THE

BLASTER'S GUIDE

A Resource for the Explosives and Blasting Industry

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Blasters Guide – Austin Powder Company

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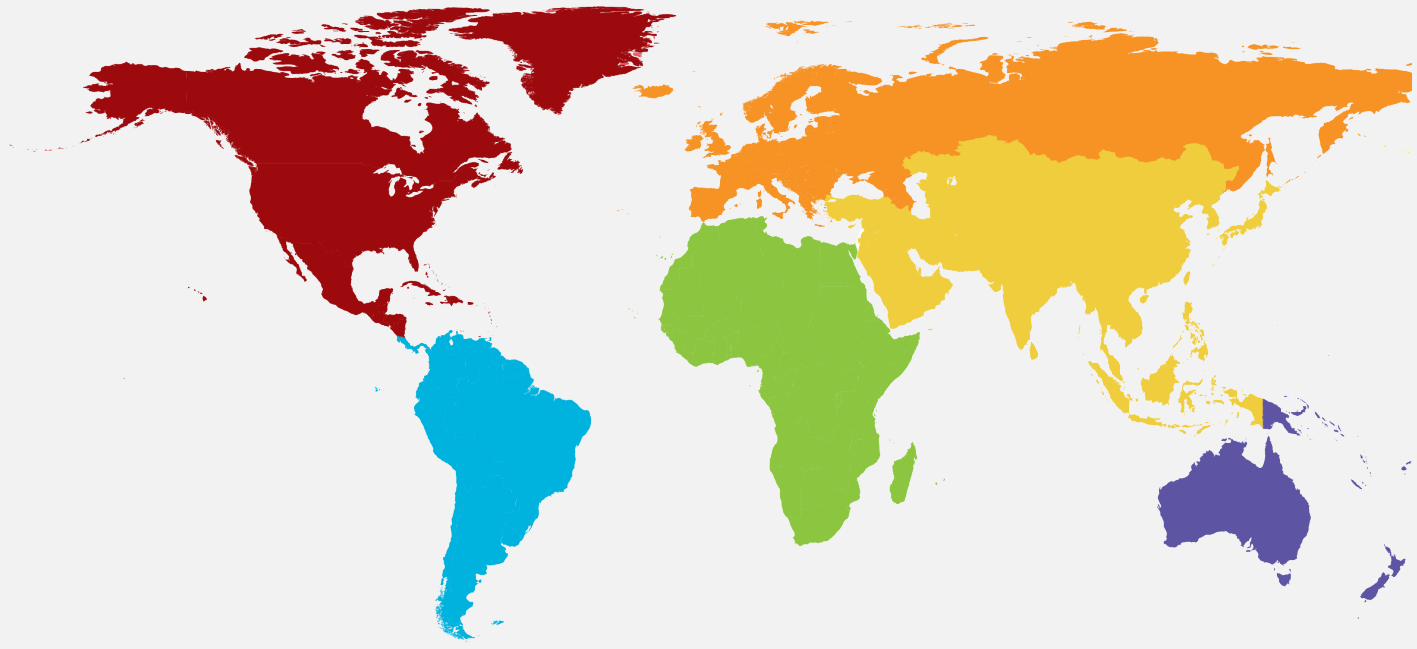
USED IN 1833
& EVER SINCE



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Blaster's General Information

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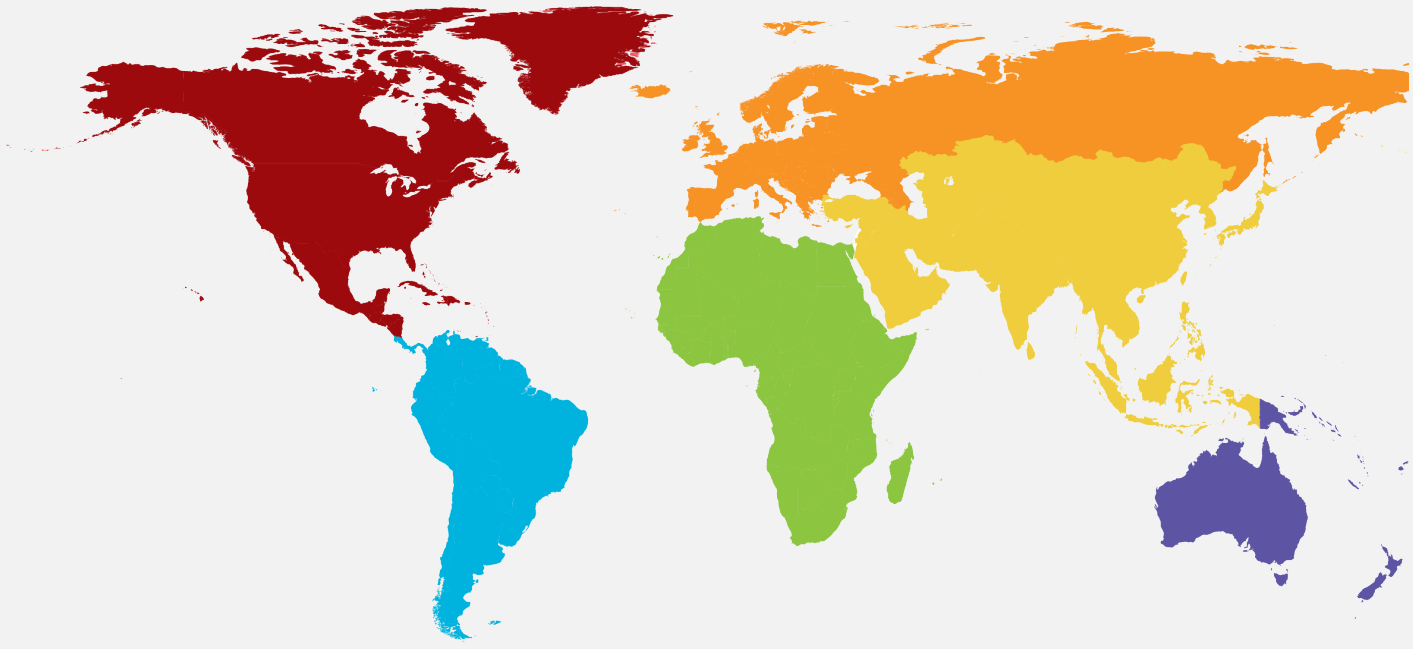

BLASTER'S GENERAL INFORMATION

Blaster's Tips

CHECK the availability of blasting shelters, your blasting equipment, the face, the drill pattern, exposure within and around the blast area, availability of adequate stemming.

DIAGRAM the shot as drilled, delay timings

MEASURE burden, spacing and depth, noting any deviations

CALCULATE the powder factor

INSURE adequate trained personnel on blast crew

LOAD so shot can be fired prior to completion of loading in case of emergency (weather, equipment break-down, etc.)

CLEAN shot area prior to hook-up

CLEAR blast area after hook-up

UTILIZE blasting shelter and adequate cover for all in blast area

RECEIVE distinct "clear to fire" signal

CHECK post blast area for safe re-entry

GIVE "clear to re-enter" signal

COMPLETE shot report with diagram

EVACUATE BLAST AREA WHEN ELECTRICAL STORMS THREATEN AND ALWAYS USE COMMON SENSE!

Blaster's Rules

1. Check blasting equipment for condition, capacity, etc. prior to loading the shot.

2. Arrive at the blast site early. Allow yourself ample time to load and connect shots. Misfires are caused by hurrying.

3. Observe the formation and drill pattern prior to loading. Look for mud seams, soft material, light burdens and spacing.

4. Diagram the shot as drilled. Time your shot using MS numbers, rather than cap numbers. Review timings before caps are laid out.

5. Calculate powder factors prior to loading. Measure burden, spacing and depth. Don't use the driller's measurements!

6. Keep the number of people to a minimum when loading and connecting up. Idle people can be dangerous.

7. Assign duties to specific people during loading and be sure they carry out those duties.

8. Start loading your shot in such a manner that you could shoot in the event of equipment failure.

9. When loading bulk explosives, a 1-ft. to 2-ft. column of bulk explosives should be loaded prior to the primer.

10. When loading packaged explosives, load one stick prior to the primer. This ensures that the primer is not driven into cuttings at the bottom of the borehole.

11. Be certain that stemming is adequate. Avoid using wet or muddy stemming material. Crushed stone is recommended.

12. Always clean the shot area of bags, wire, boxes, etc. prior to the connecting up.

13. Always have adequate cover at the blasting point.

14. Make sure you understand the signal to fire the shot. If in doubt, delay firing.

15. Complete your shot report before leaving the site.

16. Evacuate blast area when threatened with electrical storms.

17. Always use common sense!

Austin Powder Company's Safety Policy

The SAFETY of our employees, customers, suppliers and the public is our first priority.

A 'ZERO' accident and incident rate is our primary objective.

All employees must think, act and work SAFELY at all times in all work environments.

All employees are accountable for the SAFETY of their fellow employees, customers, suppliers, and all others in their work environment.

The management of the company will provide proper equipment and training, and will ensure a SAFE work environment.

Austin Powder Company's Commitment

We will face the issues that impact our customers and our company with:

- Safety
- Security
- Compliance
- Respect for all individuals
- Quality in all our products and services
- Integrity
- A fair return

Austin Powder Company's Misfire Procedures

When a misfire occurs, use the one-half hour waiting time to clear your mind and think about the condition that has been created. Document the hole or area that contains the misfire completely, while this is still fresh in your mind.

