
Blasting Plan

For

Park Road Commons

Dorset Street, South Burlington, VT 05403

September 12, 2024

Prepared By: Maine Drilling & Blasting, Inc

Western Construction

7190 State Route 40

Argyle, NY 12809

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Joseph Happy / Colin Wadsworth

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General

Maine Drilling & Blasting, Inc. considers safety as the priority during all phases of blasting operations. We are knowledgeable of and will follow all local, state and federal regulations related to transportation and use of explosives. The project specifications and conditions have been reviewed. Details of procedures for pre-blast surveys, explosives use, blast security, monitoring and documentation are enclosed.

Pre-Blast Surveys / Notifications

Pre-blast surveys will be offered to all property owners within 250 foot radius of the blast site. Appropriate notices will be given and appointments arranged for those owners who desire a survey. Pre-blast surveys will be conducted by a Company Representative. Results of those surveys will be documented through video or still photographs and appropriate narration or written reports.

Blast Monitoring

A representative of Maine Drilling & Blasting, Inc. who has been properly trained in the setup and use of seismic monitoring equipment will monitor all blasts. At least one seismograph will be in use at all times. Placement of monitoring equipment will be at the nearest structure to the blast site. Maine Drilling & Blasting, Inc. monitoring equipment will consist of White Industrial Mini-Seis III Pro seismographs. Details are enclosed. Results of blast monitoring will typically be available before the next blast, usually immediately following a blast. Results can be reviewed and modifications can be made to the blast design for the next blast if necessary.

Sequence of Blasting

All blasting operations will be strictly coordinated with O'leary-Burke Civil Associates, all subcontractors, engineers, and state/local jurisdictions. Emphasis will be on the safe and efficient removal of the rock existing on this project without impact to surrounding structures. Blasts will be developed so as to create adequate relief which will minimize ground vibrations per blast design below and offer the greatest protection possible to the surrounding structures.

Blasting Procedures

1. Blasting operations shall commence after 7:00 AM and cease before 5:00 PM, Monday through Friday.
2. 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.
3. Warning and all-clear signals of different character that are audible within a range of one-quarter mile from the point of the blast shall be given. All persons within the permit area shall be notified of the meaning of the signals through appropriate instructions and signs posted.
4. Access to blasting area shall be regulated to protect the public from the effects of blasting. Access to the blasting area shall be controlled to prevent unauthorized entry before each blast and until the perimeter's authorized representative has determined that no unusual circumstances exist after the blast. Access to and travel in or through the area can then safely resume.
5. Areas in which charged holes are awaiting firing shall be guarded, barricaded and posted, or flagged against unauthorized entry.

6. All blasts shall be made in the direction of the stress relieved face previously marked out or previously blasted.
7. All stemming shall be a minimum as specified using clean, dry 3/8" crushed stone.
8. Blasting mats shall be used as necessary to cover blasts.
9. The Blasting Contractor shall insure that extra safety and judgment is exercised by his blaster to prevent the simultaneous blasting of numerous holes.

Blasting Mats

Blasting mats and backfill will be used to control excessive amounts of rock movement when blasting in close proximity to structures and completely at the discretion of the blaster. Placement and number of mats are typically determined by the blaster. Mats will be placed so as to protect all people and structures on, or surrounding the blast site and property. Rubber tire type blasting mats will be utilized on this project and will be approximately 12' x 24' in size; Rubber mat @ 12' x 24' 38 lbs./s.f. = 10,944 lbs./ea.

Blast Security and Warning Whistles

Each blast will be preceded by a security check of the affected area and then a series of warning whistles. Communications will be made with job site supervisors and local officials as required to ensure the safest possible operation. All personnel in the vicinity closest to the blast area will be warned. The warning whistles will follow the following sequence:

3 Audible Signal Pulses - 5 Minutes to Blast

2 Audible Signal Pulses - 1 Minute to Blast

1 Audible Signal Pulses - All Clear

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

Explosives

All explosives will be delivered to the job site on a daily basis and transported following applicable federal, state, and local laws and regulations. Only the amount of explosives required to perform the day's work will be brought to the site. All explosives will be stored in approved magazines when not in use.

Enclosed are Technical Data and SDS sheets for the explosive products proposed for use on this project. Any one of, or a combination of these products may be in use at any one time on the site.

Blaster Qualifications

All Maine Drilling & Blasting, Inc. blasters on this job will be licensed in the State of Vermont and have received various amounts of training in the safe use and handling of explosives. Their licenses are enclosed. Additionally, Maine Drilling & Blasting, Inc. blasters are familiar with all OSHA Regulations, State Regulations, and Federal Regulations regarding construction site safety, including transportation, use, and handling of explosive materials. Weekly safety meetings are to be held on site by the Maine Drilling & Blasting, Inc. job foreman, with a record of that meeting returned to the Maine Drilling & Blasting, Inc. office.

Blasting Personnel

All blasting operations shall be conducted by experienced, trained and competent persons who understand the hazards involved. Persons working with explosive materials shall:

1. Have demonstrated knowledge of, and a willingness to comply with, safety and security requirements.
2. Be capable of using mature judgment in all situations.
3. Be of good physical condition and not addicted to intoxicants, narcotics, or other similar type of drugs.
4. The person(s) responsible for the explosives shall possess current knowledge of the local, State and Federal laws and regulations applicable to his work.
5. The person(s) responsible for the explosives shall have obtained a Certificate of Competency or a license as required by State law.

Licenses and Permits

Maine Drilling & Blasting, Inc. is fully licensed and insured for the transportation, use, and handling of explosives. Evidence of insurance is available. Blasting permits will be applied for as required from the local authorities by the Maine Drilling & Blasting, Inc. Blaster/Foreman when blasting is about to begin.

Blast Vibration

Blast vibration will be monitored at the blast site, typically at the structure(s) closest to the blast site. Vibration limits will closely follow industry limits and the State and Local Regulations. Blast designs will be modified as required to stay within the guidelines and meet project schedules as well. Blasting operations will be modified accordingly when approaching buildings and utilities. Enclosed are preliminary vibrations calculations based on known distances to the structures of concern and anticipated initial blast designs.

Ground vibration peak particle velocity limits shall not exceed USBM Alternative Blasting Criteria

- * US Bureau of Mines (USBM) RI 8507 Appendix B
- * Standard, and applicable State Regulations

Air blast overpressure level not to exceed 133 peak dB (linear) two Hertz high -pass system.

Blast Reports

Enclosed is a sample of a Maine Drilling & Blasting, Inc. Blast Report. This report will be filled out for each blast and copies supplied as needed.

Typical Blast Design

Enclosed is what would be considered typical blast designs for any close proximity blasting to structures, utilities, gas lines, or dry waterbody crossings. Hole sizes, depths, spacing and loading information is provided. These designs are to be considered a good starting point. Modifications are usually made, if necessary, following the first blasts to meet control and seismic considerations.

Blaster's Licenses / Qualifications

**Vermont Department
of Public Safety**



Barnum
Cody

Issue Date: 2023-10-24
Expires: 2026-10-24

Explosive License

This card must be carried when
possessing or using explosives.

1476 South Street
New Haven VT 05472
DOB: 1991-03-27

If found return to:
Vermont DPS
45 State Drive,
Waterbury, VT 05671

Male	5'11"	150	Brown	Brown
Gender	Height	Weight	Eyes	Hair

License Type: A License # 1951

This credential is the property of the State
of Vermont. Counterfeiting, Altering, or
Misusing may violate Title 13, Section
2000 of the Vermont Statutes Annotated

Signature

**Vermont Department
of Public Safety**



Billings
Mark

Issue Date: 2023-01-08

Expires: 2026-01-08

Explosive License

This card must be carried when
possessing or using explosives.

295 Wilmouth Road
Shrewsbury VT 05738

DOB: 1967-01-04

If found return to:
Vermont DPS
45 State Drive,
Waterbury, VT 05671

Male	5'10"	260	Brown	Brown
Gender	Height	Weight	Eyes	Hair

License Type: A

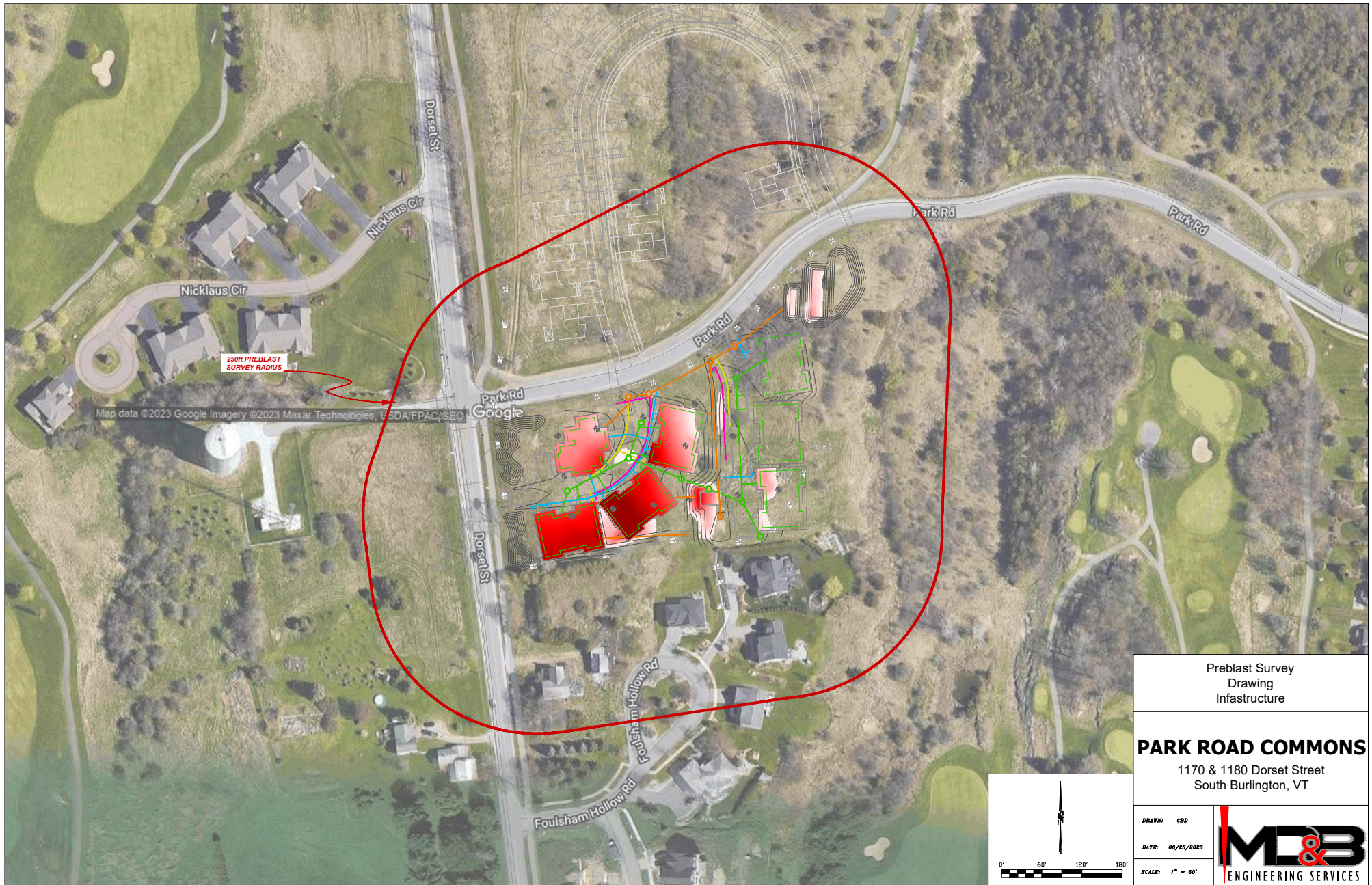
License # 1170

This credential is the property of the State
of Vermont. Counterfeiting, Altering, or
Misusing may violate Title 13, Section
2030 of the Vermont Statutes Annotated

Signature

Blasting Location Sketch





Preblast Survey
Drawing
Infrastructure

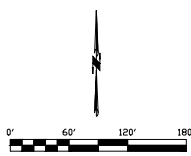
PARK ROAD COMMONS

1170 & 1180 Dorset Street
South Burlington, VT

DRAWN: CBD

DATE: 06/23/2023

SCALE: 1" = 80'



Drilling Equipment

FlexiROC T30 R Construction Edition

Surface drill rig for quarrying and construction

Hole diameter: 45–102 mm



Extend your reach and versatility

The FlexiROC T30 R Construction Edition is a tophammer rig designed for a wide range of drilling applications.

With Radio Remote Control, self-adjusting RPM and an extensive boom reach, the FlexiROC T30 R Construction Edition is versatile and extremely efficient. Powerful enough to drill into very hard rock. The rig's compact size means it can easily be transported from job to job – allowing you to maximize on the availability of your investment.



⊕ Main benefits

Excellent rig stability means operator safety and productivity

Application versatility thanks to the COP 1640+ rock drill

Extensive boom reach means fewer set ups



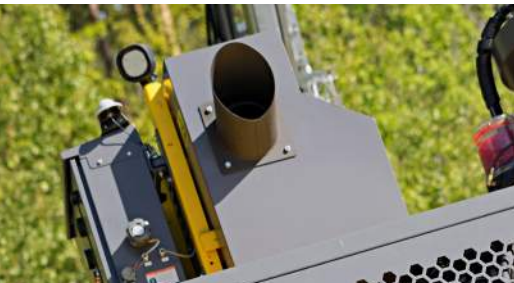
Availability at your fingertips

With great boom coverage that lets you drill more holes per set-up, the FlexiROC T30 R Construction Edition delivers true productivity. It is all in your hands with the 2.4 Ghz bluetooth Radio Remote Control.



+ Great reach and productivity

With its extensive boom reach, the FlexiROC T30 R Construction Edition offers contractors savings in both time and money. Boom reach of 5 300 mm (with RAS or RHS) through an 80° radius translates into more holes from fewer set-ups. This versatility makes the FlexiROC T30 R Construction Edition an ideal choice for demanding construction jobs, such as road construction and foundation drilling.



+ Reliable and efficient

The FlexiROC T30 R Construction Edition meets stringent Tier 4 Final engine emissions standards. Self-adjusting RPM ensure great efficiency and low diesel consumption. FlexiROC T30 R Construction Edition is equipped with the COP Logic system, which automatically adjusts impact and drill feed pressure to ensure optimal performance and increased service life of rock drilling tools.



+ Safer than ever

The FlexiROC T30 R Construction Edition excels even in difficult terrain where its low center of gravity provide rugged mobility in all conditions. With Radio Remote Control as standard, the operator has full control over tramming and drilling while working at a safe distance from the rig – ideal for sites with limited access or unstable terrain. The FlexiROC T30 R Construction Edition can also be equipped with a hydraulic winch for secure anchoring on slopes up to 30°.



A comprehensive service offering

Even the best equipment needs to be serviced regularly to make sure it sustains peak performance. An Epiroc service solution offers peace of mind, maximizing availability and performance throughout the lifetime of your equipment. We focus on safety, productivity and reliability.

By combining genuine parts and an Epiroc service from our certified technicians, we safeguard your productivity – wherever you are.

Technical specifications

Main components

- Crawler type two speed undercarriage with track oscillation system
- Cummins turbo charged diesel engine QSB4.5 Tier 4 Final
- Atlas Copco screw type compressor
- Folding boom system
- Hydraulic rock drills COP 1840+, COP 1640+
- Alternative Rod Handling Systems, RHS
- Dust Collection System, DCT
- Radio Remote Control system with integrated display

Hole range (recommended)

With Rod Adding System (RAS) or Rod Handling System (RHS) with 3.6 m (12') rods and 4.3 m (14') starter rod	Threads	Metric	US	Metric	US
Extra long folding boom	R32, T35, TC35, T38, T45	Ø 45–89 mm	Ø 1.75"–3.5"	7.4 m (RAS) 14.8 m (RHS)	24' (RAS) 48' (RHS)

Engine

Cummins turbo charged, diesel engine, QSB4.5, Tier 4 Final	
Power rating at 2000 rpm	116 kW/155 hp
Electronic variable engine speed	870–2 030 rpm
Variable fan control	
Green saver – automatic low engine speed	

Compressor

Folding boom: Atlas Copco OIS, screw compressor	Metric	US
Working pressure, max	8.5 bar	123 psi
FAD, at normal working pressure	95 l/s	201 cfm
Extra long folding boom: Atlas Copco OIS, screw compressor		
Working pressure, max	8.5 bar	123 psi
FAD, at normal working pressure	80 l/s	170 cfm

Hydraulic rock drill

Rock drill	Boom type	Impact power		Hydraulic pressure, max		Impact rate	RPM, max	Torque, max		Weight approx						
COP SC19	Folding boom	19 kW	25,5 hp	230 bar	3 336 psi	42–50 Hz	110	1 970 Nm	1 453 lbf/ft	174 kg	384 lb					
COP SC16	Folding boom	16 kW	21.4 hp	200 bar	2 900 psi	55-73 Hz	215	1 070 Nm	789 lbf/ft	193 kg	425.5 lb					
	Extra long folding boom						135	1 550 Nm	1 143 lbf/ft							
							215	1 070 Nm	789 lbf/ft							
								340	670 Nm	494 lbf/ft						

Electrical system

Voltage	24 V
Batteries	2 x 12 V, 185 Ah
Alternator	24 V, 70 Ah
Work lights, front	2 x 70 W halogen
Work lights, rear	2 x 70 W halogen
Work lights, feed	2 x 70 W
Display with diagnostics and settings	

Feed

	Extra long folding boom*	
	Metric	US
Total length	6 000 mm	236"
Travel length	4 070 mm	160"
Feed extension	1 000 mm	39"
Feed rate, max	0.9 m/s	3 ft/min
Feed force, max	12 kN	2 697 lbf
Tractive pull, max	15 kN	3 372 lbf

* Hydraulic aluminium cylinder feed with hose guide and single drill steel support with moveable lower guide/dust hood.

