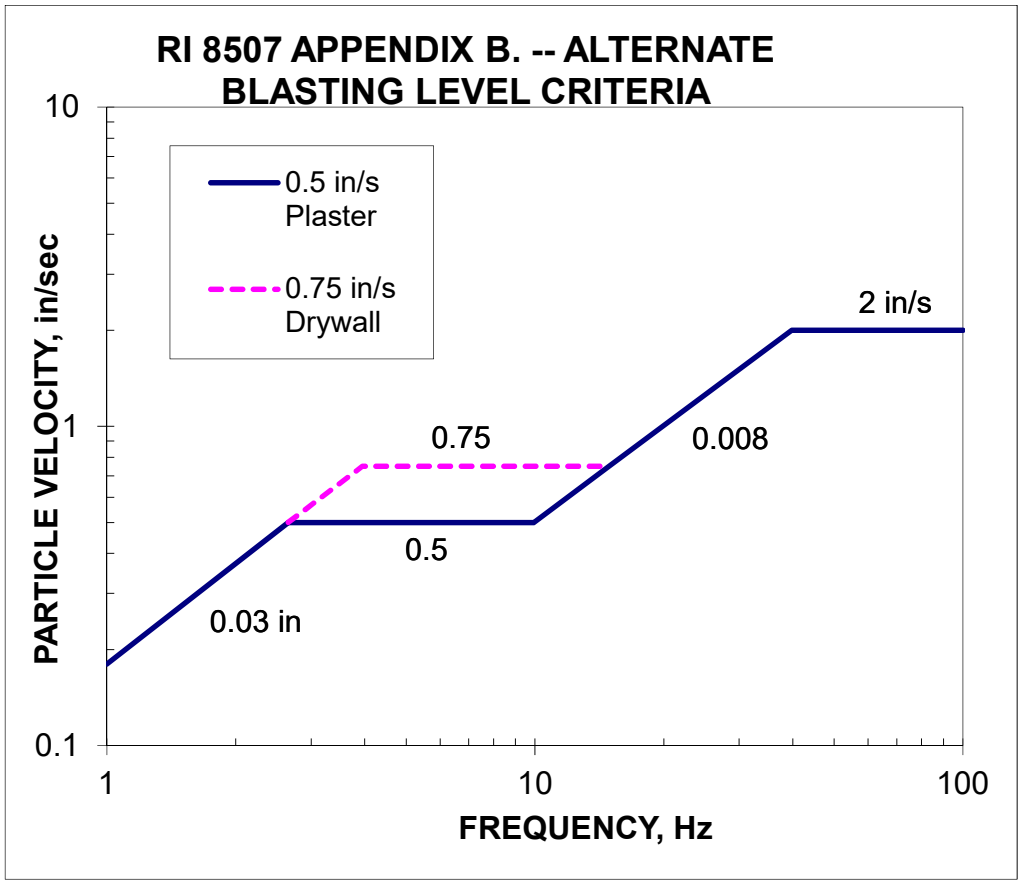


Figure B-1 Safe levels of blasting vibration using a combination of velocity & displacement

In RI 8485, The Bureau of Mines built on research that had previously determined “Safe Limits” for air response. In the Bureaus’ conclusions on page 67 of the Report the authors indicate that the former “Safe Level” of 140 dB was “high enough to for significant annoyance” The new recommended level was designed to provide “annoyance acceptability”. The recommended annoyance limit from this study (incorporated into CMR1 65.9.1 NFPA 495 11.3.1) for air response (as measured by ISEE approved blasting seismographs) is 133 dBL (.013psi) peak. This level is less than the pressure generated by a 20 mph gust of wind and well below levels that could be damaging. Air overpressure levels will be limited to 133dBL (.013psi)**.** In the report, the authors indicate a 20 mph gust can increase the pressure in the direction of the receiver 10 – 20 dB. The RI 8485 research concluded wind direction and speed have the greatest effect on air overpressure transmission. They identified thermal inversions as the second most influential factor. In addition to identifying natural influences, the report identifies the primary source of overpressure as an Air Pressure Pulse generated by the expansion of rock volume in the fragmentation process displacing the surrounding air mass. This audio is a fundamental part of the process and cannot be appreciably reduced. However, the lack of open faces and relatively small charge weights and volumes generated by project designs will considerably limit the APP as compared to mine blasts. Two other sources related to confinement can be influenced by design. Because the acoustics of any given blast are complex and are comprised of both controllable and uncontrollable elements, it is not uncommon for overpressure histories from well-designed “like” blasts to range 20 dB at a given receiver.

Environmental Considerations

All explosives will be handled according to the current version of the IME Best Practices

INSTITUTE OF MAKERS OF EXPLOSIVES

Blasting; Best Practices

The potential to impact surface or groundwater with the substances used in commercial explosives can be controlled through the implementation of certain measures. Implementing such measures as part of a standard operating procedure will eliminate or minimize the potential for these substances to dissolve in or become associated with water. The specific measures included can be grouped into the following four (4) basic categories:

1. Education/Training of Explosive Users
2. Selection of Appropriate Explosives for the Job and Conditions
3. Explosives Loading and Handling
4. Attention to Technical Matters

1. Education/Training of Explosive Users

Both the owners/operators of the location where explosives are being used and the personnel working with commercial explosives should be well informed of all applicable regulations as well as any potential consequences associated with the products' exposure to water. The federal Clean Water Act, or the equivalent state statute, regulates the release of substances, in particular those that can cause an undue risk to human health or the environment. In addition, the Resource Conservation and Recovery Act, governs the disposal of hazardous wastes.

2. Selection of Appropriate Explosive for the Job and Conditions

Selecting the proper explosive for the particular job is critical to the prevention of surface or groundwater impact.

- ANFO (ammonium nitrate - fuel oil) is not water-resistant and should be avoided if contact with water is likely.
- Various types of commercial explosives are available to withstand exposure to water. Water-resistant explosives include the cartridge forms of gelatinous nitroglycerin, watergels and emulsions and the bulk forms of emulsions which are: 1) Site Mixed Emulsion (ammonium nitrate - fuel oil - emulsifier) is a water-resistant explosive, semi-solid. This is manufactured on site and detonated while still warm assuring complete detonation. 2) Repump Emulsion (ammonium nitrate - fuel oil - emulsifier) is a water-resistant explosive, semi solid, manufactured off site, transported and pumped into the borehole as needed.

3. Explosives Loading and Handling

- All excess product in augers or hoses is to be recovered and used either in the next blasthole or recycled in the mixer/holding tank.
- Explosive spillage around the blasthole collar is to be controlled and any such spillage should be placed into the blasthole before stemming
- Water contacting explosives during cleanup is to be contained and managed in accordance with applicable regulations
- Minimize the amount of time that explosives are exposed to wet conditions within the blasthole. The blast should be initiated as near the time the loading is completed as safety and operational procedures allow.
- Avoid having explosives exposed to precipitation.
- To assure complete detonation of explosives placed into the ground, a sufficient number of boosters must be used.

4. Attention to Technical Matters

- The actual physical conditions into which explosives are being placed must be taken into account.
- Personnel responsible for loading explosives into the boreholes should be in continuous communication with the drillers of those boreholes or supplied with adequate drill logs, so that any knowledge regarding fractures, crevices or cavities is obtained.
- Where Bulk ANFO or Emulsion is used in fractured, creviced or cavitied boreholes, plastic borehole sleeves and/or positioned inert stemming decks will be used to ensure total detonation of the explosives and avoidance of excessive charges.
- Choosing and placing the correct drilling patterns that results in the optimal use of explosives with all the explosives undergoing complete detonation.
- Quality assurance/quality control measures to maintain drilling accuracy that prevents the detonation in one blasthole from impacting the proper detonation in a nearby blasthole.
- Selecting the appropriate drilling equipment so that adequate borehole quality is maintained.
- Where appropriate to ensure complete detonation, two (2) primers will be used in each blasthole; one near the top and one near the bottom of the explosive column.
- Correct selection of delay timing for each blasthole to ensure detonation of the entire pattern, and the prevention of cut-off blastholes.

Dust control during drilling operations is facilitated through the use of integrated vacuum dust collector and vapor systems installed by the manufacturer of the drilling equipment.

All storm water runoff and groundwater plans will be by the site contractor

Explosives

For fragmentation of the bulk or open rock MD will utilize the NONEL® EZ DET® 1.4B Nonelectric Blast Initiation System. An Electronic Initiation System may be utilized for pre-split blasting. The design flexibility and accuracy of electronic detonators make electronic initiation the best choice for pre-split initiation.

There will be **no explosives containing perchlorates** used on this site at any time.

ANFO (prilled ammonium nitrate and fuel oil mixture) will not be used on this project.

Water resistant, metered and packaged emulsion and emulsion blend blasting agents will be utilized for this project. Holes will be primed with high density, high velocity, high energy molecular cast primers designed to optimize initiation of blasting agents.

SDS (MSDS) and Technical Information data sheets for the products proposed for use on this project are provided in the Annex.

All explosives will be delivered to the job site on a daily basis. There will be no overnight storage. Material quantities sufficient to perform the day's work will be transported to the site. All explosives materials will be transported in stored in secured vehicular storage magazines approved and permitted by the State Fire Marshall

Misfires

Heavy matting is often a contributing factor to the most common causes of misfires. These include: undetected breaks; faulty signal connections and damaged or pinched signal conduit. The use of electronic initiation provides a significant advance in safety by dramaticly reducing the possibility of these types of misfires. Although Electronic Initiation will minimize a misfire posibiltiy, it cannot be absolutely ruled out. Regulatory Guidance for the handling of misfires is provided in NFPA 495 10.5. The Technical Guidance from which it is sourced can be found in the I.M.E. Safety Library in SLP 17. Text concerning the proper handling of misfires has been excerpted from the most recent update to SLP 17 and is located in the Annex.

Vertical Over-Break Control

Control of over break is a complex and often frustrating issue. Technology at present doesn't afford us the ability to laser cut a uniform and undisturbed bearing surface with explosives. It has always been assumed over break is solely a function of over drilling and over blasting, however consideration must be given as to the nature of the geology presented at the proposed bearing surface. Open seams near or below sub grade design elevation and variation in strata layering and competence will influence depth of excavation. These variations may be difficult to map. In load bearing areas, sub-drilling will be modified if needed as directed to minimize over break to an acceptable degree. Initial sub drilling will be 2 ft. Modification direction must be based on evaluation of elevation and condition of bearing surface presented at bottom of excavation. Test excavations should be conducted regularly if rock excavation significantly trails operations to provide relevant data. In all cases, blast dynamics minimally require a borehole to be of adequate depth to safely accommodate both the charge and confinement medium. Some States require that a pre-blast analysis and design consider the fundamental geometric relationship of the blast design. In Massachusetts for example CMR1: 65.9.8.3.1. charges the blaster with developing a "blast design plan which establishes sound relationships between current industry standards and the allowable limits of the effects of blasting." These industry standards or rules of thumb are empirical formulas developed by Dr. Ash, Dr. Bergman, and others and were espoused by Joseph Pugliese in USBM RI 8550. After the 1996 extensive rewrite of State explosives regulation, the empirical formulas were written into the State Fire Marshall's Training Course: **"Understanding and Regulating Explosives Using the Amended Regulation"**. Page 11 of this text provides the formula and associated table for determining appropriate stiffness ratio of shot design. The table indicates a stiffness ratio of 2 or more is desirable. A stiffness ratio of 1 or less requires redesign of shot and specifically states **"do not shoot".** The unintended consequences of an excessive stiffness ratio (poor fragmentation, excessive ground and air response and "fly rock") can be significantly diminished by insuring design reflects at a minimum that, Bh = 2B.

Where:
Bh = Bench height
B = Burden

In order that over break constraints do not drive blast design into a technically prohibitive or unsafe direction, consideration should be given to a strategy allows some soil overburden to be left in place undisdurbed over shallow ledge cuts to afford minimum confinement requirements. During the stripping operations efforts should be made when possible to insure adequate confinement depth remains above shallow rock cuts. An overburden stripping plan can be developed from geotechnicnical data that will allow removal of overburden to rock or minimum confinement elevation which ever is greater. A 10 ft. hole minimum will be required to support safe design.

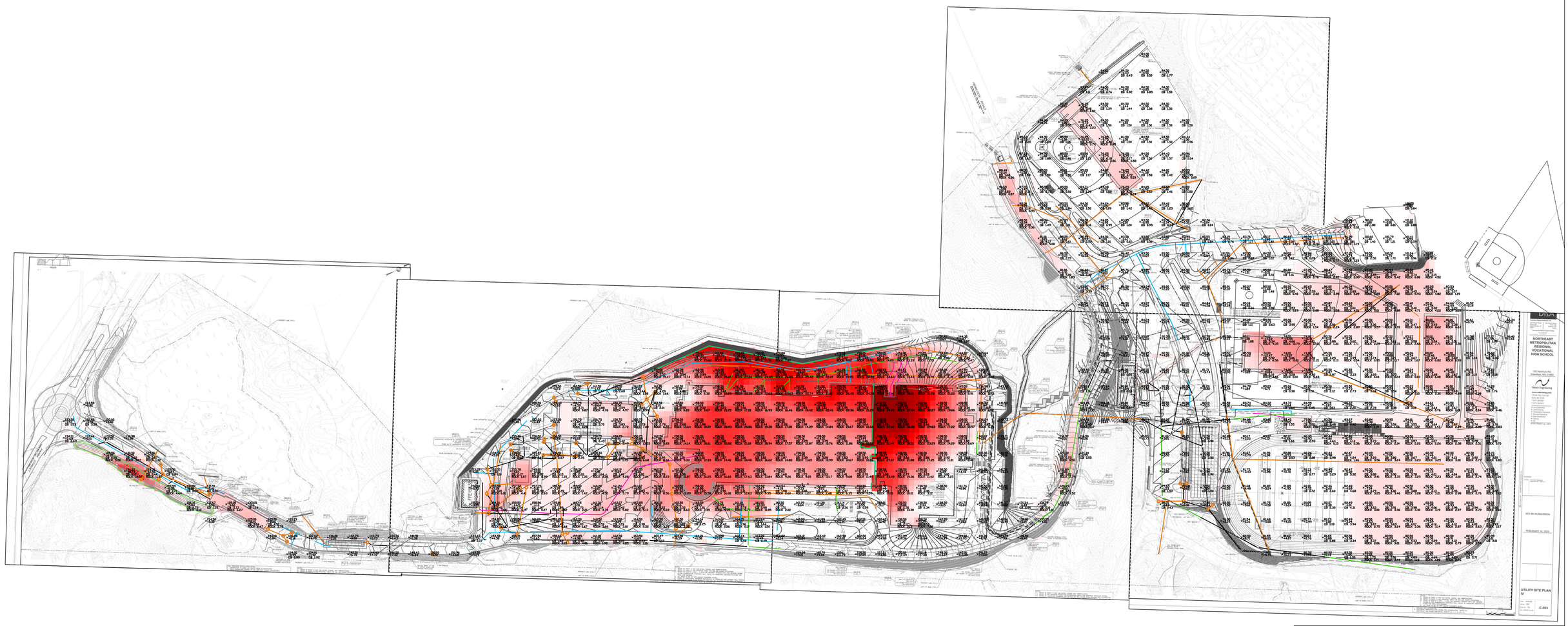
Proposed Blast Designs

The proposed initial Test Blast Design has been provided. The design has been scaled based on proximity to the nearest structure. Charge sizes, hole depths, pattern geometry and detailed loading information is provided in the spreadsheet. A detailed vibration analysis of proposed design is also factored in the proposed Blast Design.

This design provides a sound calculated starting point. As the work progresses, design refinements will be made as required in response to performance indicators and encountered conditions including ground and air response, displacement control, fragmentation, floor grading requirements, back break, and existing geology structure.

Blast Plan Annex

Cut/Fill Drawing



Cut/Fill
Drawing

Northeast Metro Tech

100 Hemlock Road
Wakefield, MA

DRAWN:	RAF
DATE:	03/10/23
SCALE:	1" = 100'

MD&B ENGINEERING SERVICES

Preblast Survey Radius Drawing

Preblast Survey
Drawing

Northeast Metro Tech

100 Hemlock Road
Wakefield, MA

DRAWN: RAF

DATE: 03/10/23

SCALE: 1" = 120'

0' 120' 240' 360'

MD&B ENGINEERING SERVICES

Test Blast Design

Preblast Survey
Drawing

Northeast Metro Tech

100 Hemlock Road
Wakefield, MA

DRAWN: RAF

DATE: 03/10/23

SCALE: 1" = 120'

MD&B ENGINEERING SERVICES

PRE-BLAST DESIGN and VIBRATION ANALYSIS
Northeast Metro Tech
April 25, 2023

Blast Data		
Represents the maximum lbs allowed vs. the closest structure		
Scale Distance	25	
Actual Distance	446	ft
Max Charge Weight/Delay	318.27	lbs
Actual vs Allowed Calculations		
Maximum Hole Depth	11	**ft**
Stemming Between Decks	0	ft
Stemming at top	6	ft
Diameter of hole/product	3.5	in
Density	1.26	g/cc
Lbs/ft	5.26	lbs/ft
Max Allowed Feet of Powder/Delay	5.00	ft
Decks Required?	No	
Actual # of Stemming Decks	0.0	
Actual Total ft. of Product	5.00	ft
Actual Total lb's of Product/Hole	26.28	lbs
Actual Feet of Product/Deck	5.00	ft
Actual Lbs/Deck	26.28	lbs
Powder Factor	1.35	
Yardage per hole	19.47	cu. yd's
Sq. ft per hole	47.78	sq. ft
Square Pattern	7.00	ft
Burden	6.0	
Spacing	8.0	ft

Production Blast Vibration Analysis Estimated PPV's (inches/sec) at closest structures using different "K" factors								
Holes or Decks/Delay Factor	1.00							
Max lbs/delay	26.28	K Value	130.00		K Value	160.00		K Value	242.00
Max ft/delay	5.00							
Closest Residence (7 June Circle)	445.00							
Scale Distance	86.81	Est. PPV	0.10		Est. PPV	0.13		Est. PPV	0.19
	0.00							
Scale Distance	0.00	Est. PPV	#DIV/0!		Est. PPV	#DIV/0!		Est. PPV	#DIV/0!

Department of Fire Services
Facts About Blasting

Department of Fire Services
Commonwealth of Massachusetts

Facts About Blasting

for Massachusetts Property Owners

www.mass.gov/dfs

Department of Fire Services
Division of Fire Safety
P. O. Box 1025 - State Road
Stow, Massachusetts 01775
978-567-3100 • Fax 978-567-3121

Blasting Facts

- The Institute of Makers of Explosives (IME) reports that in 2012 over 12 million pounds of commercial explosives were sold for use in Massachusetts.
- Explosives are used directly or indirectly in almost every aspect of our lives. Car, trucks, roads, bridges, homes, and office buildings are all built with products that had their origins with explosives. Even baby powder has its origin with explosives!
- Mining and construction are the two most common uses of explosives.

Blasting Regulations

Commercial explosives and the blasting industry are regulated by a number of state and federal agencies. In Massachusetts, 527 CMR 1.00 is the primary regulation that applies to explosives licensing, permitting, storage, sales, use, transportation, and manufacture. 527 CMR 1.00 is administered through the Department of Fire Services, Division of Fire Safety.

Federal agencies that regulate explosives include:

- Alcohol, Tobacco, Firearms and Explosives (ATF) – sales and storage
- Department of Transportation (DOT) – transportation
- Occupational Safety and Health Administration (OSHA) – construction use and handling
- Mining Safety and Health Administration (MSHA) – mining use and handling

Massachusetts Regulations

527 CMR 1.00
Key Parts of the Regulation

Section 1.12.8.39.1 Licenses, Permits, Certificates

Certificate of Competency
Explosives Users Certificate
Use and Handling Permit
Sale of Explosive Material

Section 65.9.1 Storage

Section 65.9.1 Transportation

Section 65 Use of Explosive Materials (Blasting)

Blast Analysis
Blast Design Plan
Allowable Limits of Effects of Blasting
Preblast Inspection Surveys
Blasting Damage Complaint

Section 65.9.15.1.1.3 Pre/Post Blast Inspection Waiver

Section 65.9.18 Blasting Regulatory Review Form (FP-296)

Important parts of 527 CMR 1.00 for the homeowner to be aware of:

Section 65.9.8 Blast Analysis

A document from the blasting company considering the effects of blasting on adjacent properties.