Do not permit any work in the misfire area. “Danger” off the area. Notify the permittee of the misfire. Contact your supervisor for assistance. We recommend that prior to refiring a misfire, another blaster familiar with the mine/quarry be brought in to assist with the decision to fire or render inert the explosive.

Proper misfire handling should be conducted by experienced individuals familiar with the initiation systems and explosives used, as well as the proper techniques to handle, neutralize and render safe the explosive materials. Specific recommendations cannot be made concerning misfires as every misfire is unique and very site specific. Each misfire must be handled individually.

All information regarding the misfire must be analyzed completely and a plan of action established with a method to “Make Safe” the area. Specific Federal/State or Local laws may also dictate additional procedures.

When a misfire occurs, the power source used to initiate the blast must be disconnected, the firing line shunted or made safe before entering the blast area to inspect the misfire. All personnel must stay out of the blast area for at least 1/2 (30 minutes) hour. Access to the blast area must remain blocked and guarded.

Once a determination is made by the blaster in charge and another blaster familiar with the area of the stability of the area, such as adequate burdens, spacing, stemming, etc., a decision may be made to refire the misfire. Refiring a misfire is usually the safest and best way to eliminate the danger. Extra care must be taken, as the designed pattern HAS changed.

Once a determination has been made to refire, the blast area must be cleared to double the initial perimeter (at a minimum). If this is not possible, alternate methods of handling should be considered.

The Federal Mine Safety and Health Administration (MSHA)

IN 30 CFR (CODE OF FEDERAL REGULATIONS), PART 57.6000, DEFINES A MISFIRE AS:

“The complete or partial failure of explosive material to detonate as planned. The term also is used to describe the explosive material itself that has failed to detonate.

A misfire is described as the failure of an explosive charge to detonate. The best advice that can be given regarding the handling of misfires is to take every precaution to prevent their occurrence.

Anytime misfired holes, portions of a misfired hole, or unexploded explosive material remains after a blast is fired, a hazardous situation is created that will exist until the proper handling of unfired explosive material. A misfire requires sound judgement and a comprehensive understanding of explosives. Most misfires occur because of improper techniques or short cuts, and sometimes because of the geological formation.

It is important that any investigation into a misfire be conducted with a fair and open mind. Any preconceived idea of the cause may mask the true cause, and prevent a future occurrence.”

MSHA - 30 CFR. PART 57.6311 ADDRESSES THE HANDLING OF MISFIRES AS:

(a) Faces and muck piles shall be examined for misfires after each blasting operation.

(b) Only work necessary to remove a misfire and protect the safety of miners engaged in the removal shall be permitted in the affected area until the misfire is disposed of in a safe manner.

(c) When a misfire cannot be disposed of safely, each approach to the area affected by the misfire shall be posted with a warning sign at a conspicuous location to prohibit entry, and the condition shall be reported i mmediately to mine management.

(d) Misfires occurring during the shift shall be reported to mine management not later than the end of the shift.

MSHA - 30 CFR. PART 57.6310 DEFINES THE MISFIRE WAITING PERIOD AS:

When a misfire is suspected, persons shall not enter the blast area until:

(a) For 30 minutes if safety fuse and blasting caps are used; or

(b) For 15 minutes if any other type detonators are used.

The Occupational Safety and Health Administration (OSHA)

(a) If a misfire is found, the blaster shall provide proper safeguards for excluding all employees from the danger zone.

(b) No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.

(c) No attempt shall be made to extract explosives from any charged or misfired hole; a new primer shall be put in and the hole reblasted. If refiring of the misfired hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is under water, blown out with air.

(d) If there are any misfires while using cap and fuse, all employees shall remain away from the charge for at least 1 hour. Misfires shall be handled under the direction of the person in charge of the blasting. All wires shall be carefully traced and a search made for unexploded charges.

(e) No drilling, digging, or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.

OSHA Regulations (Standards - 29 CFR) Misfires. - 1926.911

- Standard Number: 1926.911
- Standard Title: Misfires.
- SubPart Number: U
- SubPart Title: Blasting and the Use of Explosives

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BLAST DESIGN FORMULAS

HOW TO READ FORMULAS

FORMULA NAME

FORMULA

VARIABLES and [UNITS]

Variables used in formula and required units in [brackets]. If input variables are not in required units, then you must use the unit conversion tables.

Absolute Bulk Strength (ABS)

$$ABS_E = AWS_E \times d_E$$

VARIABLES and [UNITS]

ABS_E = Absolute bulk strength of the explosive [cal/cc]

AWS_E = Absolute weight strength of the explosive [cal/g]

d_E = Density of the explosive [g/cm^3]

Absolute Weight Strength (AWS)

$$AWS_E = \frac{RBS_E \times 7.462}{d_E}$$

VARIABLES and [UNITS]

AWS_E = Absolute weight strength of the explosive [cal/g]

RBS_E = Relative bulk strength of the explosive [ANFO = 100]

d_E = Density of the explosive [g/cm^3]

Base-Charge Length Formula

$$E_b = [(0.3 \rightarrow 0.5) \times B] + J$$

VARIABLES and [UNITS]

E_b = Length of base charge of high density explosives [ft]

B = Average burden [ft]

J = Sub-drilling depth [ft]

Actual Scaled Distance Formula

Actual Scaled Distance

$$SD = \frac{D}{\sqrt{W}}$$

Maximum Charge Weight per Delay

$$W = \left(\frac{D}{SD}\right)^2$$

Minimum Distance

$$D = SD \times \sqrt{W}$$

VARIABLES and [UNITS]

SD = Scaled distance factor

W = Charge weight per delay [lb]

D = Distance [ft]

Burden Formula

$$B = D_e \times \left(2 \times \left[\frac{d_e}{d_r} \right] + 1.5 \right)$$

VARIABLES and [UNITS]

B = Burden [ft]
d_e = Density of the explosives [g/cm^3]
d_r = Density of the rock [g/cm^3]
D_e = Diameter of fully coupled explosive column [in]

Deck Stemming Formula

For Dry Holes $T_d = 0.5 \times D$

For Wet Holes $T_d = 1.0 \times D$

VARIABLES and [UNITS]

T_d = Minimum length of stone deck consisting of particles of size T_s [ft]
D = Blast-hole diameter [in]

Face Height Formula

$$H = (5 \rightarrow 10) \times D$$

VARIABLES and [UNITS]

H = Face Height [ft]
D = Blast-hole Diameter [in]

Hole-to-Hole Delay Time Formula

$$D_{hth} = \underset{ms/ft}{(0 \rightarrow 5)} \times S$$

VARIABLES and [UNITS]

D_{hth} = Delay time between holes in a row [ms]
S = Spacing between holes in a row [ft]

Hole-to-Hole Delay Times to Improve Fragmentation

Rock Type	*ms/ft*
Sands, Loams, Marls and Coals	1.8 - 2.1
Some Limestones, Rock Shale and some Shales	1.5 - 1.8
Compact Limestones and Marbles, some Granites and Basalts, Quartzite Rocks and some Gneisses and Gabbros	1.2 - 1.5
Diabase, Diabase Porphyrites, Compact Gneisses, and Mica Schists and Magnetites	0.9 - 1.2

Leading underground mining technology

Loading Density Formula

$$d_l = 0.3404 \times D_e^{\,2} \times d_e$$

VARIABLES and [UNITS]

d_l = Explosives loading density [lb/ft]
D_e = Diameter of explosives column [in]
d_e = Density of explosives [g/cm^3]

Loading a blast on an iron ore range

Maximum Charge Weight per Delay

$$W = \left(\frac{D}{SD}\right)^2$$

VARIABLES and [UNITS]

SD = Scaled distance factor
W = Charge weight per delay [lb]
D = Distance [ft]

Minimum Distance Formula

$$D = SD \times \sqrt{W}$$

VARIABLES and [UNITS]

SD = Scaled distance factor
W = Charge weight per delay [lb]
D = Distance [ft]

Powder Factor Formula

Volume of Rock

$$PF = \frac{W_e}{V}$$

VARIABLES and [UNITS]

PF = Powder factor [lb/yd^3]
W_e = Total weight of explosives used in blast [lb]
V = Total volume of rock generated in blast [yd^3]

Weight of Rock

$$PF = \frac{W_r}{W_e}$$

VARIABLES and [UNITS]

PF = Powder factor [t/lb]
W_r = Total weight of rock generated in blast [t]
W_e = Total weight of explosives used in blast [lb]

Pre-Splitting Formulas for Air-Decked Charges

Spacing of Air-Decked Charges

$$S = (1.5 \rightarrow 2.0) \times D$$

VARIABLES and [UNITS]

S = Spacing between air-decked holes [ft]
D = Diameter of blast-hole [in]

Weight of Air-Decked Charges

$$W = (0.08 \rightarrow 0.12) \times S \times L_h$$

VARIABLES and [UNITS]

W = Weight of air-deck charge [lb]
S = Spacing between blast-holes [ft]
L_h = Length of blast-hole [ft]

Stemming Column Length

$$T = (1.0 \rightarrow 1.2) \times D$$

VARIABLES and [UNITS]

T = Stemming column length [ft]
D = Diameter of blast-hole [in]

Pre-Splitting Formulas for De-Coupled Charges

Linear Charge Weight

$$W_l = \frac{D^2}{28}$$

VARIABLES and [UNITS]

W_l = Linear charge weight for pre-splitting explosive [lb/ft]
D = Diameter of blast-hole [in]

Spacing between Pre-Split Holes

$$S = \frac{D^2}{2.8}$$

VARIABLES and [UNITS]

S = Spacing between pre-split holes [ft]
D = Diameter of blast-hole [in]