Hydraulic system

Anti-jamming		
Rotation Pressure Control feed RPC-F		
Damper Pressure Control - impact DPC-I		
Return and drainage filters F (filtration rate)	16 µm absolute	
Hydraulic oil cooler max ambient temperature	50°C	122°F

Dust collector DCT

	Metric	US
Filter area	8 m²	86 sq.ft
Suction capacity at 500 mm wg	580 l/s	1 228 cfm
Suction hose diameter	102/127 mm	4/5"
Cleaning air pressure, max	7.5 bar	109 psi
Cleaning air consumption at 7 bar	15 l/pulse	0.53 cu.ft/pulse
Filter cleaning while drilling		
2 pcs of filter elements		

Volumes

	Metric	US
Hydraulic oil tank	200 l	52.8 gal
Hydraulic system, total	250 l	66.0 gal
Compressor oil	20 l	5.3 gal
Diesel engine oil	11 l	2.9 gal
Diesel engine, fuel tank	270 l	71.3 gal
Traction gear	3 l	0.8 gal
Lubrication tank (ECL)	10 l	2.6 gal
AdBlue	15 l	4.0 gal

Technical specifications



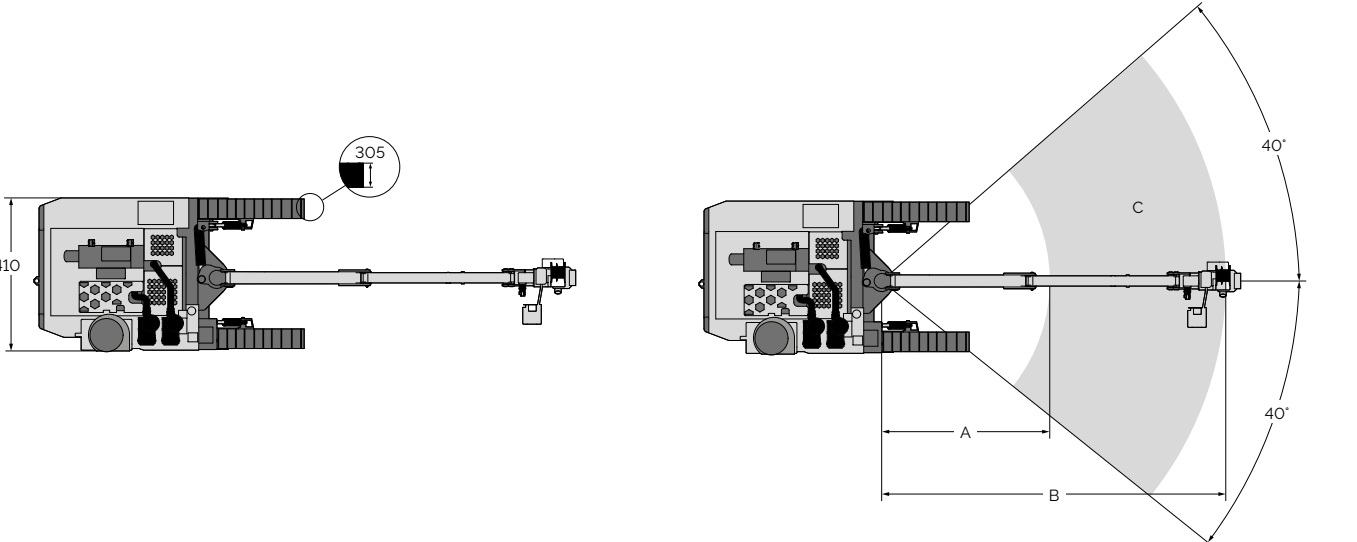
Height and length

Extra long folding boom		
Height (H)	2 950 mm	116"
Length (L)	9 200 mm	362"

*Boom folded

Feed height (H)

	Metric	US
Extra long folding boom	6 200 mm	244"



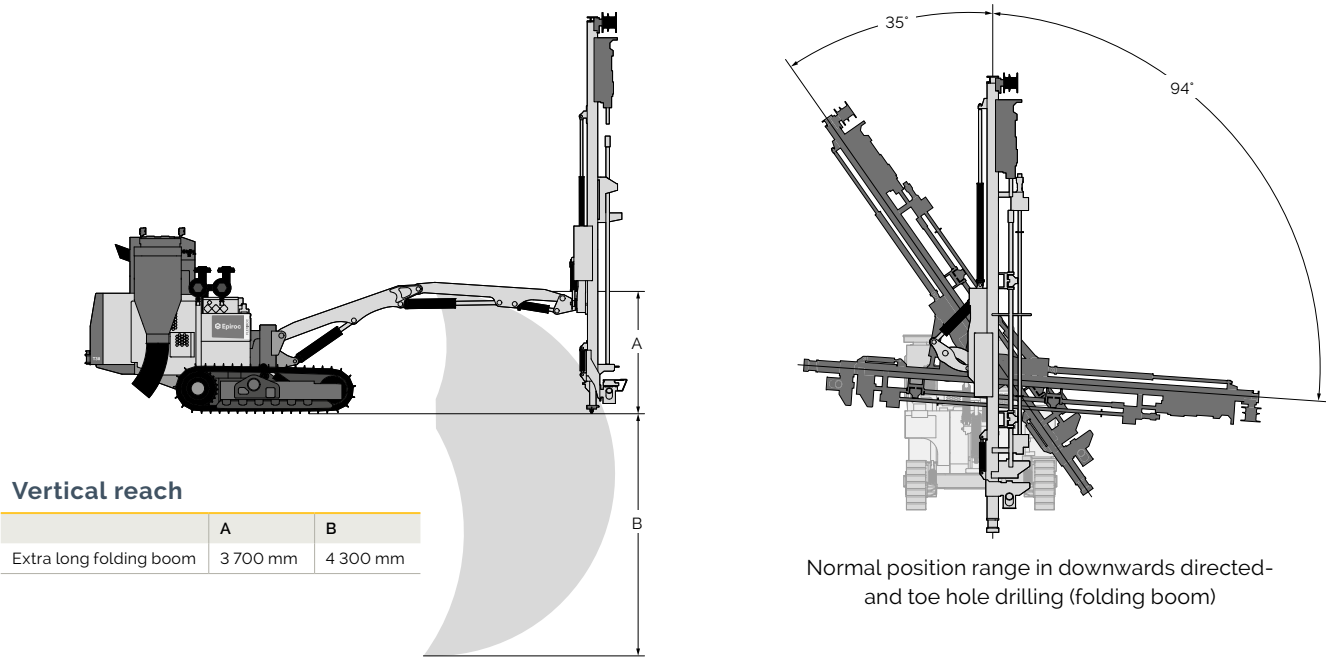
Weight

Standard unit excluding all options and drill steel	Metric	US
Extra long folding boom	10 000 kg	22 050 lb

Horizontal reach and coverage area

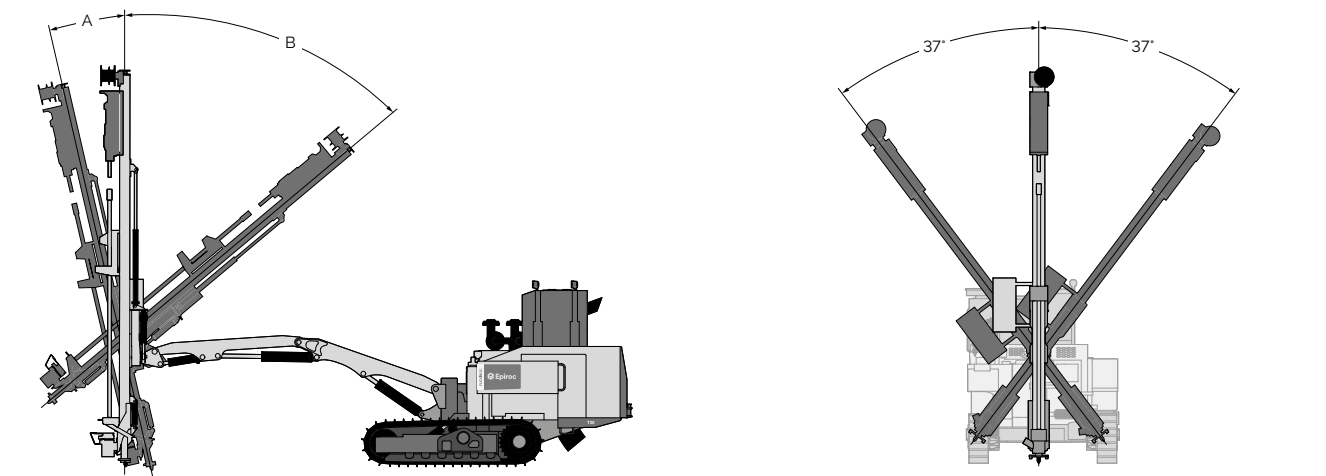
	A	B	C
Extra long folding boom	2 600 mm	5 300 mm	15 m²

Technical specifications



Vertical reach

	A	B
Extra long folding boom	3 700 mm	4 300 mm



Dumping angles

	A	B
Extra long folding boom	13°	50°

Normal position range in downwards directed drilling (extra long folding boom)

Selection of options

Carrier

- Hydraulic support leg
- Hydraulic winch
- Cold start kit (-25 °C)
- Diesel engine pre-heater
- Extra LED work lights

Feed

- Silence Kit for reduced noise levels
- Jaw set for R32/T38 sleeves for RAS arm
- Jaw set for T45 sleeves for RAS arm
- Rod rack with a capacity of three 3 660 mm (12') rods (option on extra long folding boom only in combination with RAS)
- Rod Handling System with a capacity of three 3 660 mm (12') rods for extra long folding boom

Hole measuring systems

- Mechanical hole inclination instrument – ROCANGIE
- Electronic hole inclination instrument with depth/sight/laser and auto feed alignment
- GPS aiming device

Lube oil and lube system

- Thread greasing devise, type ECG (with oil)
- Central lubrication system
- Tropical hydraulic oil, ISO VG 68
- Artic hydraulic oil, ISO VG 32
- Environmentally conformed hydraulic oil, ISO VG 46
- ECL collection system

Dust control

- Rubber disc for dust collector hood
- Rubber skirt for dust collector hood
- Water mist system including tank

Delivered equipment, not mounted

- Gas charging equipment for rock drill
- Conversion kit R32
- Conversion kit T38
- Conversion kit T45
- Conversion kit T35/TC35

United in performance. Inspired by innovation.

Performance unites us, innovation inspires us, and commitment drives us to keep moving forward.

Count on Epiroc to deliver the solutions you need to succeed today and the technology to lead tomorrow.

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Lightning Plan

Lightning Procedures

All blasting operations shall be suspended and all persons shall be removed from the blasting areas during the approach and progress of an electrical storm. The blast site security protocol will be initiated and the area will be secured. The following rules must be followed:

- A lightning detector should be used to monitor the proximity of lightning to the shot. When the storm is 10 miles distant as identified by the lightning detector, notify all persons in the blasting crew of approaching storm. Stop all loading of holes and evacuate all personnel, except blaster and assistant, to a safe distance from the blast area. Details of the lightning detector equipment are included as an attachment to this plan.
- If the blast cannot be initiated before the storm arrives (within 10 miles as indicated by the lightning detector), the blaster and assistant shall evacuate the site to a safe distance.
- Personnel may return to worksite when the storm has passed and is 10 miles distant as determined by the lightning detector or after the completion of blast which allows for inspection of site and/or misfire.

Utility Series Model TB-U1- MBL

Features and Specifications

ThunderBolt® Utility BL series (New)

FEATURES and what is included in the Standard ThunderBolt® Utility series package :

- Highest Grade Durable Plastic
- Fully Gasketed (water-resistant)
- Custom Desk Stand
- Custom Fitted, Hard-sided, Field Carrying Case
- Soft Carry Pouch
- Custom Wall Mount
- Back Lit LCD Screen
- 120-volt or 220V AC Adapter (Low noise proprietary adapter included)*
- 12V Mobile adapter
- 9 V Duracell® Pro Cell Battery
- Instruction Manual on CD
- Quick start guide



Storm and Lightning Detection

- Range 75 Miles Radius to unit (120 km in metric version)

Accuracy APPROACH SPEED- $\pm 10\%$

Storm Range $\pm 1\%$ at 10 miles , $\pm 5\%$ at 40 miles , $\pm 7\%$ at 75 miles

Computer Analysis and Detection Automatically Displays:

- Ranging
- Storm approach speed
- E.T.A. at User Location
- When storm is local / within 8 mile range
- Time to Clear
- Enhanced Severe Storm/Squall Line/ Multiple Cell Detection

Background EMI Detection and Suppression

- User-Selectable Noise Detection setting and Mapping from main menu for indoor or outdoor detection.
- Automatic update of noise sampling during operation.

Electronic Specifications:

- Operating Life - 45,000 hours
- Operating Temperature - 0 - 115°F
- Operating Voltage - 9V DC
- Detection Frequency- 10 kHz VLF

4 Warning modes:

- Text messages via 2 x 16 LCD
- LED Warning light at top
- ThunderBolt® Emblem Lights up when storm is detected
- Multiple Audible tones for alarm differentiation
- Automatic noise analysis and filtering
- Low Battery indicator screen
- Auto off feature (for units left on battery for 2 hours)
- 3 user selectable alarm range settings
- 1 automatic alarm range (8 mile range or Storm is Local)

Size 6.4" X 3.4" X 1.5"

Weight 14 oz.

Warranty 3 Year Limited Manufacturers / 45 day guaranty

Air Blast Extrapolator & Air Blast Prediction

Airblast Extrapolator

For use only when there is a airblast measurement available
in the same direction as the point of concern.

Enter AB 1 (the airblast level measured-in dBL) to get PSI 1 (psi of AB 1).
Enter DIST 1 (distance to the location of the airblast measurement)
and DIST 2 (distance to point of concern) to extrapolate PSI 2 (psi)
and AB 2 (dB) at point of concern.

AB 1	PSI 1	DIST 1	DIST 2	PSI 2	AB 2
117.3	0.002128	150	1953	6.16E-05	86.54878

Open air detonation
(Perkins, Jackson,1964)
Demolition and detcord

AB 1	PSI 1	DIST 1	DIST 2	PSI 2	AB 2
117.3	0.002128	150	1953	3.3E-05	81.13177

Coal mine parting
(USBM RI 8485)
Coal or Quarry Average

AB 1	PSI 1	DIST 1	DIST 2	PSI 2	AB 2
117.3	0.002128	150	1953	0.000277	99.61202

Coal mine highwall
(USBM RI 8485)
Coal or quarry expected

LBS	DIST	(SD [^] .333) (PSI)	(DBL)	OPEN AIR DETONATION (Demolition, Cord)
100	800	172.355 0.153312	154.4636	

LBS	DIST	(SD [^] .333) (PSI)	(DBL)	HIGHWALL RI 8485 (Coal, Construction or Quarry Average)
100	800	172.355 0.002715	119.4279	

LBS	DIST	(SD [^] .333) (PSI)	(DBL)	PARTING RI 8485 (Coal, Construction or Quarry Worst Case)
100	800	172.355 0.039643	142.7155	

Enter **LBS** (pounds of explosives) and **DIST** (distance to point of concern) to solve for SD[^].333 (cube root scaled distance), psi (pounds square inch) and dBL (decibels linear) **The above three formulae can be used in the absence of airblast measurements.**

In all cases enter your values (under the bolded labels) over the sample values!!