Section 65.9.8.3 Blast Design Plan

The blast design plan describes the design of the initial blasts and all the necessary safety precautions that will be taken.

Massachusetts Regulations (continued)

Section 65.9.15 Preblast Inspection Surveys

When blasting takes place within 250 feet of a property not owned or controlled by the project, a free survey must be offered to the property owner.

NFPA 495, 2013 Edition Warnings

The blaster must sound warnings when ready to fire a blast.

NFPA 495, 2013 Edition, Chapter 11
Allowable Limits of Effects of Blasting

Limits that are set for vibration and noise that result from a blast. 527 CMR 1.00 Section 65.9.14.4 contains the requirements for the use of a seismograph.

Section 65.9.18 Blasting Regulatory Review

If a property owner thinks that damage occurred as a result of blasting, they should file a regulatory review form with the fire department within 30 days of the blasting.

A Few Things To Remember

If a blasting project is planned near your property, take a close look at your home or business. You may be surprised at how many cracks in walls, floors, and ceilings already exist just from seasonal changes in humidity, age, and normal wear and tear. Most property owners don't notice these cracks until after blasting has started and mistake them for blasting damage.

The limits set for blasting noise and vibration are conservative and are below the threshold of where damage is known to occur.

The limits set in 527 CMR 1.00 are the result of years of study and research by universities and the Federal Government. The United States Bureau of Mines (USBM) RI 8507 Report is the primary source for establishing noise and vibration damage levels.

Who Do You Contact?

In Massachusetts there are two places to go for blasting help.

Local fire departments issue a ***Permit to Blast***. The permit is issued only if all the correct planning has taken place and all other conditions of 527 CMR 1.00 have been met.

Through the Department of Fire Services, the Division of Fire Safety issues ***Blasting Certificates of Competency*** and ***Explosives Users Certificates*** to blasters and blasting companies. Local fire departments will not issue a blasting permit without these documents. The certificates document that the blaster is competent to conduct blasting operations, and that his company has shown evidence of both bonding and the required insurance.

Other Blasting Information

How is blasting noise and vibration measured?

A seismograph is used to measure blasting noise and vibration. Seismographs are set up next to the closest structure to the blast site. The machines record the ground vibration and noise generated by the blast. The information is used to determine if the blast has exceeded limits set in the regulations.

Does the blaster keep records?

The blaster is required to keep detailed records of each blast. The records contain the size, time, and location of the blast, the amount of explosives used, and the results of the seismograph monitoring.

Will you hear or feel the blast?

You may hear or feel a blast depending on your distance from the blasting site. Humans are sensitive to noise and sound. What you feel does not necessarily mean that damage is occurring. Let the blasting company know if you are being startled or if you have other concerns about what is taking place.

What if I am sure that blasting damage has occurred?

If you feel that damage has occurred to your property, fill out a ***Blasting Regulatory Review Form***. The form (FP-296) is available from the local fire department (and on the DFS website under ***Fire Prevention Forms***), and must be submitted to the local fire department within 30 days of the blasting incident. The blasting company will then be required to submit records to the fire department for the blasts in question. The records will be reviewed by both the fire department and the Division of Fire Safety for any violations of the regulations. The blasting company, or its insurance company, is also required to respond to the claimant and to investigate the claim.

What precautions can be taken before blasting starts?

If you are offered a preblast survey, accept the offer. The survey is an inventory of existing conditions of the property. It is also an opportunity for the property owner to ask questions and the blasting company to educate citizens. If you have any concerns or questions, raise them during the preblast survey. The blasting company should be ready and willing to answer questions and address concerns.

Useful Numbers

Department of Fire Services
P. O. Box – State Road, Stow, MA 01775
(978) 567-3100
www.mass.gov/dfs

Western Massachusetts Office
P. O. Box 389
One Prince Street, Northampton, MA 01060-0389
(413) 587-3181, Fax (413) 587-9819

Division of Fire Safety
Main Telephone: (978) 567-3375, Fax: (978) 567-3199

- Code Compliance & Enforcement Unit - Stow
  Telephone: (978) 567-3375, Fax: (978) 567-3199
- Code Compliance & Enforcement Unit - Northampton
  Telephone: (413) 587-3181, Fax: (413) 587-9819

Contact your local fire department at:

www.mass.gov/dfs

Department of Fire Services
P. O. Box 1025 - State Road
Stow, Massachusetts 01775
978-567-3100 • Fax 978-567-3121

Seismograph Information

ISEE
International Society of Explosives Engineers

ISEE FIELD PRACTICE GUIDELINES FOR BLASTING SEISMOGRAPHS 2020

Published By
International Society of Explosives Engineers
26500 Renaissance Parkway
Cleveland, OH 44128 USA
www.isee.org

This edition of *ISEE Field Practice Guidelines for Blasting Seismographs* was revised by the ISEE Standards Committee in 2020, and supersedes all previous editions. It was approved by the Society's Board of Directors in its role of Secretariat of the Standards at its 2020 meeting.

International Society of Explosives Engineers (ISEE) – Standards Committee Members[1]
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Robert Turnbull, Instantel
Randall Wheeler, White Industrial Seismology
Board Liaison, Douglas Hoy, Sayre Associates, Inc

[1]This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

Committee Scope: This Committee shall have primary responsibility for documents on the manufacture, transportation, storage, and use of explosives and related materials. This Committee does not have responsibility for documents on consumer and display fireworks, model and high power rockets and motors, and pyrotechnic special effects.

Origin and Development of ISEE Standards for Blasting Seismographs
One of the goals of the ISEE Standards Committee is to develop uniform and technically appropriate standards for blasting seismographs. The intent is to improve accuracy and consistency in vibration and air overpressure measurements. Blasting seismograph performance is affected by how the blasting seismograph is built and how it is placed in the field.

In 1994, questions were raised about the accuracy, reproducibility and defensibility of data from blasting seismographs. To address this issue, the International Society of Explosives Engineers (ISEE) established a Seismograph Standards Subcommittee at its annual conference held in February 1995. The committee was comprised of seismograph manufacturers, researchers, regulatory personnel and seismograph users.
In 1997, the Committee became the Blast Vibrations and Seismograph Section. The initial standards were drafted and approved by the Section in December 1999. Subsequently, the ISEE Board of Directors approved two standards in the year 2000: 1) ISEE Field Practice Guidelines for Blasting Seismographs; and 2) Performance Specifications for Blasting Seismographs.

In 2002, the Society established the ISEE Standards Committee. A review of the ISEE Field Practice Guidelines and the Performance Specifications for Blasting Seismographs fell within the scope of the Committee. Work began on a review of the Field Practice Guidelines in January 2006 and was completed in February 2008 to produce the 2009 edition. A revision to the Performance Specifications was started in 2009 and completed in 2011.

The ISEE Standards Committee takes on the role of keeping the standards up to date every 5 years. This document is the result of the latest effort by the ISEE Standards Committee to keep the standards up to date with current field techniques and technology.

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Disclaimer: These field practice recommendations are intended to serve as general guidelines and cannot describe all types of field conditions. It is important that the operator evaluate these conditions and obtain good coupling between the monitoring instrument and the surface to be monitored. In all cases, the operator is responsible for documenting the field conditions and setup procedures in the permanent record for each blast.

PREFACE

Blasting seismographs are used to establish compliance with Federal, state and local regulations and evaluate explosive performance. Laws and regulations have been established to prevent damage to property and injury to people. The disposition of the rules is strongly dependent on the accuracy of ground vibration and air overpressure data. In terms of explosive performance the same holds true. One goal of the ISEE Standards Committee is to ensure consistent recording of ground vibrations and air overpressure between all blasting seismographs.

ISEE Field Practice Guidelines
for Blasting Seismographs
2020 Edition

PART I. GENERAL GUIDELINES

Blasting seismographs are deployed in the field to record the levels of blast-induced ground vibration and air overpressure. Accuracy of the recordings is essential. These guidelines define the user's responsibilities when deploying blasting seismographs in the field and assume that the blasting seismographs conform to the ISEE "Performance Specifications for Blasting Seismographs" [3].

1. Read the instruction manual and be familiar with the operation of the instrument. Every seismograph comes with an instruction manual. Users are responsible for reading the appropriate sections and understanding the proper operation of the instrument before monitoring a blast.

2. Seismograph calibration. Annual calibration of the seismograph is recommended.

3. Keep proper blasting seismograph records. A user's log should note: the user's name, date, time, place and other pertinent data.

4. Document the location of the seismograph. This includes the name of the structure and where the seismograph was placed on the property relative to the structure. Any person should be able to locate and identify the exact monitoring location at a future date.

5. Know and record the distance to the blast. The horizontal distance from the seismograph to the blast should be known to at least two significant digits. For example, a blast within 1000 meters or feet would be measured to the nearest tens of meters or feet respectively and a blast within 10,000 meters or feet would be measured to the nearest hundreds of feet or meters respectively. Where elevation changes exceed 2.5 horizontal:1 vertical, slant distances or true distance should be used.

6. Record the blast. When seismographs are deployed in the field, the time spent deploying the unit justifies recording an event. As practical, set the trigger levels low enough to record each blast.

7. Record the full time history waveform. Summary or single peak value recording options available on many seismographs should not be used for

monitoring blast generated vibrations. Operating modes that report peak velocities over a specified time interval are not recommended when recording blast induced vibrations.

8. Set the sampling rate. The blasting seismograph should be programmed to record the entire blast event in enough detail to accurately reproduce the vibration trace. In general the sample rate should be at least 1000 samples per second.

9. Know the data processing time of the seismograph. Some units take up to 5 minutes to process and print data. If another blast occurs within this time the second blast may be missed.

10. Know the memory or record capacity of the seismograph. Enough memory must be available to store the event. The full waveform should be saved for future reference in either digital or analog form.

11. Know the nature of the report that is required. For example, provide a hard copy in the field; keep digital data as a permanent record or both. If an event is to be printed in the field, a printer with paper is needed.

12. Allow ample time for proper setup of the seismograph. Many errors occur when seismographs are hurriedly set up. Generally, more than 15 minutes for set up should be allowed from the time the user arrives at the monitoring location until the blast.

13. Know the temperature. Seismographs have varying manufacturer specified operating temperatures.

14. Secure cables. Suspended or freely moving cables from the wind or other extraneous sources can produce false triggers due to microphonics.

PART II. GROUND VIBRATION MONITORING

Placement and coupling of the vibration sensor are the two most important factors to ensure accurate ground vibration recordings.

A. Sensor Placement

The sensor should be placed on or in the ground on the side of the structure towards the blast. A structure can be a house, pipeline, telephone pole, etc. Measurements on driveways, walkways, and slabs are to be avoided where possible.

1. Location relative to the structure. Sensor placement should ensure that the data obtained adequately represents the ground-borne vibration levels received at the structure. The sensor should be placed within 3.05 meters (10 feet) of the structure or less than 10% of the distance from the blast, whichever is less.

2. Soil density evaluation. The soil should be undisturbed or compacted fill. Loose fill material, unconsolidated soils, flower-bed mulch or other

unusual mediums may have an adverse influence on the recording accuracy.

3. The sensor must be nearly level.

4. Typical practice is to point the longitudinal/radial channel towards the blast site. However, other sensor orientations are allowed.

a. For blast-by-blast sensor deployment, the longitudinal/radial channel should be pointed towards the closest blast hole. Records should indicate if this condition is met.

b. For multiple-blast sensor deployment, the azimuth (0-360 degrees, +/- 5 degrees) of the longitudinal/radial channel relative to true north should be recorded.

5. Where access to a structure and/or property is not available, the sensor should be placed closer to the blast in undisturbed soil.

B. Sensor Coupling

If the acceleration exceeds 1.96 m/s^2 (0.2 g), decoupling of the sensor may occur. Depending on the anticipated acceleration levels spiking, burial, or sandbagging of the geophone to the ground may be appropriate.

1. If the acceleration is expected to be:

a. Less than 1.96 m/s^2 (0.2 g), no burial or attachment is necessary.

b. Between 1.96 m/s^2 (0.2 g), and 9.81 m/s^2 (1.0 g), burial or attachment is preferred. Spiking may be acceptable.

c. Greater than 9.81 m/s^2 (1.0 g) , burial or firm attachment is required [7].

The following table exemplifies the particle velocities and frequencies where accelerations are 1.96 m/s^2 (0.2 g) and 9.81 m/s^2 (1.0 g).

Frequency, Hz	4	10	15	20	25	30	40	50	100	200
Particle Velocity mm/s (in/s) at 1.96 m/s^2 (0.2 g)	78.0 (3.07)	31.2 (1.23)	20.8 (0.82)	15.6 (0.61)	12.5 (0.49)	10.4 (0.41)	7.8 (0.31)	6.2 (0.25)	3.1 (0.12)	1.6 (0.06)
Particle Velocity mm/s (in/s) at 9.81 m/s^2 (1.0 g)	390 (15.4)	156 (6.14)	104 (4.10)	78.0 (3.07)	62.4 (2.46)	52.0 (2.05)	39.0 (1.54)	31.2 (1.23)	15.6 (0.61)	7.8 (0.31)

2. Burial or attachment methods.

a. The preferred burial method is excavating a hole that is no less than three times the height of the sensor [1], spiking the sensor to the bottom of the hole, and firmly compacting soil around and over the sensor.

b. Attachment to bedrock is achieved by bolting, clamping or adhering the sensor to the rock surface.

c. The sensor may be attached to the foundation of the structure if it is located within +/- 0.305 meters (1-foot) of ground level [5]. This should only be used if burial, spiking or sandbagging is not practical.

3. Other sensor placement methods.

a. Shallow burial is anything less than described at 2a above.

b. Spiking entails removing the sod, with minimal disturbance of the soil and firmly pressing the sensor with the attached spike(s) into the ground.

c. Sand bagging requires removing the sod with minimal disturbance to the soil and placing the sensor on the bare spot with a sand bag over top. Sand bags should be large and loosely filled with about 4.55 kilograms (10 pounds) of sand. When placed over the sensor the sandbag profile should be as low and wide as possible with a maximum amount of firm contact with the ground.

d. A combination of both spiking and sandbagging gives even greater assurance that good coupling is obtained.

C. Programming Considerations

Site conditions dictate certain actions when programming the seismograph.

1. Ground vibration trigger level. The trigger level should be programmed low enough to trigger the unit from blast vibrations and high enough to minimize the occurrence of false events. The level should be slightly above the expected background vibrations for the area. A good starting level is 1.3mm/s (0.05in/s).

2. Dynamic range and resolution. If the seismograph is not equipped with an auto-range function, the user should estimate the expected vibration level and set the appropriate range. The resolution of the printed waveform should allow verification of whether or not the event was a blast.

3. Recording duration. Set the record time for 2 seconds longer than the blast duration plus 1 second for each 335 meters (1100 feet) from the blast.

PART III. AIR OVERPRESSURE MONITORING

Placement of the microphone relative to the structure is the most important factor.

A. Microphone Placement

The microphone should be placed along the side of the structure, nearest the blast.

1. The microphone should be mounted near the geophone with the manufacturer's wind screen attached.

2. The microphone may be placed at any height above the ground [2].

3. If practical, the microphone should not be shielded from the blast by nearby buildings, vehicles or other large barriers. If such shielding cannot be avoided, the horizontal distance between the microphone and shielding object should be greater than the height of the shielding object above the microphone.

4. If placed too close to a structure, the air overpressure may reflect from the house surface and record higher amplitudes. Structure response noise may also be recorded. Reflection can be minimized by placing the microphone near a corner of the structure. [6].

5. The orientation of the microphone is not critical for air overpressure frequencies below 1,000 Hz [6].

6. The microphone element must be kept dry to help maintain proper calibration and minimize the potential for corrosion. A common practice is to place a windscreen (typically provided by the manufacturer) on the microphone and cover it loosely with a thin plastic bag, or "rain shield." Other methods can be used to protect the microphone from moisture; however, the pressure around the microphone sensing element must be able to change in relation to the pressure change caused by the blast overpressure.

a. When using a plastic bag as a rain shield, the bag should be tied loosely around the microphone, allowing some exchange of air between the inside and outside of the shield. Completely sealing a rain shield could result in the following:

i. Condensation – water accumulates inside the shield. A small hole in the bottom of the shield can help mitigate this issue.
ii. Static Pressure – over time pressure could build in the shield.
iii. Rain Triggers – rain drops striking a tightly sealed shield will cause pressure pulses that could trigger the seismograph.

b. It is acceptable to keep microphones inside security boxes or other protective covers as long as the pressure change in the enclosure reflects the pressure change outside of the protective cover in the surrounding environment.

B. Programming Considerations
Site conditions dictate certain actions when programming the seismograph to record air overpressure.

1. Trigger Level – When only an air overpressure measurement is desired, the trigger level should be low enough to trigger the unit from the air overpressure and high enough to minimize the occurrence of false events. The level should be slightly above the expected background noise for the area. A good starting level is 20 Pa (0.20 millibars or 120 dB).

2. Recording Duration – When only recording air overpressure, set the recording time for at least 2 seconds more than the blast duration. When ground vibrations and air overpressure measurements are desired on the same record, follow the guidelines for ground vibration programming (Part II C.3).

REFERENCES

1. American National Standards Institute, Vibration of Buildings – Guidelines for the Measurement of Vibrations and Evaluation of Their Effects on Buildings. ANSI S2.47-1990, R1997.

2. Eltschlager, K. K., White, R. M. Microphone Height Effects on Blast-Induced Air Overpressure Measurements, 31st Annual Conference on Explosives and Blasting Technique, International Society of Explosives Engineers, 2005.

3. International Society of Explosives Engineers. ISEE Performance Specifications for Blasting Seismographs, 2011.

4. Siskind, D. E., Stagg, M. S., Kopp, J. W., Dowding, C. H. Structure Response and Damage by Ground Vibration From Mine Blasting. US Bureau of Mines Report of Investigations 8507, 1980.

5. Siskind, D. E., Stagg, M. S. Blast Vibration Measurements Near and On Structure Foundations, US Bureau of Mines Report of Investigations 8969, 1985.

6. Stachura, V. J., Siskind, D. E., Engler, A. J., Airblast Instrumentation and Measurement for Surface Mine Blasting, US Bureau of Mines Report of Investigations 8508, 1981.

7. Stagg, M. S., Engler, A. J., Measurement of Blast –Induced Ground Vibrations and Seismograph Calibration, US Bureau of Mines Report of Investigations 8506, 1980.