Pressure Formula

$$P = 0.000000233 \times VOD^2 \times d_E$$

VARIABLES and [UNITS]

P = Pressure [kbar]
VOD = Velocity of detonation of explosive [ft/sec]
d_E = Density of explosive [g/cm^3]

Relative Weight Strength (RWS)

$$RWS_E = \frac{AWS_E}{91{,}000}$$

VARIABLES and [UNITS]

RWS_E = Relative weight strength of the explosive [ANFO = 100]

AWS_E = Absolute weight strength of the explosive [cal/g]

Resistance Formulas

For Parallel Circuits

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots + \frac{1}{R_n}$$

For Series Circuits

$$R_{total} = R_1 + R_2 + R_3 + \ldots + R_n$$

VARIABLES and [UNITS]

R_{total} = Total resistance of the electrical circuit [Ω]

$R_1 \ldots R_n$ = Resistance of individual blasting caps or circuit branches [Ω]

Bulk trucks preparing for another day on the job

Row-to-Row Delay Time Formula

$$D_{rtr} = (2 \rightarrow 15) \times B \quad \text{ms/ft}$$

VARIABLES and [UNITS]

D_{rtr} = Delay time between consecutive rows [ms]

B = Maximum burden in front of a row of holes [ft]

Effects of Various Row-to-Row Delays

Effects	*ms/ft*
Violent excessive air-blast and back-break	2
High pile close to face, moderate air-blast and back-break	2 - 3
Average pile height, average air-blast and back-break	3 - 4
Scattered pile with minimum back-break	4 - 6

Stone Stemming Particle Size Formula

$$T_s = \frac{D}{12 \rightarrow 20}$$

VARIABLES and [UNITS]

T_s = Clean crushed stone stemming particle size [in]

D = Blast-hole diameter [in]

Sub-Drilling Formula

$$J = (0.2 \rightarrow 0.5) \times B$$

VARIABLES and [UNITS]

B = Burden [ft]
J = Sub-drilling [ft]

Industry's leading Detonating Cord

"Supersonic" Face Velocity Formula

$$D_{min} = \frac{S}{1.127}$$

VARIABLES and [UNITS]

D_{min} = In order to avoid air-blast from "supersonic" lateral face velocity, the delay between holes must be more than D_{min} [ms]

S = Spacing between blast holes [ft]

Spacing Formulas

	If: $\frac{H}{B} \geq 4$	*If:* $\frac{H}{B} < 4$
Instant	$S = 2.0 \times B$	$S = \frac{H + (2 \times B)}{3}$
Delayed	$S = 1.4 \times B$	$S = \frac{H + (7 \times B)}{8}$

VARIABLES and [UNITS]

H = Face height [ft]
B = Burden [ft]
S = Blast-hole spacing [ft]

Top Stemming Length Formula

$$T = (0.7 \rightarrow 1.3) \times B$$

VARIABLES and [UNITS]

B = Burden [ft]
T = Top stemming length [ft]

Water Displacement Formula

$$C = \frac{L_w \div L_c}{1 - \left(\frac{D_c}{D_h}\right)^2}$$

VARIABLES and [UNITS]

C = Number of explosives cartridges required to rise above standing water
L_w = Length of the standing water column [ft]
L_c = Length of one explosives cartridge [ft]
D_c = Diameter of explosives cartridges [in]
D_h = Diameter of blast-hole [in]

HEET Truck on display at an open house in 2001

Weight of Rock per Blast Hole Formula

$$W = V \times d_r$$

VARIABLES and [UNITS]

W = Weight of rock generated per blast-hole [t]
V = Bank volume of rock generated per blast-hole [yd^3]
d_r = Bank density of rock [t/yd^3]

Vibration Level Prediction Formulas

Peak Particle Velocity Prediction

$$PPV = K \times SD^{-1.6}$$

VARIABLES and [UNITS]

PPV = Peak particle velocity [in/s]
K = Ground transmission constant [K=160 if no other seismic data is available]
SD = Scaled distance factor

Site Specific Ground Transmission Constant

$$K = PPV \times SD^{1.6}$$

VARIABLES and [UNITS]

K = Ground transmission constant
PPV = Peak particle velocity [in/s]
SD = Scaled distance factor

Volume of Rock per Blast Hole Formula

$$V = \frac{B \times S \times H}{27}$$

VARIABLES and [UNITS]

V = Bank volume of rock per blast-hole [yd^3]
B = Burden [ft]
S = Spacing [ft]
H = Face height [ft]

CONVERSIONS AND TABLES

THE BLASTER'S GUIDE — CONVERSION FACTORS

(Fig 1)

CURRENT UNIT →	MULTIPLIED BY →	NEW UNIT
NEW UNIT ←	DIVIDED BY ←	CURRENT UNIT

LENGTH

Meter [m]	39.37	Inch [in]
Meter [m]	3.281	Feet [ft]
Millimeter [mm]	0.001	Meter [m]
Centimeter [cm]	0.3937	Inch [in]
Inch [in]	25.40	Millimeter [mm]
Foot [ft]	0.305	Meter [m]
Mile (statute) [mi]	1609.0	Meter [m]
Mile (statute) [mi]	5280.0	Foot [ft]
Mile (nautical) [mi]	1.15	Mile (statute) [mi]

PRESSURE

Pound Per Square Inch [psi]	6.8948	Kilopascals [kPa]
Atmosphere [atm]	4.696	Pound Per Square Inch [psi]
One ft of H2O (@15°C)	0.4335	Pound Per Square Inch [psi]

MASS (WEIGHT)

Kilogram [kg]	2.2	Pound [lb]
Grain [gr]	0.0648	Gram [g]
Grain [gr]	0.000143	Pound [lb]
Ounce [oz]	28.35	Gram [g]
Pound [lb]	0.4536	Kilogram [kg]
Tonne (metric ton)	1.1023	Tons (short)

VOLUME

Cubic Centimeter [cm^3]	0.061	Cubic Inch [in^3]
Cubic Inch [in^3]	16.39	Cubic Centimeter [cm^3]
Cubic Meter [m^3]	1.31	Cubic Yards [yd^3]
Cubic Feet [ft^3]	0.028	Cubic Meter [m^3]
U.S. Gallon	3.785	Liter [L]
U.S. Gallon	0.1337	Cubic Feet [ft^3]
Ounce (U.S. fluid)	29.57	Cubic Centimeter [cm^3]
Cubic Yards [yd^3]	0.7646	Cubic Meter [m^3]

POWDER FACTOR / SPECIFIC CHARGE

Pounds Per Cubic Yard [lb/yd^3]	0.593	Kilograms Per Cubic Meter [kg/m^3]
Kilograms Per Cubic Meter [kg/m^3]	1.686	Pounds Per Cubic Yard [lb/yd^3]

VELOCITY

Meters Per Second [m/sec]	3.281	Feet Per Second [ft/sec]
Feet Per Second [ft/sec]	0.3048	Meters Per Second [m/sec]
Inches Per Second [in/sec]	25.4	Millimeters Per Second [cm/sec]
Inches Per Second [in/sec]	2.54	Centimeters Per Second [cm/sec]
Millimeters Per Second [cm/sec]	0.03937	Inches Per Second [in/sec]

AREA

Square Centimeter [cm^2]	0.155	Square Inch [in^2]
Square Meter [m^2]	1550.0	Square Inch [in^2]
Square Inch [in^2]	6.45	Square Centimeter [cm2]
Square Feet [ft^2]	0.0929	Square Meter [m^2]
Acre	43560.0	Square Feet [ft^2]
Square Mile [mi^2]	640.0	Acre

DENSITY

Pounds Per Cubic Feet [lbs/ft^3]	16.0	Kilograms Per Cubic Meter [g/m^3]
Pounds Per Cubic Feet [lbs/ft^3]	0.01602	Grams Per Cubic Centimeter [g/cm^3]
Grams Per Cubic Centimeter [g/cm^3]	62.43	Pounds Per Cubic Feet [lbs/ft^3]