AB 1	PSI 1	DIST 1	DIST 2	PSI 2	AB 2	OPEN AIR DETONATION (Demolition, Cord)
136.2	0.018749945	405	576	0.011532	131.9901	

AB 1	PSI 1	DIST 1	DIST 2	PSI 2	AB 2	HIGHWALL RI 8485 (Coal, Construction or Quarry Average)
136.2	0.018749945	405	576	0.014176	133.7829	

AB 1	PSI 1	DIST 1	DIST 2	PSI 2	AB 2	PARTING RI 8485 (Coal, Construction or Quarry Worst Case)
136.2	0.018749945	405	576	0.010586	131.2467	

Enter **AB 1** (the airblast level measured in dBL) to solve for PSI 1 (pounds square inch of AB 1). Enter **DIST 1** (distance to the location of the airblast measurement) and **DIST 2** (distance to point of concern) to solve for PSI 2 (pounds square inch of AB 2) and AB 2 (the airblast level predicted at DIST 2, in dBL) **Use the above three formulae only when there is a airblast measurement available in the same direction as your point of concern.**

dBL	PSI	SD[^].333	OPEN AIR DETONATION (Demolition, Cord)
136.2	0.018749945	790.1532	

dBL	PSI	SD[^].333	HIGHWALL RI 8485 (Coal, Construction or Quarry Average)
136.2	0.018749945	15.11785	

dBL	PSI	SD[^].333	PARTING RI 8485 (Coal, Construction or Quarry Worst Case)
136.2	0.018749945	273.3855	

Enter **dBL** to solve for PSI, necessary to determine the SD[^].333 at which the airblast level is likely to occur. **Use to the above formulae to design blasts to target a desired airblast level.**

LBS	Maximum amount of explosives per delay in pounds.
DIST	Distance to the point of concern.
SD[^].333	Cube root (.333) scaled distance.
AB	Airblast, reported in decibels.
DIST 1	Distance to the point of the known airblast level.
DIST 2	Distance to the point of the point of concern.
PPV 1	The known airblast level.
PPV 2	The airblast level at the point of concern.
PSI	Airblast pressure, reported in PSI, pound per square inch.

SD[^].333	PSI	dBL	OPEN AIR DETONATION (Demolition, Cord)
300	0.071353335	147.8203	

300	0.001748561	115.6057	HIGHWALL RI 8485 (Coal, Construction or Quarry Average)
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300	0.016404019	135.051	PARTING RI 8485 (Coal, Construction or Quarry Worst Case)
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dBL Wind Velocity Equivalent

dBL	MPH
92.788	2.472712165

Sample Blast Report



Blast Report



Job#	_____	Cust. PO#	N/A	
Date	_____	Cust. Supt. Name	_____	
Customer Name	_____	Pick Tkts#	_____	_____
Job Address	_____	N/A	N/A	N/A
		N/A	N/A	N/A

State	_____	Permit No.	_____	Identify Hazards
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Pre Shift Insp.Time (24hrs) :	_____
Post Shift Insp.Time (24hrs):	_____

Blaster :	_____	Precautions Taken:
License #:	=====	<u>See JHA and Site Security</u>
Signature:		

	Weather Comments:
--	-------------------

No. of Crew Members	_____
Crew Members Names :	

_____	_____	_____	N/A
_____	A	N/A	N/A
N/A	N/A	N/A	N/A

Seismograph Monitoring Plan (Not to Scale):

Shot # _____ Shot Time (24hrs) _____ Shot VideoTaped: _____ Weather

Notes: Weather Conditions: _____

Temp (°F): _____

Wind Direction: _____

Wind Spd: _____ MPH

Preblast

Blast Direction: _____

Blast Location: _____

Location of Structure: _____

Dist. to Closest (Feet) _____

Structure _____

Railroad/Highway _____

Overhead Util _____

N/A _____

Underground Util _____

N/A _____

Max Holes/Delay: _____

Max Weight/Delay: _____ Lbs

Predicted K Factor: _____

Scale Dist.: _____

Predicted PPV: _____

Pay Quantities

Fire Detail # of Hrs: _____

Pay Cubic Volume _____

N/A _____

N/A _____

Pay Calculations Notes

Shot Info

Configuration

Total Drill Depth(Ft)	Total SqFt	Powder Factor	Total Product Weight (Lbs) :
Total Tons	N/A	Total Yards	Avg Weight / Hole (Lbs):
Cal Method	Pattern		
# Holes		Cover Used /No N/A	
AVG	Min	Max	
Drill Depth		Stone Weight	
Burden(Feet)	Feet	Type of Terrian	
Spacing (Feet)	Feet	Type of Rock	
Hole Diameter		Stemming Type	
OverBurden (Ft)		Height of Face	
Control Row Taped		Angled Holes /Face Bermed	
			Laser/BoreTracking

Total Pounds

Type Of Initiation: Non-Electric

Product #	Desc	Qty	Wgt	Product #	Desc	Qty	Len
			Lbs				
BA BULK Totals:			Lbs				
Product #	Desc	Qty	Wgt				
			Lbs				
			Lbs	DETS DHOLE Totals:			
BAPACKAGED Totals:			Lbs	Product #	Desc	Qty	Len
Product #	Desc	Qty	Wgt				
			Lbs				
			Lbs	LINES Totals:			
BOOSTERS Totals:			Lbs	Product #	Desc	Qty	Len
				SURF DELAY Totals:			

Description: Production

Elevation	Feet
Brench (ft)	N/A
Floor (ft)	N/A
Overburden (ft)	
Sub Drilling(ft)	
Total Depth (ft)	

N/A

N/A

N/A

N/A

N/A

N/A

N/A

Seismographs

Operator Name	Location of Seis	Seis #	Monitor Log Status	Actual PPV	Actual PPV Freq.	Actual db	Actual Dist. (ft)	Actual K Factor

Description: Decked

Elevation	Feet
Brench (ft)	N/A
Floor (ft)	N/A
Overburden (ft)	
Sub Drilling(ft)	
Total Depth (ft)	

N/A

N/A

N/A

N/A

N/A

N/A

Sample Drilling Log Sheet

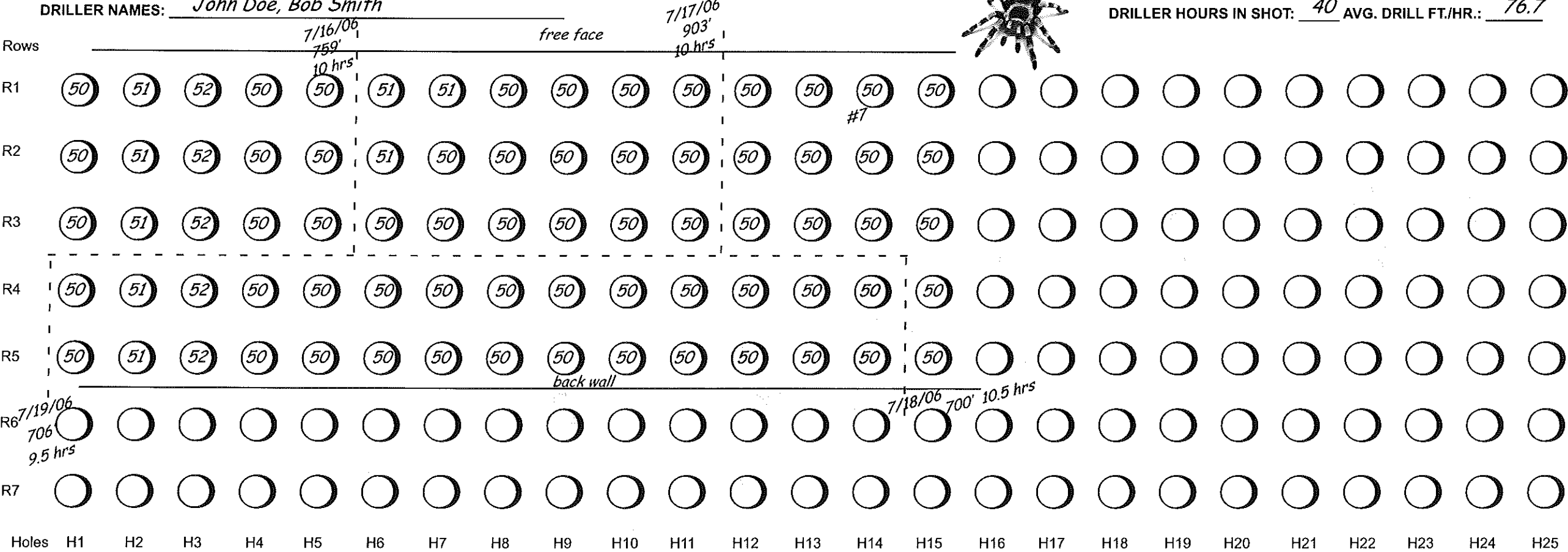
CUSTOMER: Best Customer
LOCATION: City, State
SHOT NO: 13 DATE: 7/20/06 TIME: 9:38 am
BENCH ELEV.: 210 FLOOR ELEV.: 160
BLAST LOCATION: Southeast Corner
DRILLER NAMES: John Doe, Bob Smith

HOLE REPORT: SQUARE PATTERN

Maine Drilling
& Blasting

P.O. BOX 1140 • 423 Brunswick Ave. • Gardiner, ME 04345

NUMBER OF HOLES: 75
SPACING: 9 BURDEN: 10
DEPTH: 50-52' DIAMETER: 4"
TOTAL DRILL FEET IN SHOT: 3,068
DRILL DAYS IN SHOT: 4 AVG. DRILL FT./DAY: 767
DRILLER HOURS IN SHOT: 40 AVG. DRILL FT./HR.: 76.7



COMMENT CODE KEY:

- 1 = Mud Seam
- 2 = Overburden
- 3 = Soft Rock
- 4 = Deviation Detected
- 5 = Pressure Settings
- 6 = Accessories Lost or Broken in Shot
- 7 = Accessories Not Retrieved and Location
- 8 = Number of Holes Redrilled and Cause
- 9 = Method used to Collar Holes
- 10 = Angled-Document Degree/offset

HOLE AND DRILLING NOTES (Holes without comment are free from defect or overburden):

- 4. Losing light@ 30', should be boretracked
- 5. Reduced pressure to 120 bar helped with deviation, reduced drill production by 1 hour/day
- 6. Broke a steel and couldn't retrieve

All geological conditions are recorded above. Driller's signature: John Doe Date: 7/20/06

I have communicated with the driller(s) and understand all identified geological conditions:

B.I.C. Signature: Jim Barker Date: 7/20/06

CUSTOMER: _____

LOCATION: _____

SHOT NO: _____ DATE: _____ TIME: _____

BENCH ELEV.: _____ FLOOR ELEV.: _____

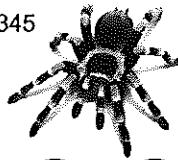
BLAST LOCATION: _____

DRILLER NAMES: _____

HOLE REPORT: STAGGERED PATTERN

Maine Drilling
& Blasting

P.O. BOX 1140 • 423 Brunswick Ave. • Gardiner, ME 04345



NUMBER OF HOLES: _____

SPACING: _____ BURDEN: _____

DEPTH: _____ DIAMETER: _____

TOTAL DRILL FEET IN SHOT: _____

DRILL DAYS IN SHOT: _____ AVG. DRILL FT./DAY: _____

DRILLER HOURS IN SHOT: _____ AVG. DRILL FT./HR.: _____

Rows

R1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
R2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
R3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
R4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
R5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
R6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
R7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Holes	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24	H25
-------	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

COMMENT CODE KEY:

- 1 = Mud Seam
- 2 = Overburden
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- 5 = Pressure Settings
- 6 = Accessories Lost or Broken in Shot
- 7 = Accessories Not Retrieved and Location
- 8 = Number of Holes Redrilled and Cause
- 9 = Method used to Collar Holes
- 10 = Angled-Document Degree/offset

HOLE AND DRILLING NOTES (Holes without comment are free from defect or overburden) _____

All geological conditions are recorded above. Driller's signature: _____ Date: _____

I have communicated with the driller(s) and understand all identified geological conditions:

B.I.C. Signature: _____ Date: _____

Typical Blast Design and Timing Diagrams

Owner/Site

Location: South Burlington, VT

Division: Western

Customer

Author Cole Dube

Blast Plan Description: <6' Rock Cuts

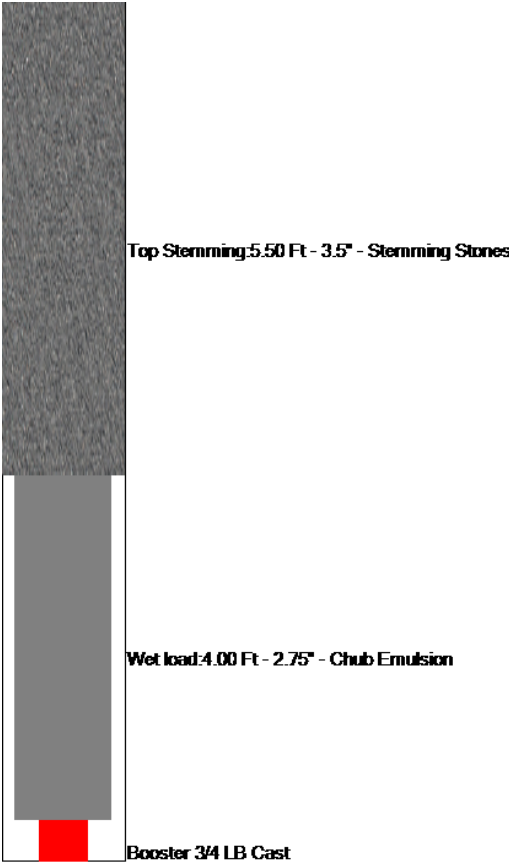


9/12/2024 10:36 AM

APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	25
Hole Depth:	9.50 Ft
Hole Diameter:	3.5 in
Burden:	5.00 Ft
Spacing:	5.00 Ft
Holes per Delay:	1
Pounds Per Delay:	12.65 Lbs
Pounds Per Hole:	12.65 Lbs
Total est. Pounds:	316.25 Lbs
Powder Factor:	1.44 Lbs/Cy
Decks:	0

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160	Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	75	Distance to Structure
Lbs per Delay (w)	12.65	Lbs explosives per 8 milisecond delay
Scaled Distance (sd)	21.09	(sd = d/ square root of w)
Estimated PPV	1.22	(ppv = k * sd ^ -1.6)

Typical for Production work consistent with holes 9.5 Ft deep at 75 from a structure utilizing 3.5' In diameter at a 5 Ft by 5 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

Owner/Site

Location: South Burlington, VT

Division: Western

Customer

Author Cole Dube

Blast Plan Description: >6' Rock Cuts

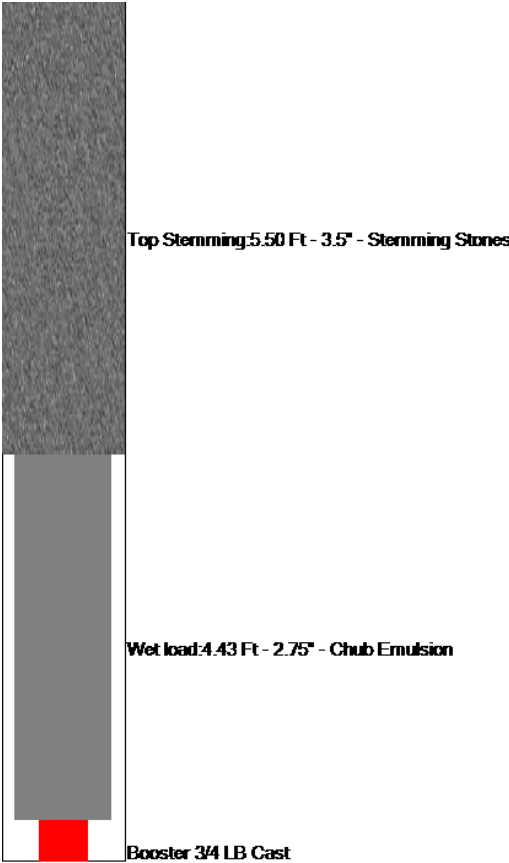


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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	25
Hole Depth:	9.93 Ft
Hole Diameter:	3.5 in
Burden:	5.00 Ft
Spacing:	5.00 Ft
Holes per Delay:	1
Pounds Per Delay:	14.01 Lbs
Pounds Per Hole:	14.01 Lbs
Total est. Pounds:	350.25 Lbs
Powder Factor:	1.52 Lbs/Cy
Decks:	0

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160 Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	100 Distance to Structure
Lbs per Delay (w)	14.01 Lbs explosives per 8 milisecond delay
Scaled Distance (sd)	26.72 (sd = d/ square root of w)
Estimated PPV	0.83 (ppv = k * sd ^ -1.6)

Typical for Production work consistent with holes 9.93 Ft deep at 100 from a structure utilizing 3.5' In diameter at a 5 Ft by 5 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