Calibration Certificate

Part Number:	714A0801
Description:	BLASTMATE III
Serial Number:	BA10827
Calibration Date:	February 16, 2022
Calibration Reference Equipment:	718A1501

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: _____

Martin Hogue

Instantel 309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642

Calibration Certificate

Part Number: 714A9701
Description: TRIAXIAL GEOPHONE (ISEE)
Serial Number: BG8544
Calibration Date: February 16, 2022
Calibration Reference Equipment: SRV-AFR 714J7401

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

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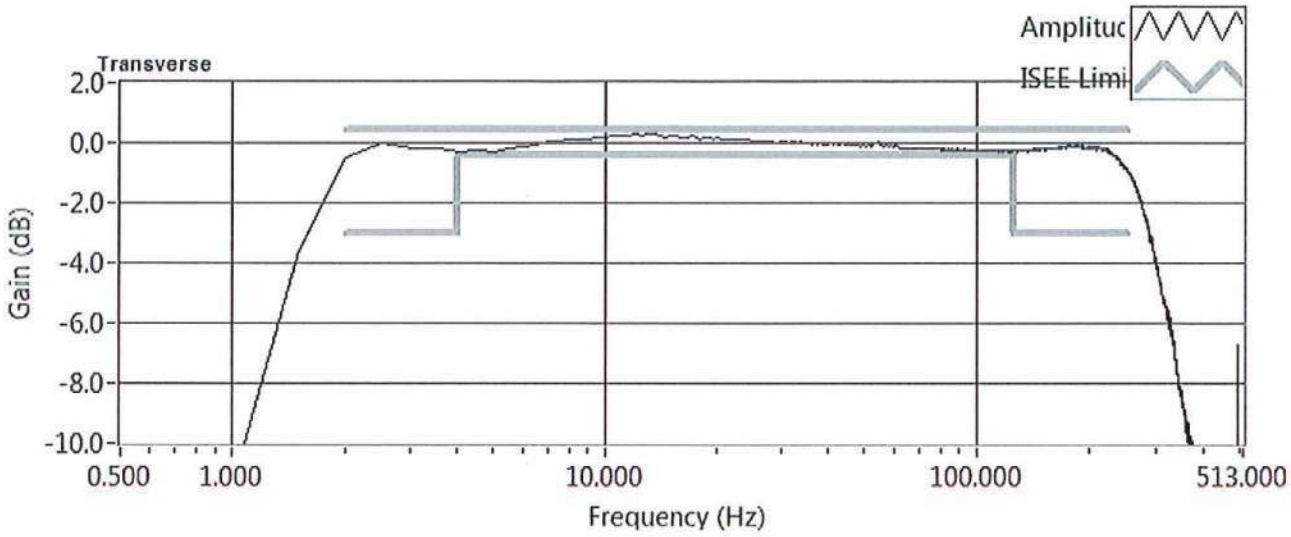
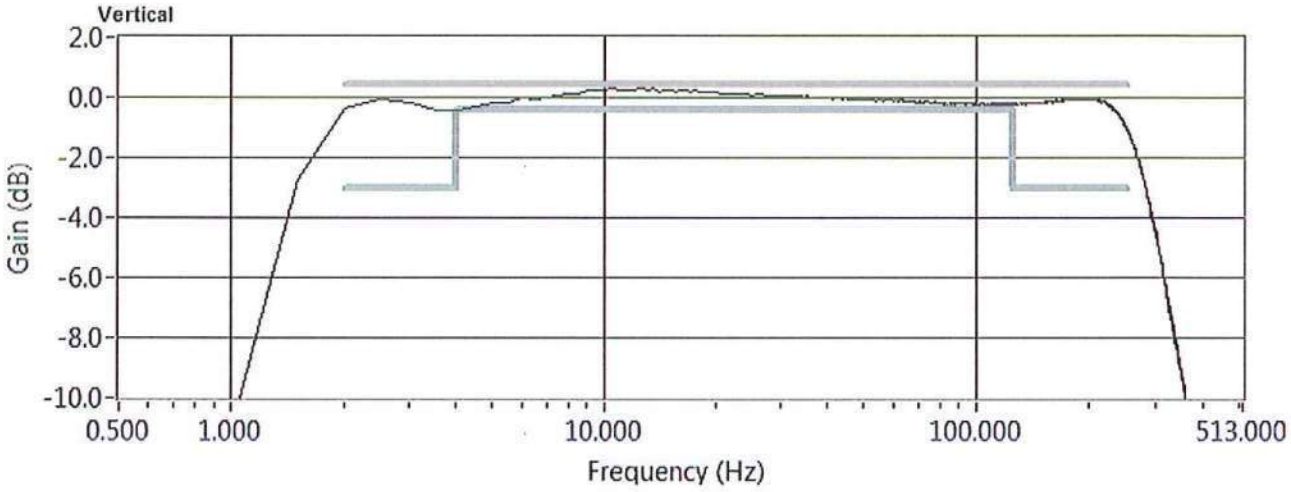
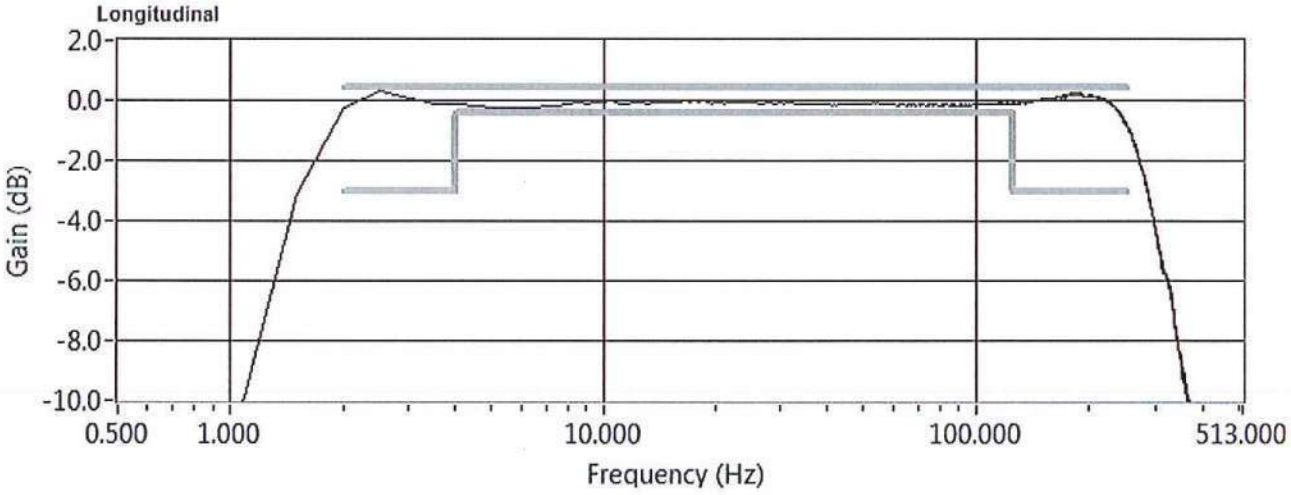
Calibrated By: _____
Martin Hogue

Instantel 309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642

Amplitude Frequency Response of BG8544 (As Found)







Calibration Certificate

Part Number: 714A9801
Description: LINEAR MICROPHONE 2-250HZ
Serial Number: BH7679
Calibration Date: February 16, 2022
Calibration Reference Equipment: SRV-AFR 714J7401

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

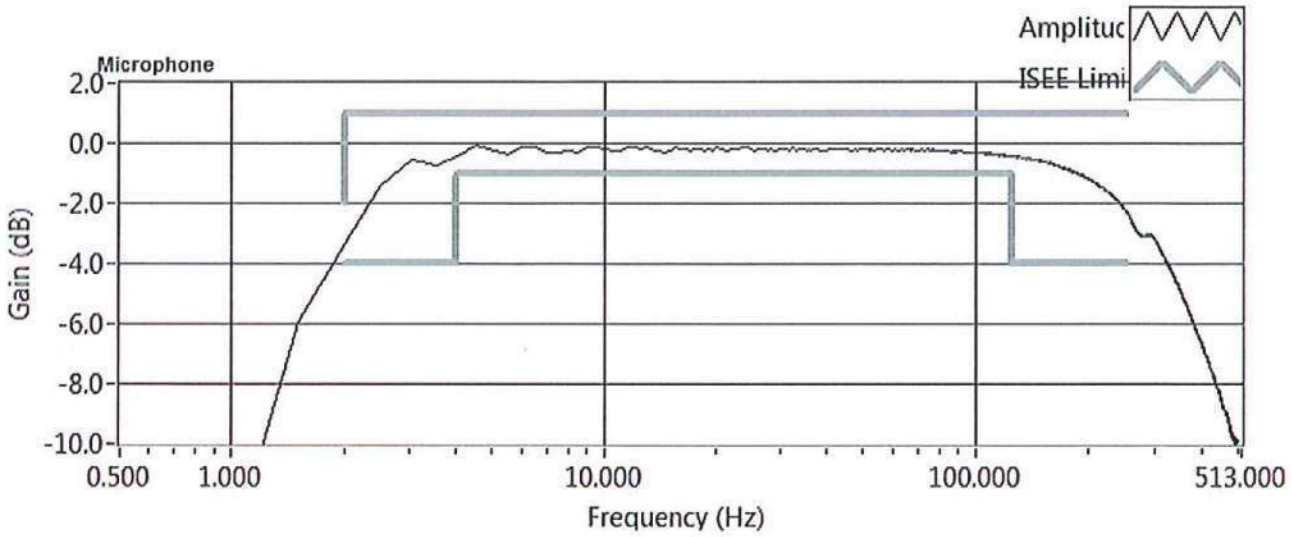
The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: _____
Martin Hogue

Instantel 309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642

Amplitude Frequency Response of BH7679 (As Found)



FUSE INSTALLATION INSTRUCTIONS

FUSE

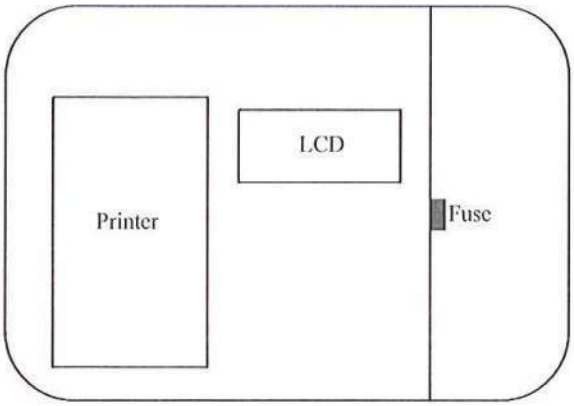
IMPORTANT

For BlastMate III, DS-477 / 677 Series I and DS-477 / 677 Series II; the fuse has been removed to preserve battery life during shipment. Install the fuse (see diagrams below for locations), and put unit on charge for 24 hours.

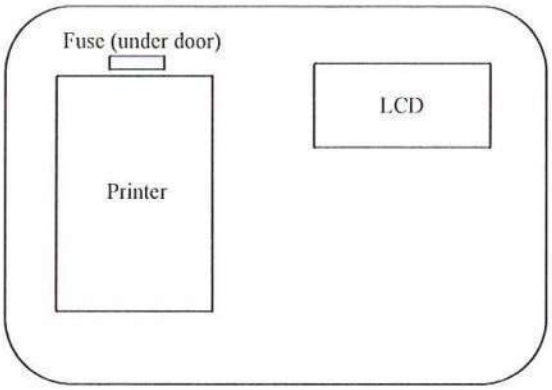
For MiniMate Plus and MiniMate DS-077; the battery cable is disconnected during shipment. Before using it, remove the four screws in the lid and carefully open the enclosure. Connect the battery cable and re-assemble. Ensure the wires are not pinched prior to closing the lid. Put unit on charge for 24 hours.

WARNING: When charging the unit, ensure the lid of the unit is opened to reduce any potential hazard of hydrogen gas buildup.

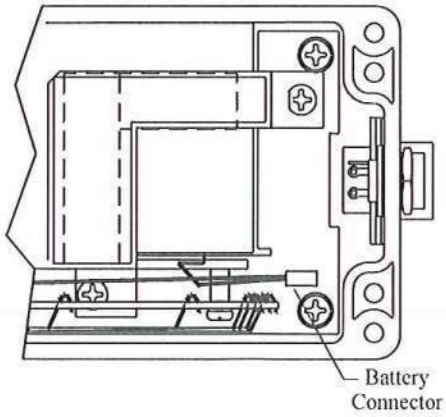
Reset with system software via an IBM compatible PC if unit is a DS-677 series. For other products set correct Time/Date and Setups if required. Consult the user manual for details.



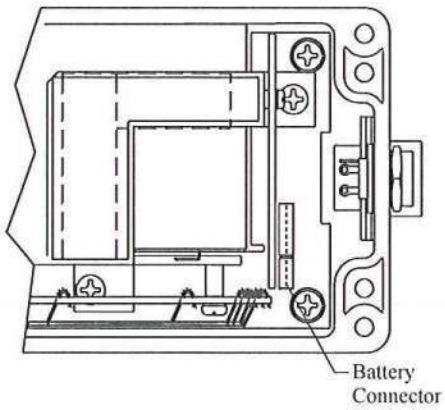
DS-477/677 Series I



BlastMate III
DS-477 / 677 Series II



MiniMate DS-077 (cover removed)
MiniMate Plus (S/N less than 6000)



MiniMate Plus (cover removed)
(S/N greater than 6000)

Dynamat Data Sheet

Blasting mats

Popular Products :

- 8 ft. x 16 ft. (2.43m x 4.87m)
- 10 ft. x 15 ft. (3m x 4.5m)
- 12 ft. x 24 ft. (3.65m x 7.3m)

Custom Made Products

Our equipment enables us to produce blasting mats to your particular specifications in sizes ranging from 4 x 4 ft. (1.2 x 1.2m.) to 16 x 28 ft. (4.87 x 8.53m.). A flexibility that is unique in the industry.

WHY CHOOSE DYNAMAT BLASTING MATS?		
Our Innovative Processes		
The Dynamat Advantage		Our Goals
Automated processes	We have developed automated processes that let us measure the compaction of the blasting mats.	To ensure consistent quality.
Meticulous tire selection	Our manufacturing processes demand it.	
Our Added Value		
The Dynamat Advantage		Our Goals
Blasting mats over 12 feet (3.66 m) wide	We are the **only manufacturer** in North	To match our client's needs.

	America to make products of such widths.	
12 inches (30 cm) between each cable	We have always spaced them this way. **All** our competitors, on the other hand, leave a gap of 14 to 16 inches (35 to 41 cm) between their cables.	To produce safe blasting mats that control flying debris better.
Forged circular rings	We used forged rings, while the competition used welded ones.	To make blasting mats easier to handle.
Two dimensions of rings	We use 10 and 13-inch (25and 33 cm) rings.	To obtain the resistance required for hoisting.
The benefits of traditional blasting mats vs. blasting mats made of truck tires (transport mat)	▪ greater flexibility and adaptability to the terrain. ▪ maximal absorption of the energy released by dynamiting. ▪ reduced possibilities of a partial blast. ▪ unequalled ease in handling.	To provide a safe product that not only eliminates all risk of flying debris when dynamiting, but also ensures optimal performance.

Superior quality = safety

Our products are subject to rigorous quality control at every step of the manufacturing process. Carefully selected, the recovered tires that make up our blasting mats are tied together with new cables, and that translates into solidity and resistance. All the rubber pieces are perforated in order to minimize tears. This means that clients can use our blasting mats in total safety.

Traceability

In a process that's unique to Dynamat, blasting mats are individually numbered to allow them to be easily traced and identified wherever they are on a project involving dynamiting. Now that's an advantage that's undeniably Dynamat!

Dynamat is North America's leading manufacturer of blasting mats !

Custom-made

Our equipment lets us produce custom-made blasting mats to your specifications in sizes ranges from 4 x 4 ft. (1.20 x 1.20m) to 16 x 28 ft. (4.88 x 8.53 m). Only Dynamat can offer you blasting mats this big. Another Dynamat advantage!

Our blasting mats

BLASTING MATS			
Dimensions	**Weight**	**Number that fit into a 53-ft. trailer**	
		Canada ON/QC	USA
8 ft. x 16 ft. (2.43m x 4.87m)	5 120 lbs. (2 323 kg.)	15	9
10 ft. x 15 ft. (3.00m x 4.50m)	6 000 lbs. (2 722 kg.)	13	8
12 ft. x 16 ft. (3.65m x 4.87m)	7 680 lbs. (3 485 kg.)	11	6
12 ft. x 24 ft. (3.65m x 7.30m)	11 520 lbs. (5 226 kg.)	6	4

*** Any other size available on request.**

Safe Transportation and Handling of Explosives

17
SAFETY LIBRARY PUBLICATION
October 2011

SAFETY IN THE TRANSPORTATION, STORAGE, HANDLING AND USE OF EXPLOSIVE MATERIALS

MISFIRES

Every precaution must be taken to prevent misfires. Experience has shown that if proper procedures are followed the probability of misfires occurring is reduced to an absolute minimum. Detection of misfires during the post-blast inspection is paramount since history shows that many serious accidents involve misfired explosives of which workers are unaware. When a misfire occurs, it is sometimes difficult to detect the presence of the unexploded materials. If a misfire is suspected, do not give the "all-clear" signal and immediately barricade the area and notify managerial level personnel as soon as possible and by the end of the shift. This identified misfired area should be barricaded from unauthorized entry until the misfire is successfully resolved. For this reason, never drill into or near a borehole that has previously been loaded with explosive materials. Accidents could occur if misfired explosive material is impacted by a drill steel or bit.

Because misfires occur under so many varied conditions, and are caused by so many different factors, it is impossible to offer detailed instructions to cover every situation. Moreover, due to the potential hazards involved, ***misfires should only be handled by persons who are thoroughly trained and experienced in the properties of explosive materials and their use in blasting operations.***

A. Prevention Plan

A thorough investigation should always be made of all misfire incidents so the cause can be determined and corrective action can be taken to prevent recurrence. Some of the more frequent causes of misfires are:

1. inadequate or improperly made primers;
2. use of nonwater-resistant explosive materials in wet work;
3. improper loading practices;
4. physical damage to leg wires of electric or electronic detonators, shock tube leads, detonating cord, or primers;
5. failure to light fuse or to connect the delay detonators into the blasting circuit;

6. failure or improper initiation system connection;

7. insufficient or excessive electric current;

8. damage to the fuse powder train;

9. improper programming of electronic delay detonators;

10. dead pressing or other damage caused by the detonation of nearby charges;

11. lost or dropped downlines from the collar of the borehole during the loading or stemming process;

12. inadequate or improper inert decking material; and

13. improper delay timing between decked charges or boreholes.

Occasionally, the primer will detonate, but not initiate a portion of the explosive materials in the borehole. These failures should be handled in the same manner as failures of the entire charge. Partial failures are usually caused by:

1. cutoff holes or sections of holes;

2. improper or inadequate priming;

3. deteriorated explosive materials;

4. improper loading or drill cuttings between cartridges or unplanned separation of explosive column;

5. effect of water or moisture on the explosive materials; and

6. dead pressing or other damage caused by the detonation of nearby charges.

Minimizing cutoffs in the borehole may be accomplished by properly priming the explosive materials throughout the borehole, by properly delaying the blast, using multiple or "insurance" primers, and by designing the round with due consideration to burdens and spacing and all visible seams and partings.

B. Waiting Period

If a misfire is known to occur involving the use of cap and fuse, the blast area should be kept clear for at least 30 minutes. If electric or nonelectric (shock tube) detonators, or detonating cord systems are involved in a misfire, the waiting period should be at least 15 minutes. If electronic detonators are involved in a misfire, wait a minimum of 30 minutes before reentering the blast area, unless the manufacturer recommends additional time. Entry to the blast area should be restricted during the waiting period. If electric initiation has been used, the lead-in-line should be disconnected from the blasting machine, the lines shunted and the blasting machine secured. If shock tube initiation has been used, the lead-in-line should be disconnected from the blasting machine and the blasting machine secured.

C. Misfire Resolution Procedures

After the appropriate waiting period, the blaster-in-charge (BIC) and an *absolute minimum* number of authorized, competent, and experienced personnel required to assess the situation may enter the blast area. The BIC should develop a plan for resolving the misfire and communicate that plan to essential personnel before work begins. Figure 3 shows the basic elements of a logic flow diagram for a typical misfire resolution procedure.