Pounds of Explosive per Foot of Blasthole

Dia. Hole [in]	Product or Loading Density [g/cc]																			Dia. Hole [mm]
	0.50	0.75	0.80	0.82	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.54	
3/4	0.01	0.14	0.15	0.16	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	19
7/8	0.13	0.20	0.21	0.21	0.22	0.23	0.25	0.26	0.27	0.29	0.30	0.31	0.33	0.34	0.35	0.37	0.38	0.39	0.40	22
1	0.17	0.26	0.27	0.28	0.29	0.31	0.32	0.34	0.36	0.37	0.39	0.41	0.43	0.44	0.46	0.48	0.49	0.51	0.52	25
1 1/4	0.27	0.40	0.43	0.44	0.45	0.48	0.51	0.53	0.56	0.59	0.61	0.64	0.67	0.69	0.72	0.74	0.77	0.80	0.82	32
1 3/8	0.32	0.48	0.52	0.53	0.55	0.58	0.61	0.64	0.68	0.71	0.74	0.77	0.80	0.84	0.87	0.90	0.93	0.97	0.99	35
1 1/2	0.38	0.57	0.61	0.63	0.65	0.69	0.73	0.77	0.80	0.84	0.88	0.92	0.96	1.00	1.03	1.07	1.11	1.15	1.18	38
1 5/8	0.45	0.67	0.72	0.74	0.76	0.81	0.85	0.90	0.94	0.99	1.03	1.08	1.12	1.17	1.21	1.26	1.30	1.35	1.38	41
1 3/4	0.52	0.78	0.83	0.86	0.89	0.94	0.99	1.04	1.01	1.15	1.20	1.25	1.30	1.36	1.41	1.46	1.51	1.56	1.61	45
1 7/8	0.60	0.90	0.96	0.98	1.02	1.08	1.14	1.20	1.26	1.32	1.38	1.44	1.50	1.56	1.62	1.68	1.74	1.80	1.84	48
2	0.68	1.02	1.09	1.12	1.16	1.23	1.29	1.36	1.43	1.50	1.57	1.63	1.70	1.77	1.84	1.91	1.98	2.04	2.01	50
2 1/4	0.86	1.29	1.38	1.41	1.47	1.55	1.64	1.72	1.81	1.90	1.98	2.07	2.15	2.24	2.33	2.41	2.50	2.59	2.65	57
2 1/2	1.06	1.60	1.70	1.75	1.81	1.92	2.02	2.13	2.23	2.34	2.45	2.55	2.66	2.77	2.87	2.98	3.09	3.19	3.28	65
2 3/4	1.29	1.93	2.06	2.11	2.19	2.32	2.45	2.58	2.70	2.83	2.96	3.09	3.22	3.35	3.48	3.61	3.73	3.86	3.97	70
3	1.53	2.30	2.45	2.51	2.60	2.76	2.91	3.06	3.22	3.37	3.52	3.68	3.83	3.98	4.14	4.29	4.44	4.60	4.72	75
3 1/2	2.09	3.13	3.34	3.42	3.55	3.75	3.96	4.17	4.38	4.59	4.80	5.01	5.21	5.42	5.63	5.84	6.05	6.26	6.42	90
4	2.72	4.09	4.36	4.47	4.63	4.90	5.18	5.45	5.72	5.99	6.27	6.54	6.81	7.08	7.35	7.63	7.90	8.17	8.39	100
4 1/4	3.08	4.61	4.92	5.04	5.23	5.54	5.84	6.15	6.46	6.77	7.07	7.38	7.69	8.00	8.30	8.61	8.92	9.23	9.47	110
4 1/2	3.45	5.17	5.52	5.65	5.86	6.21	6.55	6.90	7.24	7.58	7.93	8.27	8.62	8.96	9.31	9.65	10.00	10.34	10.62	115
5	4.26	6.38	6.81	6.98	7.24	7.66	8.09	8.51	8.94	9.36	9.79	10.22	10.64	11.07	11.49	11.92	12.34	12.77	13.11	125
5 1/2	5.15	7.73	8.24	8.45	8.76	9.27	9.79	10.30	10.82	11.33	11.85	12.36	12.88	13.39	13.91	14.42	14.94	15.45	15.86	140
5 5/8	5.39	8.08	8.62	8.83	9.16	9.70	10.24	10.77	11.31	11.85	12.39	12.93	13.47	14.01	14.54	15.08	15.62	16.16	16.59	145
6	6.13	9.19	9.81	10.05	10.42	11.03	11.65	12.26	12.87	13.48	14.01	14.71	15.32	15.94	16.55	17.16	17.77	18.39	18.88	150
6 1/4	6.65	9.98	10.64	10.91	11.31	11.97	12.64	13.30	13.97	14.63	15.30	15.96	16.63	17.29	17.96	18.62	19.29	19.95	20.48	160
6 1/2	7.19	10.79	11.51	11.80	12.23	12.95	13.67	14.39	15.11	15.82	16.54	17.26	17.98	18.70	19.42	20.14	20.86	21.58	22.15	165
6 3/4	7.76	11.64	12.41	12.72	13.19	13.96	14.74	15.51	16.29	17.07	17.84	18.62	19.39	20.17	20.94	21.72	22.50	23.27	23.89	170
7 3/8	9.26	13.89	14.82	15.19	15.74	16.67	17.59	18.52	19.45	20.37	21.30	22.22	23.15	24.08	25.00	25.93	26.85	27.78	28.52	187
7 7/8	10.56	15.84	16.89	17.32	17.95	19.01	20.06	21.12	22.17	23.23	24.28	25.34	26.40	27.45	28.51	29.56	30.62	31.67	32.52	200
8	10.90	16.34	17.43	17.87	18.52	19.61	20.70	21.79	22.88	23.97	25.06	26.15	27.24	28.33	29.42	30.51	31.60	32.69	33.56	203
9	13.79	20.69	22.06	22.62	23.44	24.82	26.20	27.58	28.96	30.34	31.72	33.01	34.48	35.85	37.23	38.61	39.99	41.37	42.47	230
9 7/8	16.60	24.90	26.56	27.23	28.22	29.88	31.54	33.20	34.86	36.52	38.18	39.84	41.51	43.17	44.83	46.49	48.15	49.81	51.13	250
10 5/8	19.22	28.83	30.75	31.52	32.67	34.60	36.52	38.44	40.36	42.28	44.21	46.13	48.05	49.97	51.89	53.82	55.74	57.66	59.20	270
12 1/4	25.55	38.32	40.88	41.90	43.43	45.99	48.54	51.01	53.65	56.21	58.76	61.32	63.87	66.43	68.98	71.53	74.09	76.64	78.69	311
13 3/4	32.19	48.28	51.50	52.79	54.72	57.94	61.16	64.38	67.59	70.81	74.03	77.25	80.47	83.69	86.91	90.13	93.34	96.56	99.14	350
15	38.31	57.46	61.29	62.82	65.12	68.95	72.78	76.61	80.44	84.27	88.10	91.94	95.77	99.60	103.43	107.26	111.09	114.92	117.98	380
17 1/2	52.14	78.21	83.42	85.51	88.64	93.85	99.06	104.28	109.49	114.71	119.92	125.13	130.35	135.56	140.78	145.99	151.20	156.42	160.59	445

Pounds of Explosives per Foot of Blasthole = 0.3405 x Loading Density [g/cc] x Explosive Diameter²

Kilograms of Explosive per Meter of Blasthole

Dia. Hole [in]	Product or Loading Density [g/cc]																		Dia. Hole [mm]
	0.50	0.75	0.80	0.82	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	
3/4	0.14	0.21	0.23	0.23	0.24	0.26	0.27	0.28	0.30	0.31	0.33	0.34	0.36	0.37	0.38	0.40	0.41	0.43	19
7/8	0.19	0.29	0.31	0.32	0.33	0.35	0.37	0.39	0.41	0.43	0.45	0.46	0.48	0.50	0.52	0.54	0.56	0.58	22
1	0.25	0.38	0.40	0.42	0.43	0.46	0.48	0.51	0.53	0.56	0.58	0.61	0.63	0.66	0.68	0.71	0.73	0.76	25
1 1/4	0.40	0.59	0.63	0.65	0.67	0.71	0.75	0.79	0.83	0.87	0.91	0.95	0.99	1.03	1.07	1.11	1.15	1.19	32
1 3/8	0.48	0.72	0.77	0.78	0.81	0.86	0.91	0.96	1.01	1.05	1.10	1.15	1.20	1.24	1.29	1.34	1.39	1.44	35
1 1/2	0.57	0.85	0.91	0.93	0.97	1.02	1.08	1.14	1.20	1.25	1.31	1.37	1.42	1.48	1.54	1.59	1.65	1.71	38
1 5/8	0.67	1.00	1.07	1.01	1.14	1.20	1.27	1.34	1.40	1.47	1.54	1.60	1.67	1.74	1.80	1.87	1.94	2.00	41
1 3/4	0.77	1.16	1.24	1.27	1.32	1.39	1.47	1.55	1.63	1.70	1.78	1.86	1.94	2.01	2.09	2.17	2.25	2.32	45
1 7/8	0.89	1.33	1.42	1.46	1.51	1.60	1.69	1.78	1.87	1.96	2.05	2.13	2.22	2.31	2.40	2.49	2.58	2.67	48
2	1.01	1.52	1.62	1.66	1.72	1.82	1.92	2.02	2.13	2.23	2.33	2.43	2.53	2.63	2.73	2.83	2.93	3.04	50
2 1/4	1.28	1.92	2.05	2.10	2.18	2.31	2.43	2.56	2.69	2.82	2.95	3.07	3.20	3.33	3.46	3.59	3.71	3.84	57
2 1/2	1.58	2.37	2.53	2.59	2.69	2.85	3.00	3.16	3.32	3.48	3.64	3.80	3.95	4.11	4.27	4.43	4.59	4.74	65
2 3/4	1.91	2.87	3.06	3.14	3.25	3.44	3.64	3.83	4.02	4.21	4.40	4.59	4.78	4.97	5.17	5.36	5.55	5.74	70
3	2.28	3.42	3.64	3.73	3.87	4.01	4.33	4.55	4.78	5.00	5.24	5.46	5.69	5.92	6.15	6.38	6.60	6.83	75
3 1/2	3.01	4.65	4.96	5.08	5.27	5.58	5.89	6.20	6.51	6.82	7.13	7.44	7.75	8.06	8.37	8.68	8.99	9.30	90
4	4.05	6.07	6.48	6.64	6.88	7.29	7.69	8.01	8.50	8.91	9.31	9.72	10.12	10.52	10.93	11.33	11.74	12.14	100
4 1/4	4.57	6.85	7.31	7.49	7.77	8.23	8.68	9.14	9.60	10.05	10.51	10.97	11.42	11.88	12.34	12.80	13.25	13.71	110
4 1/2	5.12	7.68	8.20	8.40	8.71	9.22	9.73	10.25	10.76	11.27	11.78	12.30	12.81	13.32	13.83	14.35	14.86	15.37	115
5	6.33	9.49	10.12	10.37	10.75	11.39	12.02	12.65	13.28	13.92	14.55	15.18	15.81	16.45	17.08	17.71	18.34	18.98	125
5 1/2	7.65	11.48	12.25	12.55	13.01	13.78	14.54	15.31	16.07	16.84	17.60	18.37	19.13	19.90	20.66	21.43	22.19	22.96	140
5 5/8	8.01	12.01	12.81	13.13	13.61	14.41	15.21	16.01	16.81	17.61	18.41	19.21	20.01	20.81	21.61	22.41	23.21	24.02	145
6	9.11	13.66	14.57	14.94	15.48	16.39	17.31	18.22	19.13	20.04	20.95	21.86	22.77	23.68	24.59	25.50	26.41	27.32	150
6 1/4	9.88	14.82	15.81	16.21	16.80	17.79	18.78	19.77	20.75	21.74	22.73	23.72	24.71	25.70	26.68	27.67	28.66	29.65	160
6 1/2	10.69	16.03	17.10	17.53	18.17	19.24	20.31	21.38	22.45	23.52	24.59	25.65	26.72	27.79	28.86	29.93	31.00	32.07	165
6 3/4	11.53	17.29	18.44	18.90	19.60	20.75	21.90	23.05	24.21	25.36	26.51	27.67	28.82	29.97	31.12	32.28	33.43	34.58	170
7 3/8	13.76	20.64	22.02	22.57	23.39	24.77	26.15	27.52	28.90	30.27	31.65	33.03	34.40	35.78	37.15	38.53	39.91	41.28	187
7 7/8	15.69	23.54	25.10	25.73	26.67	28.24	29.81	31.38	32.95	34.52	36.09	37.66	39.22	40.79	42.36	43.93	45.50	47.07	200
8	16.19	24.29	25.91	26.55	27.53	29.15	30.76	32.38	34.00	35.62	37.24	38.86	40.48	42.01	43.72	45.34	46.96	48.58	203
9	20.49	30.74	32.79	33.61	34.84	36.89	38.94	40.99	43.04	45.08	47.13	49.18	51.23	53.28	55.33	57.38	59.43	61.48	230
9 7/8	24.67	37.01	39.47	40.46	41.94	44.41	46.88	49.34	51.81	54.28	56.74	59.21	61.68	64.15	66.61	69.08	71.55	74.01	250
10 5/8	28.56	42.84	45.70	46.84	48.55	51.41	54.27	57.12	59.98	62.84	65.69	68.55	71.40	74.26	77.12	79.97	82.83	85.68	270
12 1/4	37.97	56.95	60.75	62.26	64.54	68.34	72.14	75.93	79.73	83.52	87.32	91.12	94.91	98.71	102.51	106.30	110.10	113.90	311
13 3/4	47.83	71.75	76.53	78.45	81.32	86.01	90.88	95.67	100.45	105.23	110.02	114.80	119.58	124.37	129.15	133.93	138.72	143.50	350
15	56.93	85.39	91.08	93.36	96.77	102.47	108.16	113.85	119.54	125.24	130.93	136.62	142.31	148.01	153.70	159.39	165.08	170.78	380
17 1/2	77.48	116.22	123.97	127.07	131.72	139.47	147.21	154.96	162.71	170.46	178.21	185.96	193.70	201.45	209.20	216.95	224.70	232.44	445

