



**Maine Drilling
& Blasting**

Blasting Plan

for

North Avenue Tank Replacement

67 North Avenue Westport, CT

July 29, 2020

Prepared By: Maine Drilling & Blasting, Inc

**South Division
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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 an Independent third party. Results of those surveys will be documented through video or still photographs and appropriate narration or written reports.

Blast Monitoring

All blasts will be monitored by an Independent third party who has been properly trained in the setup and use of seismic monitoring equipment. 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 may choose to perform their own seismic monitoring to confirm the accuracy of the third party performing the seismic monitoring. 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 Verdi Construction Company, and Fire Department. 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 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 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. 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. Overnight storage will be a licensed secure magazine site. 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 Connecticut and have received various amounts of training in the safe use and handling of explosives. 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 a 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 vibration 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

Airblast 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 are what would be considered typical blast designs for this project. 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.

Appendix

1. Instantel Blastmate III Data Sheet
2. Sample Blast Report
3. Typical Blast Designs
4. Explosive Product Data Sheets
5. Blaster Qualifications

Blastmate III™

Full-Featured, Advanced Vibration and Overpressure Monitor

Range of Applications:

- Blast-monitoring for compliance
- Near-field blast analysis
- Pile driving
- Construction activity
- Demolition activity
- Heavy transportation
- Bridge monitoring
- Structural analysis
- Underwater blast monitoring
- 4 or 8 channel data aquisition
- Remote monitoring - Auto Call Home™

Consultants, engineers and contractors the world over recognize the **Instintel® Blastmate III™** vibration and overpressure monitor as the most versatile and most reliable full featured monitor available. It provides all of the industry-leading features of the **Instintel Minimate Plus™** monitor, conveniently packaged with a full keyboard and a high-resolution printer. This allows you to setup, add notes and print complete event reports in the field, without a computer.

Versatile

With standard features like the **Instintel Histogram Combo™** monitoring mode, zero dead-time between events, and flexible sample rates up to 65,536 S/s, the **Blastmate III** system provides you with control and confidence to monitor reliably in any situation. For added versatility, you have the option to add 4 more channels and extra memory, providing two complete standard monitors in a single package.

For more demanding monitoring applications, the **Instintel Blastware® Advanced Module** software provides the capability to monitor a broad selection of vibration and overpressure sensors, as well as sensors for related structural and environmental measurements. Monitor vibration, ambient environmental conditions, and the movement of structural cracks, all at the same time, all using the same **Blastmate III** monitor.

Easy to use

The features and versatility of the **Blastmate III** monitor set it apart, but the fact that it is also easy to use makes it truly revolutionary. The dedicated single use function keys, backlit LCD and simple menu-driven operation make setup and operation quick and easy, even for inexperienced personnel.

Tough

The **Blastmate III** monitor has been built to survive, with a fully sealed top panel, non-corrosive industrial grade connectors and sealed electronics, all packed in a rugged, water-resistant case.

Blastmate III - Reliability and versatility for any monitoring application.



Key Features

- Fast high-resolution thermal printer for event reports in the field without the need for a computer.
- Full keyboard simplifies entry of job-specific notes and information.
- Dedicated function keys and intuitive menu-driven operation enable quick and easy setup.
- **Histogram Combo** mode allows capture of full waveform records while recording in histogram mode.
- Sample rates from 1,024 to 16,384 S/s per channel - up to 65,536 S/s available on a single channel.
- Available 8-channel option allows for 2 standard triaxial geophones and 2 microphones to be used on a single **Blastmate III** monitor.
- Continuous monitoring means zero dead time, even while the unit is processing.
- Any channel can be matched to a wide variety of sensors - geophones, accelerometers, or hydrophones.



Blastmate III™

General Specifications

	Blastmate III
Channels	Microphone and Triaxial Geophone or 4 independent user-configurable channels (two Microphones and two Triaxial Geophones or 8 independent channels with optional 8-channel upgrade)
Vibration Monitoring (with Standard Triaxial Geophone)	
Range	Up to 254 mm/s (10 in/s)
Resolution	0.127 mm/s (0.005 in/s) or 0.0159 mm/s (0.000625 in/s) with built-in preamp
Accuracy (ISEE / DIN)	+/- 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz / DIN 45669-1 standard
Transducer Density	2.13 g/cc (133 lbs/ft³)
Frequency Range (ISEE / DIN)	2 to 250 Hz, within zero to -3 dB of an ideal flat response / 1 to 315 Hz
Maximum Cable Length (ISEE / DIN)	75 m (250 ft) / 1,000 m (3,280 ft)
Air Overpressure Monitoring	
Weighting Scales	Linear or A-weight
Linear Range	88 to 148 dB (500 Pa (0.072 PSI) Peak)
Linear Resolution	0.25 Pa (0.0000363 PSI)
Linear Accuracy	+/- 10% or +/- 1 dB, whichever is larger, between 4 and 125 Hz
Linear Frequency Response	2 to 250 Hz between -3 dB roll off points
A-weight Range	50 to 110 dBA
A-weight Resolution	0.1 dBA

Waveform Recording

Record Modes	Manual, Single-shot, Continuous
Seismic Trigger	0.125 to 254 mm/s (0.005 to 10 in/s)
Acoustic Triggers	
Linear	100 to 148 dB
A-weight	55 to 110 dBA
Sample Rate	1,024 to 16,384 S/s per channel (independent of record time), up to 65,536 S/s in single-channel mode with advanced software (maximum 8,192 S/s per channel for 8 channels)
Record Stop Mode	Fixed record time, Instantel® AutoRecord™ record stop mode
Record Time	1 to 100 seconds (programmable in one-second steps) or 500 seconds plus 0.25 seconds pre-trigger
AutoRecord Time	Auto window programmable from 1 to 9 seconds, plus a 0.25 second pre-trigger. Event is recorded until activity remains below trigger level for duration of auto window, or until available memory is filled. Recording uninterrupted by event processing - No dead time
Cycle Time	
Storage Capacity	
Full Waveform Events	300 one-second events at 1,024 S/s sample rate (1,500 event capacity with optional memory upgrade)
Event Summaries	1,750 (8,750 event capacity with optional memory upgrade)