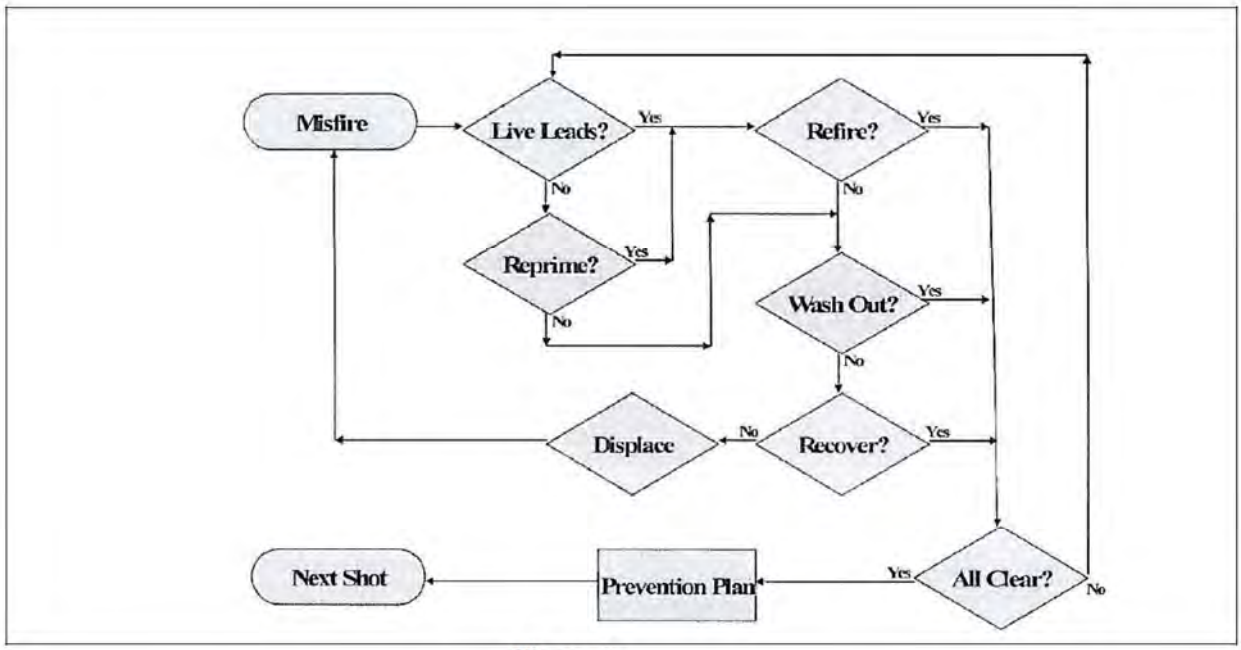


Figure 3
Misfire Resolution Protocol

1. Refiring

   The safest and surest way to dispose of any misfired explosive material is by detonation (providing there is sufficient burden or cover to contain the blast). The BIC should, before taking any action, make an evaluation to determine the amount and location of the unfired explosive material and the condition of the ground surrounding the misfires.

   If the blast was fired electrically, a check should be made of all apparently unfired circuits. Electric detonator circuits should be checked for continuity by use of a blasting galvanometer, blasting ohmmeter, blaster's ohmmeter or blaster's multimeter. Electronic detonator circuits should be checked for continuity with equipment recommended by the manufacturer of the electronic system. Misfires attributable to malfunctions of the electrical circuit may be reconnected and fired if the holes have sufficient burden. When entire holes or groups of holes have failed to fire, the problem may have been failure of the initiation system to deliver energy to that portion of the pattern. In this case, the primers may still be functional and the holes can be refired.

   When detonating cord or nonelectric detonators are involved in misfires, it is virtually impossible to test for circuit continuity. However, the blaster can check any lines coming out of the hole and, if they appear to be intact, reconnect them and try to detonate the misfired holes.

   Due to the varying and unique designs of electronic detonator systems, misfires must be handled according to the specific manufacturer's recommended procedures.

Often only a portion of the blast will fire and crater or otherwise disturb the area around the collar of the blastholes. In this situation, an examination should be made to locate and mark the individual blastholes. If there are detonator leg wires, leads, or detonating cord downlines in the holes they should be checked to determine the feasibility of refiring the holes.

Probably one of the greatest hazards associated with the handling of misfires is the possibility of excessive flyrock when refiring the charge. This is especially true when only a portion of the blast has fired, reducing the burdens and shattering the ground surrounding the misfired holes. A thorough evaluation should be made of the area containing misfired holes before any action is taken to refire the holes. Sometimes it may be necessary to eliminate certain holes to prevent excessive flyrock, or to cover the area with rock screenings, sand, and/or mats to contain the blast. In all instances of refiring misfired charges, the possibility of excessive flyrock is an important consideration and personnel and equipment must be moved beyond the normal blast area or provide proper shelter.

2. Repriming

In blastholes where the leg wires are discontinuous, or leads or detonating cord are cut off in the hole, there may still be explosive materials in the hole, which can be reprimed and fired. If the powder column is visible, it may be possible to place a fresh primer on top of the column. When stemming is still in the blasthole, it can be removed by vacuuming, blowing it out with air, or washing it out with water. Care should be taken to ensure that the introduction of electrically powered equipment into the blast site does not present a hazard. Normally, the use of air to blow out stemming in large diameter holes is impractical due to the large volume of air required. A jet of water introduced into the hole through a rubber or plastic hose will often work in large diameter holes, especially where drill cuttings have been used for stemming. Air or water will work equally well for small diameter holes. When blowing stemming out of blastholes, dirt, stone chips and mud will be ejected from the hole with great velocity and personnel should take proper precautions. When misfires involve electric detonators, special precautions must be implemented to prevent premature detonation from an extraneous electrical charge such as static generated by moving particles. These precautions may prevent certain stemming removal procedures.

When attempting to remove stemming from a misfired blasthole, only plastic or rubber hoses or wooden tamping poles should be used. Exercise care so that explosive materials are not vacuumed. Ferrous metal tools, pipes or rods should not be used. Never allow a drill to set up over a misfired hole to drill or blow out the stemming or the explosive charge.

In holes where the stemming has been removed and the powder column is accessible, a new primer should be placed in the hole and the hole refired. Because the explosive material to be primed may have gotten wet in the process of removing the stemming, the new primer should be of high strength to assure initiation of the misfired explosive material.

The sound of the new primer firing is not a dependable indication that the entire charge of misfired explosive material has detonated. The primer may have caused some of the charge to burn, creating a "hangfire" which could eventually detonate from a build up of heat and pressure. It is recommended that no one return to the blast area for at least one hour following the firing of a reprimed misfired charge.

3. Hangfires
In addition to the specific risk of explosives burning following the repriming of a misfired blasthole, misfires of any kind always create the possibility that some of the misfired explosive material may start to burn. This burning explosive, which is commonly called a "hangfire", could eventually result in an explosion, especially if the burning explosive is confined in the blasthole. Burning explosives generally result from an interruption in the explosive column caused by drill cuttings or loose material in the blasthole creating separations, a shifting or squeezing of the blasthole due to rock movement, or by other factors which slow down or interrupt the steady state velocity of the explosive charge. Whenever a misfire occurs the area should always be checked for signs of explosives burning near or in the blastholes. In the event of a burning charge, personnel should leave the area and entrance to the site should be restricted until all evidence of burning has ceased.

Another possible cause of burning explosive materials is "arcing" of long-period delay electric detonators when using an AC or DC power line. "Arcing" can be eliminated by using capacitor discharge type blasting machines or time limiting switch on the powerline.

4. Washing Out
Where conditions do not permit the refiring of a misfired charge, it is often possible to wash the charge out of the hole. Consideration must be given to the environmental impact and compliance of such an activity.

5. Recovering
When misfired holes cannot be refired, or the explosive materials cannot be readily recovered or washed out of the holes, consideration must be given to recovering the misfired charge from the ground. A written procedure for this type of recovery should exist for the operation. This procedure should consider the following elements:

a. Nonmetallic Tools. When attempting to remove the explosive charge from a misfired blasthole, only plastic, rubber, or wooden tools and tamping poles should be used. Ferrous metal tools, pipes or rods should not be used.
b. Experienced Persons. Designate an experienced person as the ground spotter knowledgeable of the location, loading, and properties of the misfired explosives. The ground spotter or his designated responsible representative should be present and direct all operations during the search and movement of any materials suspected of containing misfired explosives. Any equipment operator involved should be informed of the potential hazards of the operation and shown items for which he should be watchful.
c. Protect Operator. A barricade should be provided to give protection to the operator of equipment used for the recovery. A barricade could be constructed of high velocity impact resistant plastic, such as Lexan® plastic, or other material sufficient to protect the operator from flying materials (such as rock fragments) resulting from the accidental detonation of misfired explosives.
d. Protect Ground Spotter. Either a protective shelter should be available, or the movement of the equipment should occur in a manner so that the ground spotter is barricaded from any potential flying materials such as rock fragments resulting from any accidental detonation of misfired explosives.
e. Communication. The equipment operator and the ground spotter should have a constant method of communication such as a dedicated two-way radio system.
f. Discovery. Any person involved in the procedure should halt the operation immediately whenever any remnants of misfired explosives are observed. When any explosive material is discovered, the ground spotter should control procedures to safely remove the

hazard. This may include continuation of physical recovery, procedures to safely detonate the explosives in place, or other procedures.

g. Digging. Movement of any material that may contain misfired explosives should only be performed in the immediate presence and direction of a ground spotter. Digging should be approached from a direction that reduces the probability of contact with multiple misfired charges.

h. Primer and Downline Protection. When digging approaches the location of a suspected misfired primer or downline, extra care should be taken to ensure that forces capable of initiating the primer or downline are not delivered to the primer or downline. The excavation elevation should be changed (either elevated or lowered) to prevent the probability of impact of the equipment digging edge with the misfired primer assembly.

i. Material Inspection. Material suspected of containing misfired explosives should be spread out in a thin pile for further examination. Whenever any misfired explosives are observed, they should be carefully removed for safe disposal. When this material is sent for further processing such as crushing or milling, the processing personnel should be notified. As the material is being unloaded for processing, the material should be visually checked again from a safe location for the presence of explosives.

j. Material Handling. Transport equipment for the material should be oriented in a manner to protect the operator from any potential flying materials such as rock fragments resulting from accidental detonation of misfired explosives. The operators of equipment used for transport of mucked material should remain inside the equipment.

6. Displacing

As a last resort, drilling and blasting holes adjacent to the misfired hole(s) and displacing the unfired explosive materials may be considered. Extreme care should be exercised since intersection of the misfired charge with the drill may cause detonation. When possible, drilling should be conducted remotely, protecting the drill operator from the forces of such a detonation. Unfired explosives remaining in misfired blastholes may be initiated or ignited by the detonation of adjacent blastholes. For this reason no misfired blastholes should be left near a blast with the intention of firing the misfired holes later.

CAUTION: This method can be extremely hazardous and should be attempted only by experienced, qualified persons.

7. Disposal of Misfired Explosives

Misfires should be disposed of as promptly as possible to eliminate the potential hazard of any misfired holes being accidentally initiated. All recovered explosive material to be disposed of should be taken to a separate storage magazine and managed in accordance with applicable laws and regulations pertaining to waste disposal. In some locations, misfires must be reported to regulatory agencies that will prescribe procedures for proper handling.

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC SAFETY
Office of the State Fire Marshal

CMR 13: EXPLOSIVES COURSE HANDOUT

Understanding and Regulating Explosives Using the Amended Regulation

(Effective March 1, 1996)

Material Stiffness Ratio

Stiffness ratio provides insight into the potential for unwanted adverse effects

- Bench height (L) =
- Burden (B) =

L / B = Material Stiffness Ratio (L/B)

STIFFNESS RATION TABLE				
Stiffness Ratio	1	2	2	4
Fragmentation	Poor	Fair	Good	Excellent
Air Blast	Severe	Fair	Good	Excellent
	Severe	Fair	Good	Excellent
Ground Vibration	Severe	Fair	Good	Excellent
Comments	Severe backbreak & toe problems. Do not shoot *REDESIGN*	Redesign if possible	Good control and fragmentation	No increased benefit by increasing stiffness ratio above 4

Note:: Round off L/B and compare with Stiffness Ratio Table

SPG_r determined by chart

Rock Type	Specific Gravity	ton/yd ^{3} (Cu Yd)
Basalt	2.8 - 3.0	2.57
Diabase	2.6 - 3.0	2.36
Diorite	2.8 - 3.0	2.50
Dolomite	2.8 - 2.9	2.43
Gneiss	2.6 - 2.9	2.43
Granite	2.6 - 2.9	2.30
Hematite	4.5 - 5.3	4.12
Limestone	2.4 - 2.9	2.23
Marble	2.1 - 2.9	2.09
Micaschist	2.5 - 2.9	2.30
Quartzite	2.0 - 2.8	2.16
Sandstone	2.0 - 2.8	2.03
Shale	2.4 - 2.8	2.16
Slate	2.5 - 2.8	2.23
Trap Rock	2.6 - 3.0	2.36

SPG_e is provided on the Explosive Material Manufacturers Safety Data Sheet

Burden Estimated from Specific Gravity (Density Ratio)

Specific Gravity of explosive (SPG_e) =

Specific Gravity of rock (SPG_r) =

Diameter of Explosive (D_e) =

SPG_e / SPG_r = Density Ratio (DR)

Note: Using the Density Ratio / Burden Estimate Table Find DR in row 1. Find D_e in column 1. Where both vertical column 1 and horizontal row 1 intersect the approximate Burden is read in feet.

Diameter of Explosive	DENSITY RATIO / BURDEN ESTIMATE TABLE Density Ration (DR)						
	0.20	0.30	0.40	0.50	0.60	0.70	0.80

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SDS and Technical Information Data Sheets

TECHNICAL DATA SHEET

CAST BOOSTERS

TROJAN® SPARTAN® SR™

Shock Resistant Cast Booster

Properties

SDS #1108

Density	g/cc avg	1.65
Velocity	m/sec	7,550
	ft/s	24,800
Detonation Pressure	Kbars	235
Water Resistance		6 months with no loss of sensitivity
Shelf Life Maximum		5 years from date of production
Maximum Usage Temperature*		65°C / 150°F

*Never expose explosive materials to sources of heat exceeding 66°C (150°F) or to open flame, unless such materials or procedures for their use have been recommended for such exposure by the manufacturer.

All Dyno Nobel Inc. energy and gas volume values except Velocity and Detonation Pressure are calculated using PRODET™ the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.

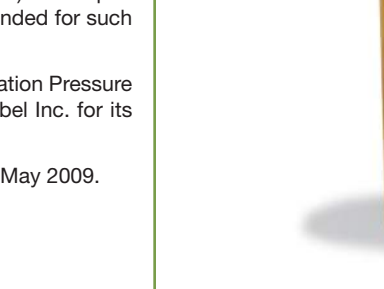
Velocity and Detonation Pressure are the result of empirical methods during May 2009.

IMPORTANT WARNING !

NEVER USE A DETONATOR LESS THAN 8.89cm (3.5 inch) WITH THE TROJAN SPARTAN SR CAST BOOSTER. MISFIRES MAY RESULT.

Hazardous Shipping Description

- UN 0042 Boosters, 1.1D PG II



PRODUCT DESCRIPTION

TROJAN SPARTAN SR cast boosters are detonator sensitive, high density, high energy molecular explosives available in three sizes designed to optimize initiation of all booster detonator sensitive explosives.

In addition to the internal through-tunnel and detonator well, the TROJAN SPARTAN SR (Shock Resistant) cast booster has an internal sleeve to protect the circuit board in electronic detonators and is designed specifically for use with Dyno Nobel's DigiShot®, DigiShot® Plus, SmartShot®, and DigiShot® Plus 4G electronic detonators. The TROJAN SPARTAN SR can, however, also be used with any detonator (minimum length = 8.89 cm / 3.5 in) that may require additional protection from high shock, water hammer, effects during decking, corner operations or in certain geologies.

The TROJAN SPARTAN SR (Shock Resistant) cast booster also incorporates the unique Caplock™ feature which holds the detonator in place more securely and makes it more difficult for the detonator to be pulled out of capwell position while it is being lowered into the borehole. Even with this new Caplock feature, the detonator can still be removed if necessary.

Product Disclaimer: Please see reverse side.

DYNO® Dyno Nobel

TECHNICAL DATA SHEET

TROJAN® SPARTAN® SR™

Shock Resistant Cast Booster

Properties Cont.

Packaging

Unit Weight		Unit Dimensions				Case Quantity	Gross Weight/Case	
		Length		Diameter				
g	oz	cm	in	cm	in		kg	lbs
150	5.5	11.9	4.7	3.6	1.4	95	18.9	41.8

Note: All weights and dimensions are approximate.

Case Dimensions

42 x 33 x 14 cm 16 ½ x 13 x 5 ½ in

PRODUCT DESCRIPTION - continued

TROJAN SPARTAN SR cast boosters are formulated from the highest quality PETN and other high explosive materials ensuring reliability, consistency and durability in all blasting environments.

The fluorescent yellow container makes the TROJAN SPARTAN booster more visible on the blast site and reduces the possibility of misplaced charges.

APPLICATION RECOMMENDATIONS

- NEVER force the detonator into the through-tunnel, the detonator-well or otherwise attempt to clear these areas if obstructed. If the through-tunnel or detonator-well does not accommodate the detonator, do not use the booster. Notify your Dyno Nobel representative.
- ALWAYS use a detonator with a minimum length of 8.89 cm (3.5 in). The detonator well length is 10.2 cm (4.0 in).
- Extremely low temperatures do not affect the performance of cast boosters with commercial detonators. Low temperatures do affect detonators and detonating cord. Be certain your initiation system is suitable for your application in extremely low temperatures. Cast boosters are more susceptible to breakage during handling in extremely cold temperatures.

TRANSPORTATION, STORAGE AND HANDLING

- Dyno Nobel cast boosters must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.
- For maximum shelf life (5 years), Dyno Nobel cast boosters must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old.

ADDITIONAL INFORMATION – Visit **dynonobel.com** for Brochures and Case Studies related to this product.

DYNO® Dyno Nobel

Safety Data Sheet

According to: 1907/2006/EC (REACH), 1272/2008/EC (CLP), and OSHA GHS
Trade Name: CAST BOOSTERS

SECTION 1 – IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
6440 S. Millrock Drive, Suite 150
Salt Lake City, Utah 84121
Phone: 801-364-4800
Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com
www.dynonobel.com

SDS #: 1108
Date: 08/26/2020
Supersedes: 07/20/2020

1.1 Product Identifier
Trade Name: CAST BOOSTERS
Article Number:
No other identifiers
1108
Other Product Identifiers:

DYNO® CORD SENSITIVE BOOSTERS - CS35, CS45, CS90, CS135
TROJAN® SPARTAN®
TROJAN® SPARTAN® Slider
TROJAN® Stinger
TROJAN® NB
TROJAN® NB UNIVERSAL
TROJAN® Twinplex
TROJAN® SPARTAN® SR
TROJAN® SPARTAN® Cone
TROJAN® Ringprime
TROJAN® SPARTAN® CSU
TROJAN® WB
TROJAN® SHIELD™

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. Emergency Telephone Number

CHEMTREC	**1-800-424-9300**	**(US/Canada)**
	+01 703-527-3887	**(International)**

SECTION 2 – HAZARD(S) 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.

Information Concerning Particular Hazards for Human and Environment: The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
Classification System: The classification is according to the latest editions of the EU-lists and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists and is supplemented by information from technical literature and by information provided by the company.
Additional Information: There are no other hazards not otherwise classified that have been identified.
0 percent of the mixture consists of component(s) of unknown toxicity.