Kilograms of Explosive per Meter of Blasthole = 0.506 x Loading Density [g/cc] x Explosive Diameter²

Cubic Yards per Foot of Borehole

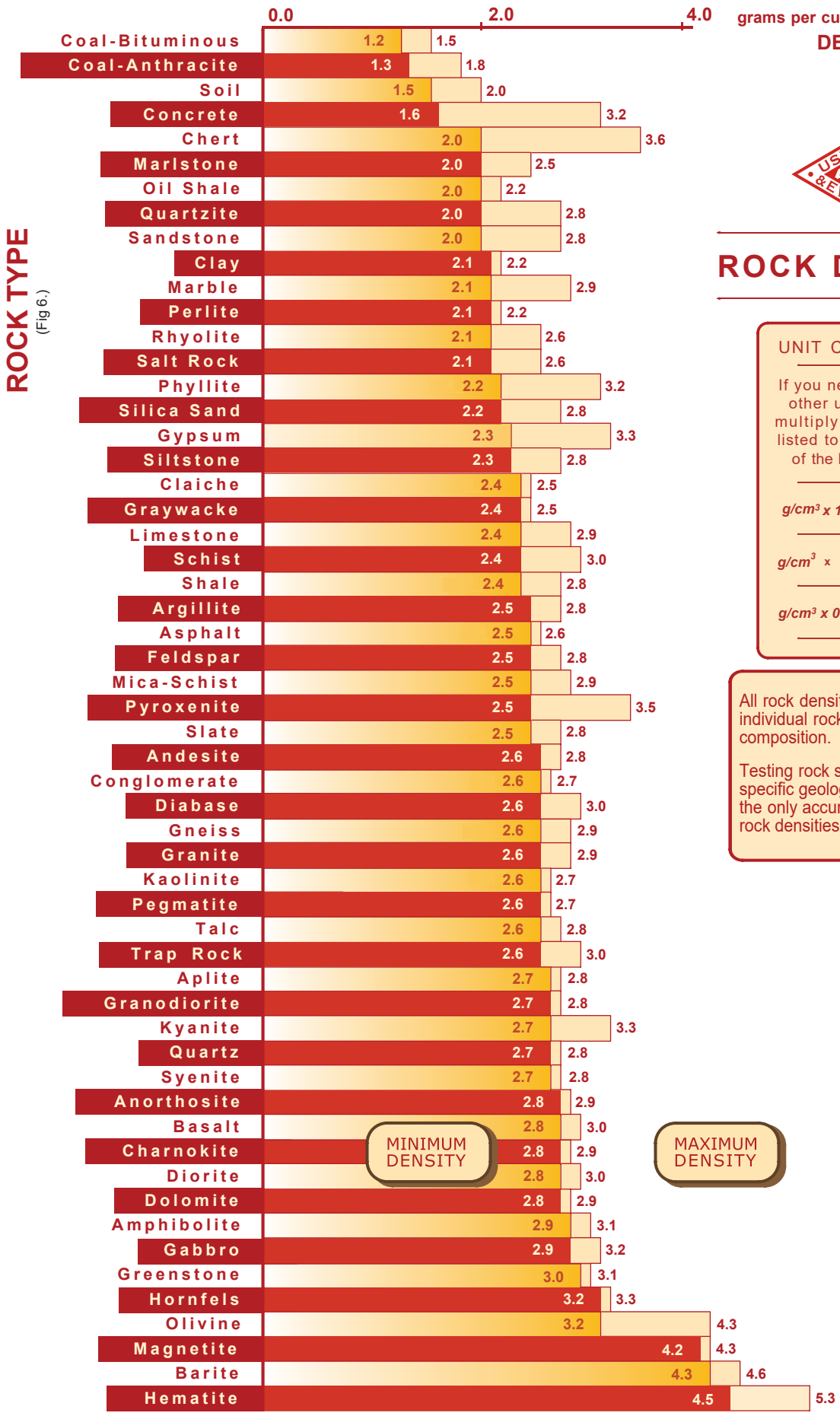
(Fig 4) **THE BLASTER'S GUIDE**

Spacing [ft] \ Burden [ft]	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
4	0.59	0.74	0.89	1.04	1.19	1.33	1.48	1.63	1.78	1.93	2.07	2.22	2.37	2.52	2.67																								
5	0.74	0.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78	2.96	3.15	3.33	3.52	3.70																				
6	0.89	1.11	1.33	1.56	1.78	2.00	2.22	2.44	2.67	2.89	3.11	3.33	3.56	3.78	4.00	4.22	4.44	4.67	4.89																		
7	1.04	1.30	1.56	1.81	2.07	2.33	2.59	2.85	3.11	3.37	3.63	3.89	4.15	4.41	4.67	4.93	5.19	5.44	5.70	5.96	6.22																
8	1.19	1.48	1.78	2.07	2.37	2.67	2.96	3.26	3.56	3.85	4.15	4.44	4.74	5.04	5.33	5.63	5.93	6.22	6.52	6.81	7.11	7.41	7.70														
9	1.33	1.67	2.00	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00	5.33	5.67	6.00	6.33	6.67	7.00	7.33	7.67	8.00	8.33	8.67	9.00	9.33												
10	1.48	1.85	2.22	2.59	2.96	3.33	3.70	4.07	4.44	4.81	5.19	5.56	5.93	6.30	6.67	7.04	7.41	7.78	8.15	8.52	8.89	9.26	9.63	10.00	10.37	10.74	11.11										
11	1.63	2.04	2.44	2.85	3.26	3.67	4.07	4.48	4.89	5.30	5.70	6.11	6.52	6.93	7.33	7.74	8.15	8.56	8.96	9.37	9.78	10.19	10.59	11.00	11.41	11.81	12.22	12.63	13.04								
12	1.78	2.22	2.67	3.11	3.56	4.00	4.44	4.89	5.33	5.78	6.22	6.67	7.11	7.56	8.00	8.44	8.89	9.33	9.78	10.22	10.67	11.11	11.56	12.00	12.44	12.89	13.33	13.78	14.22	14.67	15.11						
13	1.93	2.41	2.89	3.37	3.85	4.33	4.81	5.30	5.78	6.26	6.74	7.22	7.70	8.19	8.67	9.15	9.63	10.11	10.59	11.07	11.56	12.04	12.52	13.00	13.48	13.96	14.44	14.93	15.41	15.89	16.37	16.85	17.33				
14	2.07	2.59	3.11	3.63	4.15	4.67	5.19	5.70	6.22	6.74	7.26	7.78	8.30	8.81	9.33	9.85	10.37	10.89	11.41	11.93	12.44	12.96	13.48	14.00	14.52	15.04	15.56	16.07	16.59	17.11	17.63	18.15	18.67	19.19	19.70		
15	2.22	2.78	3.33	3.89	4.44	5.00	5.56	6.11	6.67	7.22	7.78	8.33	8.89	9.44	10.00	10.56	11.11	11.67	12.22	12.78	13.33	13.89	14.44	15.00	15.56	16.11	16.67	17.22	17.78	18.33	18.89	19.44	20.00	20.56	21.11	21.67	22.22
16	2.37	2.96	3.56	4.15	4.74	5.33	5.93	6.52	7.11	7.70	8.30	8.89	9.48	10.07	10.67	11.26	11.85	12.44	13.04	13.63	14.22	14.81	15.41	16.00	16.59	17.19	17.78	18.37	18.96	19.56	20.15	20.74	21.33	21.93	22.52	23.11	23.70
17		3.15	3.78	4.41	5.04	5.67	6.30	6.93	7.56	8.19	8.81	9.44	10.07	10.70	11.33	11.96	12.59	13.22	13.85	14.48	15.11	15.74	16.37	17.00	17.63	18.26	18.89	19.52	20.15	20.78	21.41	22.04	22.67	23.30	23.93	24.56	25.19
18		3.33	4.00	4.67	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.00	10.67	11.33	12.00	12.67	13.33	14.00	14.67	15.33	16.00	16.67	17.33	18.00	18.67	19.33	20.00	20.67	21.33	22.00	22.67	23.33	24.00	24.67	25.33	26.00	26.67
19			4.22	4.93	5.63	6.33	7.04	7.74	8.44	9.15	9.85	10.56	11.26	11.96	12.67	13.37	14.07	14.78	15.48	16.19	16.89	17.59	18.30	19.00	19.70	20.41	21.11	21.81	22.52	23.22	23.93	24.63	25.33	26.04	26.74	27.44	28.15
20			4.44	5.19	5.93	6.67	7.41	8.15	8.89	9.63	10.37	11.11	11.85	12.59	13.33	14.07	14.81	15.56	16.30	17.04	17.78	18.52	19.26	20.00	20.74	21.48	22.22	22.96	23.70	24.44	25.19	25.93	26.67	27.41	28.15	28.89	29.63
21				5.44	6.22	7.00	7.78	8.56	9.33	10.11	10.89	11.67	12.44	13.22	14.00	14.78	15.56	16.33	17.11	17.89	18.67	19.44	20.22	21.00	21.78	22.56	23.33	24.11	24.89	25.67	26.44	27.22	28.00	28.78	29.56	30.33	31.11
22				5.70	6.52	7.33	8.15	8.96	9.78	10.59	11.41	12.22	13.04	13.85	14.67	15.48	16.30	17.11	17.93	18.74	19.56	20.37	21.19	22.00	22.81	23.63	24.44	25.26	26.07	26.89	27.70	28.52	29.33	30.15	30.96	31.78	32.59
23					6.81	7.67	8.52	9.37	10.22	11.07	11.93	12.78	13.63	14.48	15.33	16.19	17.04	17.89	18.74	19.59	20.44	21.30	22.15	23.00	23.85	24.70	25.56	26.41	27.26	28.11	28.96	29.81	30.67	31.52	32.37	33.22	34.07
24					7.11	8.00	8.89	9.78	10.67	11.56	12.44	13.33	14.22	15.11	16.00	16.89	17.78	18.67	19.56	20.44	21.33	22.22	23.11	24.00	24.89	25.78	26.67	27.56	28.44	29.33	30.22	31.11	32.00	32.89	33.78	34.67	35.56
25						8.33	9.26	10.19	11.11	12.04	12.96	13.89	14.81	15.74	16.67	17.59	18.52	19.44	20.37	21.30	22.22	23.15	24.07	25.00	25.93	26.85	27.78	28.70	29.63	30.56	31.48	32.41	33.33	34.26	35.19	36.11	37.04