Owner/Site

Location: South Burlington, VT

Division: Western

Customer

Author Cole Dube

Blast Plan Description: Outside Open

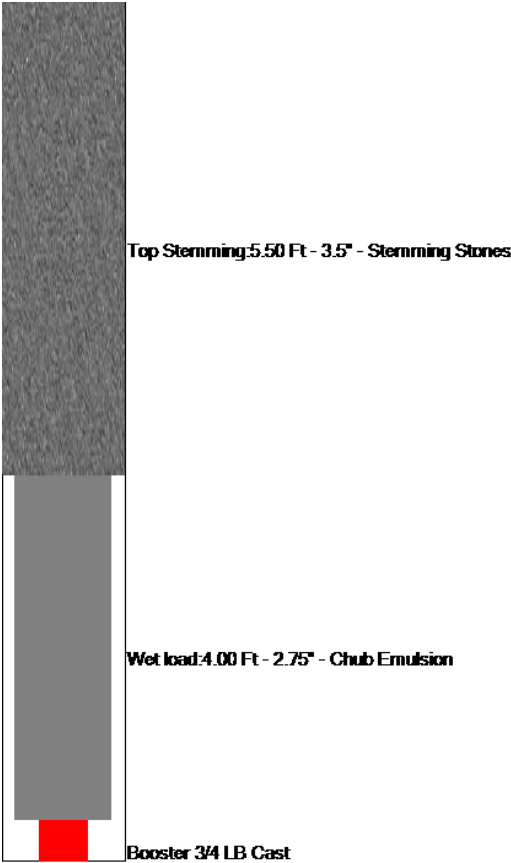


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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	25
Hole Depth:	9.50 Ft
Hole Diameter:	3.5 in
Burden:	6.00 Ft
Spacing:	4.00 Ft
Holes per Delay:	1
Pounds Per Delay:	12.65 Lbs
Pounds Per Hole:	12.65 Lbs
Total est. Pounds:	316.25 Lbs
Powder Factor:	2.92 Lbs/Cy
Decks:	0

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

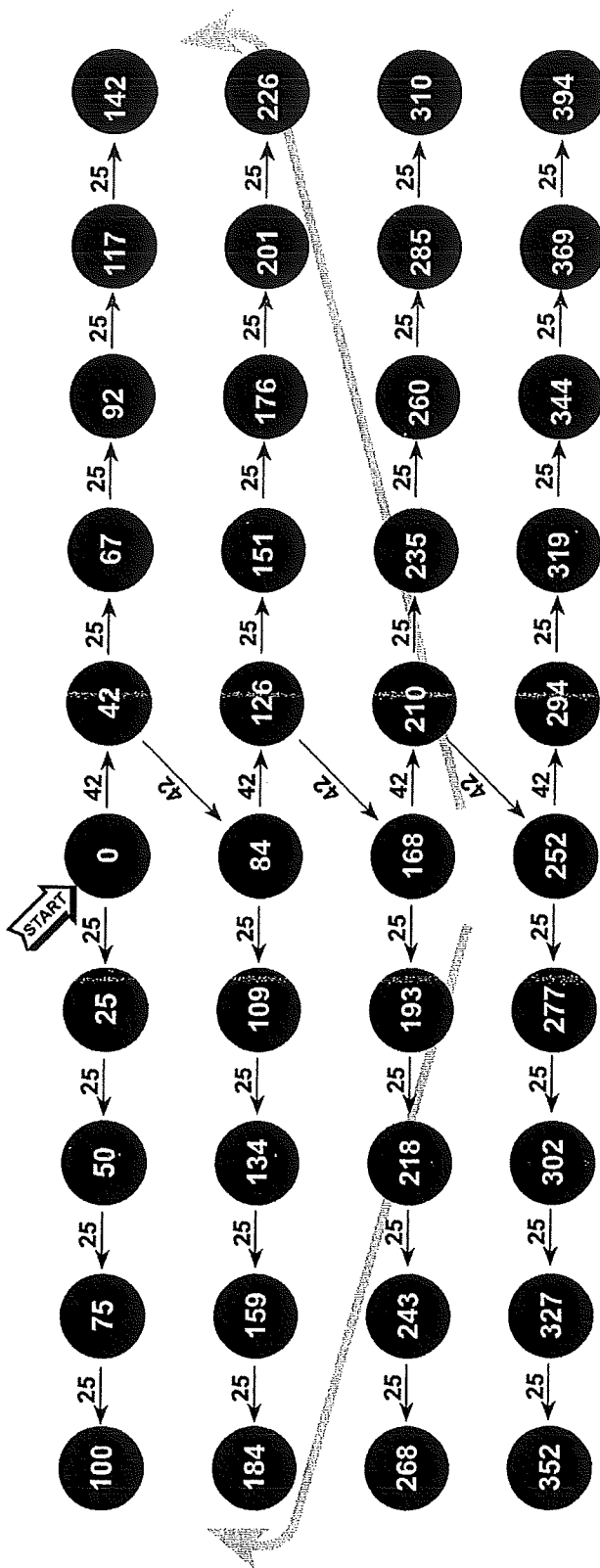
Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) :	160 Ground Constant based on Site/Rock Conidtions
Distance Ft (d)	75 Distance to Structure
Lbs per Delay (w)	12.65 Lbs explosives per 8 milisecond delay
Scaled Distance (sd)	21.09 (sd = d/ square root of w)
Estimated PPV	1.22 (ppv = k * sd ^ -1.6)

Typical for Production work consistent with holes 9.5 Ft deep at 75 from a structure utilizing 3.5' In diameter at a 6 Ft by 4 Ft pattern.

Plan View/Timing Design (please see attached timing diagram)

FREE FACE



<div><div>DYNO</div><div>Dyno Nobel</div></div> <div>2650 Decker Lake Blvd, Suite 300 Salt Lake City, Utah, USA 84119 Telephone: (800) 732-7534 www.dynonobel.com</div> <div>DYNO NOBEL INC. and its subsidiaries disclaim any warranties with respect to their products and the information presented herein, the safety or suitability thereof, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all uses including death, losses, or damages to persons or property arising from the use of their products. Under no circumstances shall DYNO NOBEL INC. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.</div>	<div>000 Sequential Time</div> <div>NONEL® EZTL® Delay Time (ms)</div> <div><div>90</div><div>Movement Direction</div></div>	<div>1</div> <div>10</div>	<div>NOTES</div> <div>Double surface units recommended with this timing sequence!</div> <div>Must have no more than 5 holes on opening side to ensure 1 hole per 8ms delay.</div>	
	<div>APPLICATIONS</div> <div>Quarry, construction or open pit</div>	<div>SURFACE DELAYS</div> <div>25ms and 42ms</div>		
	<div>LIMITATIONS</div> <div>10 holes in length and infinite in depth or 2 rows deep and infinite in length</div>	<div>IN-HOLE DELAYS</div> <div>Same delay period in each hole. Suggested in-hole delay: 500ms</div>		

Fly Rock & Misfire Prevention Guidelines & IME Blasting Best Practices

Fly-Rock Prevention Plan

Prevention of Fly-Rock

Fly-rock prevention is most effective through good planning, attention to detail on drilling, loading and site security. Each category below contains items that are known to be effective in preventing fly-rock.

Planning

1. It must be clearly established who the (BIC) is and then clearly communicated to the entire crew.
2. The BIC must clearly communicate what the responsibilities are for each crew member.
3. BIC must understand the abilities of the crew. Trainees must be trained and supervised on all job functions, (assign a trainer).
4. Through the use of the Job Hazard Analysis the crew must become familiar with the blast environment and clearly identify all hazards on and around the job site.
5. The BIC must communicate with the drill operators and other blasters with experience to fully understand the geology on site.
6. The blast design must take into consideration all the relevant parameters, blast geometry, hazards, type of products, timing and type and amount of cover in use.
7. All pre-blast calculations must be done prior to the blast and adjusted should conditions change on the site or drilling conditions dictate a modification of the plan. Powder factor should be determined prior to loading the first hole.
8. Each blast should be designed according to the direction of least danger.
9. Start each project with a conservatively designed test blast. that will not only provide information on the geology but will provide relief for the next shot.
10. When location or conditions on the job site change consider your next blast as a test blast.
11. Document your blast plan and have it reaffirmed.
12. Request hold harmless on shots that may cause damage or takes unnecessary risks.

Drilling

13. Carefully monitor and record hole depths, amount of overburden, and any drill hole anomalies with light colored crayons on the cones or another effective method.
14. Use flashlights attached to tapes to determine straightness of holes. If deviation is even slightly suspected, have holes bore tracked.
15. Arrange for Laser Profiling and Bore Tracking for high wall faces with exposures to property.

Loading the Shot

16. Have hole sheets and timing patterns on paper before loading.
17. Profile all faces before loading front row of holes.
18. Have blaster-in-charge load first and second rows of holes.
19. When using pourables (Bulk or ANFO):
 - a. Have an appropriate plan to deal with seams, voids, faces, and overloaded holes.
 - b. Make the appropriate design modifications for the use of bulk.
 - c. Keep the increased hazards in mind.
20. Take the time necessary to work safely and do not take shortcuts, or unnecessary risks. (DO NOT RUSH!)
21. Know the exact amount of burden on the face and load and cover accordingly, if face is bermed and you're uncertain of face location, excavate to find the face and then reberm.
22. Utilize berms for faces as appropriate.
23. If questioning the necessity to or the amount of cover, add cover.
24. Know the exact amount of overburden over the rock and load and cover accordingly.

25. Use offsets properly.
26. Train the blast crew on proper stemming techniques, what stemming anomalies may look like, why, and how to report them.
27. Monitor the stemming to make certain that all holes are properly stemmed.
28. Use only appropriate crushed stone and non-sparking stemming rods to compact the stone in each hole.
29. Pay attention when using bulk as it can coat the sides of the hole reducing the effectiveness of the stemming.
30. BIC must walk the shot twice and check power, double-up on power and down hole caps when necessary (critical shots).
31. Ensure 100% safe detonation! Misfires can be a source for flyrock. Follow all Misfire Prevention Guidelines!
32. If there is a remote possibility of fly rock from a blast, take the necessary additional precautions.
33. Never make assumptions. If unfamiliar with the situation; figure it out, then get another opinion to confirm your decision .
34. Always communicate with supervisors when safety issues are compromised.

Site Security

35. Secure loading area before, during, and after loading.
36. Have a thorough, written Blast Zone Security Plan:
 - a. Design an over cautious plan.
 - b. Communicate the plan with our crew, the Contractor and his crew.
 - c. Have all blast guards use hand-held radios on the same frequency or another acceptable means of communication.
37. Secure the blast zone by removing people from the blast area (especially keeping them away from the face of the blast) and have them stay at an overly safe distance behind the blast and put them under cover.
38. Blaster must have proper cover.
39. Execute the Blast Zone Security plan to the "T".

Misfire Prevention Guidelines

Prevention of Misfires

These guidelines were established to provide good work practices that will greatly reduce the possibility of a misfire due to self-induced causes.

Shot Design Nonelectric

1. Use proper hookup procedures as found in the MD&B published guidelines
2. The Blaster-In-Charge may determine the need for extra surface delays to create a dual path system to enhance reliability
3. Ensure that there is enough slack in the shock tube
4. Ensure shot design allows for complete energization or in cases of larger shots appropriate advancement of the initiation sequence.

Shot Design Electric

5. Ensure shot design allows for complete energization
6. Tape connections in wet locations
7. Monitor meter while matting
8. Test equipment regularly
9. Perform stray current tests

Loading

10. "Tape" all non-electric connections to ensure there is a proper connection
11. The Blaster-In-Charge must walk the shot completely and verify all connections prior to shooting
12. The Blaster-In-Charge will have additional competent person(s) walk the shot to ensure all connections are made properly
13. Use caution whenever sticking a loading pole or stemming rod into a loaded hole as it can damage shock tube
14. Re-prime any hole where separation is suspected
15. Re-prime any hole where you have used a powder retriever
16. Do not step on shock tube

Matting

17. Matting shall only be performed under the direction of the Blaster-In-Charge, or their competent designee
18. Ensure that the excavator on the project is sufficient in size to handle the mats in an efficient manner
19. Communicate the matting procedure clearly with the excavator operator, discuss hand signals also.
20. Design the shot with the excavators reach in mind
21. Clean mats by "shaking" them with an excavator. This is more effective when the tire "grain" is sloping downward
22. Do not drag mats over a shot
23. Do not set mats with a front-end loader or other equipment that cannot properly hoist the mat over the shot
24. Place ANFO bags under shock tube exposed to jagged surfaces
25. Utilize sand cover whenever geological conditions warrant extra coverage

General Prevention Techniques

26. Do not cut open detonator boxes with a knife
 27. Do not allow your powder knife to swing from a lanyard (strap) unless the blade is protected
 28. Document and calculate timing before loading the shot
 28. After the shot has been tied in – GET OFF THE SHOT!
-



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.

USBM Appendix B Alternative Blasting Level Criteria

APPENDIX B.-ALTERNATIVE BLASTING LEVEL CRITERIA

Safe blasting vibration criteria were developed for residential structures, having two frequency ranges and a sharp discontinuity at 40 Hz (table 13). There are blasts that represent an intermediate frequency case, being higher than the structure resonance (4 to 12 Hz) and lower than 40 Hz. The criteria of table 13 apply equally to a 35-Hz and a 10-Hz ground vibration, although the responses and damage potentials are very much different.

Using both the measured structure amplifications (fig. 39) and damage summaries (figs. 52 and 54), a smoother set of criteria was developed. These criteria have more severe measuring requirements, involving both displacement and velocity (fig. B-1).

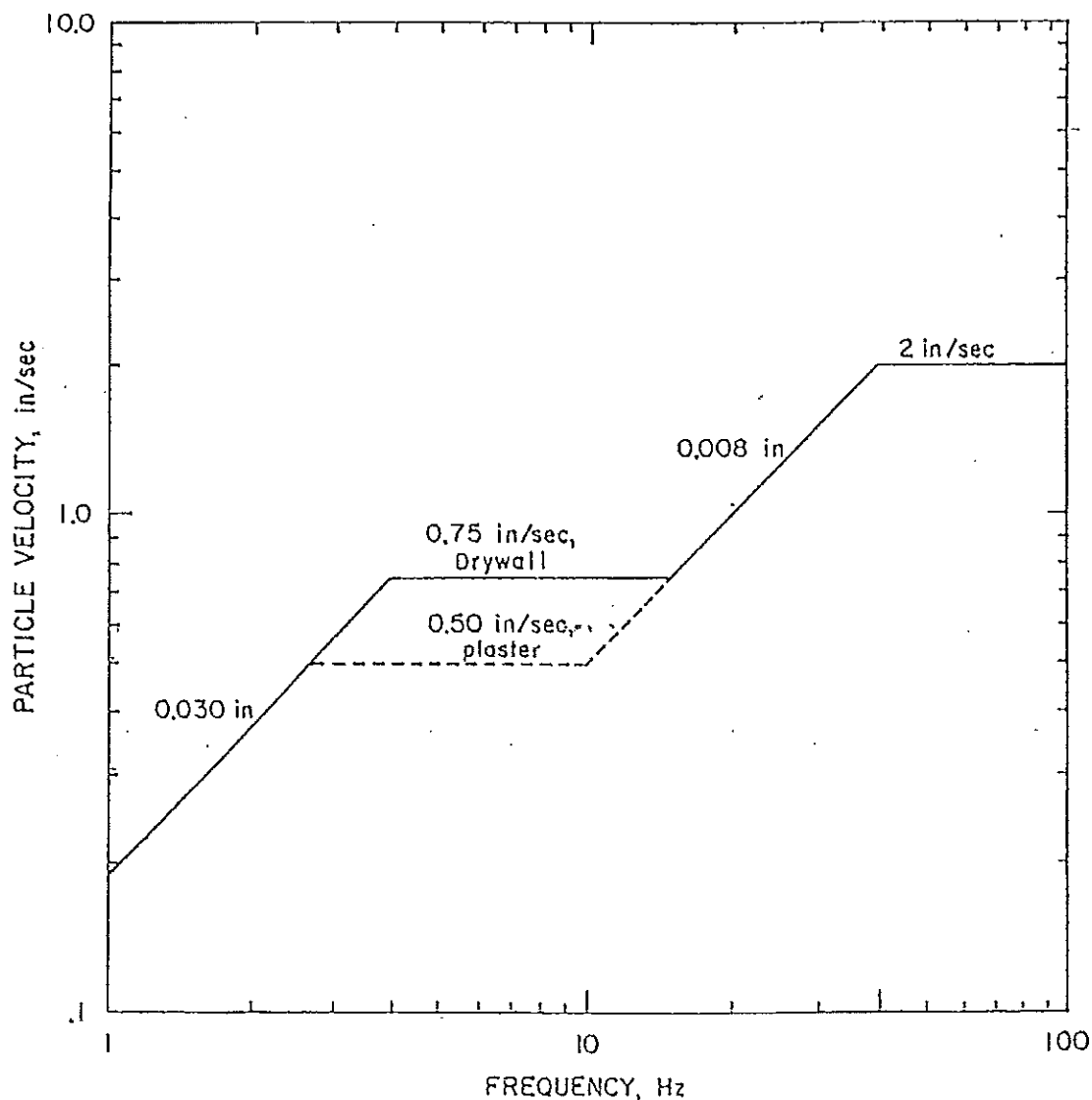


Figure B-1.—Safe levels of blasting vibration for houses using a combination of velocity and displacement.

Seismograph Specifications



Mini-Seis III Pro™

The Mini-Seis III Pro is the ultimate vibration monitor. It is suitable for geotechnical, environmental, blast monitoring and more. It features sampling rates of up to 16K over 4 or 8 channels. There is also a 128K single channel sample rate. The unit has a 16 bit dynamic range and is very low power.

Recording modes include waveform, histogram, histogram/waveform and manual. The waveform record duration can be set from 1 to 120 seconds at all sample rates. The histogram period can be set at 1, 10, 20, 30, 40, 50, 60 or 900 seconds.