2.2 Label Elements
Labelling According to Regulation (EC) No 1272/2008
The product is additionally classified and labelled according to the Globally Harmonized System within the United States (GHS).
The product is classified and labelled according to the CLP regulation.
Hazard Pictograms


GHS01

Signal Word	: Danger
Hazard-determining components of labelling:	: pentaerythritol tetranitrate (PETN) : octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) : perhydro-1,3,5-trinitro-1,3,5-triazine (RDX) : 2,4,6-trinitrotoluene (TNT) : aluminium powder (pyrophoric)
Hazard statements	: H201 Explosive; mass explosion hazard.
Precautionary Statements	: P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P250 - Do not subject to grinding/shock/friction. P280 - Wear protective gloves/protective clothing/eye protection/face protection. P373 - DO NOT fight fire when fire reaches explosives. P370+P380 - In case of fire: Evacuate area. P372 - Explosion risk in case of fire. P401 - Store in accordance with local/regional/national/international regulations. P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.
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

3.1 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
CAS: 118-96-7 EINECS: 204-289-6 Index number: 609-008-00-4	2,4,6-trinitrotoluene (TNT) T R23/24/25; E R2; N R51/53 R33
	Expl. 1.1, H201 Acute Tox. 3, H301; Acute Tox. 3, H311; Acute Tox. 3, H331 STOT RE 2, H373 Aquatic Chronic 2, H411
CAS: 7429-90-5	aluminum metal F R15
	Water-react. 1, H260
CAS: 121-82-4 EINECS: 204-500-1	perhydro-1,3,5-trinitro-1,3,5-triazine (RDX) T R25; E R2
	Expl. 1.1, H201 Acute Tox. 3, H301
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

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

SECTION 4 – FIRST AID MEASURES

4.1 Description of First Aid Measures
General Information: No special measures required.
After Inhalation: Supply fresh air; consult doctor in case of complaints.
After Skin Contact: Generally the product does not irritate the skin.
Wash with soap and water.
If skin irritation is experienced, consult a doctor.
After Eye Contact: Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
After Swallowing: Do not induce vomiting; call for medical help immediately.
4.2 Most Important Symptoms and Effects, Both Acute and Delayed
Blast injury if mishandled.
Hazards: Danger of blast or crush-type injuries.
4.3 Indication of Any Immediate Medical Attention and Special Treatment Needed
Product may produce physical injury if mishandled. Treatment of these injuries should be based on the blast and compression effects.

SECTION 5 – FIRE-FIGHTING 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
Evacuate area.
Wear protective clothing.
Ensure adequate ventilation.
Keep away from ignition sources.
Protect from heat.
Isolate area and prevent access.
6.2 Environmental Precautions
No special measures required.
6.3 Methods and Material for Containment and Cleaning Up
Pick up mechanically.
Send for recovery or disposal in suitable receptacles.
Dispose unusable material as waste according to item 13.

6.4 Reference to Other Sections
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

SECTION 7 – HANDLING AND STORAGE

7.1 Precautions for Safe Handling
Open and handle receptacle with care.
Handle with care. Avoid jolting, friction and impact.
Use only in well ventilated areas.
Do not subject to grinding/shock/friction.
Information About Fire - and Explosion Protection: Keep ignition sources away - Do not smoke. Protect from heat. Prevent impact and friction. Emergency cooling must be available in case of nearby fire.
7.2 Conditions for Safe Storage, Including Any Incompatibilities Storage:
Requirements to be Met by Storerooms and Receptacles: Store in a cool location.
Avoid storage near extreme heat, ignition sources or open flame.
Information About Storage in One Common Storage Facility: Store away from foodstuffs.
Store away from oxidising agents.

Further Information About Storage Conditions: Store under lock and key and with access restricted to technical experts or their assistants only.
Keep away from heat.
7.3 Specific End Use(s): No further relevant information available.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Additional Information About Design of Technical Facilities: No further data; see item 7.

8.1 Control Parameters

Ingredients with Limit Values that Require Monitoring at the Workplace:	
118-96-7 2,4,6-trinitrotoluene (TNT)	
PEL (USA)	Long-term value: 1,5 mg/m³ Skin
REL (USA)	Long-term value: 0,5 mg/m³ Skin
TLV (USA)	Long-term value: 0,1 mg/m³ Skin; BEI-M
EL (Canada)	Long-term value: 0,1 mg/m³ Skin
EV (Canada)	Short-term value: 0,2 mg/m³, 0,02 ppm Long-term value: 0,1 mg/m³, 0,01 ppm Skin
7429-90-5 aluminum metal	
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)
121-82-4 perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)	
REL (USA)	Short-term value: 3 mg/m³ Long-term value: 1,5 mg/m³ Skin
TLV (USA)	Long-term value: 0,5 mg/m³ Skin
EL (Canada)	Long-term value: 0,5 mg/m³ Skin
EV (Canada)	Long-term value: 0,5 mg/m³ Skin

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

Ingredients with biological limit values:	
118-96-7 2,4,6-trinitrotoluene (TNT)	
BEI (USA)	1,5 % of hemoglobin Medium: blood Time: during or end of shift Parameter: Methemoglobin (background, nonspecific, semi-quantitative)

Additional Information: The lists valid during the making were used as basis.

8.2 Exposure Controls
Personal Protective Equipment:
General Protective and Hygienic Measures: The usual precautionary measures are to be adhered to when handling chemicals.
Keep ignition sources away - Do not smoke.
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Respiratory Protection: Not required under normal conditions of use.
Respiratory protection may be required after product use.
Protection of Hands: Wear gloves for the protection against mechanical hazards according to NIOSH or EN 388.
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
Material of Gloves: The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
Penetration Time of Glove Material: The exact break through time must 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	:	80 °C (176 °F) (trinitrotoluene)
Boiling point/Boiling range	:	Undetermined.
Flash Point	:	Not applicable.
Flammability (solid, gaseous)	:	Explosive; mass explosion hazard.
Auto/Self-ignition temperature	:	Not determined.
Decomposition temperature	:	Not determined.
Self-igniting	:	Product is not self-igniting.
Danger of explosion	:	Risk of explosion by shock, friction, fire or other sources of ignition.
Explosion limits		
Lower	:	Not determined.
Upper	:	Not determined.
Vapour pressure	:	Not applicable.
Density at 20 °C (68 °F)	:	1,55 - 1,65 g/cm³ (12,935 - 13,769 lbs/gal)
Relative density	:	Not determined.
Vapour density	:	Not applicable.
Evaporation rate	:	Not applicable.
Solubility in / Miscibility with water	:	Variable, dependent upon product composition and packaging.
Partition coefficient (n-octanol/water)	:	Not determined.
Viscosity		
Dynamic	:	Not applicable.
Kinematic	:	Not applicable.
9.2 Other Information	:	No further relevant information available.

SECTION 10 – STABILITY AND REACTIVITY

10.1 Reactivity:

10.2 Chemical Stability:

Thermal Decomposition / Conditions to be Avoided: No decomposition if used and stored according to specifications. Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

10.3 Possibility of Hazardous Reactions: Danger of explosion. Toxic fumes may be released if heated above the decomposition point.

10.4 Conditions to Avoid: Keep ignition sources away - Do not smoke.

10.5 Incompatible Materials: No further relevant information available.

10.6 Hazardous Decomposition Products: Carbon monoxide and carbon dioxide
Nitrogen oxides Hydrocarbons.

SECTION 11 – TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects:
Acute toxicity:
LD/LC50 values relevant for classification: None.
Primary irritant effect:
On the Skin: Not a skin irritant in unused form. Vapors/particles from used product are possibly irritating to skin.
On the Eye: Not an eye irritant in unused form. Vapors/particles from used product are possibly irritating to eyes.
Sensitisation: No sensitising effects known.
Subacute to Chronic Toxicity: No further relevant information available.
Acute Effects (Acute Toxicity, Irritation and Corrosivity): Danger of blast or crush-type injuries.
Repeated Dose Toxicity: No further relevant information available.

SECTION 12 – ECOLOGICAL INFORMATION

12.1 Toxicity
Aquatic Toxicity: Toxic for aquatic organisms
12.2 Persistence and Degradability: No further relevant information available.
12.3 Bioaccumulative Potential: No further relevant information available.
12.4 Mobility in Soil: No further relevant information available.
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.
Toxic for aquatic organisms
Due to available data on eliminability/decomposition and bioaccumulation potential prolonged term damage of the environment cannot be excluded.
12.5 Results of PBT and vPvB Assessment PBT: Not applicable.
vPvB: Not applicable.
12.6 Other Adverse Effects: No further relevant information available.

SECTION 13 – DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods:
Recommendation: Must not be disposed together with household garbage. Do not allow product to reach sewage system. Damaged materials pose a danger to anyone in the immediate area; consult experts for disposal of damaged products.
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. Residual materials should be treated as hazardous.
Uncleaned Packaging:
Recommendation: Disposal must be made according to official regulations.

SECTION 14 – TRANSPORT INFORMATION

14.1 UN-Number

DOT, ADR, IMDG	:	UN0042
IATA	:	FORBIDDEN

14.2 UN Proper Shipping Name

DOT, IMDG : Boosters, without detonator
ADR : 0042, BOOSTERS, WITHOUT DETONATOR
IATA : FORBIDDEN

14.3 Transport Hazard Class(es)

DOT, ADR, IMDG
Class : 1.1
Label : 1.1D

IATA
Class : FORBIDDEN

14.4 Packing Group

DOT, ADR, IMDG : II
IATA : FORBIDDEN

14.5 Environmental Hazards:

Marine Pollutant: : No
Special Marking (IATA): : Prohibited from Transport in Passenger Aircraft.

14.6 Special Precautions for User: Not applicable.

EMS Number: : F-B,S-X

14.7 Transport in Bulk According to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

Transport/Additional information:

ADR
Limited quantities (LQ) : 0
Excepted quantities (EQ) Code: E0
Not permitted as Excepted Quantity
Tunnel restriction code 1

IMDG
Limited Quantities (LQ) : 0
Excepted Quantities (EQ) : Code: E0
Not permitted as Excepted Quantity

IATA : FORBIDDEN.
UN "Model Regulation" : UN0042, BOOSTERS, WITHOUT DETONATOR, 1.1D, II

SECTION 15 – REGULATORY INFORMATION

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture
United States (USA)

SARA
Section 355 (Extremely Hazardous Substances)
None of the ingredients are listed.
Section 313 (Specific Toxic Chemical Listings)
7429-90-5 aluminum metal
TSCA (Toxic Substances Control Act)
All ingredients are listed.
Proposition 65 (California)
Chemicals known to cause cancer
118-96-7 2,4,6-trinitrotoluene (TNT)
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)		
118-96-7 121-82-4 2691-41-0	2,4,6-trinitrotoluene (TNT) perhydro-1,3,5-trinitro-1,3,5-triazine (RDX) octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	C C D
IARC (International Agency for Research on Cancer)		
118-96-7	2,4,6-trinitrotoluene (TNT)	3
TLV (Threshold Limit Value established by ACGIH)		
7429-90-5 121-82-4	aluminum metal perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)	A4 A4
NIOSH-Ca (National Institute for Occupational Safety and Health)		
None of the ingredients are listed.		
Canada **Canadian Domestic Substances List (DSL)**		
All ingredients are listed.		
Canadian Ingredient Disclosure list (limit 0.1%)		
None of the ingredients are listed.		
Canadian Ingredient Disclosure list (limit 1%)		
118-96-7 2,4,6-trinitrotoluene (TNT) 7429-90-5 aluminum metal **Other regulations, limitations and prohibitive regulations** This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.		
Substances of very high concern (SVHC) according to REACH, Article 57		
None of the ingredients are listed.		

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

SECTION 16 – OTHER INFORMATION

Revision Date : 22/05/2015
Other Information :
Relevant Phrases

- H200 Unstable explosives.
- H201 Explosive; mass explosion hazard.
- H260 In contact with water releases flammable gases which may ignite spontaneously.
- H301 Toxic if swallowed.
- H311 Toxic in contact with skin.
- H331 Toxic if inhaled.
- H315 Causes skin irritation.
- H373 May cause damage to organs through prolonged or repeated exposure.
- H411 Toxic to aquatic life with long lasting effects.
- R15 Contact with water liberates extremely flammable gases.
- R2 Risk of explosion by shock, friction, fire or other sources of ignition.
- R22 Harmful if swallowed.

- R23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
- R24 Toxic in contact with skin.
- R25 Toxic if swallowed.
- R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.
- R33 Danger of cumulative effects.
- R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Abbreviations and acronyms:

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

Sources

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Dyno Nobel SDS

BLASTEX®

Technical Information

PACKAGED EXPLOSIVES

Small & Large Diameter Cast Booster Sensitive Emulsion

Product Description

BLASTEX is a booster sensitive, water resistant, packaged emulsion explosive designed to satisfy a majority of medium diameter explosive applications for quarry and construction blasting. It is a cost effective alternative to most detonator sensitive, water resistant, packaged emulsion explosives. BLASTEX is available in two grades with increasing energy level for each.

Application Recommendations

- Package diameter and type affect product density. Use cartridge count to determine actual explosive charge weight.
- Ensure continuous column loading. For column lengths in excess of 6 m (20 ft) or whenever column separation is suspected, multiple priming is recommended.
- Emulsion explosives are susceptible to "dynamic shock" and may detonate at low order or fail completely when applied in very wet conditions, where explosive charges or decks are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for alternate product recommendations when these conditions exist.
- **ALWAYS** use a cast booster as a primer for BLASTEX to ensure maximum performance.
- **ALWAYS** use a 340 g (12 oz) or larger cast booster at internal product temperatures higher than -18º C (0º F). At internal product temperatures below -18º C (0º F) and higher than -34º C (-30º F) use a 454 g (16 oz) or larger cast booster.
- **NEVER** use BLASTEX at internal product temperatures below -34º C (-30º F). At internal product temperatures below -34º C (-30º F), adequate product warm-up time must be allowed after loading into boreholes and before initiation.
- Use with detonating cord is not recommended.

Properties

SDS #1063

		BLASTEX	BLASTEX PLUS
Density	(g/cc) Avg	1.26	1.26
Energy[a]	(cal/g)	740	800
	(cal/cc)	930	1,010
Relative Weight Strength[a]		0.84	0.91
Relative Bulk Strength[a,b]		1.29	1.40
Velocity[c]	(m/s)	5,000	4,900
	(ft/s)	16,400	16,100
Detonation Pressure[c]	(Kbars)	79	76
Gas Volume[a]	(moles/kg)	44	39
Fume Class		IME1 & NRCan[d]	IME1
Shelf Life Maximum		1 year (from date of production)	
Maximum Water Depth		45 m (150 ft)	
Water Resistance		Excellent	

[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 @ 75 mm (3 in) diameter

[d] Approved by Natural Resources Canada as Fume Class 1 in:
*valeron chub 50 mm (2 in) diameter and greater
*shot bag 125 mm (5 in) diameter and greater

Hazardous Shipping Description

Explosive, Blasting, Type E, 1.5D, UN 0332 II

See Product Disclaimer on page 2

DYNO Dyno Nobel

Groundbreaking Performance™

BLASTEX®

Technical Information

Transportation, Storage and Handling

- BLASTEX and BLASTEX PLUS must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
- Packaged emulsions have a shelf life of one (1) year when stored at temperatures between -18º C and 38º C (0º F and 100º F). 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 ad the Safety Library Publications of the Institute of Makers of Explosives.

Packaging Details

- Package diameter and type affect product density. Use cartridge count to determine actual explosive charge weight.
- All weights are approximate.
- BLASTEX and BLASTEX PLUS are available in a wide variety of sizes. Custom sizes are subject to surcharge and may require longer than usual lead times.
- Check with your Dyno Nobel representative should you have any questions.

Packaging—Chub

Diameter x Length		Blastex	Blastex Plus	Case Quantity	Case Weight		Net Explosive Weight / Chub	
mm	in				kg	lbs	kg	lbs
50 x 400	2 x 16	■	■	18	18.0	40	1.00	2.20
57 x 400	2¼ x 16	■	■	14	17.7	39	1.26	2.78
65 x 400	2½ x 16	■	■	12	18.1	40	1.51	3.33
70 x 400	2¾ x 16	■	■	9	17.3	38	1.92	4.23
75 x 400	3 x 16	■	■	8	18.2	40	2.27	5.00
89 x 400	3½ x 16	■	■	6	16.7	37	2.77	6.11

Packaging—Shot Bag

Bag Diameter		Bag Weight		Tote Bag Quantity
mm	in	kg	lbs	
125	5	11.3	25	40

Tote Bag Dimensions

84 x 84 x 94 cm 33 x 33 x 37 in

Case Dimensions

44 x 35 x 20 cm 17.25 x 13.875 x 7.875 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

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 #: 1063
Date: 02/02/2017
Supersedes: 06/02/2016

Product Identifier
Product Form: Mixture
Product Name: Packaged Emulsion Explosives

Trade Name(s):
Synonyms:

BLASTEX®
BLASTEX® PLUS
BLASTEX® TX
BLASTGEL® TX
BLASTGEL® ARCTIC

Other Means of Identification
Product Class: Emulsion Explosives, Packaged

Intended Use of the Product:
Industrial blasting 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
Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS07

Signal Word (GHS-US) : Danger
Hazard Statements (GHS-US) : H205 – May mass explode in fire
Precautionary Statements (GHS-US) : P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P264 - Wash exposed areas. thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
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 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.

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

Other Hazards

Hazards Not Otherwise Classified (HNOC): Not available
Other Hazards: None

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	65 - 85	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Sodium nitrate	(CAS No) 7631-99-4	0.1 – 10	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
Aluminum	(CAS No) 7429-90-5	0.1 - 3	Comb. Dust, H232 Flam. Sol. 1, H228 Water-react. 2, H261
Mineral Oil	(CAS No) 64742-54-7	0 – 2	Asp. Tox. 1, H304
Wax (paraffin)	(CAS No) 8002-72-2	0.0 – 2.2	Not Classified

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

This is a packaged product that will not result in exposure to the contents under normal conditions of use. In the event of contact, administer first aid appropriate for symptoms present.

General: Never give anything by mouth to an unconscious person. If exposed or concerned, seek medical advice and attention.

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. Gently wash with plenty of soap and water followed by rinsing with water for at least 15 minutes. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do not induce vomiting. Immediately call a POISON CENTER or doctor/physician.

Most Important Symptoms and Effects Both Acute and Delayed

General: Avoid ingestion, contact with eyes or skin.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause serious eye irritation.

Ingestion: Seek medical attention.

Chronic Symptoms: None expected under normal conditions of use.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable 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.
Unsuitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS
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: This product is an explosive with mass detonation hazard. Heating may cause an explosion.
Reactivity: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in a large quantity.

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. Guard against re-entry.
Protection During Firefighting: See above
Hazardous Combustion Products: Nitrogen Oxides (NO_x), Carbon Monoxide (CO). Ammonia.
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. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Eliminate every possible source of ignition.
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: Eliminate ignition sources. Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up
Methods for Cleaning Up: Protect from all ignition sources. If no fire danger is present, and product is undamaged and/or uncontaminated, pick up or sweep up and repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.
Reference to Other Sections
See heading 8, Exposure Controls and Personal Protection. Concerning disposal elimination after cleaning, see section 13.

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling
This is a packaged product that will not result in exposure to the contents under normal conditions of use.
Additional Hazards When Processed: This product is an explosive and should only be used under the supervision of trained and licensed personnel. Use accepted safe industry practices when handling and using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work. Do not eat, drink or smoke when using this product.
Conditions for Safe Storage, Including Any Incompatibilities
Technical Measures: 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.
Storage Conditions: Store in cool, dry, well-ventialated location. Store in compliance with Federal, State and local regulations. Keep away from heat, flame, ignition sources and strong shock. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of

heat. Isolate from incompatibles.
Incompatible Materials: Corrosives (strong acids and strong bases or alkalis)
Specific End Use(s) For industrial blasting applications.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Occupational Exposure Limits

Ingredients:	Product identifier:	ACGIH TLV-TWA	OSHA PEL-TWA
Ammonium nitrate	(CAS No) 6484-52-2	None	None
Sodium nitrate	(CAS No) 7631-99-4	None	None
Aluminum	(CAS No) 7429-90-5	10 mg/m^3 (dust)	15 mg/m^3 (total)
Mineral Oil	(CAS No) 64742-54-7	5 mg/m^3 (mist)	5 mg/m^3 (mist)
Wax (paraffin)	(CAS No) 8002-72-2	2-10 mg/m^3 (wax fume)	None

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).