Histogram Recording

Record Modes	Histogram and Instantel Histogram Combo™ (monitor captures triggered waveforms while recording in Histogram mode)
Recording Interval	2, 5 or 15 seconds; 1, 5 or 15 minutes
Storage Capacity	46,656 intervals - 3 days at 5-second intervals or 102 days at 15 minute intervals (with memory upgrade - 15 days at 5-second intervals or 540 days at 15 minute intervals)

Physical Specifications

Dimensions	269 x 355 x 165 mm (10.6 x 14.0 x 6.5 in)
Weight	6.4 kg (14 lbs)
Battery	Rechargeable 6 V sealed gel cell - capacity for 30 days of continuous monitoring
User Interface	63 domed tactile keys including full keyboard and dedicated keys for common functions
Display	4-line x 20 character, high contrast, backlit LCD with online help
Printer	High resolution thermal plotter
PC Interface	RS-232
Auxiliary Inputs and Outputs	External Trigger, Remote Alarm, coordinate download from GPS
Environmental	
Printer/LCD Operating Temperature	-10 to 50°C (14 to 122°F)
Electronics Operating Temperature	-20 to 60°C (-4 to 140°F)
Remote Communications	Compatible with Telephone, GSM, Cellular, RF, Satellite, Short-haul modems, and Ethernet® device servers. Automatically transfers events when they occur through Instantel Auto Call Home™ feature.
Additional Features	Monitor start/stop timer

714B0053 Rev 07 - Product Specifications are Subject to Change



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The World's Most Trusted Vibration Monitors



Blast Report

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

State _____ Permit No. _____ Identify Hazards

Pre Shift Insp.Time (24hrs) : _____

Post Shift Insp.Time (24hrs): _____

Blaster : _____

License #: _____

Signature:



Precautions Taken:

See JHA and Site Security

Weather
Comments:

No. of Crew Members _____

Crew Members Names :

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

Seismograph Monitoring Plan (Not to Scale):



Description: Production		Description: Decked	
Elevation	Feet	Elevation	Feet
Brench (ft)	N/A	Brench (ft)	N/A
Floor (ft)	N/A	Floor (ft)	N/A
Overburden (ft)		Overburden (ft)	
Sub Drilling(ft)		Sub Drilling(ft)	
Total Depth (ft)		Total Depth (ft)	
N/A		N/A	
N/A		0	
ation of Seis		Seis #	Monitor Log Status
			Actual PPV
			Actual PPV Freq,
			Actual db
			Actual Dist. (ft)
			Actual K Factor

Please See Attached for Seismograph Report

Loaded Hole-Blast Design for:

Job North Avenue Tank Replacement

Owner/Site Aquarion

Location: Westport, CT

Division: South

Customer Verdi Construction Company

Author bjones On:7/22/2020 Updated By tboncek On: 7/29/2020

Blast Plan Description: Mass rock 25-50ft away

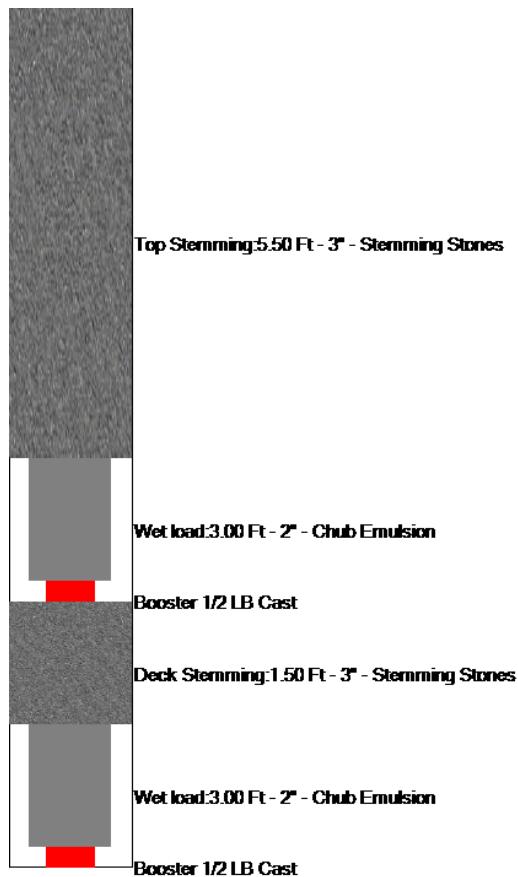


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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	15
Hole Depth:	10.00 Ft
Hole Diameter:	3 in
Burden:	3.00 Ft
Spacing:	3.00 Ft
Holes per Delay:	1
Pounds Per Delay:	2.57 Lbs
Pounds Per Hole:	5.14 Lbs
Total est. Pounds:	77.10 Lbs
Powder Factor:	1.54 Lbs/Cy
Decks:	1

Loaded Hole Depth - Diameter - Product



Blast Plan Notes:

Typical hole design when blasting within 25-50 ft from existing water tank.

Vibration Prediction (formula based on Dupont Handbook)

Site Factor (k) : 160 *Ground Constant based on Site/Rock Coniditions*

Distance Ft (d) 25 *Distance to Structure*

Lbs per Delay (w) 2.57 *Lbs explosives per 8 milisecond delay*

Scaled Distance (sd) 15.59 ($sd = d / \sqrt{w}$)

Estimated PPV 1.97 ($ppv = k * sd^{-1.6}$)

Typical for Production work consistent with holes 10 Ft deep at 25 from a structure utilizing 3' In diameter at a 3 Ft by 3 Ft pattern.