Data can be downloaded to a computer or thumb drive using high speed USB. Remote access by RS232 with baud rates up to 460800 is supported. The unit has over 3.5 GB of memory and can store up to 4096 waveform and histogram records.

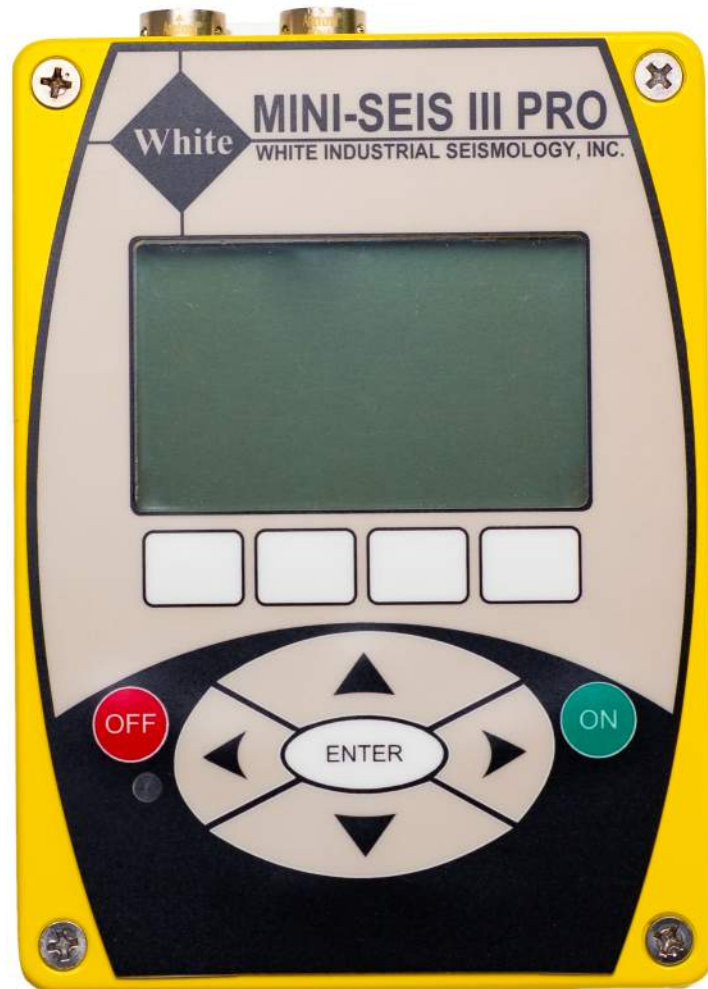
The user interface is simple and easy to navigate. Soft keys provide additional options depending on the screen being viewed. Optional GPS is available to store location coordinates and provide highly accurate clock syncing.

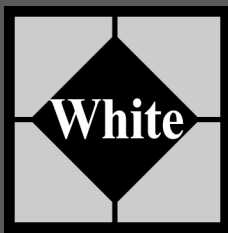
For advanced monitoring the instrument supports the use of non-standard sensors. White can provide a hardware interface for accelerometers, strain gauges, hydrophones and nearly any other AC or DC coupled sensor.

Multiple units can be connected together in a master-slave arrangement where the master unit triggers all of the slave units simultaneously. This feature provides a common time base useful for determining propagation velocity, structure phase response and more.

[Specifications](#)

[User Manual](#)





Industrial Seismology, Inc.

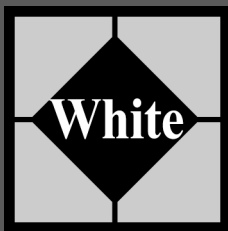
Mini-Seis III Pro Specifications

General

Channels	Standard - three seismic channels and one acoustic channel. Optional – three additional seismic channels and one additional acoustic channel (8 channel model). Support is available for non-standard sensors.
Seismic	
Range	Standard 260 mm/s (10.24 in/s). Other ranges may be customized at the factory.
Resolution	0.008 mm/s (0.0003 in/s) depending on the range.
Frequency Range (ISEE)	2 to 250 Hz at 1024 sample rate as per ISEE Seismograph Performance Specifications for Blasting Seismographs 2017 Edition. The upper frequency limit is 1/4 the sample rate.
Frequency Range (DIN)	From 1 to 315 Hz.
Accuracy (ISEE)	Conforms with ISEE Performance Specifications for Blasting Seismographs 2017 Edition.
Accuracy (DIN)	DIN 45669-1 Standard.
Transducer Density	Approximately 2.01 g/cc (125 lb/ft ³)
Acoustic	
Weighting	Linear overpressure.
Range	0.0156 Pa (0.000156 Mb) depending on range.
Frequency Range	2 to 250 Hz at 1024 sample rate as per ISEE Seismograph Performance Specifications for Blasting Seismographs 2017 Edition. The upper frequency limit is 1/4 the sample rate.
Linear Accuracy	Conforms with ISEE Performance Specifications for Blasting Seismographs 2017 Edition.
Timer	Allows an instrument to be active only during selected times on a daily basis.
Communication	High speed USB or serial.
Storage Capacity	Up to 4096 waveform and histogram records of any duration.
External Data Storage	Write to USB thumb drive.
System Log	The system log tracks on/off times, changes to setup parameters and system operation.
Operating Modes	Waveform, histogram, histogram/waveform and manual.
Data Reporting	Waveform and histogram events can be reported without needing to deactivate the current operating mode.
Data Retrieval	Data can be downloaded without requiring deactivation of the current operating mode.
GPS	Optional integrated GPS stores location information in the record summary

Waveform Modes

Waveform	Standard mode used for blast monitoring and discrete transient event monitoring.
Manual	Trigger from the keypad or an external switch.
Simultaneous Triggering	Using a combination of manual and triggered modes, multiple units can be connected in serial for simultaneous triggering.
Multi-Level Triggering	Three trigger levels allow for the use of warning lights and sounds.
Sample Rate	1024, 2048, 4096, 8192, 16384 samples per second per channel over 8 channels. Also 65536 and 131072 samples per second over 1 channel.
Duration	1 to 120 seconds at all sample rates.
Pre-Trigger	1 second at 1024 sample rate. The pre-trigger time decreases proportional to the sample rate.
Minimum Trigger Level	
Seismic	0.254 mm/s (0.01 in/s) depending on range.
Linear Acoustic	88 dBL depending on range.
Downtime Between Events	None at all sample rates.
Dynamic Sensor Test	With the exception of the single channel and non-standard sensors, a dynamic sensor test is performed at the end of every event in waveform mode.



Industrial Seismology, Inc.

Mini-Seis III Pro Specifications

Histogram Modes

Histogram	Standard mode for recording discrete measurements from continuous and semi-continuous sources.
Histogram/Waveform	A waveform is recorded while the histogram is running when one of the trigger thresholds is met or exceeded.
Sample Rate	1024, 2048 or 4096 samples per second over 8 channels.
Sample Period	1, 10, 20, 30, 40, 50, 60 seconds and 15 minutes.
Data Stored	Channel peaks, their frequencies and optionally the vector sum.
Histogram Interval	The histogram interval determines how long a histogram will run before deactivating and starting a new histogram. From 1 to 12 hours or 0 which starts a new histogram at midnight.

Reporting

General	Reporting requires an approved remote access device capable of port forwarding TCP data. The reporting can be provided by the White Reporting Service™ or handled by the user with the appropriate version of the White AutoReceive™ software.
Waveform Mode	With reporting activated, after a recording, the seismograph will output a string of characters consisting of the unit serial number and other information.
Histogram Mode	With reporting activated, after a histogram is made inactive, the seismograph will output a string of characters consisting of the unit serial number and other information.

Physical

Size	Approximately 15 cm. x 11.5 cm. x 9 cm. (6 in. x 4.5 in. x 3.5 in.).
Weight	Approximately 1.6 Kg. (3.5 lbs.) without accessories.
Battery	Internal 6.0 volt rechargeable.
Display	The high contrast graphics display facilitates the instrument's setup. It also allows the operator to view operating parameters and summary data.
Keypad	The keypad can be used to navigate screens and modify setup data.
Clock	A 24 hour clock maintains the date and time to the second, even if the primary power fails.
Operating Time	With a fully charged battery the unit will operate from 7 to 10 days at 1024 samples per second. Longer times may be obtained using the timer mode or external power from a solar panel or deep cycle battery.
Charging	An internal charging circuit allows charging with the supplied plug-in wall mount charger or available 10 to 15 volt DC supply. Power supplies for international use are available.
Operating Temperature	0 to 130 degrees F (-18 to 54 degrees C).

WoodsCan Electric Air Horn – Audible Device for Blast Notification



WoodsCan Hornet

Rechargeable Electric Air Horn

The world's most advanced portable signaling device for industrial and commercial safety

I have been using the WoodsCan blasting horn on a daily basis for urban and downtown blasting procedures since it was first introduced. Never would I want to go back to an aerosol device. With the in-truck quick charge, I have never yet been in a position where my signal warning device fails to work. In my line of work this is imperative. Every blaster that I come in contact with either has one or wants one...they work!

Bruce Rowell - Western Grater Contracting, Ltd.



Reliable

- A consistent 120+ decibels of sound
- Reliable even in cold weather
- Improves crew productivity over disposable compressed gas air horns

Safe

- No frostbite from leaking gas cans
- No more explosion risks in hot weather
- Transportable on an airplane

Cost Effective

- Pays for itself within a few months
- Save hundreds the first year alone
- Save more each year thereafter

Go Green

- No more metal cans to dispose of
- No more tetrafluoroethane (potent greenhouse gas) discharged into the atmosphere
- Ozone friendly

WoodsCan Hornet product highlights:

- Cost-effective signaling device
- Extremely reliable – no more leaky gas cans
- Consistent 120 decibels of sound
- High intensity LED light
- Patented design
- Over 500 one-second pulls per charge
- Rechargeable 14 volt lithium-ion battery
- 30 minute charge time
- Easy to operate
- Environmentally friendly with no greenhouse gas discharged
- Six month limited warranty



Each WoodsCan Hornet kit includes:

- WoodsCan Hornet electric air horn
- 14 volt rechargeable lithium-ion battery
- Charger (120 or 230 VAC)
- 12 volt inverter
- Durable carrying case
- (Optional) second lithium-ion battery
- User's manual

Regardless of your application,
the WoodsCan Hornet will
meet your signaling needs:

- Mining
- Quarrying
- Construction
- Seismic Exploration
- Animal Control
- Special Events
- Many more...



For more information, contact us
at info@woodscan.com
or visit: www.woodscan.com



Blasting Mats Cut Sheets



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 America to make products of such widths.	To match our client's needs.
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)	<ul style="list-style-type: none">• 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 inc.
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Laval, Québec
H7M 3H7

Printed on : July 20th 2016

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E-mail : info@dynamat.qc.ca
Website : <http://www.dynamat.qc.ca/>

SDS Sheets

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Date: 03/16/2018

Maine Drilling & Blasting

88 Gold Ledge Ave,
Auburn, NH 03032

Supersedes: 08/24/2015 & 09/2005

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.

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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 de minimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: 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.

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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 methemoglobinemia – 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

Safety Data Sheet

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/m ³)	100 mg/m ³ (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.

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SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	: Solid
Appearance	: White to tan colored thick cream. If aluminum 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

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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])
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Persistence and Degradability Not available

Bioaccumulative Potential

Ammonium nitrate (6484-52-2)

BCF fish 1	(no bioaccumulation expected)
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Log Pow	-3.1 (at 25 °C)
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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

Safety Data Sheet

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

Safety Data Sheet

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 Classification

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 Classification

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

Fuels, diesel, no. 2 (68476-30-2)

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

Safety Data Sheet

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

Revision Date : 08/24/2015
Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

Party Responsible for the Preparation of This Document

Maine Drilling & Blasting

88 Gold Ledge Ave

Auburn, NH 03032

Phone: (603) 647-0299 Toll Free: (800) 370-0299

Disclaimer

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BLASTEX[®]

Small & Large Diameter Booster Sensitive Emulsion

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



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 -18° C (0° F). At internal product temperatures below -18° C (0° F) and higher than -34° C (-30° F) use a 454 g (16 oz) or larger cast booster.
- NEVER** use BLASTEX at internal product temperatures below -34° C (-30° F). At internal product temperatures below -34° C (-30° F), adequate product warm-up time must be allowed after loading into boreholes and before initiation.
- Use with detonating cord is not recommended.

Product Disclaimer: Please see reverse side.

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BLASTEX[®]

Small & Large Diameter Booster Sensitive Emulsion

Properties Cont.

Packaging, Chub

Diameter x Length		Blastex	Blastex Plus	Case Qty	Net Explosive 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

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 -18° C and 38° C (0° F and 100° 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 and 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.
- *Add two pounds for Gross Case Weight

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

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

Product Disclaimer: Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

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Safety Data Sheet

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: dнна.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1063

Date: 07/20/2020

Supersedes: 10/12/2018

Product Identifier

Product Form: Mixture

Product Name: Packaged Emulsion Explosives

Trade Name(s):

Synonyms:

BLASTEX®

BLASTEX® PLUS

BLASTEX® TX

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.

Safety Data Sheet

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 de minimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

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

Safety Data Sheet

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-ventilated 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

Safety Data Sheet

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 de minimus 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

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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)

Safety Data Sheet

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

Safety Data Sheet

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 : 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:

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

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

Safety Data Sheet

Disclaimer

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Dyno Nobel SDS

TECHNICAL DATA SHEET



NONEL® EZ DET 1.4B

Nonelectric Blast Initiation System

Properties

SDS
#1122

Net Explosive Content per 100 units 0.0810 kg
0.1785 lbs

Nominal Time msec	Nominal Time msec	Nominal Time msec	Connector Block Color
17 / 350	17 / 500	17 / 700	Yellow
25 / 350	25 / 500	25 / 700	Red
42 / 350	42 / 500	42 / 700	White
25 / 375			Red

Note:

This product is also available with a High Strength cap. For more information, please contact your local Dyno Nobel sales representative.

This product is only available in the US

Hazardous Shipping Description

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



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 an in-hole, High Strength, detonator on the other. The surface detonator is inside a color-coded plastic EZ™ Connector block to facilitate easy connections to 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.
- 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.

Product Disclaimer: Please see reverse side.

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TECHNICAL DATA SHEET



NONEL® EZ DET 1.4B

Nonelectric Blast Initiation System

Properties Cont.

Packaging

Length		Case Type	Quantity/ Case
meters	feet		
3.5	12	D*	90
4.5	16	D*	60
7	24	D*	60
9	30	D*	40
12	40	D*	30
15	50	D*	30
18	60	D*	25
24	80	DC	40
30	100	DC	40
37	120	DC	30

• Length rounded to nearest one-half meter.

• Case weight varies by length & delay; see case label for exact weight.

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

Case Dimensions

Detpak Case (DC)	48 x 45 x 26 cm	18 ¾ x 17 ¾ x 10 ¾ in
Detpak (D)	44 x 22 x 25 cm	17 ½ x 8 ¾ x 10 in

APPLICATION RECOMMENDATIONS - continued

- **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.

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

Product Disclaimer: Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

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Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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

Details of the supplier of the Safety Data Sheet

Manufacturer/Supplier:

Dyno Nobel Inc.

6440 S. Millrock Drive, Suite 150

Salt Lake City, Utah 84121

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

E-Mail: dnnahse@am.dynonobel.com

SDS #: 1122

Date: 07/20/2020

Supersedes: 05/22/2015

Product identifier

Trade name: NONEL® Non-electric Delay Detonators

Article number: 1122

Other product identifiers:

NONEL® MS
NONEL® EZ DET®
NONEL® MS ARCTIC
NONEL® EZTL™
NONEL® LP NONEL®
EZ DRIFTER®
NONEL® SL
NONEL® SUPER
NONEL® TD
NONEL® MS CONNECTOR
NONEL® TWINPLEX™
NONEL® STARTER

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

Emergency telephone number:

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

SECTION 2: HAZARDS IDENTIFICATION

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.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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

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:

Hazard-determining components of labelling:

Warning

diazodinitro phenol (DDNP)

pentaerythritol tetranitrate (PETN)

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

lead diazide orange lead

H204 Fire or projection hazard.

Hazard statements:

Precautionary statements:

P210

P250

P280

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

Do not subject to grinding/shock/friction.

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

Ground/bond container and receiving equipment.

DO NOT fight fire when fire reaches explosives.

In case of fire: Evacuate area.

Explosion risk in case of fire.

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

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

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

Hazard description:

WHMIS-symbols:

NFPA ratings (scale 0 - 4):

HMIS-ratings (scale 0 - 4):

HMIS Long Term Health Hazard Substances

13424-46-9

7439-92-1

13463-67-7

7758-97-6

7778-74-7

Explosive products are not classified under WHMIS.

Not available.