Exposure Controls
Appropriate Engineering Controls: Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Personal Protective Equipment: Gloves. Protective goggles. Protective clothing.
Materials for Protective Clothing: protective clothing.
Hand Protection: Protect against incidental skin contact.
Eye Protection: Chemical goggles or safety glasses.
Skin and Body Protection: Wear suitable protective clothing.
Respiratory Protection: Use a NIOSH-approved respirator or self-contained breathing apparatus whenever exposure may exceed established Occupational Exposure Limits.
Environmental Exposure Controls: Do not allow the product to be released into the environment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	White or pink opaque semi-solid, which will appear gray if product contains aluminum. Typically paper or plastic chub packaging.
Odor	:	Faint petroleum odor
Odor Threshold	:	Not available
pH	:	Not applicable
Evaporation Rate	:	< 1
Melting Point	:	Not applicable
Freezing Point	:	Not applicable
Boiling Point	:	Not applicable
Flash Point	:	Not applicable

Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Ammonium nitrate: 210 °C (410 °F)
Flammability (solid, gas)	:	Not applicable
Lower Flammable Limit	:	Not applicable
Upper Flammable Limit	:	Not applicable
Vapor Pressure	:	Not applicable
Relative Vapor Density at 20 °C	:	Not applicable
Relative Density	:	Not applicable
Density	:	1.20 - 1.30 g/cc
Specific Gravity	:	Not applicable
Solubility	:	Partially soluble in water
Partition coefficient: n-octanol/water	:	Not available
Viscosity	:	Not available
Explosive properties	:	Explosive; mass explosion hazard
Explosion Data – Sensitivity to Mechanical Impact	:	Not sensitive
Explosion Data – Sensitivity to Static Discharge	:	Not sensitive

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in a large quantity.
Chemical Stability: Stable under normal temperature and pressure.
Possibility of Hazardous Reactions: Hazardous polymerization will not occur.
Conditions to Avoid: Keep away from heat, flame, ignition sources and strong shock.
Incompatible Materials: Corrosives (strong acids and strong bases or alkalis).
Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO), Ammonia

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: May cause eye irritation.
Respiratory or Skin Sensitization: Not classified
Germ Cell Mutagenicity: Not classified
Teratogenicity: Not classified
Carcinogenicity: Not classified
Specific Target Organ Toxicity (Repeated Exposure): Not classified
Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: Not classified
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: Causes eye irritation.
Symptoms/Injuries After Ingestion: If ingested, seek medical attention.

Information on Toxicological Effects - Ingredient(s)
LD50 and LC50 Data:

Sodium nitrate (7631-99-4)

LD50 Oral Rat	> 2000 mg/kg
Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Not classified

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Persistence and Degradability

Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**

Bioaccumulative Potential

Sodium nitrate (7631-99-4)	
Bioaccumulative Potential	Not expected to bioaccumulate.

Ammonium nitrate (6484-52-2)	
BCF fish 1	No bioaccumulation expected.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

Toxicity Not classified

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

Additional Information: None

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E or Agent blasting, Type E

Hazard Class : 1.5D

Identification Number : UN0332

Label Codes : 1.5D

Packing Group : II

ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)

Hazard Class : 1.5D

Identification Number : UN0332

Label Codes : 1.5D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y

14.3 In Accordance with IATA
Proper Shipping Name : AGENT, BLASTING TYPE E
Identification Number : UN0332
Hazard Class : 1
Label Codes : 1.5D

ERG Code (IATA) : 1L

14.4 In Accordance with TDG
Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Packing Group : II
Hazard Class : 1.5D
Identification Number : UN0332
Label Codes : 1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Packaged Emulsion Explosives

Bureau of Alcohol Tobacco & Firearms (BATF)
Department of Transportation (DOT)
Mine Safety & Health Administration (MSHA)

Canadian Regulations

Packaged Emulsions

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

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

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

Revision date : 02/02/2017
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:

Expl. 1.5	Explosive Category 1.5
H205	May mass explode in fire

Party Responsible for the Preparation of This Document
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2795 East Cottonwood Parkway, Suite 500
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Dyno Nobel SDS

NONEL® EZ DET®CPZ 1.4B

Technical Information

Nonelectric Blast Initiation System
Perchlorate Free

Product Description

NONEL® nonelectric delay detonator EZ DET® 1.4B units consist of a length of orange shock tube with a surface detonator attached to one end and a Standard (#8) in-hole detonator on the other. The surface detonator is inside a color-coded plastic EZ™ Connector block to facilitate easy connections to shock tube leads. This block can hold up to 6 shock tube leads. Easy-to-read, color-coded delay tags display the delay number and nominal firing time prominently.

NONEL EZ DET units can be easily connected to one another to satisfy basic blast design requirements in construction, mining, and quarry operations. They can also be used in combination with NONEL MS, NONEL EZTL™ and/or NONEL TD detonators to satisfy complex blast design requirements and minimize inventory of initiation system components.

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** select a NONEL EZ DET unit having more than enough tubing length to extend from the planned primer location in the borehole to the collar of the next hole.

Properties

MSDS #1122

Net Explosive Content per 100 units 0.0810 kg / 0.1782 lbs

Nominal Time (msec)	Delay Code	Connector Block Color
17/350	DBZ	Yellow
25/350	ABZ	Red
25/375	AEZ	Red

Hazardous Shipping Description

Detonator assemblies nonelectric, 1.4B, UN 0361 PG II

See Product Disclaimer on page 2.

DYNO Dyno Nobel

Groundbreaking Performance™

NONEL® EZ DET® CPZ 1.4B

Technical Information

Application Recommendations (continued)

- **ALWAYS** protect the plastic EZ Connector block and all shock tube leads from impact or damage during the loading and stemming operations. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ Connector block contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.
- **ALWAYS** be sure that the shock tube(s) are securely inserted, one at a time, into the EZ Connector block. The head of the EZ Connector block should rise to accept the shock tube and return to a closed position with an audible click.
- **ALWAYS** ensure that individual shock tubes remain aligned side by side in the connector channel and do not cross one over the another on insertion.
- **NEVER** use NONEL EZ DET units with detonating cord. The low strength surface detonator will not initiate detonating cord and may cause misfires.
- **NEVER** attempt to disassemble the delay detonator from the plastic EZ Connector block or use the detonator without the connector.
- **NEVER** place more than 6 shock tube leads into the plastic EZ Connector block. Misfires may result.
- **NEVER** pull, stretch, kink or put tension on shock tube such that the tube could break.
- **NEVER** splice NONEL EZ DET shock tube together to extend between holes.
- **NEVER** connect NONEL EZ DET units together until all holes have been primed, loaded and stemmed and the blast site has been cleared.

Transportation, Storage and Handling

- NONEL EZ DET 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 EZ DET 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		Product Code	Case Type	Quantity per Case
m	ft			
4.5	16	DX---616	D*	60
7	24	DX---623	D*	60
9	30	DX---629	D*	40
12	40	DX---641	D*	30
18	60	DX---660	DC	50
24	80	DX---680	DC	40
30	100	DX---6M0	DC	30

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

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.
- Replace "---" in Product Code with delay desired.

Case Dimensions

Detpak Case (DC)	48 x 45 x 26 cm	18¾ x 17¾ x 10¼ in
Detpak (D)	44 x 22 x 25 cm	17 ½ x 8 ¾ x 10 in

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NONEL® EZTL™ CPZ

Technical Information

Nonelectric Trunkline Delay Detonators Perchlorate Free

Product Description

NONEL® nonelectric delay detonator EZTL™ units consist of a length of yellow shock tube, with a surface detonator attached to one end and the other end sealed. The detonator is housed in a plastic EZ Connector block which facilitates easy connection to shock tube. A white J-hook is affixed near the sealed end. Easy-to-read, color-coded delay tags display the delay number and nominal firing time prominently.

EZTL detonators are designed for use with NONEL MS and EZ DET® units to provide effective and accurate surface timing between blastholes and/or rows of blastholes in surface and underground blasting designs.

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** be sure that the shock tube(s) are securely inserted, one at a time, into the plastic EZ connector. The head of the connector block should rise to accept the tube, and return to a closed position with an audible click.
- **ALWAYS** ensure that the individual shock tubes remain aligned side by side in the EZ connector channel and do not cross over one another during insertion.
- **ALWAYS** protect the plastic EZ connector and all shock tube leads from impact or

Properties

MSDS #1122

Net Explosive Content per 100 units 0.0240 kg / 0.0529 lbs

Delay Time (msec)	Delay Code	Connector Block Color
17	17Z	Yellow
25	25Z	Red
33	33Z	Green

Hazardous Shipping Description

Detonator assemblies nonelectric, 1.4B, UN 0361 PG II

See Product Disclaimer on page 2.

DYNO Dyno Nobel

Groundbreaking Performance™

NONEL® EZTL™ CPZ

Technical Information

Application Recommendations (continued)

damage. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ connector contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.

- **NEVER** use NONEL EZTL detonators with detonating cord. The low strength surface detonator will not initiate detonating cord.
- **NEVER** attempt to disassemble the delay detonator from the EZ connector block or use the detonator without the connector.
- **NEVER** place more than 6 shock tube leads into an EZ connector block. Misfires may result.
- **NEVER** tie-in NONEL EZTL units until all holes have been primed, loaded, stemmed and the blast site has been cleared**.**

Transportation, Storage and Handling

- NONEL EZTL 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 EZTL 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		Product Code	Case Type	Quantity per	
m	ft			Case*	Inner Carton
3.5	12	DY---812ME	D	90	30
6	20	DY---820ME	D	60	20
9	30	DY---830ME	D	45	15
12	40	DY---840ME	D	30	10

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

- Length rounded to nearest one-half meter.
- Case weight varies by length & delay; see case label for exact weight.
- Replace "---" in Product Code with delay desired.

Case Dimensions

Detpak (D) 44 x 22 x 25 cm 17½ x 8¾ x 10 in

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Material Safety Data Sheet

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

MSDS # 1322
Date 08/29/12

Supercedes
New

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): NONEL® EZ DET® CPZ
NONEL® EZTL™ CPZ

Product Class: NONEL® Non-electric Delay Detonators

Product Appearance & Odor: Aluminum cylindrical shell with varying length and diameter of attached colored plastic tubing. The detonator may be enclosed in a plastic housing, and an assembly may contain two detonators. Odorless.

DOT Hazard Shipping Description: UN0361 Detonator assemblies, non-electric 1.4B II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

		Occupational Exposure Limits	
Ingredients	**CAS#**	**OSHA PEL-TWA**	**ACGIH TLV-TWA**
Pentaerythritol Tetranitrate (PETN)	78-11-5	None[1]	None[2]
Lead Azide	13424-46-9	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Lead	7439-92-1	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Silicon	7440-21-3	15 mg / m^3 (total dust) 5 mg / m^3 (respirable fraction)	10 mg / m^3
Red Lead (Lead tetroxide)	1314-41-6	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Titanium dioxide	13463-67-7	15 mg/m^3	10 mg/m^3
Silica (crystalline)	61790-53-2	See Note Below	0.05 mg/m^3 (resp frac)
Aluminum	7429-90-5	15 mg/m^3 (total dust) 5 mg/m^3 (respirable fraction)	5 mg/m^3
Antimony	7440-36-0	0.5 mg/m^3	0.5 mg/m^3
Cyclotetramethylene Tetranitramine (HMX)	2691-41-0	None[1]	None[2]
Diazodinitrophenol	4682035	No value established	No value established

[1] Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m^3 ; respirable fraction, 5 mg/m^3 .
[2] Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m^3 ; respirable part., 3 mg/m^3 .
Note: The OSHA PEL for crystalline silica is calculated as follows:
Quartz, respirable: 10 mg/m^3 [e] / % SiO_2 + 2 Quartz, total dust: 30 mg/m^3 / % SiO_2 + 2

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).

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Density: Not Applicable
Percent Volatile by Volume: Not Applicable
Evaporation Rate (Butyl Acetate = 1): Not Applicable

Vapor Pressure: Not Applicable
Density: Not Applicable
Solubility in Water: Not Applicable

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable **Flammable Limits:** Not Applicable
Extinguishing Media: (See Special Fire Fighting Procedures section.)
Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe, distant location. Allow fire to burn unless it can be fought remotely or with fixed extinguishing systems (sprinklers).
Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

This is a packaged product that will not result in exposure to the explosive material under normal conditions of use. Exposure concerns are primarily with post-detonation reaction products, particularly heavy metal compounds.

Eyes: No exposure to chemical hazards anticipated with normal handling procedures. Particulates in the eye may cause irritation, redness, swelling, itching, pain and tearing.
Skin: No exposure to chemical hazards anticipated with normal handling procedures. Exposure to post-detonation reaction products may cause irritation.
Ingestion: No exposure to chemical hazards anticipated with normal handling procedures. Post-detonation reaction product residue is toxic by ingestion. Symptoms may include gastroenteritis with abdominal pain, nausea, vomiting and diarrhea. See systemic effects below.

Inhalation: Not a likely route of exposure. See systemic effects below.
Systemic or Other Effects: None anticipated with normal handling procedures. Repeated inhalation or ingestion of post-detonation reaction products may lead to systemic effects such as respiratory tract irritation, ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Heavy metal (lead) poisoning can occur.
Carcinogenicity: ACGIH classifies Lead as a “Suspected Human Carcinogen. NTP, OSHA, and IARC consider components contained in this detonator carcinogenic.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.
Skin: Wash with soap and water.
Ingestion: Seek medical attention.
Inhalation: Not applicable.
Special Considerations: None

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact.
Conditions to Avoid: Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock. Do not attempt to disassemble.
Materials to Avoid (Incompatibility): Corrosives (acids and bases or alkalis).
Hazardous Decomposition Products: Carbon Monoxide (CO), Nitrous Oxides (NO_X), Lead (Pb), Antimony (Sb) and various oxides and complex oxides of metals.
Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate all personnel to a safe distant area and allow to burn or fight fire remotely. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. If loose explosive powder is spilled, such as from a broken detonator, only properly qualified and authorized personnel should be involved with handling and clean-up activities. Spilled explosive powder is extremely sensitive to initiation and may detonate. Follow applicable Federal, State, and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: None required for normal handling. Provide enhanced ventilation after use if in underground mines or other enclosed areas.

Respiratory Protection: None required for normal handling.

Protective Clothing: Cotton gloves are recommended.

Eye Protection: Safety glasses are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Only properly qualified and authorized personnel should handle and use explosives. Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

Precautions to be taken during use: Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.

Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

These products contain the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	Max. lbs/1000 units
Lead	7439-92-1	36.0
	(Use Toxic Chemical Category Code)	
Lead Compounds	N420	2.0

Range* of Section 313 Chemicals in each product

Product	lb Pb per 1000 detonators	lb Pb compounds per 1000 detonators
NONEL® EZ DET® CPZ	**22 - 36**	**2.0**
NONEL® EZTL™ CPZ	**5 - 15**	**0.5 – 0.7**

*** The exact quantity and weight percent of Section 313 Chemicals in each delay period and tubing length for each product is available upon request.**

Disclaimer

NONEL® Lead Line

Technical Information

Nonelectric Shock Tube

Product Description

NONEL LEAD LINE is NONEL shock tube spooled at the factory in 763 meter (2,500 foot) lengths for easy application and deployment. NONEL LEAD LINE shock tube is a small diameter, three-layer plastic tube coated on the innermost wall with a reactive explosive compound. When initiated, NONEL shock tube propagates a low energy signal, similar to a dust explosion, at approximately 2000 m/sec (6,500 ft/sec) along the tube's length with minimal disturbance to the outside of the tube. The signal is transmitted from one NONEL shock tube to another through field-assembled splices.

NONEL LEAD LINE provides maximum flexibility to the blaster in choosing a position of safety from which to initiate nonelectric blast rounds in either underground or surface applications. NONEL LEAD LINE is the only NONEL product that can be cut and spliced into a NONEL detonator product to construct a custom length nonelectric starter assembly.

Application Recommendations

- **ALWAYS** splice NONEL LEAD LINE to NONEL EZTL™ nonelectric trunkline delay detonators, NONEL EZ DET® nonelectric blast initiation system, NONEL TD or NONEL Starter detonators to make-up the nonelectric starter assembly when using

Properties

MSDS #1124

Net Explosive Content per 100 units 0.0044 kg
0.0097 lbs

Length		Spools / Case
m	ft	
762	2500	2

- Length rounded to nearest one-half meter.
- See case label for exact case weight.

Hazardous Shipping Description

Articles, Explosives, N.O.S. (HMX, Aluminum), 1.4S, UN 0349, PG II

See Product Disclaimer on page 2.

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Groundbreaking Performance™

NONEL® Lead Line

Technical Information

Application Recommendations (continued)

NONEL LEAD LINE as the primary initiator for NONEL blast rounds.

- **ALWAYS** trim at least 3 m [10 ft] of tubing before inserting into a nonelectric shock tube starting device or whenever dirt and/or moisture may have compromised the open tube ends before making a splice connection.
- **ALWAYS** replace the plastic tube closure over the open end of any NONEL LEAD LINE that remains on the spool and is intended to be used to make up another nonelectric starter assembly.
- **ALWAYS** make the final hook-up of the nonelectric starter assembly to the blast round only after all equipment and non-essential personnel are clear of the blast area.
- **ALWAYS** unspool NONEL LEAD LINE by hand if the starter assembly has been spliced to it and is attached to the blast round.
- **ALWAYS** keep any NONEL LEAD LINE tube ends sealed and free from dirt and moisture since dirt or moisture in the shock tube may cause a misfire.
- **NEVER** use NONEL LEAD LINE for in-hole use. NONEL LEAD LINE is for use outside the borehole only.
- **NEVER** attempt to knot different lengths of shock tube together. Shock tube will not initiate itself through knot connections. It must be spliced.
- **NEVER** remove the plastic tube closure from the NONEL LEAD LINE shock tube until just before splicing.
- **NEVER** attach the starter assembly to the blast round until after the LEAD LINE deployment is complete whenever NONEL LEAD LINE is to be unspooled by any method other than by hand,

Application Recommendations (continued)

- **NEVER** run over NONEL LEAD LINE with equipment. This may damage the shock tube and may cause a misfire. **ALWAYS** replace the NONEL LEAD LINE if it is damaged.
- When making a nonelectric starter assembly using NONEL LEAD LINE, **ALWAYS** remove the plastic tube closure and save for later use. Splice two freshly-cut ends of NONEL shock tube together (one from the NONEL LEAD LINE and the other from the NONEL detonator) by inserting them into opposite ends of the plastic connector sleeve and pushing them toward one another until they are both at least ½ cm (¼ in) in the splice.

Transportation, Storage and Handling

- NONEL LEAD LINE 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 LEAD LINE 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.

Case Dimensions

51 x 25 x 28 cm 20 x 9 ⅞ x 10 ⅞ in

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DYNO® Dyno Nobel

Groundbreaking Performance™

Safety Data Sheet

According to: 1907/2006/EC (REACH), 1272/2008/EC (CLP), and OSHA GHS
Trade Name: Shock Tube

SECTION 1 – IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
6440 S. Millrock Drive, Suite 150
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com
www.dynonobel.com

SDS #: 1124
Date: 07/20/2020
Supersedes: 05/22/2015

1.1 Product Identifier
Trade Name: Shock Tube
Article Number: 1124
Other Product Identifiers:
NONEL® LEAD LINE

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. Emergency Telephone Number

CHEMTREC	**1-800-424-9300**	**(US/Canada)**
	+01 703-527-3887	**(International)**

SECTION 2 – HAZARD(S) 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.
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: Not applicable.
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	: octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
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.
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 available.
vPvB	: Not available.

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

3.1 Mixtures

Description: Mixture of substances listed below with nonhazardous additions.

Dangerous components:	
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: 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

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.
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 – FIRE-FIGHTING 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.
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
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
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: 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.
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.
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: Protective work 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)	:	Fire or projection hazard.
Auto/Self-ignition temperature	:	Not determined.
Decomposition temperature	:	Not determined.
Self-igniting	:	Not determined.
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.

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: Possible in traces.

Nitrogen oxides.

SECTION 11 – TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

Acute Toxicity:

LD/LC50 Values Relevant for Classification: None.

Sensitisation: No sensitising effects known.

Primary irritant effect:

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

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

Sensitisation: No sensitising effects known.

Subacute to Chronic Toxicity: No further relevant information available.

Acute Effects (Acute toxicity, Irritation and Corrosivity): Danger of blast or crush-type injuries.