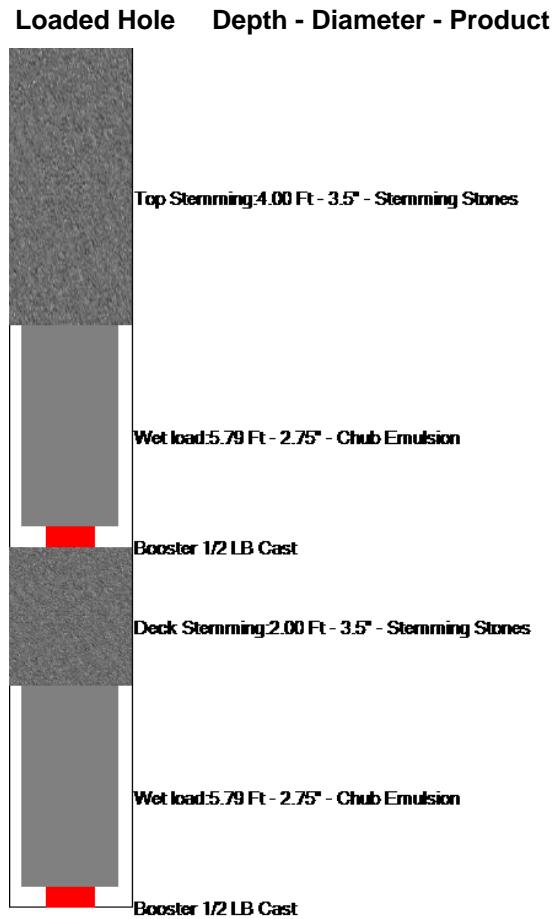
Plan View/Timing Design (please see attached timing diagram)

Loaded Hole-Blast Design for:**Job** North Avenue Tank Replacement**Owner/Site** Aquarion**Location:** Westport, CT**Division:** South**Customer** Verdi Construction Company**Author** bjones On:7/22/2020 Updated By jcaron On: 7/23/2020**Blast Plan Description:** 50-100ft. away

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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	15
Hole Depth:	11.79 Ft
Hole Diameter:	3.5 in
Burden:	5.00 Ft
Spacing:	6.00 Ft
Holes per Delay:	1
Pounds Per Delay:	9.38 Lbs
Pounds Per Hole:	18.76 Lbs
Total est. Pounds:	281.40 Lbs
Powder Factor:	1.43 Lbs/Cy
Decks:	1

**Blast Plan Notes:****Vibration Prediction (formula based on Dupont Handbook)**

Site Factor (k) :	160 <i>Ground Constant based on Site/Rock Coniditions</i>
Distance Ft (d)	50 <i>Distance to Structure</i>
Lbs per Delay (w)	9.38 <i>Lbs explosives per 8 milisecond delay</i>
Scaled Distance (sd)	16.33 (<i>sd = d/ square root of w</i>)
Estimated PPV	1.83 (<i>ppv = k * sd ^ -1.6</i>)

Typical for Production work consistent with holes 11.79 Ft deep at 50 from a structure utilizing 3.5' In diameter at a 5 Ft by 6 Ft pattern.

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

Loaded Hole-Blast Design for:

Job North Avenue Tank Replacement

Owner/Site Aquarion

Location: Westport, CT

Division: South

Customer Verdi Construction Company

Author bjones On:7/22/2020 Updated By jcaron On: 7/23/2020

Blast Plan Description: >100ft away

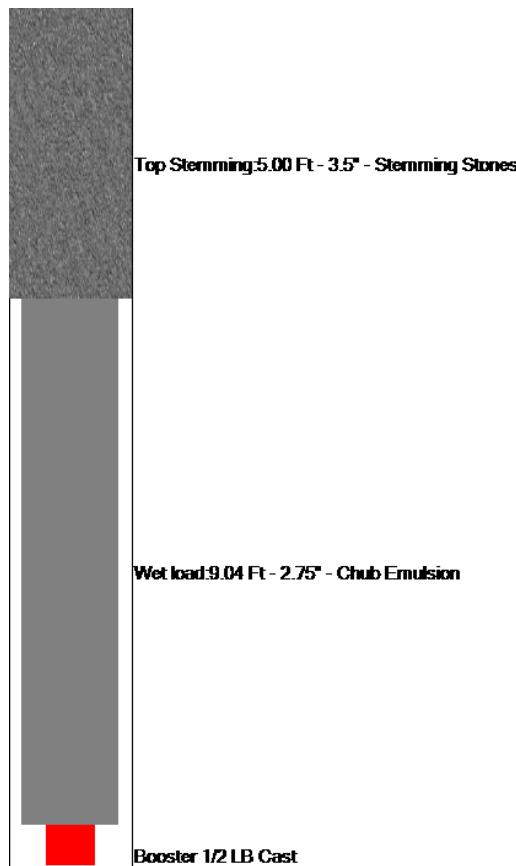


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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	35
Hole Depth:	14.04 Ft
Hole Diameter:	3.5 in
Burden:	6.00 Ft
Spacing:	7.00 Ft
Holes per Delay:	1
Pounds Per Delay:	29.29 Lbs
Pounds Per Hole:	29.29 Lbs
Total est. Pounds:	1,025.15 Lbs
Powder Factor:	1.35 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 Coniditions*

Distance Ft (d) 100 *Distance to Structure*

Lbs per Delay (w) 29.29 *Lbs explosives per 8 milisecond delay*

Scaled Distance (sd) 18.48 ($sd = d / \sqrt{w}$)

Estimated PPV 1.50 ($ppv = k * sd^{-1.6}$)

Typical for Production work consistent with holes 14.04 Ft deep at 100 from a structure utilizing 3.5' In diameter at a 6 Ft by 7 Ft pattern.