Not available.

lead diazide

lead

titanium dioxide

lead chromate

potassium perchlorate

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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

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: 13424-46-9 EINECS: 236-542-1 Index number: 082-003-00-7	lead diazide  T Repr. Cat. 1, 3 R61;  Xn R62-20/22;  E R3;  N R50/53 R33  Unst. Expl., H200  Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373  Aquatic Acute 1, H400; Aquatic Chronic 1, H410  Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7439-92-1 EINECS: 231-100-4	lead  T Repr. Cat. 1 R60-61-48/23/25;  N R50/53  Repr. 1A, H360FD; STOT RE 1, H372  Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 7440-21-3 EINECS: 231-130-8	silicon  F R11  Flam. Sol. 2, H228
CAS: 2691-41-0 EINECS: 220-260-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)  T R24;  Xn R22;  E R2  Expl. 1.1, H201  Acute Tox. 3, H301; Acute Tox. 3, H311
CAS: 7782-49-2 EINECS: 231-957-4 Index number: 034-001-00-2	selenium  T R23/25 R33-53  Acute Tox. 3, H301; Acute Tox. 3, H331  STOT RE 2, H373  Aquatic Chronic 4, H413

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

CAS: 1314-41-6 EINECS: 215-235-6 Index number: 082-001-00-6	orange lead T Repr. Cat. 1, 3 R61; Xn R62-20/22; N R50/53 R33 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 10294-40-3 EINECS: 233-660-5 Index number: 056-002-00-7	barium chromate Xn R20/22 Carc. 1A, H350 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7758-97-6 EINECS: 231-846-0 Index number: 082-004-00-2	lead chromate T Carc. Cat. 2, Repr. Cat. 1, 3 R45-61; Xn R62; N R50/53 R33 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 4682-03-5	diazodinitro phenol (DDNP) Xi R36/38; Xi R43; E R3 Unst. Expl., H200 Skin Irrit. 2, H315; Eye Irrit. 2, H319; Skin Sens. 1, H317
CAS: 7440-36-0 EINECS: 231-146-5	antimony substance with a Community workplace exposure limit
CAS: 7440-33-7 EINECS: 231-143-9	tungsten substance with a Community workplace exposure limit
CAS: 7429-90-5 EINECS: 231-072-3 Index number: 013-001-00-6	aluminium powder (pyrophoric) F R15-17 Pyr. Sol. 1, H250; Water-react. 2, H261
CAS: 7439-98-7 EINECS: 231-107-2	molybdenum substance with a Community workplace exposure limit
CAS: 61790-53-2	Diatomaceous earth (Silica-Amorphous) substance with a Community workplace exposure limit
CAS: 7778-74-7 EINECS: 231-912-9 Index number: 017-008-00-5	potassium perchlorate Xn R22; O R9 Ox. Sol. 1, H271 Acute Tox. 4, H302
CAS: 7727-43-7 EINECS: 231-784-4	barium sulphate, natural substance with a Community workplace exposure limit
SVHC	
13424-46-9	lead diazide
1314-41-6	orange lead
7758-97-6	lead chromate

Additional information: For the wording of the listed risk phrases refer to section 16.

For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

SECTION 4: FIRST AID MEASURES

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.

Most important symptoms and effects, both acute and delayed

Blast injury if mishandled.

Hazards

Danger of blast or crush-type injuries.

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

Extinguishing media

Suitable extinguishing agents: DO NOT fight fire when fire reaches explosives.

For safety reasons unsuitable extinguishing agents: None.

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.

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

Personal precautions, protective equipment and emergency procedures

Wear protective clothing.

Ensure adequate ventilation

Protect from heat.

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.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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.

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

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.

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.

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.

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

PEL (USA)

Long-term value: 0,05 mg/m³
as Pb; See 29 CFR 1910,1025

REL (USA)

Long-term value: 0,05* mg/m³
as Pb;*8-hr TWA; See Pocket Guide App. C

TLV (USA)

Long-term value: 0,05 mg/m³
as Pb; BEI

EL (Canada)

Long-term value: 0,05 mg/m³
as Pb; IARC 2A, R

7439-92-1 lead

PEL (USA)

Long-term value: 0,05* mg/m³
*see 29 CFR 1910,1025

REL (USA)

Long-term value: 0,05* mg/m³
*8-hr TWA, excl. lead arsenate; See PocketGuideApp.C

TLV (USA)

Long-term value: 0,05* mg/m³
*and inorganic compounds, as Pb; BEI

EL (Canada)

Long-term value: 0,05 mg/m³
R; IARC 2B

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

EV (Canada)	Long-term value: 0,05 mg/m ³ as Pb, Skin (organic compounds)
7440-21-3 silicon	
PEL (USA)	Long-term value: 15* 5** mg/m ³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m ³ *total dust **respirable fraction
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 10* 3** mg/m ³ *total dust; **respirable fraction
EV (Canada)	Long-term value: 10 mg/m ³ total dust
7782-49-2 selenium	
PEL (USA)	Long-term value: 0,2 mg/m ³ as Se
REL (USA)	Long-term value: 0,2 mg/m ³ as Se
TLV (USA)	Long-term value: 0,2 mg/m ³ as Se
EL (Canada)	Long-term value: 0,1 mg/m ³
EV (Canada)	Long-term value: 0,2 mg/m ³
1314-41-6 orange lead	
PEL (USA)	Long-term value: 0,05 mg/m ³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m ³ as Pb; *8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m ³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m ³ as Pb; IARC 2A, R
EV (Canada)	Long-term value: 0,05 mg/m ³ as Pb, Skin (organic compounds)
13463-67-7 titanium dioxide	
PEL (USA)	Long-term value: 15* mg/m ³ *total dust
REL (USA)	See Pocket Guide App. A
TLV (USA)	Long-term value: 10 mg/m ³ withdrawn from NIC
EL (Canada)	Long-term value: 10* 3** mg/m ³ *total dust; **respirable fraction; IARC 2B
EV (Canada)	Long-term value: 10 mg/m ³ total dust
10294-40-3 barium chromate	
PEL (USA)	Long-term value: 0,005* mg/m ³ Ceiling limit: 0,1** mg/m ³ *as Cr(VI) **as CrO ₃ ; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m ³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,01 mg/m ³ as Cr

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

EL (Canada)	Long-term value: 0,01 mg/m ³ as Cr; ACGIH A1 IARC 1
7758-97-6 lead chromate	
IOELV (EU)	Long-term value: 2 mg/m ³ as Cr
PEL (USA)	Long-term value: 0,005* mg/m ³ Ceiling limit: 0,1** mg/m ³ *as Cr(VI) **as CrO ₃ ; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m ³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,05* 0,012** mg/m ³ *as Pb; BEI ; **as Cr
EL (Canada)	Long-term value: 0,05* 0,012** mg/m ³ ACIGH A2, IARC 2A; R; *as Pb;**as Cr
EV (Canada)	Long-term value: 0,012* 0,05** mg/m ³ *as Cr, **as Pb
7727-43-7 barium sulphate, natural	
PEL (USA)	Long-term value: 15* 5** mg/m ³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m ³ *total dust **respirable fraction
TLV (USA)	Long-term value: 5* mg/m ³ *inhalable fraction; E
EL (Canada)	Long-term value: 10* 3** mg/m ³ *total dust, **respirable fraction
EV (Canada)	Long-term value: 10 mg/m ³ total dust
61790-53-2 Diatomaceous earth (Silica-Amorphous)	
PEL (USA)	20mppcf or 80mg/m ³ /%SiO ₂
REL (USA)	Long-term value: 6 mg/m ³ See Pocket Guide App. C
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 4* 1,5** mg/m ³ *total, **respirable
EV (Canada)	Long-term value: 10* 3** mg/m ³ uncalcined; *inhalable;**respirable
7439-98-7 molybdenum	
PEL (USA)	Long-term value: 15* mg/m ³ *Total dust
TLV (USA)	Long-term value: 10* 3** mg/m ³ as Mo; *inhalable fraction ** respirable fraction
EL (Canada)	Long-term value: 3* 10** mg/m ³ as Mo; *respirable **inhalable
EV (Canada)	Long-term value: 10* 3** 0,5*** mg/m ³ metal,insol.compnd.:*inh;**resp;sol.compnd.:***resp
7440-33-7 tungsten	
PEL (USA)	and insoluble compounds, as We
REL (USA)	Short-term value: 10 mg/m ³ Long-term value: 5 mg/m ³ as W

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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

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

Exposure controls

Personal protective equipment:

General protective and hygienic measures:

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

Keep ignition sources away - Do not smoke.

Keep away from foodstuffs, beverages and feed.

Wash hands before breaks and at the end of work.

Respiratory protection:

Not required under normal conditions of use.

Respiratory protection may be required after product use.

Protection of hands:



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

Material of gloves:

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

the glove material can not be calculated in advance and has therefore to be checked prior to the application.

Penetration time of glove material:

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

Eye protection:

Face protection



Safety glasses

Body protection: Impervious protective clothing

Limitation and supervision of exposure into the environment:

No further relevant information available.

Risk management measures:

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

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

General Information

Appearance:

Form:

Solid material

Colour:

According to product specification

Odour:

Odourless

Odour threshold:

Not determined.

pH-value:

Not applicable.

Change in condition

Melting point/Melting range:

Not determined.

Boiling point/Boiling range:

Undetermined.

Flash point:

Not applicable.

Flammability (solid, gaseous):

Fire or projection hazard.

Auto/Self-ignition temperature:

Not determined.

Decomposition temperature:

Not determined.

Self-igniting:

Product is not self-igniting.

Danger of explosion:

Heating may cause an explosion.

Explosion limits:

Lower:

Not determined.

Upper:

Not determined.

Vapour pressure:

Not applicable.

Density:

Not determined.

Relative density

Not determined.

Vapour density

Not applicable.

Evaporation rate

Not applicable.

Solubility in / Miscibility with water:

Variable, dependent upon product composition and packaging.

Partition coefficient (n-octanol/water):

Not determined.

Viscosity:

Dynamic:

Not applicable.

Kinematic:

Not applicable.

Other information

No further relevant information available.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

SECTION 10: STABILITY AND REACTIVITY

Reactivity

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.

Possibility of hazardous reactions Danger of explosion.

Toxic fumes may be released if heated above the decomposition point. Reacts violently with oxidising agents.

Conditions to avoid Keep ignition sources away - Do not smoke.

Incompatible materials: No further relevant information available.

Hazardous decomposition products: Carbon monoxide and carbon dioxide

Hydrocarbons

Leadoxide vapour

Bariumoxide vapour

Toxic metal oxide smoke

Chlorine compounds

Danger of forming toxic pyrolysis products.

Nitrogen oxides

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Acute toxicity:

LD/LC50 values relevant for classification:

7439-92-1 lead

Oral LD50 >2000 mg/kg (rat)

7782-49-2 selenium

Oral LD50 6700 mg/kg (rat)

7758-97-6 lead chromate

Oral LD50 12000 mg/kg (mouse)

Primary irritant effect:

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

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

Sensitisation: No sensitising effects known.

Subacute to chronic toxicity: No further relevant information available.

Acute effects (acute toxicity, irritation and corrosivity): Danger of blast or crush-type injuries.

Repeated dose toxicity: Contains known or suspect carcinogens when inhaled. Product is in non-inhalable form and is nonclassifiable as a carcinogen.

CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction): Contains known or suspect carcinogens when inhaled. Product is in non-inhalable form and is non- classifiable as a carcinogen.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Aquatic toxicity: Toxic for aquatic organisms

Persistence and degradability: No further relevant information available.

Bioaccumulative potential: May be accumulated in organism

Mobility in soil: No further relevant information available.

Ecotoxicological effects:

Remark: Toxic for fish

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

Additional ecological information:

General notes: Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water

Do not allow product to reach ground water, water course or sewage system, even in small quantities. Danger to drinking water if even extremely small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

The product contains heavy metals. Avoid transfer into the environment. Specific preliminary treatments are necessary

Toxic for aquatic organisms

Due to available data on eliminability/decomposition and bioaccumulation potential prolonged term damage of the environment can not be excluded.

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

Other adverse effects: No further relevant information available.

SECTION 13: DISPOSAL CONSIDERATIONS

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

UN-Number

DOT, ADR, IMDG, IATA

UN0361

UN proper shipping name

DOT

Detonator assemblies, non-electric

ADR

0361 DETONATOR ASSEMBLIES, NONELECTRIC,

IMDG

DETONATOR ASSEMBLIES, NONELECTRIC,

IATA

DETONATOR ASSEMBLIES, NON-ELECTRIC

Transport hazard class(es)

DOT, ADR, IMDG, IATA



Class

1.4

Label

1.4B

Packing group

DOT, ADR, IMDG, IATA

II


Environmental hazards:

Marine pollutant:

No

Safety Data Sheet

According to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and OSHA GHS
Trade name: NONEL® Non-electric Delay Detonators

Special marking (IATA):		Prohibited from Transport in Passenger Aircraft.
		Cargo Aircraft Only.
Special precautions for user		Not applicable.
EMS Number:		F-B, S-X
Segregation groups		Lead and its compounds
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code		Not applicable.
Transport/Additional information:		
ADR		
Limited quantities (LQ)	0	
Excepted quantities (EQ)	Code: EO	
Tunnel restriction code	2 (E)	
IMDG		
Limited quantities (LQ)	0	
Excepted quantities (EQ)	Code: EO	
UN "Model Regulation":	UN 0361, DETONATOR ASSEMBLIES, NONELECTRIC, 1.4B, II	

SECTION 15: REGULATORY INFORMATION

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

United States (USA)

SARA

Section 355 (extremely hazardous substances):

None of the ingredients are listed.

Section 313 (Specific toxic chemical listings):

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

TSCA (Toxic Substances Control Act):

All ingredients are listed.

Proposition 65 (California):

Chemicals known to cause cancer:

13424-46-9	lead diazide
7439-92-1	lead
1314-41-6	orange lead

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

13463-67-7	titanium dioxide	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Chemicals known to cause reproductive toxicity for females:		
7439-92-1	lead	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Chemicals known to cause reproductive toxicity for males:		
7439-92-1	lead	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Chemicals known to cause developmental toxicity:		
13424-46-9	lead diazide	
7439-92-1	lead	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Carcinogenic Categories		
EPA (Environmental Protection Agency)		
13424-46-9	lead diazide	B2
7439-92-1	lead	B2
7782-49-2	selenium	D
1314-41-6	orange lead	B2
10294-40-3	barium chromate	A(inh), D(oral), K/L(inh), CBD(oral)
7758-97-6	lead chromate	K
7727-43-7	barium sulphate, natural	D, CBD(inh), NL(oral)
7778-74-7	potassium perchlorate	NL
2691-41-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	D
IARC (International Agency for Research on Cancer)		
13424-46-9	lead diazide	2A
7439-92-1	lead	2B
7782-49-2	selenium	3
1314-41-6	orange lead	2A
13463-67-7	titanium dioxide	2B
10294-40-3	barium chromate	1
7758-97-6	lead chromate	1
61790-53-2	Diatomaceous earth (Silica-Amorphous)	3
TLV (Threshold Limit Value established by ACGIH)		
13424-46-9	lead diazide	A3
7439-92-1	lead	A3
1314-41-6	orange lead	A3
13463-67-7	titanium dioxide	A4
10294-40-3	barium chromate	A1

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

7758-97-6	lead chromate	A2
7439-98-7	molybdenum	A3
7429-90-5	aluminium powder (pyrophoric)	A4
NIOSH-Ca (National Institute for Occupational Safety and Health)		
13463-67-7	titanium dioxide	
10294-40-3	barium chromate	
7758-97-6	lead chromate	

Canada

Canadian Domestic Substances List (DSL)

Some components are listed on the NDSL. All ingredients are listed.

Canadian Ingredient Disclosure list (limit 0.1%)

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

Canadian Ingredient Disclosure list (limit 1%)

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

Other regulations, limitations and prohibitive regulations

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

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

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

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

SECTION 16: OTHER INFORMATION

Relevant phrases

H200 Unstable explosives.	
H201 Explosive; mass explosion hazard.	
H228 Flammable solid.	
H250 Catches fire spontaneously if exposed to air.	
H261 In contact with water releases flammable gases.	
H271 May cause fire or explosion; strong oxidiser.	
H301 Toxic if swallowed.	
H302 Harmful if swallowed.	
H311 Toxic in contact with skin.	
H315 Causes skin irritation.	
H317 May cause an allergic skin reaction.	
H319 Causes serious eye irritation.	

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

H331 Toxic if inhaled.	
H332 Harmful if inhaled.	
H350 May cause cancer.	
H360Df May damage the unborn child. Suspected of damaging fertility.	
H360FD May damage fertility. May damage the unborn child.	
H372 Causes damage to organs through prolonged or repeated exposure.	
H373 May cause damage to organs through prolonged or repeated exposure.	
H400 Very toxic to aquatic life.	
H410 Very toxic to aquatic life with long lasting effects.	
H413 May cause long lasting harmful effects to aquatic life.	
R11 Highly flammable.	
R15 Contact with water liberates extremely flammable gases.	
R17 Spontaneously flammable in air.	
R2 Risk of explosion by shock, friction, fire or other sources of ignition.	
R20/22 Harmful by inhalation and if swallowed.	
R22 Harmful if swallowed.	
R23/25 Toxic by inhalation and if swallowed.	
R24 Toxic in contact with skin.	
R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.	
R33 Danger of cumulative effects.	
R36/38 Irritating to eyes and skin.	
R43 May cause sensitisation by skin contact.	
R45 May cause cancer.	
R48/23/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.	
R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.	
R53 May cause long-term adverse effects in the aquatic environment.	
R60 May impair fertility.	
R61 May cause harm to the unborn child.	
R62 Possible risk of impaired fertility.	
R9 Explosive when mixed with combustible material.	