26						8.67	9.63	10.59	11.56	12.52	13.48	14.44	15.41	16.37	17.33	18.30	19.26	20.22	21.19	22.15	23.11	24.07	25.04	26.00	26.96	27.93	28.89	29.85	30.81	31.78	32.74	33.70	34.67	35.63	36.59	37.56	38.52
27							10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00	39.00	40.00
28							10.37	11.41	12.44	13.48	14.52	15.56	16.59	17.63	18.67	19.70	20.74	21.78	22.81	23.85	24.89	25.93	26.96	28.00	29.04	30.07	31.11	32.15	33.19	34.22	35.26	36.30	37.33	38.37	39.41	40.44	41.48
29								11.81	12.89	13.96	15.04	16.11	17.19	18.26	19.33	20.41	21.48	22.56	23.63	24.70	25.78	26.85	27.93	29.00	30.07	31.15	32.22	33.30	34.37	35.44	36.52	37.59	38.67	39.74	40.81	41.89	42.96
30								12.22	13.33	14.44	15.56	16.67	17.78	18.89	20.00	21.11	22.22	23.33	24.44	25.56	26.67	27.78	28.89	30.00	31.11	32.22	33.33	34.44	35.56	36.67	37.78	38.89	40.00	41.11	42.22	43.33	44.44
31									13.78	14.93	16.07	17.22	18.37	19.52	20.67	21.81	22.96	24.11	25.26	26.41	27.56	28.70	29.85	31.00	32.15	33.30	34.44	35.59	36.74	37.89	39.04	40.19	41.33	42.48	43.63	44.78	45.93
32									14.22	15.41	16.59	17.78	18.96	20.15	21.33	22.52	23.70	24.89	26.07	27.26	28.44	29.63	30.81	32.00	33.19	34.37	35.56	36.74	37.93	39.11	40.30	41.48	42.67	43.85	45.04	46.22	47.41
33										15.89	17.11	18.33	19.56	20.78	22.00	23.22	24.44	25.67	26.89	28.11	29.33	30.56	31.78	33.00	34.22	35.44	36.67	37.89	39.11	40.33	41.56	42.78	44.00	45.22	46.44	47.67	48.89
34										16.37	17.63	18.89	20.15	21.41	22.67	23.93	25.19	26.44	27.70	28.96	30.22	31.48	32.74	34.00	35.26	36.52	37.78	39.04	40.30	41.56	42.81	44.07	45.33	46.59	47.85	49.11	50.37
35											18.15	19.44	20.74	22.04	23.33	24.63	25.93	27.22	28.52	29.81	31.11	32.41	33.70	35.00	36.30	37.59	38.89	40.19	41.48	42.78	44.07	45.37	46.67	47.96	49.26	50.56	51.85
36											18.67	20.00	21.33	22.67	24.00	25.33	26.67	28.00	29.33	30.67	32.00	33.33	34.67	36.00	37.33	38.67	40.00	41.33	42.67	44.00	45.33	46.67	48.00	49.33	50.67	52.00	53.33
37												20.56	21.93	23.30	24.67	26.04	27.41	28.78	30.15	31.52	32.89	34.26	35.63	37.00	38.37	39.74	41.11	42.48	43.85	45.22	46.59	47.96	49.33	50.70	52.07	53.44	54.81
38												21.11	22.52	23.93	25.33	26.74	28.15	29.56	30.96	32.37	33.78	35.19	36.59	38.00	39.41	40.81	42.22	43.63	45.04	46.44	47.85	49.26	50.67	52.07	53.48	54.89	56.30
39													23.11	24.56	26.00	27.44	28.89	30.33	31.78	33.22	34.67	36.11	37.56	39.00	40.44	41.89	43.33	44.78	46.22	47.67	49.11	50.56	52.00	53.44	54.89	56.33	57.78
40													23.70	25.19	26.67	28.15	29.63	31.11	32.59	34.07	35.56	37.04	38.52	40.00	41.48	42.96	44.44	45.93	47.41	48.89	50.37	51.85	53.33	54.81	56.30	57.78	59.26
41														25.81	27.33	28.85	30.37	31.89	33.41	34.93	36.44	37.96	39.48	41.00	42.52	44.04	45.56	47.07	48.59	50.11	51.63	53.15	54.67	56.19	57.70	59.22	60.74
42														26.44	28.00	29.56	31.11	32.67	34.22	35.78	37.33	38.89	40.44	42.00	43.56	45.11	46.67	48.22	49.78	51.33	52.89	54.44	56.00	57.56	59.11	60.67	62.22
43															28.67	30.26	31.85	33.44	35.04	36.63	38.22	39.81	41.41	43.00	44.59	46.19	47.78	49.37	50.96	52.56	54.15	55.74	57.33	58.93	60.52	62.11	63.70
44															29.33	30.96	32.59	34.22	35.85	37.48	39.11	40.74	42.37	44.00	45.63	47.26	48.89	50.52	52.15	53.78	55.41	57.04	58.67	60.30	61.93	63.56	65.19
45																31.67	33.33	35.00	36.67	38.33	40.00	41.67	43.33	45.00	46.67	48.33	50.00	51.67	53.33	55.00	56.67	58.33	60.00	61.67	63.33	65.00	66.67
46																32.37	34.07	35.78	37.48	39.19	40.89	42.59	44.30	46.00	47.70	49.41	51.11	52.81	54.52	56.22	57.93	59.63	61.33	63.04	64.74	66.44	68.15
47																	34.81	36.56	38.30	40.04	41.78	43.52	45.26	47.00	48.74	50.48	52.22	53.96	55.70	57.44	59.19	60.93	62.67	64.41	66.15	67.89	69.63
48																	35.56	37.33	39.11	40.89	42.67	44.44	46.22	48.00	49.78	51.56	53.33	55.11	56.89	58.67	60.44	62.22	64.00	65.78	67.56	69.33	71.11
49																		38.11	39.93	41.74	43.56	45.37	47.19	49.00	50.81	52.63	54.44	56.26	58.07	59.89	61.70	63.52	65.33	67.15	68.96	70.78	72.59
50																			40.74	42.59	44.44	46.30	48.15	50.00	51.85	53.70	55.56	57.41	59.26	61.11	62.96	64.81	66.67	68.52	70.37	72.22	74.07