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

Loaded Hole-Blast Design for:

Job North Avenue Tank Replacement

Owner/Site Aquarion

Location: Westport, CT

Division: South

Customer Verdi Construction Company

Author bjones On:7/22/2020 Updated By jcaron On: 7/23/2020

Blast Plan Description: Trench

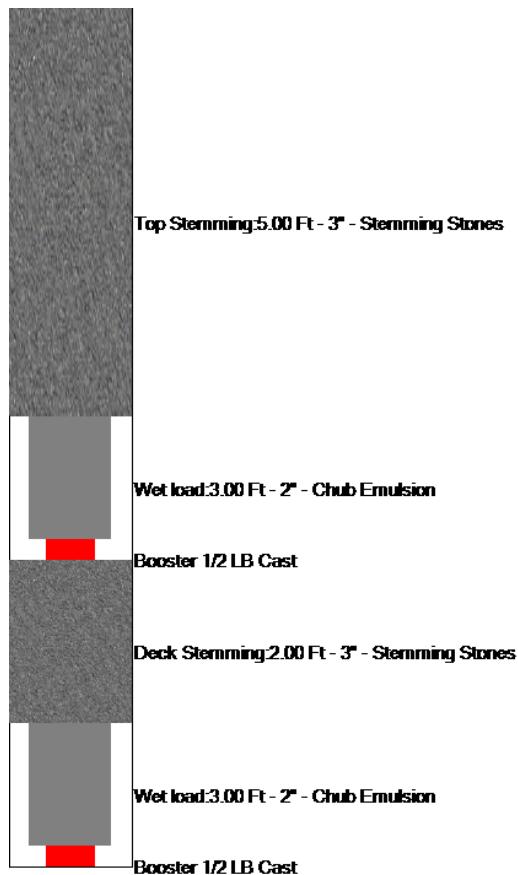


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APENDIX A. - Blast Design Plan:

Est. Number Of Holes:	50
Hole Depth:	10.00 Ft
Hole Diameter:	3 in
Burden:	4.00 Ft
Spacing:	4.00 Ft
Holes per Delay:	1
Pounds Per Delay:	2.57 Lbs
Pounds Per Hole:	5.14 Lbs
Total est. Pounds:	257.00 Lbs
Powder Factor:	1.73 Lbs/Cy
Decks:	1

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 Coniditions*

Distance Ft (d) 25 *Distance to Structure*

Lbs per Delay (w) 2.57 *Lbs explosives per 8 milisecond delay*

Scaled Distance (sd) 15.59 ($sd = d / \sqrt{w}$)

Estimated PPV 1.97 ($ppv = k * sd^{-1.6}$)

Typical for Production work consistent with holes 10 Ft deep at 25 from a structure utilizing 3' In diameter at a 4 Ft by 4 Ft pattern.

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

BLASTEX®

Small & Large Diameter Cast Booster Sensitive Emulsion



Product Description

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

Application Recommendations

- Package diameter and type affect product density. Use cartridge count to determine actual explosive charge weight.
- Ensure continuous column loading. For column lengths in excess of 6 m (20 ft) or whenever column separation is suspected, multiple priming is recommended.
- Emulsion explosives are susceptible to "dynamic shock" and may detonate at low order or fail completely when applied in very wet conditions, where explosive charges or decks are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for alternate product recommendations when these conditions exist.
- **ALWAYS** use a cast booster as a primer for BLASTEX to ensure maximum performance.
- **ALWAYS** use a 340 g (12 oz) or larger cast booster at internal product temperatures higher than -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.

Technical Information

Properties

SDS
#1063

	BLASTEX	BLASTEX PLUS
Density (g/cc) Avg	1.26	1.26
Energy^a (cal/g)	800	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) (ft/s)	5,000	4,900
Detonation Pressure^c (Kbars)	16,400	16,100
Gas Volume^a (moles/kg)	79	76
Fume Class	44	39
Shelf Life Maximum	IME1 & NRCan ^d	IME1
Maximum Water Depth	1 year (from date of production)	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

BLASTEX®

Technical Information



Transportation, Storage and Handling

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

Packaging Details

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

Packaging—Chub

Diameter x Length mm	in	Blastex Plus	Case Quantity	Case Weight			Net Explosive Weight / Chub kg	kg	lbs	Tote Bag Dimensions 84 x 84 x 94 cm
				kg	lbs	kg				
50 x 400	2 x 16	■	■	18	18.0	40	1.00	2.20		
57 x 400	2 1/4 x 16	■	■	14	17.7	39	1.26	2.78		
65 x 400	2 1/2 x 16	■	■	12	18.1	40	1.51	3.33		
70 x 400	2 3/4 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	3 1/2 x 16	■	■	6	16.7	37	2.77	6.11		

Case Dimensions

44 x 35 x 20 cm

17.25 x 13.875 x 7.875 in

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.

DYNOMIX™

Technical Information



Booster Sensitive Explosive

Properties

SDS #1009



Product Description

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

Application Recommendations

- DYNOMIX is not recommended for wet blasthole conditions and is not for use in ground containing reactive sulphides. Consult your Dyno Nobel representative regarding applications involving borehole dewatering and plastic borehole liners
- DYNOMIX is suitable for use in ground with a temperature range of 0°C to 55°C (32°F to 131°F). For applications in ground with temperatures outside this range contact your Dyno Nobel representative

- The loading density of DYNOMIX is subject to change (i.e., density poured from a bag differs from pneumatically placed or mobile equipment delivered densities). Typical application loading densities are: 0.82 to 0.83 g/cc (poured 3 in to 5 in); 0.90 to 0.95 g/cc (pneumatic 1 in to 2 in) and 0.85 to 0.87 g/cc (bulk truck delivered 3 in to 17½ in)
- DYNOMIX has a shelf life of 3 months from date of manufacture when stored at temperatures between -17°C and 32°C (0°F and 90°F)

- **ALWAYS** use an adequately sized cast booster or packaged explosive with a high detonation pressure to prime DYNOMIX

Appendix 10

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

^a All Dyno Nobel Inc. energy and gas volume values are calculated using PRODET™, the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values
^bANFO = 1.00 @ 0.82 g/cc
^cConfined @ 150 mm (6 in) diameter