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)	
IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation	
IATA: International Air Transport Association	
GHS: Globally Harmonised System of Classification and Labelling of Chemicals	
ACGIH: American Conference of Governmental Industrial Hygienists	
EINECS: European Inventory of Existing Commercial Chemical Substances	
ELINCS: European List of Notified Chemical Substances	
CAS: Chemical Abstracts Service (division of the American Chemical Society)	
NFPA: National Fire Protection Association (USA)	

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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	
Unst. Expl.: Explosives, Unstable explosives	
Flam. Sol. 2: Flammable solids, Hazard Category 2	
Pyr. Sol. 1: Pyrophoric Solids, Hazard Category 1	
Water-react. 2: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 2	
Ox. Sol. 1: Oxidising Solids, Hazard Category 1	
Acute Tox. 3: Acute toxicity, Hazard Category 3	
Acute Tox. 4: Acute toxicity, Hazard Category 4	
Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2	
Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2	
Skin Sens. 1: Sensitisation - Skin, Hazard Category 1	
Carc. 1A: Carcinogenicity, Hazard Category 1A Carc. 1B: Carcinogenicity, Hazard Category 1B	
Repr. 1A: Reproductive toxicity, Hazard Category 1A Repr. 1A: Reproductive toxicity, Hazard Category 1A	
STOT RE 1: Specific target organ toxicity - Repeated exposure, Hazard Category 1	
STOT RE 2: Specific target organ toxicity - Repeated exposure, Hazard Category 2	
Aquatic Acute 1: Hazardous to the aquatic environment - Acute Hazard, Category 1	
Aquatic Chronic 1: Hazardous to the aquatic environment - Chronic Hazard, Category 1	
Aquatic Chronic 4: Hazardous to the aquatic environment - Chronic Hazard, Category 4	

Sources

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SDS# 1122 Date: 07/20/2020

DYNO
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Groundbreaking Performance®

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product or information. Under no circumstances shall either Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

TECHNICAL DATA SHEET



NONEL® EZTL™

Nonelectric Trunkline Delay Detonators

Properties Cont.

Packaging

Length		Case Type	Quantity / Case
meters	feet		
3.5	12	D*	90
6	20	D*	75
9	30	D*	60
12	40	D*	50
15	50	D*	45
18	60	D*	35

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

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

Case Dimensions

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

APPLICATION RECOMMENDATIONS - continued

- **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 to the blast initiation system until all blasthole surface connections have been made and inspected. Ensure the blast site has been cleared. It is important to remove nonessential personnel and equipment prior to the hole-to-hole connection process. Dyno Nobel Field Technical Representatives and product application guides can assist with unique connection situations.

TRANSPORTATION, STORAGE AND HANDLING

- NONEL EZTL must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulation
- 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

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

Product Disclaimer: Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

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Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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

Details of the supplier of the Safety Data Sheet

Manufacturer/Supplier:

Dyno Nobel Inc.

6440 S. Millrock Drive, Suite 150

Salt Lake City, Utah 84121

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

E-Mail: dnnahse@am.dynonobel.com

SDS #: 1122

Date: 07/20/2020

Supersedes: 05/22/2015

Product identifier

Trade name: NONEL® Non-electric Delay Detonators

Article number: 1122

Other product identifiers:

NONEL® MS
NONEL® EZ DET®
NONEL® MS ARCTIC
NONEL® EZTL™
NONEL® LP NONEL®
EZ DRIFTER®
NONEL® SL
NONEL® SUPER
NONEL® TD
NONEL® MS CONNECTOR
NONEL® TWINPLEX™
NONEL® STARTER

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

Emergency telephone number:

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

SECTION 2: HAZARDS IDENTIFICATION

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.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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

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:

Hazard-determining components of labelling:

Warning

diazodinitro phenol (DDNP)

pentaerythritol tetranitrate (PETN)

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

lead diazide orange lead

H204 Fire or projection hazard.

Hazard statements:

Precautionary statements:

P210

P250

P280

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

Do not subject to grinding/shock/friction.

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

Ground/bond container and receiving equipment.

DO NOT fight fire when fire reaches explosives.

In case of fire: Evacuate area.

Explosion risk in case of fire.

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

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

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

P240

P373

P370+P380

P372

P401

P501

Additional information:

Hazard description:

WHMIS-symbols:

NFPA ratings (scale 0 - 4):

HMIS-ratings (scale 0 - 4):

HMIS Long Term Health Hazard Substances

13424-46-9

7439-92-1

13463-67-7

7758-97-6

7778-74-7

Explosive products are not classified under WHMIS.

Not available.

Not available.

lead diazide

lead

titanium dioxide

lead chromate

potassium perchlorate

Safety Data Sheet

According to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and OSHA GHS
Trade name: NONEL® Non-electric Delay Detonators

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

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: 13424-46-9 EINECS: 236-542-1 Index number: 082-003-00-7	lead diazide  T Repr. Cat. 1, 3 R61;  Xn R62-20/22;  E R3;  N R50/53 R33  Unst. Expl., H200  Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373  Aquatic Acute 1, H400; Aquatic Chronic 1, H410  Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7439-92-1 EINECS: 231-100-4	lead  T Repr. Cat. 1 R60-61-48/23/25;  N R50/53  Repr. 1A, H360FD; STOT RE 1, H372  Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 7440-21-3 EINECS: 231-130-8	silicon  F R11  Flam. Sol. 2, H228
CAS: 2691-41-0 EINECS: 220-260-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)  T R24;  Xn R22;  E R2  Expl. 1.1, H201  Acute Tox. 3, H301; Acute Tox. 3, H311
CAS: 7782-49-2 EINECS: 231-957-4 Index number: 034-001-00-2	selenium  T R23/25 R33-53  Acute Tox. 3, H301; Acute Tox. 3, H331  STOT RE 2, H373  Aquatic Chronic 4, H413

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

CAS: 1314-41-6 EINECS: 215-235-6 Index number: 082-001-00-6	orange lead T Repr. Cat. 1, 3 R61; Xn R62-20/22; N R50/53 R33 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 10294-40-3 EINECS: 233-660-5 Index number: 056-002-00-7	barium chromate Xn R20/22 Carc. 1A, H350 Acute Tox. 4, H302; Acute Tox. 4, H332
CAS: 7758-97-6 EINECS: 231-846-0 Index number: 082-004-00-2	lead chromate T Carc. Cat. 2, Repr. Cat. 1, 3 R45-61; Xn R62; N R50/53 R33 Carc. 1B, H350; Repr. 1A, H360Df; STOT RE 2, H373 Aquatic Acute 1, H400; Aquatic Chronic 1, H410
CAS: 4682-03-5	diazodinitro phenol (DDNP) Xi R36/38; Xi R43; E R3 Unst. Expl., H200 Skin Irrit. 2, H315; Eye Irrit. 2, H319; Skin Sens. 1, H317
CAS: 7440-36-0 EINECS: 231-146-5	antimony substance with a Community workplace exposure limit
CAS: 7440-33-7 EINECS: 231-143-9	tungsten substance with a Community workplace exposure limit
CAS: 7429-90-5 EINECS: 231-072-3 Index number: 013-001-00-6	aluminium powder (pyrophoric) F R15-17 Pyr. Sol. 1, H250; Water-react. 2, H261
CAS: 7439-98-7 EINECS: 231-107-2	molybdenum substance with a Community workplace exposure limit
CAS: 61790-53-2	Diatomaceous earth (Silica-Amorphous) substance with a Community workplace exposure limit
CAS: 7778-74-7 EINECS: 231-912-9 Index number: 017-008-00-5	potassium perchlorate Xn R22; O R9 Ox. Sol. 1, H271 Acute Tox. 4, H302
CAS: 7727-43-7 EINECS: 231-784-4	barium sulphate, natural substance with a Community workplace exposure limit
SVHC	
13424-46-9	lead diazide
1314-41-6	orange lead
7758-97-6	lead chromate

Additional information: For the wording of the listed risk phrases refer to section 16.

For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

SECTION 4: FIRST AID MEASURES

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.

Most important symptoms and effects, both acute and delayed

Blast injury if mishandled.

Hazards

Danger of blast or crush-type injuries.

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

Extinguishing media

Suitable extinguishing agents: DO NOT fight fire when fire reaches explosives.

For safety reasons unsuitable extinguishing agents: None.

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.

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

Personal precautions, protective equipment and emergency procedures

Wear protective clothing.

Ensure adequate ventilation

Protect from heat.

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.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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.

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

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.

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.

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.

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

PEL (USA)

Long-term value: 0,05 mg/m³
as Pb; See 29 CFR 1910,1025

REL (USA)

Long-term value: 0,05* mg/m³
as Pb;*8-hr TWA; See Pocket Guide App. C

TLV (USA)

Long-term value: 0,05 mg/m³
as Pb; BEI

EL (Canada)

Long-term value: 0,05 mg/m³
as Pb; IARC 2A, R

7439-92-1 lead

PEL (USA)

Long-term value: 0,05* mg/m³
*see 29 CFR 1910,1025

REL (USA)

Long-term value: 0,05* mg/m³
*8-hr TWA, excl. lead arsenate; See PocketGuideApp.C

TLV (USA)

Long-term value: 0,05* mg/m³
*and inorganic compounds, as Pb; BEI

EL (Canada)

Long-term value: 0,05 mg/m³
R; IARC 2B

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

Trade name: NONEL® Non-electric Delay Detonators

EV (Canada)	Long-term value: 0,05 mg/m ³ as Pb, Skin (organic compounds)
7440-21-3 silicon	
PEL (USA)	Long-term value: 15* 5** mg/m ³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m ³ *total dust **respirable fraction
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 10* 3** mg/m ³ *total dust; **respirable fraction
EV (Canada)	Long-term value: 10 mg/m ³ total dust
7782-49-2 selenium	
PEL (USA)	Long-term value: 0,2 mg/m ³ as Se
REL (USA)	Long-term value: 0,2 mg/m ³ as Se
TLV (USA)	Long-term value: 0,2 mg/m ³ as Se
EL (Canada)	Long-term value: 0,1 mg/m ³
EV (Canada)	Long-term value: 0,2 mg/m ³
1314-41-6 orange lead	
PEL (USA)	Long-term value: 0,05 mg/m ³ as Pb; See 29 CFR 1910,1025
REL (USA)	Long-term value: 0,05* mg/m ³ as Pb; *8-hr TWA; See Pocket Guide App. C
TLV (USA)	Long-term value: 0,05 mg/m ³ as Pb; BEI
EL (Canada)	Long-term value: 0,05 mg/m ³ as Pb; IARC 2A, R
EV (Canada)	Long-term value: 0,05 mg/m ³ as Pb, Skin (organic compounds)
13463-67-7 titanium dioxide	
PEL (USA)	Long-term value: 15* mg/m ³ *total dust
REL (USA)	See Pocket Guide App. A
TLV (USA)	Long-term value: 10 mg/m ³ withdrawn from NIC
EL (Canada)	Long-term value: 10* 3** mg/m ³ *total dust; **respirable fraction; IARC 2B
EV (Canada)	Long-term value: 10 mg/m ³ total dust
10294-40-3 barium chromate	
PEL (USA)	Long-term value: 0,005* mg/m ³ Ceiling limit: 0,1** mg/m ³ *as Cr(VI) **as CrO ₃ ; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m ³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,01 mg/m ³ as Cr

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EL (Canada)	Long-term value: 0,01 mg/m ³ as Cr; ACGIH A1 IARC 1
7758-97-6 lead chromate	
IOELV (EU)	Long-term value: 2 mg/m ³ as Cr
PEL (USA)	Long-term value: 0,005* mg/m ³ Ceiling limit: 0,1** mg/m ³ *as Cr(VI) **as CrO ₃ ; see 29 CFR 1910,1026
REL (USA)	Long-term value: 0,0002 mg/m ³ as Cr; See Pocket Guide Apps. A and C
TLV (USA)	Long-term value: 0,05* 0,012** mg/m ³ *as Pb; BEI ; **as Cr
EL (Canada)	Long-term value: 0,05* 0,012** mg/m ³ ACIGH A2, IARC 2A; R; *as Pb;**as Cr
EV (Canada)	Long-term value: 0,012* 0,05** mg/m ³ *as Cr, **as Pb
7727-43-7 barium sulphate, natural	
PEL (USA)	Long-term value: 15* 5** mg/m ³ *total dust **respirable fraction
REL (USA)	Long-term value: 10* 5** mg/m ³ *total dust **respirable fraction
TLV (USA)	Long-term value: 5* mg/m ³ *inhalable fraction; E
EL (Canada)	Long-term value: 10* 3** mg/m ³ *total dust, **respirable fraction
EV (Canada)	Long-term value: 10 mg/m ³ total dust
61790-53-2 Diatomaceous earth (Silica-Amorphous)	
PEL (USA)	20mppcf or 80mg/m ³ /%SiO ₂
REL (USA)	Long-term value: 6 mg/m ³ See Pocket Guide App. C
TLV (USA)	TLV withdrawn
EL (Canada)	Long-term value: 4* 1,5** mg/m ³ *total, **respirable
EV (Canada)	Long-term value: 10* 3** mg/m ³ uncalcined; *inhalable;**respirable
7439-98-7 molybdenum	
PEL (USA)	Long-term value: 15* mg/m ³ *Total dust
TLV (USA)	Long-term value: 10* 3** mg/m ³ as Mo; *inhalable fraction ** respirable fraction
EL (Canada)	Long-term value: 3* 10** mg/m ³ as Mo; *respirable **inhalable
EV (Canada)	Long-term value: 10* 3** 0,5*** mg/m ³ metal,insol.compnd.:*inh;**resp;sol.compnd.:***resp
7440-33-7 tungsten	
PEL (USA)	and insoluble compounds, as We
REL (USA)	Short-term value: 10 mg/m ³ Long-term value: 5 mg/m ³ as W

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Trade name: NONEL® Non-electric Delay Detonators

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

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Trade name: NONEL® Non-electric Delay Detonators

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

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

Exposure controls

Personal protective equipment:

General protective and hygienic measures:

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

Keep ignition sources away - Do not smoke.

Keep away from foodstuffs, beverages and feed.

Wash hands before breaks and at the end of work.

Respiratory protection:

Not required under normal conditions of use.

Respiratory protection may be required after product use.

Protection of hands:



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

Material of gloves:

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

the glove material can not be calculated in advance and has therefore to be checked prior to the application.

Penetration time of glove material:

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

Eye protection:

Face protection



Safety glasses

Body protection: Impervious protective clothing

Limitation and supervision of exposure into the environment:

No further relevant information available.

Risk management measures:

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

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

General Information

Appearance:

Form:

Solid material

Colour:

According to product specification

Odour:

Odourless

Odour threshold:

Not determined.

pH-value:

Not applicable.

Change in condition

Melting point/Melting range:

Not determined.

Boiling point/Boiling range:

Undetermined.

Flash point:

Not applicable.

Flammability (solid, gaseous):

Fire or projection hazard.

Auto/Self-ignition temperature:

Not determined.

Decomposition temperature:

Not determined.

Self-igniting:

Product is not self-igniting.

Danger of explosion:

Heating may cause an explosion.

Explosion limits:

Lower:

Not determined.

Upper:

Not determined.

Vapour pressure:

Not applicable.

Density:

Not determined.

Relative density

Not determined.

Vapour density

Not applicable.

Evaporation rate

Not applicable.

Solubility in / Miscibility with water:

Variable, dependent upon product composition and packaging.

Partition coefficient (n-octanol/water):

Not determined.

Viscosity:

Dynamic:

Not applicable.

Kinematic:

Not applicable.

Other information

No further relevant information available.

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

SECTION 10: STABILITY AND REACTIVITY

Reactivity

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.

Possibility of hazardous reactions Danger of explosion.

Toxic fumes may be released if heated above the decomposition point. Reacts violently with oxidising agents.

Conditions to avoid Keep ignition sources away - Do not smoke.

Incompatible materials: No further relevant information available.

Hazardous decomposition products: Carbon monoxide and carbon dioxide

Hydrocarbons

Leadoxide vapour

Bariumoxide vapour

Toxic metal oxide smoke

Chlorine compounds

Danger of forming toxic pyrolysis products.

Nitrogen oxides

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Acute toxicity:

LD/LC50 values relevant for classification:

7439-92-1 lead

Oral LD50 >2000 mg/kg (rat)

7782-49-2 selenium

Oral LD50 6700 mg/kg (rat)

7758-97-6 lead chromate

Oral LD50 12000 mg/kg (mouse)

Primary irritant effect:

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

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

Sensitisation: No sensitising effects known.

Subacute to chronic toxicity: No further relevant information available.

Acute effects (acute toxicity, irritation and corrosivity): Danger of blast or crush-type injuries.