Cubic Meters per Meter of Borehole

(Fig 5) **THE BLASTER'S GUIDE**

Spacing [m] \ Burden [m]	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25	7.50	7.75	8.00	8.25	8.50	8.75	9.00	9.25	9.50	9.75	10.00
1.00	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50																							
1.25	1.25	1.56	1.88	2.19	2.50	2.81	3.13	3.44	3.75	4.06	4.38	4.69	5.00	5.31	5.63	5.94	6.25																					
1.50	1.50	1.88	2.25	2.63	3.00	3.38	3.75	4.13	4.50	4.88	5.25	5.63	6.00	6.38	6.75	7.13	7.50	7.88	8.25																			
1.75	1.75	2.19	2.63	3.06	3.50	3.94	4.38	4.81	5.25	5.69	6.13	6.56	7.00	7.44	7.88	8.31	8.75	9.19	9.63	10.06	10.50																	
2.00	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50	13.00															
2.25	2.25	2.81	3.38	3.94	4.50	5.06	5.63	6.19	6.75	7.31	7.88	8.44	9.00	9.56	10.13	10.69	11.25	11.81	12.38	12.94	13.50	14.06	14.63	15.19	15.75													
2.50	2.50	3.13	3.75	4.38	5.00	5.63	6.25	6.88	7.50	8.13	8.75	9.38	10.00	10.63	11.25	11.88	12.50	13.13	13.75	14.38	15.00	15.63	16.25	16.88	17.50	18.13	18.75											
2.75	2.75	3.44	4.13	4.81	5.50	6.19	6.88	7.56	8.25	8.94	9.63	10.31	11.00	11.69	12.38	13.06	13.75	14.44	15.13	15.81	16.50	17.19	17.88	18.56	19.25	19.94	20.63	21.31	22.00									
3.00	3.00	3.75	4.50	5.25	6.00	6.75	7.50	8.25	9.00	9.75	10.50	11.25	12.00	12.75	13.50	14.25	15.00	15.75	16.50	17.25	18.00	18.75	19.50	20.25	21.00	21.75	22.50	23.25	24.00	24.75	25.50							
3.25	3.25	4.06	4.88	5.69	6.50	7.31	8.13	8.94	9.75	10.56	11.38	12.19	13.00	13.81	14.63	15.44	16.25	17.06	17.88	18.69	19.50	20.31	21.13	21.94	22.75	23.56	24.38	25.19	26.00	26.81	27.63	28.44	29.25					
3.50	3.50	4.38	5.25	6.13	7.00	7.88	8.75	9.63	10.50	11.38	12.25	13.13	14.00	14.88	15.75	16.63	17.50	18.38	19.25	20.13	21.00	21.88	22.75	23.63	24.50	25.38	26.25	27.13	28.00	28.88	29.75	30.63	31.50	32.38	33.25		
3.75	3.75	4.69	5.63	6.56	7.50	8.44	9.38	10.31	11.25	12.19	13.13	14.06	15.00	15.94	16.88	17.81	18.75	19.69	20.63	21.56	22.50	23.44	24.38	25.31	26.25	27.19	28.13	29.06	30.00	30.94	31.88	32.81	33.75	34.69	35.63	36.56	37.50
4.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00	39.00	40.00
4.25		5.31	6.38	7.44	8.50	9.56	10.63	11.69	12.75	13.81	14.88	15.94	17.00	18.06	19.13	20.19	21.25	22.31	23.38	24.44	25.50	26.56	27.63	28.69	29.75	30.81	31.88	32.94	34.00	35.06	36.13	37.19	38.25	39.31	40.38	41.44	42.50
4.50		5.63	6.75	7.88	9.00	10.13	11.25	12.38	13.50	14.63	15.75	16.88	18.00	19.13	20.25	21.38	22.50	23.63	24.75	25.88	27.00	28.13	29.25	30.38	31.50	32.63	33.75	34.88	36.00	37.13	38.25	39.38	40.50	41.63	42.75	43.88	45.00
4.75			7.13	8.31	9.50	10.69	11.88	13.06	14.25	15.44	16.63	17.81	19.00	20.19	21.38	22.56	23.75	24.94	26.13	27.31	28.50	29.69	30.88	32.06	33.25	34.44	35.63	36.81	38.00	39.19	40.38	41.56	42.75	43.94	45.13	46.31	47.50
5.00			7.50	8.75	10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75	20.00	21.25	22.50	23.75	25.00	26.25	27.50	28.75	30.00	31.25	32.50	33.75	35.00	36.25	37.50	38.75	40.00	41.25	42.50	43.75	45.00	46.25	47.50	48.75	50.00
5.25				9.19	10.50	11.81	13.13	14.44	15.75	17.06	18.38	19.69	21.00	22.31	23.63	24.94	26.25	27.56	28.88	30.19	31.50	32.81	34.13	35.44	36.75	38.06	39.38	40.69	42.00	43.31	44.63	45.94	47.25	48.56	49.88	51.19	52.50
5.50				9.63	11.00	12.38	13.75	15.13	16.50	17.88	19.25	20.63	22.00	23.38	24.75	26.13	27.50	28.88	30.25	31.63	33.00	34.38	35.75	37.13	38.50	39.88	41.25	42.63	44.00	45.38	46.75	48.13	49.50	50.88	52.25	53.63	55.00
5.75					11.50	12.94	14.38	15.81	17.25	18.69	20.13	21.56	23.00	24.44	25.88	27.31	28.75	30.19	31.63	33.06	34.50	35.94	37.38	38.81	40.25	41.69	43.13	44.56	46.00	47.44	48.88	50.31	51.75	53.19	54.63	56.06	57.50
6.00					12.00	13.50	15.00	16.50	18.00	19.50	21.00	22.50	24.00	25.50	27.00	28.50	30.00	31.50	33.00	34.50	36.00	37.50	39.00	40.50	42.00	43.50	45.00	46.50	48.00	49.50	51.00	52.50	54.00	55.50	57.00	58.50	60.00
6.25						14.06	15.63	17.19	18.75	20.31	21.88	23.44	25.00	26.56	28.13	29.69	31.25	32.81	34.38	35.94	37.50	39.06	40.63	42.19	43.75	45.31	46.88	48.44	50.00	51.56	53.13	54.69	56.25	57.81	59.38	60.94	62.50
6.50						14.63	16.25	17.88	19.50	21.13	22.75	24.38	26.00	27.63	29.25	30.88	32.50	34.13	35.75	37.38	39.00	40.63	42.25	43.88	45.50	47.13	48.75	50.38	52.00	53.63	55.25	56.88	58.50	60.13	61.75	63.38	65.00
6.75							16.88	18.56	20.25	21.94	23.63	25.31	27.00	28.69	30.38	32.06	33.75	35.44	37.13	38.81	40.50	42.19	43.88	45.56	47.25	48.94	50.63	52.31	54.00	55.69	57.38	59.06	60.75	62.44	64.13	65.81	67.50
7.00							17.50	19.25	21.00	22.75	24.50	26.25	28.00	29.75	31.50	33.25	35.00	36.75	38.50	40.25	42.00	43.75	45.50	47.25	49.00	50.75	52.50	54.25	56.00	57.75	59.50	61.25	63.00	64.75	66.50	68.25	70.00
7.25								19.94	21.75	23.56	25.38	27.19	29.00	30.81	32.63	34.44	36.25	38.06	39.88	41.69	43.50	45.31	47.13	48.94	50.75	52.56	54.38	56.19	58.00	59.81	61.63	63.44	65.25	67.06	68.88	70.69	72.50
7.50								20.63	22.50	24.38	26.25	28.13	30.00	31.88	33.75	35.63	37.50	39.38	41.25	43.13	45.00	46.88	48.75	50.63	52.50	54.38	56.25	58.13	60.00	61.88	63.75	65.63	67.50	69.38	71.25	73.13	75.00
7.75									23.25	25.19	27.13	29.06	31.00	32.94	34.88	36.81	38.75	40.69	42.63	44.56	46.50	48.44	50.38	52.31	54.25	56.19	58.13	60.06	62.00	63.94	65.88	67.81	69.75	71.69	73.63	75.56	77.50
8.00									24.00	26.00	28.00	30.00	32.00	34.00	36.00	38.00	40.00	42.00	44.00	46.00	48.00	50.00	52.00	54.00	56.00	58.00	60.00	62.00	64.00	66.00	68.00	70.00	72.00	74.00	76.00	78.00	80.00
8.25										26.81	28.88	30.94	33.00	35.06	37.13	39.19	41.25	43.31	45.38	47.44	49.50	51.56	53.63	55.69	57.75	59.81	61.88	63.94	66.00	68.06	70.13	72.19	74.25	76.31	78.38	80.44	82.50
8.50										27.63	29.75	31.88	34.00	36.13	38.25	40.38	42.50	44.63	46.75	48.88	51.00	53.13	55.25	57.38	59.50	61.63	63.75	65.88	68.00	70.13	72.25	74.38	76.50	78.63	80.75	82.88	85.00
8.75											30.63	32.81	35.00	37.19	39.38	41.56	43.75	45.94	48.13	50.31	52.50	54.69	56.88	59.06	61.25	63.44	65.63	67.81	70.00	72.19	74.38	76.56	78.75	80.94	83.13	85.31	87.50
9.00											31.50	33.75	36.00	38.25	40.50	42.75	45.00	47.25	49.50	51.75	54.00	56.25	58.50	60.75	63.00	65.25	67.50	69.75	72.00	74.25	76.50	78.75	81.00	83.25	85.50	87.75	90.00
9.25												34.69	37.00	39.31	41.63	43.94	46.25	48.56	50.88	53.19	55.50	57.81	60.13	62.44	64.75	67.06	69.38	71.69	74.00	76.31	78.63	80.94	83.25	85.56	87.88	90.19	92.50
9.50												35.63	38.00	40.38	42.75	45.13	47.50	49.88	52.25	54.63	57.00	59.38	61.75	64.13	66.50	68.88	71.25	73.63	76.00	78.38	80.75	83.13	85.50	87.88	90.25	92.63	95.00
9.75													39.00	41.44	43.88	46.31	48.75	51.19	53.63	56.06	58.50	60.94	63.38	65.81	68.25	70.69	73.13	75.56	78.00	80.44	82.88	85.31	87.75	90.19	92.63	95.06	97.50
10.00													40.00	42.50	45.00	47.50	50.00	52.50	55.00	57.50	60.00	62.50	65.00	67.50	70.00	72.50	75.00	77.50	80.00	82.50	85.00	87.50	90.00	92.50	95.00	97.50	100.00
10.25														43.56	46.13	48.69	51.25	53.81	56.38	58.94	61.50	64.06	66.63	69.19	71.75	74.31	76.88	79.44	82.00	84.56	87.13	89.69	92.25	94.81	97.38	99.94	102.50
10.50														44.63	47.25	49.88	52.50	55.13	57.75	60.38	63.00	65.63	68.25	70.88	73.50	76.13	78.75	81.38	84.00	86.63	89.25	91.88	94.50	97.13	99.75	102.38	105.00
10.75															48.38	51.06	53.75	56.44	59.13	61.81	64.50	67.19	69.88	72.56	75.25	77.94	80.63	83.31	86.00	88.69	91.38	94.06	96.75	99.44	102.13	104.81	107.50
11.00															49.50	52.25	55.00	57.75	60.50	63.25	66.00	68.75	71.50	74.25	77.00	79.75	82.50	85.25	88.00	90.75	93.50	96.25	99.00	101.75	104.50	107.25	110.00
11.25																53.44	56.25	59.06	61.88	64.69	67.50	70.31	73.13	75.94	78.75	81.56	84.38	87.19	90.00	92.81	95.63	98.44	101.25	104.06	106.88	109.69	112.50
11.50																54.63	57.50	60.38	63.25	66.13	69.00	71.88	74.75	77.63	80.50	83.38	86.25	89.13	92.00	94.88	97.75	100.63	103.50	106.38	109.25	112.13	115.00
11.75																	58.75	61.69	64.63	67.56	70.50	73.44	76.38	79.31	82.25	85.19	88.13	91.06	94.00	96.94	99.88	102.81	105.75	108.69	111.63	114.56	117.50
12.00																	60.00	63.00	66.00	69.00	72.00	75.00	78.00	81.00	84.00	87.00	90.00	93.00	96.00	99.00	102.00	105.00	108.00	111.00	114.00	117.00	120.00
12.25																		64.31	67.38	70.44	73.50	76.56	79.63	82.69	85.75	88.81	91.88	94.94	98.00	101.06	104.13	107.19	110.25	113.31	116.38	119.44	122.50
12.50																		65.63	68.75	71.88	75.00	78.13	81.25	84.38	87.50	90.63	93.75	96.88	100.00	103.13	106.25	109.38	112.50	115.63	118.75	121.88	125.00