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



DYNOMIX™

Technical Information



Application Recommendations (continued)

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

Transportation, Storage and Handling

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

Appendix 10

TYPICAL LOADING DENSITIES AND RATES OF DETONATION (poured)

Borehole Diameter		Typical Weight Per Foot Of Borehole		Typical Detonation Velocity (confined)	
mm	in	kg	lbs	mps	fps
32	1 1/4	0.22	0.5	2,900	9,500
50	2	0.55	1.2	3,300	10,700
75	3	1.1	2.5	3,300	10,900
100	4	2.0	4.5	3,600	11,800
125	5	3.2	7.0	3,800	12,400
150	6	4.7	10.4	3,900	12,800
187	7 3/8	7.1	15.7	4,000	13,100
230	9	10.6	23.4	4,100	13,400
270	10 5/8	15.2	33.4	4,100	13,600
311	12 1/4	20.2	44.4	4,200	13,700
350	13 3/4	25.4	55.9	4,200	13,700
380	15	30.2	66.5	4,200	13,800

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NONEL® EZ DET® 1.1B

Nonelectric Blast Initiation System



Product Description

NONEL® nonelectric delay detonator EZ DET® 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.

Properties

SDS
#1122

Net Explosive Content per 100 units 0.1125 kg
 0.2480 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

*Non-standard timing combinations are made to order by special request. Please contact your Dyno Nobel representative for details.

Hazardous Shipping Description
Detonator assemblies nonelectric,
1.1B, UN 0360 PG II



NONEL® EZ DET 1.1B



Technical Information

Application Recommendations (continued)

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

Packaging

Packaging		Length m	Length ft	Case Type	Quantity/ Case
3.5	12			D*	100
4.5	16			D*	90
7	24			D*	70
9	30			DC	120
12	40			DC	120
15	50			DC	90
18	60			DC	90
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.

- 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.

Transportation, Storage and Handling

- Case Dimensions
DelPak Case (DC)
DelPak (D)
- 48 x 45 x 26 cm
44 x 22 x 25 cm
18 3/4 x 17 3/4 x 10 3/4 in
17 1/2 x 8 3/4 x 10 in

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NONEL® EZ DET® 1.4B

Nonelectric Blast Initiation System



Product Description

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

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

Application Recommendations

For detailed application recommendations, **ALWAYS** request a copy of Dyno Nobel's *Product Manual: NONEL® and PRIMACORD®* from your Dyno Nobel representative.
• **ALWAYS** select a NONEL EZ DET unit having more than enough tubing length to extend from the planned primer location in the borehole to the collar of the next hole.

Hazardous Shipping Description
Detonator assemblies nonelectric,
1.4B, UN 0361 PG II



Technical Information

Properties

SDS
#1122

Net Explosive Content per 100 units 0.0810 kg
 0.1785 lbs

This product is only available in the United States.

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

NONEL® EZ DET 1.4B



Technical Information

Application Recommendations (continued)

• **ALWAYS** protect the plastic EZ Connector block and all shock tube leads from impact or damage during the loading and stemming operations. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ Connector block contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires.

• **ALWAYS** be sure that the shock tube(s) are securely inserted, one at a time, into the EZ Connector block. The head of the EZ Connector block should rise to accept the shock tube and return to a closed position with an audible click.

• **ALWAYS** ensure that individual shock tubes remain aligned side by side in the connector channel and do not cross one over the another on insertion.

• **NEVER** use NONEL EZ DET units with detonating cord. The low strength surface detonator will not initiate detonating cord and may cause misfires.

• **NEVER** attempt to disassemble the delay detonator from the plastic EZ Connector block or use the detonator without the connector.

• **NEVER** place more than 6 shock tube leads into the plastic EZ Connector block. Misfires may result.

• **NEVER** pull, stretch, kink or put tension on shock tube such that the tube could break.

• **NEVER** splice NONEL EZ DET shock tube together to extend between holes.

• **NEVER** connect NONEL EZ DET units together until all holes have been primed, loaded and stemmed and the blast site has been cleared.

Transportation, Storage and Handling

• NONEL EZ DET must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations.

• For maximum shelf life (3 years), NONEL EZ DET must be stored in a cool, dry, well ventilated magazine. Explosive inventory should be rotated. Avoid using new materials before the old. For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the Safety Library Publications of the Institute of Makers of Explosives

Packaging

Packaging		Length m	Length ft	Case Type	Quantity / Case
		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.

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

Case Dimensions

Detpak Case (DC)
Detpak (D)

48 x 45 x 26 cm
44 x 22 x 25 cm

18³/₄ x 17³/₄ x 10³/₄ in
17¹/₂ x 8³/₄ x 10 in

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Nonelectric Trunkline Delay Detonators



Product Description

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

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

Application Recommendations

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

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

Properties

SDS
#1122

Net Explosive Content per 100 units

0.0240 kg
0.0529 lbs

Delay Time (msec)	Connector Block Color
9	Green
17	Yellow
25	Red
33	Green
42	White
67	Blue
100	Black
109	Black

Hazardous Shipping Description
Detonator assemblies nonelectric,
1.4B, UN 0361 PG II



Technical Information

NONEL® EZTL™



Technical Information

Application Recommendations (continued)

- **ALWAYS** protect the plastic EZ connector and all shock tube leads from impact or damage. Use care when placing blasting mats and cover material on top of the blasting circuit. The EZ connector contains a detonator and is subject to detonation caused by abuse such as impact. Shock tube which has been cut, ruptured or damaged may cause misfires
- **NEVER** use NONEL EZTL detonators with detonating cord. The low strength surface detonator will not initiate detonating cord
- **NEVER** attempt to disassemble the delay detonator from the EZ connector block or use the detonator without the connector
- **NEVER** place more than 6 shock tube leads into an EZ connector block, misfires may result
- **NEVER** tie-in NONEL EZTL units until all blast holes have been primed, loaded, stemmed and the blast site has been cleared

Transportation, Storage and Handling

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

Packaging

Packaging		
Length	Case Type	Quantity / Case
m	ft	
3.5	12	D*
6	20	D*
9	30	D*
12	40	D*
15	50	D*
18	60	D*

- 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

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NONEL® Lead Line

Nonelectric Shock Tube



Technical Information



Properties

SDS
#1124

Net Explosive Content per 100 units 0.0044 kg
 0.0097 lbs

Length		Spools / Case	
m	ft		
762	2500	2	

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

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 NONELEZTL™ 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.