Repeated dose toxicity: No further relevant information available.

SECTION 12 – ECOLOGICAL INFORMATION

12.1 Toxicity

Aquatic Toxicity: 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.

SECTION 14 – TRANSPORT INFORMATION

14.1 UN-Number
DOT, ADR, IMDG, IATA : UN0349
14.2 UN Proper Shipping Name
DOT : For 10,000 ft spools with Wire Lock Terminations only: Not regulated as an explosive. ARTICLES, EXPLOSIVE, N.O.S. (CONTAINS CYCLOTETRAMETHYLENE TETRANITRAMINE)
ADR : 0349 ARTICLES, EXPLOSIVE, N.O.S. (CONTAINS CYCLOTETRAMETHYLENE TETRANITRAMINE)
IMDG, IATA : ARTICLES, EXPLOSIVE, N.O.S. (CONTAINS CYCLOTETRAMETHYLENE TETRANITRAMINE)
14.3 Transport Hazard Class(es)
DOT
Class : 1.4
Label : 1.4

ADR, IMDG, IATA
Class : 1.4
Label : 1.4S

14.4 Packing Group
DOT, ADR, IMDG, IATA : II
14.5 Environmental Hazards:
Marine Pollutant: : No
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
UN "Model Regulation" : UN0349, ARTICLES, EXPLOSIVE, N.O.S., 1.4S, 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)		
None of the ingredients are listed.		
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)		
2691-41-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	D
IARC (International Agency for Research on Cancer)		
None of the ingredients are listed.		
TLV (Threshold Limit Value established by ACGIH)		
7429-90-5	aluminium powder (pyrophoric)	A4
NIOSH-Ca (National Institute for Occupational Safety and Health)		
None of the ingredients are listed.		
Canada **Canadian Domestic Substances List (DSL)**		
All ingredients are listed.		
Canadian Ingredient Disclosure list (limit 0.1%)		
None of the ingredients are listed.		
Canadian Ingredient Disclosure list (limit 1%)		
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.

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

Revision Date : 07/20/2020
Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200

Relevant Phrases

- H201 Explosive; mass explosion hazard.
- H250 Catches fire spontaneously if exposed to air.
- H261 In contact with water releases flammable gases.
- H301 Toxic if swallowed.
- H311 Toxic in contact with skin.
- 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.
- R22 Harmful if swallowed.
- R24 Toxic in contact with skin.

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
- Expl. 1.4: Explosives, Division 1.4
- 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
- Acute Tox. 3: Acute toxicity, Hazard Category 3

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

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Dyno Nobel SDS

Maine Drilling & Blasting

1966 Emulsion Blend
Technical Data Sheet

1966 Emulsion Blend is based on the Nelson Brothers PowerNel ®1500 or similar Sensitized Bulk Emulsion. For purposes of this document the PowerNel ®1500 was used to develop the information below:

PowerNel® 1500 Specification

PowerNel 1500 is an ammonium nitrate / hydrocarbon emulsion blasting agent in the form of a water-in-oil emulsion explosive. PowerNel 1500 can be used in packaged or bulk form, and it is often used in combination with low cost ANFO in various proportions to meet individual blasting needs. PowerNel 1500 is sensitized to insure effective performance when used under demanding conditions.

PowerNel® 1500 is manufactured to the following specifications:

PowerNel® 1500

Parameter	Specification
Density *g/cc*	1.25 maximum[1]
lb/gal	10.43 maximum[1]
Absolute Weight Strength *cal/g*	645[2]
Absolute Bulk Strength *cal/cc*	806
Relative Bulk Strength *(% ANFO)*	109
Velocity of Detonation[3] *ft/sec*	19,000 – 20,000
Shelf Life (minimum, matrix only)	1 year

The Sensitized Bulk Emulsion is blended to an approximate 80% Emulsion / 20% Ammonium Nitrate ratio for delivery to the job site. Additional ratios may be blended on site by "Quad" blend trucks and include 70/30 and 50/50 ratios.

BLEND	***Sensitized Emulsion***	***80/20***	***70/30****	***50/50****
DENSITY[4] g/cc	**1.25**	**1.27**	**1.29**	**1.34**
Relative Bulk Strength	**109**	**117**	**123**	**135**
Velocity of Detonation ft/sec	**19,000-20,000[3]**	**19,000[5]**	**18,700[5]**	**16,100[5]**
Water Resistance	**Excellent**	**Excellent**	**Excellent**	**Excellent**
Minimum Diameter**	**3"**	**3 ½"**	**5"**	**6"**
Minimum Booster***	**¾ lb**	**¾ lb**	**1 lb**	**2 lb**

*These blends (70/30 & 50/50) are produced on site from a "Quad" truck.

** Recommended minimum diameters

***Recommended minimum priming requirements

All data provided by Nelson Bros. laboratory:

[1] *At normal ambient temperature (approx 75 F)*
[2] *From TIGERWIN Program Code, version 4*
[3] *Measured velocities in 6.75 inch diameter borehole, 100% emulsion*
[4] *Typical values, may vary with ANFO density*
[5] *Typical, averaged values in 6.75 inch borehole*

Maine Drilling & Blasting

Setting Earth Shattering Standards
Since 1966

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Date: 03/16/2018

Supersedes: 08/24/2015 & 09/2005

Maine Drilling & Blasting
88 Gold Ledge Ave,
Auburn, NH 03032

Phone: (207) 582-2338 Toll Free: (800) 370-2338

Product Identifier
Product Form: Mixture
Product Name: 1966 Emulsion Blend

Other Means of Identification
Product Class: Emulsion
Trade Names:
1966 Emulsion Blend

Intended Use of the Product
Industrial applications

Emergency Telephone Numbers: DAY: 603-647-0299
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 – Contains materials 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.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	65 - 90	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Fuel oil / mineral oil blend	(CAS No) 68476-30-2	3 - 9	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
Polymeric Surfactant	NA	0.5 – 2	Not available

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).

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. Comply with the safety library publication No. 4 “Warnings and Instructions” as adopted by the Institute of Makers of Explosives.

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 (68476-30-2)

USA ACGIH	ACGIH TWA (mg/m³)	100 mg/m³ (inhalable fraction and vapor, as total hydrocarbons) 8 h (skin)
USA ACGIH	ACGIH chemical category	Skin - potential significant contribution to overall exposure by the cutaneous route, Confirmed Animal Carcinogen with Unknown Relevance to Humans

Exposure Controls

Appropriate Engineering Controls: Ventilation System: Indoors: A system of local and / or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details. Use explosion-proof equipment. / Outdoors: Work upwind.

Personal Protective Equipment: Personal Respirators (NIOSH Approved): A respirator is not needed under normal and intended conditions of use. If the exposure limit is exceeded and engineering controls are not feasible, use a mask with an organic vapor cartridge or positive pressure air supplied (SCBA) unit. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).

Skin Protection: Gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure - Neoprene, PVC.

Eye Protection: Use chemical safety goggles and / or a full face shield where splashing is possible.

Hygiene Measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	White to tan colored thick cream. If aluminim is present, gray metal particles will be visible. If ammonium nitrate prill is present, white to tan colored granules will be visible.
Odor	:	Slight odor of fuel oil
Odor Threshold	:	Not available
pH	:	Not available
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	165 °F (74 °C) (PMCC)
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20 °C	:	Not available
Density	:	Not available
Specific Gravity	:	1.20 – 1.30
Solubility	:	Not available
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: Avoid temperatures above (212°F (100°C).

Incompatible Materials: Avoid all contamination, especially peroxides and chlorates. Alkaline contamination may liberate ammonia fumes.

Hazardous Decomposition Products: Gaseous nitrogen oxides and carbon oxides: Toxic decomposition products including carbon monoxide (CO) may migrate to off blast-site areas.

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 (68476-30-2)	
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

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 (68476-30-2)	
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: Uncontaminated and contaminated material may be placed in large diameter boreholes and detonated so that the explosive energy is utilized as originally intended. Dispose of under direct supervision of a qualified person according to local, state and federal regulations. Call Maine Drilling & Blasting Safety and Compliance

Department for recommendations and assistance.

Additional Considerations: This material may become a hazardous waste under certain conditions and must be collected, labeled and disposed of per state and federal hazardous waste regulations.

SECTION 14 - TRANSPORT INFORMATION

In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)
Hazard Class : 1.5D
Identification Number : NA0332
Label Codes : 1.5D

Packing Group : II
ERG Number : 140

In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)
Hazard Class : 1
Identification Number : UN0332
Label Codes : 1.5D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y

In Accordance with IATA

Proper Shipping Name : AGENT, BLASTING TYPE E
Identification Number : UN0332
Hazard Class : 1
Label Codes : 1.5D

ERG Code (IATA) : 1L

In Accordance with TDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Packing Group : II
Hazard Class : 1.5D
Identification Number : UN0332
Label Codes : 1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

MDB Blend 1966

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 (68476-30-2)

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

SARA Section 313 - Emission Reporting

US State Regulations
Fuels, diesel, no. 2 (68476-30-2)
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. - 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 1966 Emulsion Blend	
WHMIS Classication	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

Canadian Regulations MDB Blend 1966	
WHMIS Classication	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**
Fuels, diesel, no. 2 (68476-30-2)	
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
WHMIS Classification	Class B Division 6 - Reactive Flammable Material Class B Division 4 - Flammable Solid

DYNOSPLIT® EX

Technical Information

PACKAGED EXPLOSIVES

Small Diameter Detonator Sensitive Continuous Packaged Emulsion

Product Description

DYNOSPLIT EX is a detonator sensitive, perchlorate free, packaged emulsion explosive product. It is produced in a continuous cartridge form specifically for both surface and underground perimeter control applications such as presplit and trim blasting. DYNOSPLIT EX is crimped every 400 mm (16 in) and externally traced the entire length with 10 g/m (50 gr/ft) detonating cord. The continuous explosive column provides consistent blast hole pressure along the entire loaded blast hole zone resulting in a uniform tensile shearing effect. DYNOSPLIT EX can be cut to fit the desired load length or spliced to increase the load length.

Application Recommendations

- DYNOSPLIT EX is recommended for use with minimum #8 strength electric, electronic or nonelectric detonators or the appropriate core load detonating cord.
- When initiating with a detonator, **ALWAYS** attach the detonator directly to the external, trace detonating cord on the DYNOSPLIT EX packaged emulsion.
- DYNOSPLIT EX will perform in temperatures from -20º to +50ºC (-4º to 122ºF).
- When internal product temperatures are below -20ºC (-4ºF), **ALWAYS** allow adequate product warm-up time. Refer to the Warm-Up Time Chart to determine adequate blast hole residence time after loading.

Properties

SDS #1157

Density	(g/cc) Avg	1.10–1.12
Energy[a]	(cal/g) (cal/cc)	775 860
Relative Weight Strength[a]		0.88
Relative Bulk Strength[a,b]		1.19
Velocity[c]	(m/s) (ft/s)	4,700 15,400
Detonation Pressure[c]	(kbars)	65
Gas Volume[a]	(moles/kg)	38
Water Resistance		Excellent
Fume Class		IME1 & NRCan1

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 @ 32 mm (1¼ in) diameter; emulsion only. Actual VOD of DYNOSPLIT EX is dependent on VOD of detonating cord (~7,000 m/sec).

Hazardous Shipping Description

Explosive, Blasting, Type E 1.1D UN 0241 II

See Product Disclaimer on page 2

DYNO Dyno Nobel

Groundbreaking Performance™

DYNOSPLIT® EX

Technical Information

PACKAGED EXPLOSIVES

Transportation, Storage and Handling

- DYNOSPLIT EX must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
- Packaged emulsions have a shelf life of one (1) year when stored at temperatures between -18ºC and 38ºC (0ºF and 100ºF). Explosive inventory should be rotated. Use old materials before new materials.
- 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."

Warm-Up Time Chart

Blast Hole Residence Time (Hours at 7ºC / 45ºF)

Internal Pruduct Temperature Before Loading		25–32 mm (1–1¼ in) Diameter		38–50 mm (1½–2 in) Diameter	
ºC	ºF	Wet	Dry	Wet	Dry
-30	-22	1.0	2.0	2.0	4.0
-40	-40	2.0	5.0	4.0	8.0

Packaging

SAP Mat. #	SAP Description	Size		Weight / Length		Chubs per Case	Length		Case Weight	
		mm x 400	in x 16	kg/m	lb/ft		m	ft	kg	lb
QG43125037	DYNOSPLIT EX 25mm x 36.5m / 1.0 x 120ft	25	1	0.49	0.33	84	36.5	120	16.8	37.0
QG43132026	DYNOSPLIT EX 32mm x 26m / 1.25 x 86ft	32	1¼	0.83	0.56	60	26.1	86	20.4	45.0
QG43138016	DYNOSPLIT EX 38mm x 16m / 1.5 x 51ft	38	1½	1.21	0.81	36	15.7	51	17.6	39.0
QG43150009	DYNOSPLIT EX 50mm x 8.7m / 2.0 x 28.5ft	50	2	2.37	1.59	20	8.7	28.5	19.3	42.4

Note: All weights are approximate

Case and Pallet Information

DYNOSPLIT EX Size	Case Dimensions		Cases per Pallet	Pallet Dimension	
	cm	in		cm	in
1 in, 1½ in, & 2 in	44.5 x 36.3 x 20.3	17.5 x 14.3 x 8	42	91 x 109	36 x 43
1¼ in	42.5 x 32.4 x 24.1	16.7 x 12.7 x 9.5	36	91 x 109	36 x 43

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DYNO® Dyno Nobel

Groundbreaking Performance™

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
6440 S. Millrock Drive, Suite 150
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1157
Date: 07/20/2020
Supercedes: 11/01/2018

Product Identifier

Product Name: DYNOSPLIT® EX; DYNOSPLIT® RiGHT

Other Means of Identification

Intended Use of the Product

For professional use only.

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. 1.1	H201
Ox. Sol. 3	H272
Skin Irrit. 2	H315
Eye Irrit. 2A	H319
Carc. 1B	H350
Asp. Tox. 1	H304

Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US) :

GHS01 GHS03 GHS07 GHS08

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) :
H201 - Explosive; mass explosion hazard.
H272 - May intensify fire; oxidizer.
H304 - May be fatal if swallowed and enters airways.
H315 - Causes skin irritation.
H319 - Causes serious eye irritation.
H350 - May cause cancer.

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 open flames, sparks, heat, hot surfaces. - No smoking.
P220 - Keep/Store away from combustible material, oxidizable materials, and incompatible materials.
P221 - Take any precaution to avoid mixing with combustible material, oxidizable materials, and incompatible materials.
P230 - Keep wetted with not less than 30% water.
P240 - Ground/bond container and receiving equipment.
P250 - Do not subject to grinding, friction, shock.
P264 - Wash hands, forearms, and exposed areas thoroughly after handling.

P280 - Wear eye protection, protective clothing, protective gloves.
P301+P310 - If swallowed: Immediately call a poison center or doctor.
P302+P352 - If on skin: Wash with plenty of water.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313 - If exposed or concerned: Get medical advice/attention.
P321 - Specific treatment (see Section 4 on this SDS).
P331 - Do NOT induce vomiting.
P332+P313 - If skin irritation occurs: Get medical advice/attention.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P362 - Take off contaminated clothing and wash before reuse.
P370+P378 - In case of fire: Use appropriate media (see section 5) to extinguish.
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 in accordance with in accordance with, local, regional, national, territorial, provincial, and international regulations.
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): Not available

Other Hazards: Toxic hepatitis, aplastic anemia, methemoglobinemia, hemolytic anemia, and cataracts have been reported after occupational exposure. 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.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	62 - 72	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Sodium nitrate	(CAS No) 7631-99-4	10 - 18	Comb. Dust, H232 Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Distillates, petroleum, hydrotreated light naphthenic	(CAS No) 64742-53-6	1 - 10	Skin Irrit. 2, H315 Eye Irrit. 2A, H319 Carc. 1B, H350 Asp. Tox. 1, H304
Pentaerythrite tetranitrate	(CAS No) 78-11-5	0.5 - 3	Unst. Expl, H200

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 if possible).

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Keep at rest and in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.

Skin Contact: Remove contaminated clothing. Gently wash with plenty of soap and water followed by rinsing with water

for at least 15 minutes. Call a POISON CENTER or doctor/physician if you feel unwell. Wash contaminated clothing before reuse.

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.

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: Eye irritation. Causes skin irritation. May cause cancer. Aspiration hazard.

Inhalation: May cause respiratory irritation.

Skin Contact: Redness, pain, swelling, itching, burning, dryness, and dermatitis.

Eye Contact: Redness, pain, swelling, itching, burning, tearing, and blurred vision.

Ingestion: Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury. Aspiration into the lungs can cause severe pulmonary edema/hemorrhage.

Chronic Symptoms: May cause cancer. May cause the blood disorder Methemoglobinemia, and with over exposure in predisposed individuals may cause: renal problems, cardiac abnormalities, other blood disorders. 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.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If you feel unwell, seek medical advice (show the label where possible).

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT fight fires involving explosives. Evacuate the area for 1 mile or more if any amount of explosives are involved in a fire. Evacuation is also required if the initial fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire, not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water can be used to cool explosives not involved in the initial fire. For large fires use remotely controlled equipment if available.

Unsuitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smothering this product could lead to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidizable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

Special Hazards Arising from the Substance or Mixture

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

Explosion Hazard: Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Reactivity: Accelerates the rate of burning materials. Oxidizer.

Advice for Firefighters

Precautionary Measures Fire: Evacuate area to a minimum distance of 1 mile or more. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Firefighting Instructions: DO NOT fight fires involving explosives. In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection During Firefighting: When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.

Hazardous Combustion Products: Toxic fumes are released. Carbon oxides (CO, CO_2). Nitrogen oxides. Methane. Hydrogen. Hydrogen cyanide.

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: Remove ignition sources. No naked lights. No smoking. Use special care to avoid static electric

charges. Evacuate danger area. Do NOT breathe (dust, vapor, mist, gas).

For Non-Emergency Personnel

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

Emergency Procedures: Evacuate danger area.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

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

Environmental Precautions

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

Methods and Material for Containment and Cleaning Up

For Containment: Ground equipment electrically. Use only non-sparking tools.

Methods for Cleaning Up: Refer to supplier/manufacturer. Clean up spills immediately and dispose of waste safely. Dispose in a safe manner in accordance with local/national regulations.

Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: Avoid dust production. This product is an explosive and should only be used under the supervision of trained and licensed personnel. Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work. Do not eat, drink or smoke when using this product.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Proper grounding procedures to avoid static electricity should be followed. Protect container from physical shock.

Storage Conditions: Store tightly closed in a dry, cool and well-ventilated place. Store at room temperature, below 100 °F (38 °C). Always avoid open flames and excessive heat exposure. Protect from freezing. In case of electrical storm and possible lightning, locations where lightning could strike and initiate explosions, such as storage areas, must be evacuated to a safe distance. Store in accordance with local, regional, national or international regulation.

Incompatible Materials: Heat sources. Strong acids. Strong bases. Strong oxidizers. Reducing agents.

Storage Temperature: < 30 °C (< 86 °F)

Special Rules on Packaging: Keep only in the original container.

Specific End Use(s) Not available

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).

Exposure Controls

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

Personal Protective Equipment: Gloves. Safety glasses.