Repeated dose toxicity: Contains known or suspect carcinogens when inhaled. Product is in non-inhalable form and is nonclassifiable as a carcinogen.

CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction): Contains known or suspect carcinogens when inhaled. Product is in non-inhalable form and is non- classifiable as a carcinogen.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Aquatic toxicity: Toxic for aquatic organisms

Persistence and degradability: No further relevant information available.

Bioaccumulative potential: May be accumulated in organism

Mobility in soil: No further relevant information available.

Ecotoxicological effects:

Remark: Toxic for fish

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

Additional ecological information:

General notes: Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water

Do not allow product to reach ground water, water course or sewage system, even in small quantities. Danger to drinking water if even extremely small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

The product contains heavy metals. Avoid transfer into the environment. Specific preliminary treatments are necessary

Toxic for aquatic organisms

Due to available data on eliminability/decomposition and bioaccumulation potential prolonged term damage of the environment can not be excluded.

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

Other adverse effects: No further relevant information available.

SECTION 13: DISPOSAL CONSIDERATIONS

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

UN-Number

DOT, ADR, IMDG, IATA

UN0361

UN proper shipping name

DOT

Detonator assemblies, non-electric

ADR

0361 DETONATOR ASSEMBLIES, NONELECTRIC,

IMDG

DETONATOR ASSEMBLIES, NONELECTRIC,

IATA

DETONATOR ASSEMBLIES, NON-ELECTRIC

Transport hazard class(es)

DOT, ADR, IMDG, IATA



Class

1.4

Label

1.4B

Packing group

DOT, ADR, IMDG, IATA

II


Environmental hazards:

Marine pollutant:

No

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According to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and OSHA GHS
Trade name: NONEL® Non-electric Delay Detonators

Special marking (IATA):		Prohibited from Transport in Passenger Aircraft.
		Cargo Aircraft Only.
Special precautions for user		Not applicable.
EMS Number:		F-B, S-X
Segregation groups		Lead and its compounds
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code		Not applicable.
Transport/Additional information:		
ADR		
Limited quantities (LQ)	0	
Excepted quantities (EQ)	Code: EO	
Tunnel restriction code	2 (E)	
IMDG		
Limited quantities (LQ)	0	
Excepted quantities (EQ)	Code: EO	
UN "Model Regulation":	UN 0361, DETONATOR ASSEMBLIES, NONELECTRIC, 1.4B, II	

SECTION 15: REGULATORY INFORMATION

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

United States (USA)

SARA

Section 355 (extremely hazardous substances):

None of the ingredients are listed.

Section 313 (Specific toxic chemical listings):

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

TSCA (Toxic Substances Control Act):

All ingredients are listed.

Proposition 65 (California):

Chemicals known to cause cancer:

13424-46-9	lead diazide
7439-92-1	lead
1314-41-6	orange lead

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

Trade name: NONEL® Non-electric Delay Detonators

13463-67-7	titanium dioxide	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Chemicals known to cause reproductive toxicity for females:		
7439-92-1	lead	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Chemicals known to cause reproductive toxicity for males:		
7439-92-1	lead	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Chemicals known to cause developmental toxicity:		
13424-46-9	lead diazide	
7439-92-1	lead	
10294-40-3	barium chromate	
7758-97-6	lead chromate	
Carcinogenic Categories		
EPA (Environmental Protection Agency)		
13424-46-9	lead diazide	B2
7439-92-1	lead	B2
7782-49-2	selenium	D
1314-41-6	orange lead	B2
10294-40-3	barium chromate	A(inh), D(oral), K/L(inh), CBD(oral)
7758-97-6	lead chromate	K
7727-43-7	barium sulphate, natural	D, CBD(inh), NL(oral)
7778-74-7	potassium perchlorate	NL
2691-41-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	D
IARC (International Agency for Research on Cancer)		
13424-46-9	lead diazide	2A
7439-92-1	lead	2B
7782-49-2	selenium	3
1314-41-6	orange lead	2A
13463-67-7	titanium dioxide	2B
10294-40-3	barium chromate	1
7758-97-6	lead chromate	1
61790-53-2	Diatomaceous earth (Silica-Amorphous)	3
TLV (Threshold Limit Value established by ACGIH)		
13424-46-9	lead diazide	A3
7439-92-1	lead	A3
1314-41-6	orange lead	A3
13463-67-7	titanium dioxide	A4
10294-40-3	barium chromate	A1

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

7758-97-6	lead chromate	A2
7439-98-7	molybdenum	A3
7429-90-5	aluminium powder (pyrophoric)	A4
NIOSH-Ca (National Institute for Occupational Safety and Health)		
13463-67-7	titanium dioxide	
10294-40-3	barium chromate	
7758-97-6	lead chromate	

Canada

Canadian Domestic Substances List (DSL)

Some components are listed on the NDSL. All ingredients are listed.

Canadian Ingredient Disclosure list (limit 0.1%)

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

Canadian Ingredient Disclosure list (limit 1%)

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

Other regulations, limitations and prohibitive regulations

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

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

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

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

SECTION 16: OTHER INFORMATION

Relevant phrases

H200 Unstable explosives.	
H201 Explosive; mass explosion hazard.	
H228 Flammable solid.	
H250 Catches fire spontaneously if exposed to air.	
H261 In contact with water releases flammable gases.	
H271 May cause fire or explosion; strong oxidiser.	
H301 Toxic if swallowed.	
H302 Harmful if swallowed.	
H311 Toxic in contact with skin.	
H315 Causes skin irritation.	
H317 May cause an allergic skin reaction.	
H319 Causes serious eye irritation.	

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

Trade name: NONEL® Non-electric Delay Detonators

H331 Toxic if inhaled.	
H332 Harmful if inhaled.	
H350 May cause cancer.	
H360Df May damage the unborn child. Suspected of damaging fertility.	
H360FD May damage fertility. May damage the unborn child.	
H372 Causes damage to organs through prolonged or repeated exposure.	
H373 May cause damage to organs through prolonged or repeated exposure.	
H400 Very toxic to aquatic life.	
H410 Very toxic to aquatic life with long lasting effects.	
H413 May cause long lasting harmful effects to aquatic life.	
R11 Highly flammable.	
R15 Contact with water liberates extremely flammable gases.	
R17 Spontaneously flammable in air.	
R2 Risk of explosion by shock, friction, fire or other sources of ignition.	
R20/22 Harmful by inhalation and if swallowed.	
R22 Harmful if swallowed.	
R23/25 Toxic by inhalation and if swallowed.	
R24 Toxic in contact with skin.	
R3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.	
R33 Danger of cumulative effects.	
R36/38 Irritating to eyes and skin.	
R43 May cause sensitisation by skin contact.	
R45 May cause cancer.	
R48/23/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.	
R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.	
R53 May cause long-term adverse effects in the aquatic environment.	
R60 May impair fertility.	
R61 May cause harm to the unborn child.	
R62 Possible risk of impaired fertility.	
R9 Explosive when mixed with combustible material.	

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)	
IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation	
IATA: International Air Transport Association	
GHS: Globally Harmonised System of Classification and Labelling of Chemicals	
ACGIH: American Conference of Governmental Industrial Hygienists	
EINECS: European Inventory of Existing Commercial Chemical Substances	
ELINCS: European List of Notified Chemical Substances	
CAS: Chemical Abstracts Service (division of the American Chemical Society)	
NFPA: National Fire Protection Association (USA)	

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

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	
Unst. Expl.: Explosives, Unstable explosives	
Flam. Sol. 2: Flammable solids, Hazard Category 2	
Pyr. Sol. 1: Pyrophoric Solids, Hazard Category 1	
Water-react. 2: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 2	
Ox. Sol. 1: Oxidising Solids, Hazard Category 1	
Acute Tox. 3: Acute toxicity, Hazard Category 3	
Acute Tox. 4: Acute toxicity, Hazard Category 4	
Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2	
Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2	
Skin Sens. 1: Sensitisation - Skin, Hazard Category 1	
Carc. 1A: Carcinogenicity, Hazard Category 1A Carc. 1B: Carcinogenicity, Hazard Category 1B	
Repr. 1A: Reproductive toxicity, Hazard Category 1A Repr. 1A: Reproductive toxicity, Hazard Category 1A	
STOT RE 1: Specific target organ toxicity - Repeated exposure, Hazard Category 1	
STOT RE 2: Specific target organ toxicity - Repeated exposure, Hazard Category 2	
Aquatic Acute 1: Hazardous to the aquatic environment - Acute Hazard, Category 1	
Aquatic Chronic 1: Hazardous to the aquatic environment - Chronic Hazard, Category 1	
Aquatic Chronic 4: Hazardous to the aquatic environment - Chronic Hazard, Category 4	

Sources

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Groundbreaking Performance®

Safety Data Sheet

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

Trade name: NONEL® Non-electric Delay Detonators

intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product or information. Under no circumstances shall either Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

TECHNICAL DATA SHEET



NONEL® LEAD LINE

Nonelectric Shock Tube

Properties

SDS
#1124

Net Explosive Content per 100 units		0.0044 kg 0.0097 lbs
Length		Spools / Case
meters	feet	
762	2500	

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

Case Dimensions

51 x 25 x 28 cm 20 x 9 7/8 x 10 7/8 in

Hazardous Shipping Description

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



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 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.

Product Disclaimer: Please see reverse side

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NONEL® LEAD LINE

Nonelectric Shock Tube

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.

APPLICATION RECOMMENDATIONS - continued

- **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,
- **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.

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

Product Disclaimer: Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

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Safety Data Sheet

According to: 1907/2006/EC (REACH), 1272/2008/EC (CLP), and 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

Safety Data Sheet

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








Trade Name: Shock Tube

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.

Safety Data Sheet

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

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.

Safety Data Sheet

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

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.

Safety Data Sheet

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

Trade Name: Shock Tube

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.

Safety Data Sheet

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

Trade Name: Shock Tube

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.

Safety Data Sheet

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

Trade Name: Shock Tube

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

Safety Data Sheet

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

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.

Safety Data Sheet

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

Trade Name: Shock Tube

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: Pyrophoric 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

Safety Data Sheet

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

Sources

SDS Prepared by:
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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

TECHNICAL DATA SHEET



TROJAN® SPARTAN®

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*	66°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.

Hazardous Shipping Description

- UN 0042 Boosters, 1.1D PG II



PRODUCT DESCRIPTION

TROJAN SPARTAN cast boosters are detonator sensitive, high density, high energy molecular explosives available in various sizes designed to optimize initiation of all booster sensitive explosives. All TROJAN SPARTAN boosters are manufactured with an internal through-tunnel and detonator well for easy application with either electric, electronic or nonelectric detonators or 10.6 g/m (50 gr/ft) minimum strength detonating cord.



TROJAN SPARTAN boosters are formulated from the highest quality PETN and other high explosive materials ensuring reliability, consistency and durability in all blasting environments. The fluorescent green container and clear printing makes the TROJAN SPARTAN booster more visible on the blast site (as well as in low light situations) and reduces the possibility of misplaced charges. The redesigned Caplock™ holds the detonator in place more securely and makes it more difficult for the detonator to be pulled out of the capwell position while it is being lowered into the borehole.

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.

Product Disclaimer: Please see reverse side.

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TROJAN® SPARTAN®

Cast Booster

Properties Cont.

Packaging

Unit Weight		Unit Dimensions				Case Quantity	Gross Weight/Case	
g	oz	Length		Diameter			kg	lbs
		cm	in	cm	in			
90*	3.2	11.9	4.7	2.7	1.1	150	14.0	30.9
150	5.5	11.9	4.7	3.6	1.4	95	15.0	33.1
200	7	11.7	4.6	4.1	1.6	72	15.6	34.4
350	12	11.9	4.7	5.0	2.0	49	17.6	38.9
400	14	11.9	4.7	5.5	2.2	40	16.8	37.0
450	16	11.9	4.7	5.8	2.3	36	17.4	38.3
900*	32	12.9	5.1	7.9	3.1	18	17.8	39.2

* The Caplock feature is not available on these boosters because the shells are made of cardboard instead of plastic.

Note: All weights and dimensions are approximate.

Case Dimensions

42 x 33 x 14 cm

16 ½ x 13 x 5 ½ in

APPLICATION RECOMMENDATIONS - continued

- **ALWAYS** use detonating cord with a coreload of 10.6 g/m (50 gr/ft) or higher when initiating the TROJAN SPARTAN booster with detonating cord.
- Minimum detonator is No. 8 strength for temperatures above -40° C (-40° F). A high strength detonator is recommended for temperatures below -40° C (-40° F).
- 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.

Product Disclaimer: Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product. Under no circumstances shall Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

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

Safety Data Sheet

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



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)

: H201 Explosive; mass explosion hazard.

: 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 statements

Precautionary Statements

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.

Safety Data Sheet

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

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.

Safety Data Sheet

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

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.

Safety Data Sheet

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

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/m ³ Skin
REL (USA)	Long-term value: 0,5 mg/m ³ Skin
TLV (USA)	Long-term value: 0,1 mg/m ³ Skin; BEI-M
EL (Canada)	Long-term value: 0,1 mg/m ³ Skin
EV (Canada)	Short-term value: 0,2 mg/m ³ , 0,02 ppm Long-term value: 0,1 mg/m ³ , 0,01 ppm Skin

7429-90-5 aluminum metal

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

Safety Data Sheet

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

EV (Canada)	Long-term value: 5 mg/m ³ aluminium-containing (as aluminium)
121-82-4 perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)	
REL (USA)	Short-term value: 3 mg/m ³ Long-term value: 1,5 mg/m ³ Skin
TLV (USA)	Long-term value: 0,5 mg/m ³ Skin
EL (Canada)	Long-term value: 0,5 mg/m ³ Skin
EV (Canada)	Long-term value: 0,5 mg/m ³ 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)
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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 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.

Safety Data Sheet

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

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.
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Flammability (solid, gaseous)	: Explosive; mass explosion hazard.
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Auto/Self-ignition temperature	: Not determined.
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Decomposition temperature	: Not determined.
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Self-igniting	: Product is not self-igniting.
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Danger of explosion	: Risk of explosion by shock, friction, fire or other sources of ignition.
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Explosion limits

Lower	: Not determined.
Upper	: Not determined.

Vapour pressure	: Not applicable.
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Density at 20 °C (68 °F)	: 1,55 - 1,65 g/cm ³ (12,935 - 13,769 lbs/gal)
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Relative density	: Not determined.
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Vapour density	: Not applicable.
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Evaporation rate	: Not applicable.
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Solubility in / Miscibility with water	: Variable, dependent upon product composition and packaging.
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Partition coefficient (n-octanol/water)	: Not determined.
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Viscosity

Dynamic	: Not applicable.
Kinematic	: Not applicable.

9.2 Other Information	: No further relevant information available.
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SECTION 10 – STABILITY AND REACTIVITY

10.1 Reactivity:

10.2 Chemical Stability:

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

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

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.

Safety Data Sheet

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

SECTION 11 – TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects:

Acute toxicity:

LD/LC50 values relevant for classification: None.

Primary irritant effect:

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

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

Sensitisation: No sensitising effects known.

Subacute to Chronic Toxicity: No further relevant information available.

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

Repeated Dose Toxicity: No further relevant information available.

SECTION 12 – ECOLOGICAL INFORMATION

12.1 Toxicity

Aquatic Toxicity: Toxic for aquatic organisms

12.2 Persistence and Degradability: No further relevant information available.

12.3 Bioaccumulative Potential: No further relevant information available.

12.4 Mobility in Soil: No further relevant information available.

Ecotoxicological effects:

Remark: Toxic for fish

Additional Ecological Information:

General Notes: Water hazard class 3 (German Regulation) (Self-assessment): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.

Danger to drinking water if even extremely small quantities leak into the ground.

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

Safety Data Sheet

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

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

Safety Data Sheet

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

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	2,4,6-trinitrotoluene (TNT)	C
121-82-4	perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)	C
2691-41-0	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	D
IARC (International Agency for Research on Cancer)		
118-96-7	2,4,6-trinitrotoluene (TNT)	3
TLV (Threshold Limit Value established by ACGIH)		
7429-90-5	aluminum metal	A4
121-82-4	perhydro-1,3,5-trinitro-1,3,5-triazine (RDX)	A4
NIOSH-Ca (National Institute for Occupational Safety and Health)		
None of the ingredients are listed.		
Canada		
Canadian Domestic Substances List (DSL)		
All ingredients are listed.		
Canadian Ingredient Disclosure list (limit 0.1%)		
None of the ingredients are listed.		
Canadian Ingredient Disclosure list (limit 1%)		
118-96-7 2,4,6-trinitrotoluene (TNT)		
7429-90-5 aluminum metal		
Other regulations, limitations and prohibitive regulations		
This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.		
Substances of very high concern (SVHC) according to REACH, Article 57		
None of the ingredients are listed.		
15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.		

SECTION 16 – OTHER INFORMATION

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.

Safety Data Sheet

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

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

Abbreviations and acronyms:

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

Sources

SDS Prepared by:
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Safety Data Sheet

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

Disclaimer

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Dyno Nobel SDS