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



NONEL® Lead Line



Technical Information

Application Recommendations (continued)

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

Application Recommendations (continued)

- When making a nonelectric starter assembly using NONEL LEAD LINE, **ALWAYS** remove the plastic tube closure and save for later use. Splice two freshly-cut ends of NONEL shock tube together (one from the NONEL LEAD LINE and the other from the NONEL detonator) by inserting them into opposite ends of the plastic connector sleeve and pushing them toward one another until they are both at least ½ cm (¼ in) in the splice.

Transportation, Storage and Handling

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

Case Dimensions

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

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TROJAN® SPARTAN®

Cast Booster



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.

Properties

SDS
#1108

Density	(g/cc) Avg	1.65
Velocity	(m/sec) (ft/s)	7,550 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 PRODETE™ 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



Technical Information

Appendix 10

TROJAN® SPARTAN



Technical Information

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.

Packaging

Unit Weight	Unit Dimensions			Case Quantity	Gross Weight/ Case			
	g	oz	Length cm	Diameter 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

Product Disclaimer

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DYNAMAX™ PRO

Extra Gelatin Nitroglycerin Dynamite



Product Description

DYNOMAX PRO is desensitized extra gelatin dynamite designed to satisfy the majority of explosive application requirements. DYNOMAX PRO is formulated to consistently deliver high detonation velocity and excellent water resistance while reducing cartridge to cartridge gap sensitivity and hole-to-hole propagation problems. DYNOMAX PRO is recommended for bottom loading and as the main explosive charge where high density and energy is required. DYNOMAX PRO is recommended for use as booster, bottom load or floor control solution.

Application Recommendations

- DYNOMAX PRO is an excellent primer for Dynomix (ANFO), Dynamix WR (WR ANFO) or other detonator sensitive packaged product and can be used as a secondary primer in hard seams or at the top of the explosive column.
- Minimum diameter is 32 mm (1¼ in).
- Minimum detonator is No. 8 strength.
- DYNOMAX PRO has been formulated to reduce susceptibility to sympathetic detonation when applied in very wet conditions where boreholes are closely spaced and/or where geological conditions promote this effect. Consult your Dyno Nobel representative for product recommendations where these conditions exist.
- Storage at elevated temperatures and/or high humidity for 12-18 months can reduce the performance of DYNOMAX PRO depending on the diameter. Consult your Dyno Nobel representative for specific recommendations.

Properties

SDS
#1019

Density	(g/cc) Avg	1.45
Energy^a	(cal/g) (cal/cc)	1,055 1,510
Relative Weight Strength^a		1.20
Relative Bulk Strength^{a,b}		2.10
Velocity^c (m/s)	(ft/s)	5,275 17,300
Detonation Pressure^c (Kbars)		101
Gas Volume^a (moles/kg)		32
Water Resistance		Excellent
Fume Class^d		IME1

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

^b ANFO = 1.00 @ 0.82 g/cc

^c Unconfined @ 50 mm (2 in) diameter.

^d IME Fume Class 1 in convolute paper shell only. Not Fume Class 1 in paper tube shell.
Natural Resources Canada Fume Class approvals pending.

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



Technical Information

DYNOMAX™ PRO

Transportation, Storage and Handling

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

Packaging

Diameter x Length		Qty / Case	Case Type	Nominal Case Weight
mm	in			
32 x 200	1 1/4 x 8	88	DA	20
32 x 400	1 1/4 x 16	44	DA	20
40 x 200	1 1/2 x 8	60	DA	20
50 x 200	2 x 8	34	DB	20
50 x 400 ^a	2 x 16 ^a	17	DB	20
65 x 400 ^a	2 1/2 x 16 ^a	10	DB	19
75 x 200	3 x 8 ^a	16	DE	20
75 x 400 ^a	3 x 16 ^a	8	DE	20

^a Available in spiral tube shell with tapered end.

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

• Product density is 1.40 g/cc for package diameters less than 50mm (2 in). Use cartridge count to determine actual explosive charge weight.

• DYNOMAX PRO is available in a wide variety of sizes. Custom sizes are subject to surcharge and may require longer than usual lead times.

Case Dimensions

DA	17 5/8 x 13 3/8 x 6 7/8 in	34 x 34 x 17 cm
DB	17 7/8 x 13 3/8 x 5 7/8 in	45 x 34 x 15 cm
DE	17 5/8 x 13 5/16 x 6 3/4 in	45 x 34 x 17 cm

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.



Technical Information

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MaineDrilling
&Blasting

Setting Earth Shattering Standards
Since 1966

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Date: 08/24/2015

Maine Drilling & Blasting

88 Gold Ledge Ave,
Auburn, NH 03032

Supersedes: 09/2005

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

Product Identifier

Product Form: Mixture

Product Name: Emulsion Blend 1966

Other Means of Identification

Product Class: Emulsion

Trade Names:

Emulsion Blend 1966

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)



Signal Word (GHS-US)

Hazard Statements (GHS-US)

: Danger

: 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
Aluminum	(CAS No) 7429-90-5	0.1 - 10	Comb. Dust Flam. Sol. 1, H228 Water-react. 2, H261
Polymeric Surfactant	NA	0.5 – 2	Not available

More than one of the ranges of concentration prescribed by Controlled Products Regulations has been used where necessary, due to varying composition.