Materials for Protective Clothing: Not available
Hand Protection: Wear chemically resistant protective gloves.
Eye Protection: Safety glasses. In case of excessive dust production, safety goggles are recommended.
Skin and Body Protection: In case of excessive dust production. Wear suitable protective clothing.
Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	Light pink waxy/greasy material packaged in a continuous string of plastic film cartridges
Odor	:	Not available
Odor Threshold	:	Not available
pH	:	Not available
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20 °C	:	Not available
Relative Density	:	Not available
Specific Gravity	:	1.10 - 1.15
Solubility	:	Water: Product mostly dissolves very slowly over time.
Partition Coefficient: N-Octanol/Water	:	Not available
Viscosity	:	Not available
Explosive properties	:	Explosive; mass explosion hazard
Explosion Data – Sensitivity to Mechanical Impact	:	Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge	:	Static discharge could act as an ignition source.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: Accelerates the rate of burning materials. Oxidizer.
Chemical Stability: Can explode from impact, heat or friction. PETN explodes at 190 - 210 °C (374 - 410 °F). Stable up to approximately 70 °C (158 °F).
Possibility of Hazardous Reactions: Extreme risk of explosion by shock, friction, fire, impact, heat or other sources of ignition.
Conditions to Avoid: May explode from heat, shock, friction or contamination. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials: Oxidizers. Reducing agents. Potassium hydroxide. Strong acids. Strong bases. Ammonia.
Hazardous Decomposition Products: Carbon oxides (CO, CO_2). Nitrogen oxides. Hydrogen. Hydrogen cyanide. Methane.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product
Acute Toxicity: Not classified
LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Causes skin irritation.
Serious Eye Damage/Irritation: Causes serious eye irritation.
Respiratory or Skin Sensitization: Not classified
Germ Cell Mutagenicity: Not classified
Teratogenicity: Not available
Carcinogenicity: May cause cancer.
Specific Target Organ Toxicity (Repeated Exposure): Not classified
Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: May be fatal if swallowed and enters airways.
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: Redness, pain, swelling, itching, burning, dryness, and dermatitis.
Symptoms/Injuries After Eye Contact: Redness, pain, swelling, itching, burning, tearing, and blurred vision.
Symptoms/Injuries After Ingestion: Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury. Aspiration into the lungs can cause severe pulmonary edema/hemorrhage.
Chronic Symptoms: May cause cancer. May cause the blood disorder Methemoglobinemia, and with over exposure in predisposed individuals may cause: renal problems, cardiac abnormalities, other blood disorders. 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.
Information on Toxicological Effects - Ingredient(s)
LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h
ATE US (oral)	2,217.00 mg/kg body weight
Sodium nitrate (7631-99-4)	
LD50 Oral Rat	> 2000 mg/kg
Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecology - General: Harmful to aquatic life with long lasting effects.

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])
Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)	
LC50 Fish 1	> 5000 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss)
EC50 Daphnia 1	> 1000 mg/l (Exposure time: 48 h - Species: Daphnia magna)
Persistence and Degradability	
Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**
Bioaccumulative Potential	
Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)
Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Consult supplier for specific recommendations.

Waste Disposal Recommendations: Refer to manufacturer/supplier for information on recovery/recycling,Destroy and dispose of in accordance with applicable local, state, provincial, territorial, federal and international regulations. Comply with regulations 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.

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

SECTION 14 - TRANSPORT INFORMATION

In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1.1D
Identification Number : UN0241
Label Codes : 1.1D

Packing Group : II
ERG Number : 112

In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1
Identification Number : UN0241
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-X
MFAG Number : 112

In Accordance with IATA

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1
Label Codes : 1.1D
ERG Code (IATA) : 1L

In Accordance with TDG		
Proper Shipping Name	:	EXPLOSIVE, BLASTING, TYPE E
Packing Group	:	II
Hazard Class	:	1.1D
Identification Number	:	UN0241
Label Codes	:	1.1D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

DYNOSPLIT® RiGHT; DYNOSPLIT® EX

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

Pentaerythrite tetranitrate (78-11-5)

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

EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA.

Ammonium nitrate (6484-52-2)

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

Sodium nitrate (7631-99-4)

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

Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)

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

US State Regulations

Ammonium nitrate (6484-52-2)

Sodium nitrate (7631-99-4)

Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)

Pentaerythrite tetranitrate (78-11-5)

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

Sodium nitrate (7631-99-4)

RTK - U.S. - Massachusetts - Right To Know 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
Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)
RTK - U.S. - Massachusetts - Right To Know List U.S. - Texas - Effects Screening Levels - Long Term U.S. - Texas - Effects Screening Levels - Short Term
Pentaerythrite tetranitrate (78-11-5)
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
Sodium nitrate (7631-99-4)
U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) List
Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)
U.S. - Massachusetts - Right To Know List
Canadian Regulations
DYNOSPLIT® RiGHT; DYNOSPLIT® EX

WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.** Class D Division 1 Subdivision B - Toxic material causing immediate and serious toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects Class F - Dangerously Reactive Material Class C - Oxidizing Material

Pentaerythrite tetranitrate (78-11-5)
Listed on the Canadian DSL (Domestic Substances List)
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

Sodium nitrate (7631-99-4)
Listed on the Canadian DSL (Domestic Substances List) Listed on the Canadian IDL (Ingredient Disclosure List)
IDL Concentration 1 %

WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects

Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)
Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification	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

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 : 07/20/2020

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:

Asp. Tox. 1	Aspiration hazard Category 1
Carc. 1B	Carcinogenicity Category 1B
Comb. Dust	Combustible Dust
Expl. 1.1	Explosive Category 1.1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Ox. Sol. 3	Oxidizing solids Category 3
Skin Irrit. 2	Skin corrosion/irritation Category 2
Unst. Expl	Unstable explosives
H200	Unstable explosives
H201	Explosive; mass explosion hazard
H232	May form combustible dust concentrations in air
H272	May intensify fire; oxidizer
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
H319	Causes serious eye irritation
H350	May cause cancer

Party Responsible for the Preparation of This Document

Dyno Nobel Inc.
6440 S. Millrock Drive, Suite 150
Salt Lake City, Utah 84121
Phone: 801-364-4800

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Dyno Nobel SDS

digishot®

Electronic Initiation System

Product Description

The DigiShot electronic initiation system is an easy-to-use, reliable accurate electronic initiation system primarily for use in large surface blasting applications. Its flexibility caters for a wide range of specilized blast configurations to optimize blast results.

Customer Benefits

- **Accurate timing** enables customers to achieve a variety of benefits ranging from better fragmentation to improved crusher throughput to happier neighbors resulting from decreased Peak Particle Velocity (PPV) and/or improved frequencies
- **Easy to use,** menu-driven software
- **Minimal on-bench components** just the electronic DigiShot detonator (in the blast hole) and a 2-wire busline on the pattern
- **No delay timing input on the bench** makes the blast loading and hookup process easier and minimizes errors
- **All delay timing is defined on the DigiShot Blast Box** so the pattern and timing sequence can be handled in a safe, off-bench location. Timing can even be managed, for your convenience, day(s) before the actual blast
- **Delay timing** is the choice of the blaster: **auto-programmed** (easier, time-saving, decreased error) or **fully programmable** (facilitates the use of virtually any delay scheme)
- Multiple DigiShot Blast Boxes **(1 Master and a Slave unit)** can be used to facilitate larger blasts

Technical Information

INITIATION SYSTEMS

Properties

SDS #1152

Detonator Shell	Copper
Cable Color	Red
Tensile Strength	>500 N / 112 lbs
System Operating Temperature (range)	-40° to +80°C -40° to +176°F
Detonator Strength	#12
Net Explosive Quantity (per 100 units)	0.10 kg / 0.22 lbs
Maximum Delay	20,000 ms
Maximum Detonators per Blaster	300
Maximum Surface Wire Length	2.5 km / 8,202 ft

Packaging

Length (m)		Case Quantity	Case Weight	
Meters	Feet		kg	lbs
6	20	100	11.3	24.9
9	30	84	12.9	28.4
15	50	60	14.0	30.9
18	60	52	15.2	33.5
24	80	40	15.0	33.0
30	100	32	14.9	32.8
37	120	24	13.5	29.8
46	150	20	13.7	30.2
55	180	16	14.1	31.1

Length rounded to nearest whole meter

Hazardous Shipping Description

Detonators, electric, 1.4B, UN0255 PG II

See Product Disclaimer on page 2

DYNO Dyno Nobel

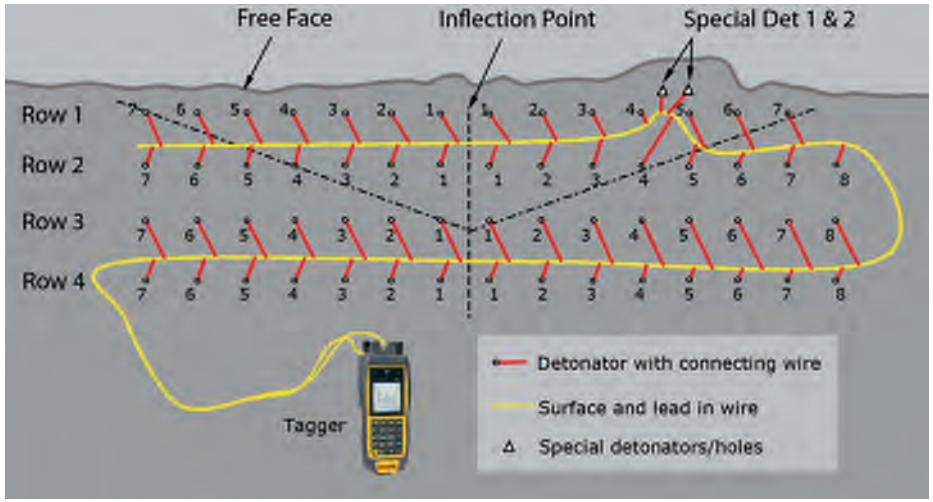
Groundbreaking Performance™

digishot®

Technical Information

Unique Features

- **No Delay Assignment on the Bench t**he blaster simply "tells" each detonator its location in the blast. The DigiShot electronic initiation system automatically checks the functionality of the detonator while concurrently assigning the detonator to its location in the pattern
- **CE4 Tagger** is a unique, light-weight, blaster-friendly hand-held tool used to assign the borehole / DigiShot detonator location with minimal key strokes. The Tagger can be used to test an individual detonator, part of the pattern or the entire circuit prior to leaving the bench. The Tagger, together with the DigiShot Blast Box, enables initiation of the blast from a point of safety. Easy-to-follow screen menus lead the blaster through all on-bench and firing operations
- **DigiShot Blast Box** can program **and** fire the blast at any point after the desired delay timing is input. For flexibility, the delay timing can be entered **at any time**, the day of the blast, the day before or any day piror to the blast. For added security, the DigiShot Blast Box is password protected, requires a DigiShot specific blast key and uses a coded signal to fire the blast
- The connectors are all rugged and water resistant. ESD Resistance, RF Resistance, Cable Abrasion & Cutting Resistance all pass CEN TS 13763-27, the European Standards of Compliance for Electronic Detonators



Transportation, Storage and Handling

- DigiShot 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), DigiShot 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.

Application Recommendations

Due to the system's flexibility, contact your local Dyno Nobel representative for Application Recommendations.

Case Dimensions

40.5 x 29.25 x 28.5 cm 16 x 11.5 x 11.25 in

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Phone 800-732-7534 Fax 801-328-6452 Web www.dynonobel.com

DYNO® Dyno Nobel

Groundbreaking Performance™

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: Detonators, Electronic (Class 1.1B)**

· **Article number:** 1152
· **Other product identifiers:**
DigiShot®
DigiShot® Plus
GeoShot
SmartShot™
DriftShot™
DriftShot 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.

· **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.

(Contd. on page 2)

Safety Data Sheet

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Trade name: Detonators, Electronic (Class 1.1B)

(Contd. of page 1)

· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.
· **Additional information:**
There are no other hazards not otherwise classified that have been identified.
0 percent of the mixture consists of component(s) of unknown toxicity

· **2.2 Label elements**
· **Labelling according to Regulation (EC) No 1272/2008**
The product is additionally classified and labelled according to the Globally Harmonized System within the United States (GHS).
The product is classified and labelled according to the CLP regulation.
· **Hazard pictograms**

GHS01

· **Signal word** Danger

· **Hazard-determining components of labelling:**
pentaerythritol tetranitrate (PETN)
lead diazide
lead
· **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.
P273	Avoid release to the environment.
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.
EUH209 Can become highly flammable in use.
· **Hazard description:**
· **WHMIS-symbols:** Explosive products are not classified under WHMIS.
· **NFPA ratings (scale 0 - 4)** Not available.

· **HMIS-ratings (scale 0 - 4)**
Warning: Contains lead salt(s). Long-term health hazard.

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Trade name: Detonators, Electronic (Class 1.1B)

(Contd. of page 2)

Not available

· **HMIS Long Term Health Hazard Substances**	
7439-92-1	lead
13424-46-9	lead diazide

· **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: 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: 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

· **SVHC**	
13424-46-9	lead diazide

· **Additional information:**
For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

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Trade name: Detonators, Electronic (Class 1.1B)

(Contd. of page 3)

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.
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.
· **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

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

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Trade name: Detonators, Electronic (Class 1.1B)

(Contd. of page 4)

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.
Keep away from heat.
· **7.3 Specific end use(s)** No further relevant information available.

(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: Detonators, Electronic (Class 1.1B)

(Contd. of page 5)

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:**	
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)
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

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

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

· **Ingredients with biological limit values:**	
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)
13424-46-9 lead diazide	
BEI (USA)	30 µg/100 ml Medium: blood Time: not critical Parameter: Lead

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· **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:**
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.

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· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Explosive; mass explosion hazard.
· **Auto/Self-ignition temperature:**	Not determined.
· **Decomposition temperature:**	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Risk of explosion by shock, friction, fire or other sources of ignition.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density:**	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
Leadoxide vapour
Hydrocarbons

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SECTION 11: Toxicological information

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

· **LD/LC50 values relevant for classification:**		
7439-92-1 lead		
Oral	LD50	>2000 mg/kg (rat)

· **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:** Not determined.
· **Subacute to chronic toxicity:** No further relevant information available.
· **Additional toxicological information:** May cause cancer.
· **Acute effects (acute toxicity, irritation and corrosivity):** Danger of blast or crush-type injuries.
· **Repeated dose toxicity:** No further relevant information available.

SECTION 12: Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** Toxic for aquatic organisms
· **12.2 Persistence and degradability** No further relevant information available.
· **12.3 Bioaccumulative potential** May be accumulated in organism
· **12.4 Mobility in soil** No further relevant information available.
· **Ecotoxical effects:**
· **Remark:** Very 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
Very 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.

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SECTION 13: Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Must not be disposed together with household garbage. Do not allow product to reach sewage system.
Damaged materials pose a danger to anyone in the immediate area; consult experts for disposal of damaged products.
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. Residual materials should be treated as hazardous.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.

SECTION 14: Transport information

· **14.1 UN-Number**
· **DOT, ADR, IMDG** UN0030
· **IATA** FORBIDDEN
· **14.2 UN proper shipping name**
· **DOT** Detonators, Electric
· **ADR** 0030, DETONATORS, ELECTRIC
· **IMDG** DETONATORS, 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
· **Label** -
· **14.4 Packing group**
· **DOT, ADR, IMDG** II
· **IATA** FORBIDDEN

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· **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-
· **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: E0
Not permitted as Excepted Quantity
· **Tunnel restriction code** (1)

· **IATA** FORBIDDEN.
· **UN "Model Regulation":** UN0030, DETONATORS, 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):**

7439-92-1	lead
13424-46-9	lead diazide

· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**

7439-92-1	lead
13424-46-9	lead diazide

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

7439-92-1	lead

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

7439-92-1	lead

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

7439-92-1	lead
13424-46-9	lead diazide

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· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**		
7439-92-1	lead	B2
13424-46-9	lead diazide	B2

· **IARC (International Agency for Research on Cancer)**		
7439-92-1	lead	2B
13424-46-9	lead diazide	2A

· **TLV (Threshold Limit Value established by ACGIH)**		
7439-92-1	lead	A3
13424-46-9	lead diazide	A3

· **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%)**

7439-92-1	lead

· **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.

· **Substances of very high concern (SVHC) according to REACH, Article 57**	
13424-46-9	lead diazide

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

SECTION 16: Other information

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· **Relevant phrases**

H200	Unstable explosives.
H302	Harmful if swallowed.
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.
R20/22	Harmful by inhalation and if swallowed.
R3	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R33	Danger of cumulative effects.
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.
R60	May impair fertility.
R61	May cause harm to the unborn child.
R62	Possible risk of impaired fertility.

· **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
Acute Tox. 4: Acute toxicity, Hazard Category 4
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

· **Sources**

SDS Prepared by:
ChemTel Inc.
1305 North Florida Avenue
Tampa, Florida USA 33602-2902

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Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573
Website: www.chemtelinc.com

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

· **1.1 Product identifier**

· **Trade name: Detonators, Electronic (1.4B)**

· **Article number:** 1152
· **Other product identifiers:**
DigiShot®
DigiShot® Plus
GeoShot
SmartShot™
DriftShot™
DriftShot 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:**
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

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.

· **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.

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· **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 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.
EUH209 Can become highly flammable in use.
· **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)**
Warning: Contains lead salt(s). Long-term health hazard.
Not available

· **HMIS Long Term Health Hazard Substances**	
13424-46-9	lead diazide

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7439-92-1	lead

· **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: 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	25-50%
CAS: 78-11-5 EINECS: 201-084-3 Index number: 603-035-00-5	pentaerythritol tetranitrate (PETN) E R3 Unst. Expl., H200	10-25%
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	10-25%

· **SVHC**

13424-46-9	lead diazide

· **Additional information:**
For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

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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:** Supply fresh air; consult doctor in case of complaints.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:** Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **Hazards** No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

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**
Ensure adequate ventilation

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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.
Dispose unusable material as waste according to item 13.
Send for recovery or disposal in suitable receptacles.
· **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**
Handle with care. Avoid jolting, friction and impact.
Use only in well ventilated areas.
· **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.
· **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.
Protect from heat and direct sunlight.
· **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

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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)

· **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)

· **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.
· **Protection of hands:**
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

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· **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

· **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:	205 °C (401 °F)
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Auto/Self-ignition temperature:**	202 °C (396 °F)
· **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.

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· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Insoluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	20,0 %
· **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:**
No decomposition if used and stored according to specifications.
· **10.3 Possibility of hazardous reactions** No dangerous reactions known.
· **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
Leadoxide vapour

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)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitisation:** No sensitising effects known.
· **Subacute to chronic toxicity:** No further relevant information available.

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· **Repeated dose toxicity:** No further relevant information available.

SECTION 12: Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** Toxic for aquatic organisms
· **12.2 Persistence and degradability** No further relevant information available.
· **12.3 Bioaccumulative potential** May be accumulated in organism
· **12.4 Mobility in soil** No further relevant information available.
· **Ecotoxical effects:**
· **Remark:** Very 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
Very 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.
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes. Residual materials should be treated as hazardous.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.

SECTION 14: Transport information

· **14.1 UN-Number**
· **DOT, ADR, IMDG, IATA** UN0255
· **14.2 UN proper shipping name**
· **DOT, IMDG, IATA** DETONATORS, ELECTRIC

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· **ADR** 0255 DETONATORS, ELECTRIC
· **14.3 Transport hazard class(es)**

· **DOT**

· **Class** 1.4
· **Label** 1.4

· **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
· **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: 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
· **UN "Model Regulation":** UN0255, DETONATORS, ELECTRIC, 1.4B, 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.

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

13424-46-9	lead diazide
7439-92-1	lead

· **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

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

7439-92-1	lead

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

7439-92-1	lead

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

13424-46-9	lead diazide
7439-92-1	lead

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**

13424-46-9	lead diazide	B2
7439-92-1	lead	B2

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

13424-46-9	lead diazide	2A
7439-92-1	lead	2B

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

13424-46-9	lead diazide	A3
7439-92-1	lead	A3

· **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%)**

7439-92-1	lead

· **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.

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

13424-46-9	lead diazide

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

SECTION 16: Other information

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· **Relevant phrases**

H200 Unstable explosives.
H302 Harmful if swallowed.
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.

R20/22 Harmful by inhalation and if swallowed.
R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R33 Danger of cumulative effects.
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.
R60 May impair fertility.
R61 May cause harm to the unborn child.
R62 Possible risk of impaired fertility.

· **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

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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. 1.4: Explosives, Division 1.4
Unst. Expl.: Explosives, Unstable explosives
Acute Tox. 4: Acute toxicity, Hazard Category 4
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

· **Sources**

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