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

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Obtain medical attention if breathing difficulty persists.

Safety Data Sheet

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

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

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

Most Important Symptoms and Effects Both Acute and Delayed

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

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause serious eye irritation.

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

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

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If ingested, causes 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

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accordance with appropriate Federal, State and local regulations.

Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling

General: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications. Comply with the safety library publication No. 4 "Warnings and Instructions" as adopted by the Institute of Makers of Explosives.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and forearms thoroughly after handling. Do not eat, drink or smoke when using this product.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Contact manufacturer for appropriate grounding/bonding guidance. Comply with applicable regulations.

Storage Conditions: Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555. Store in a dry, cool and well-ventilated place.

Keep/Store away from direct sunlight, extremely high or low temperatures, heat sources, ignition sources. Keep container closed when not in use. Store locked up.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Zinc. Copper and its alloys. Organic materials. Combustible materials.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

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

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

USA ACGIH	ACGIH TWA (mg/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

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and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

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

Safety Data Sheet

Information on Toxicological Effects - Product

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not classified

Carcinogenicity: Contains an ingredient suspected of causing cancer.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: May cause respiratory irritation.

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

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

Symptoms/Injuries After Ingestion: Ingestion is likely to be harmful or have adverse effects. Overexposure to this material may result in methemoglobinemia. Methemoglobinemia decreases the blood's ability to carry oxygen and results in symptoms such as dizziness, drowsiness, headache, shortness of breath, blue skin and lips, rapid heart rate, unconsciousness, and possibly death.

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

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

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

LD50 Oral Rat	18.7 - 24.9 ml/kg
LD50 Dermal Rabbit	> 4300 mg/kg
ATE US (dust, mist)	3.60 mg/l/4h
Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecology - General: This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

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

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

LC50 Fish 1	57 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
-------------	-----------------------------------------------------------------------------

Persistence and Degradability

Not available

Bioaccumulative Potential

Ammonium nitrate (6484-52-2)

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

Mobility in Soil

Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

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Waste Treatment Methods: Uncontaminated and contaminated material may be placed in large diameter boreholes and detonated so that the explosive energy is utilized as originally intended. Dispose of under direct supervision of a qualified person according to local, state and federal regulations. Call Maine Drilling & Blasting Safety and Compliance Department for recommendations and assistance.

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

SECTION 14 - TRANSPORT INFORMATION

In Accordance with DOT

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



Packing Group

: II
ERG Number : 140

In Accordance with IMDG

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



In Accordance with IATA

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



ERG Code (IATA)

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

Aluminum (7429-90-5)

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

Listed on SARA Section 313 (Specific toxic chemical listings)

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SARA Section 313 - Emission Reporting		1		
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				
Aluminum (7429-90-5)				
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				
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 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			
Aluminum (7429-90-5)				
Listed on the Canadian DSL (Domestic Substances List) inventory.				
Listed on the Canadian Ingredient Disclosure List				
WHMIS Classification	Class B Division 6 - Reactive Flammable Material Class B Division 4 - Flammable Solid			

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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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DYNOSPLIT® EX

Small Diameter Detonator Sensitive Continuous Packaged Emulsion



Product Description

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

Application Recommendations

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

Properties

SDS
#1157

Density	(g/cc) Avg	1.10–1.12
Energy^a	(cal/g) (cal/cc)	775 860
Relative Weight Strength^a		0.88
Relative Bulk Strength^{a,b}		1.19
Velocity^c (m/s) (ft/s)		4,700 15,400
Detonation Pressure^c (kbars)		65
Gas Volume^a (moles/kg)		38
Water Resistance		Excellent
Fume Class		IME1 & NRCam1

- ^a All Dyno Nobel Inc. energy and gas volume values are calculated using PRODETT™, the computer code developed by Dyno Nobel Inc. for its exclusive use. Other computer codes may give different values.
^b ANFO = 1.00 @ 0.82 g/cc
^c Unconfined @ 32 mm (1½ in) diameter; emulsion only. Actual VOD of DYNOSPLIT EX is dependent on VOD of detonating cord (~7,000 m/sec).



Hazardous Shipping Description

Explosive, Blasting, Type E 1.1D UN 0241 II

DYNOSPLIT® EX

- Transportation, Storage and Handling**
- DYNOSPLIT EX must be transported, stored, handled and used in conformity with all applicable federal, state, provincial and local laws and regulations.
 - Packaged emulsions have a shelf life of one (1) year when stored at temperatures between -18°C and 38°C (0°F and 100°F). Explosive inventory should be rotated. Use old materials before new materials.
 - For recommended good practices in transporting, storing, handling and using this product, see the booklet "Prevention of Accidents in the Use of Explosive Materials" packed inside each case and the "Safety Library Publications of the Institute of Makers of Explosives."

Warm-Up Time Chart
Blast Hole Residence Time (Hours at 7°C / 45°F)

Internal Product Temperature Before Loading °C	Internal Product Temperature Before Loading °F	25–32 mm (1-1/4 in) Diameter	25–32 mm (1-1/4 in) Diameter	38–50 mm (1½–2 in) Diameter	
		Wet	Dry	Wet	Dry
-30	-22	1.0	2.0	2.0	4.0
-40	-40	2.0	5.0	4.0	8.0

Packaging

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

Case and Pallet Information

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

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PRIMACORD®

Detonating Cord



Product Description

PRIMACORD detonating cords are flexible linear explosives with a core of PETN explosive encased in a textile outer jacket. PRIMACORD detonating cords are designed for use as trunklines and/or downlines in various mining, quarrying and construction applications.

Application Recommendations

- **ALWAYS** cut detonating cord with a sharp, non-sparking knife.
- **NEVER** attempt to cut detonating cords by abrasion or with a blow from a sharp or blunt object.
- **ALWAYS** use square knots to extend/join detonating cords that will propagate self-to-self. When connecting downlines to trunklines, always use a clove hitch knot and keep incoming and outgoing cords at right angles to avoid possibility of cut-offs.
- **NEVER** join PRIMACORD 1, 2 and 3 together with knots because it will not propagate self-to-self.
- **ALWAYS** use a detonating cord product, such as PRIMACORD 4Y or 4R or detonating cord with a greater explosive coreload as a trunkline to initiate PRIMACORD 1, 2 or 3.
- **ALWAYS** use a double wrap clove hitch knot to connect PRIMACORD 1, 2 and 3 detonating cord to the trunkline cord.
- **NEVER** allow trunklines and/or downlines to cross.

Properties

SDS
#1126

See Page 2 for PRIMACORD Detonating Cord properties

Technical Information



- Minimum recommended initiating detonator is a No. 8 strength.
- Minimum recommended cord initiator is a 3.6 g/m (18 gr/ft) detonating cord, such as PRIMACORD 4Y or 4R, or another detonating cord with an equal or greater explosive coreload.

Transportation, Storage and Handling

- PRIMACORD 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), PRIMACORD 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.
- C € 0589

Hazardous Shipping Description

Cord, Detonating, 1.1D, UN 0065, II EX 1992020035



PRIMACORD®



Technical Information

Packaging

Part Number	Product	PETN Coreload (nominal)*		Outside Diameter*		Tensile Strength*		Color / Counter		Weight / Case*		Spools / case	Length / Spool*		Net Explosives Content* (NEC) / 1000 ft	Velocity of Detonation (minimum) m / sec
		g/m	gr/ft	mm	in	kg	lbs	kg	lbs	kg	lbs		m	ft		
A308033	PRIMACORD 1	1.5	7.5	3.18	0.13	68	150	Yellow / 5 Black	9	20	2	610	2000	0.51	1.07	6,300
A301042	PRIMACORD 2.5	2.4	12.5	2.8	0.11	27	60	Red / 4 Black	12	25	2	610	2000	0.81	1.79	6,300
A308033	PRIMACORD 3	3.2	15	3.66	0.14	113	250	Red / 5 Black	13	29	2	610	2000	1.02	2.14	6,700
A310033	PRIMACORD 4Y	3.6	18	3.61	0.14	68	150	Yellow / 2 Black	6	14	2	305	1000	1.22	2.57	6,700
A712033	PRIMACORD 4R*	3.6	18	3.61	0.14	68	150	Red	4	8	2	610	2000	1.22	2.57	6,700
A320035	PRIMACORD 5	5.3	25	3.99	0.16	68	150	Red / 1 Black	11	25	2	458	1500	1.70	3.57	6,700
A355030	PRIMACORD 8	8.5	40	4.47	0.18	90	200	Red / 2 Black	11	24	2	305	1000	2.72	5.72	6,700
A349030	PRIMACORD 10	10.8	50	4.70	0.19	90	200	Yellow / 2 Black	12	27	2	305	1000	3.40	7.15	6,700
A356030	PRIMACORD 10 SEISMIC	10.8	50	4.70	0.19	90	200	Yellow / White	12	27	2	305	1000	3.40	7.15	6,700

* All weights and dimensions are approximate

- Notes:**
1. Higher coreload detonating cords are available.
 2. Alternative packaging is available for some products.

Please contact your Dyno Nobel representative for details.

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Blaster Profile

Michael Rodriguez – Blasting Supervisor
South Construction Division

I. Work History:

- Maine Drilling & Blasting:
 - Blasting Foreman; January 2013 to Present
 - Driller; June 2011 to January 2013

II. Training and Education:

- Maine Drilling and Blasting:
 - MSHA Annual Refresher – 03/10/2020
 - Blaster Technical Training – 4/2-3/2014
 - Blasting Safety – 3/8/2017
 - HazMat General Awareness – 9/20/2017
 - HazMat Transport Security – 9/20/2017
 - HazMat Indepth Security Awareness – 9/2/2017
 - Driller I & Driller II Training – 3/2/2012
 - OSHA 10 Hour Construction – 11/29/2006

III. Projects:

Putnam Construction, Inc Milford, CT	3025 SFT Open/Mass Rock
TMS Construction, LLC Greenwich, CT	8535 SFT Open/Mass Rock
BC Heating & Cooling Bozrah, CT	7925 SFT Open/Mass Rock 100 LFT Trench Rock
Amec Construction Corp Lowe's Complex Norwalk, CT	1000 LFT Trench 85000 SFT Open Rock/Mass Rock
Price Gregory UGI Gas Pipeline Montrose, PA	10,000 LFT Trench
Southfield Properties LLC Davenport Landing Stamford, CT	12796 SFT Open/Mass Rock
Significant Homes LLC	10475 SFT Open/Mass Rock

John St
Greenwich, CT

OCS Industries
Port Jervis, NY

H& P Builders, LLC
South End Court
Greenwich, CT

Amec Construction Corp
Ritch Avenue West
Greenwich, CT

Double C Contractors, LLC
PO Box 132
Cromwell, CT 06416

14409 SFT Open/ Mass Rock

4243 SFT Open/Mass rock

930 LFT Trench
4907 SFT Open/Mass Rock

27406 CYDS Open/Mass Rock

IV. Explosive Product Type Experience:

Class 1, 1.1 Detonators: electric, non-electric

Class 1, 1.4 High Explosives; Dynamite, Unimax, Cast Boosters

Class 1, 1.5 Blasting Agents; Emulsions, Hydromite, Anfo, Bulk Emulsions

V. Additional Information:

- Blasting License: CT, NY
- ATFE Employee Possessor Clearance

State of Connecticut
Dept Emergency Services & Public Protection
EXPLOSIVES LICENSE

Lic # 18382

Type 1, 3

Exp. 08/24/20

Michael J. Rodriguez

305 Wall St.

Meriden, CT 06450

DOB 03/31/80



SIGNATURE ON FILE

1-Use

2-Storage

3-Transportation

FINGERPRINTS ON FILE

Commissioner