USED IN 1833 AUSTIN & EVER SINCE

ROCK DENSITIES

UNIT CONVERSIONS

If you need to convert to other units of density, multiply a density value listed to the left with one of the below constants.

$g/cm^3 \times 1685.6 = lb/yd^3$

$g/cm^3 \times 62.428 = lb/ft^3$

$g/cm^3 \times 0.84278 = t/yd^3$

All rock densities vary because individual rock types vary slightly in composition.

Testing rock samples or place-specific geologic studies provide the only accurate measurements of rock densities.

THE

BLASTER'S GUIDE

A Resource for the Explosives and Blasting Industry

Legal Disclaimer: Neither Austin Powder nor any of its affiliates shall be responsible for the use of any product, services or information referred to herein. Any users of information contained in this guide assume the risk of relying on such information. Austin Powder makes no representations or warranties as to the information provided herein or with respect to products or services referred to in this guide. The information contained herein may contain inaccuracies and is subject to change without notice. Users of products of Austin Powder are referred to Safety Data Sheets and Austin Powder technical information bulletins for further important information.

Austin Powder Company
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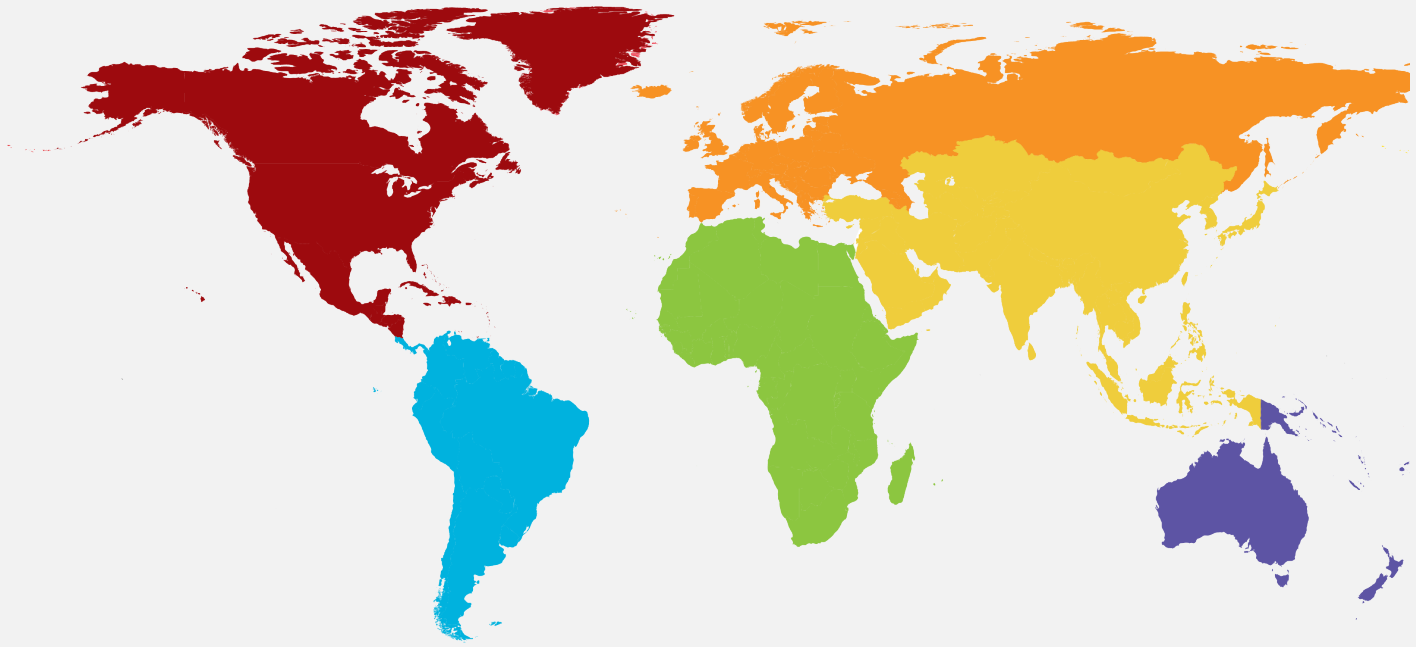
Email: info@austinpowder.com
Blasters Guide – Austin Powder Company

Seismic Product Information Bulletins

2021 Seismic PIB Catalog

USED IN 1833 & EVER SINCE



PIB Catalog Index

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

Austinite® & HEET Bulk®

PRODUCT INFORMATION BROCHURE

Bulk Austinite 15 (ANFO blasting agent) and bulk HEET (blends of emulsion and Austinite 15) are augered products for dry or dewatered blast holes that provide a wide range of energy and water resistance to meet many application requirements.

ADVANTAGES

- Good fragmentation and excellent heave provide easy to dig muck piles.
- Energy and water resistance can be adjusted to meet application demands.
- Bulk HEET loading convenience and the potential for expanded patterns can reduce costs.

PROPERTIES

Product	Density [g/cc]	VOD*		Water Resistance	Minimum Hole Diameter	
		[ft/s]	[m/s]		[in]	[mm]
Austinite 15	0.82	13,000	3,960	Poor	2	50
Hydromite ® 1100 Blends:						
HEET 130	1.20	13,500	4,115	Good**	4	100
HEET 150	1.30	15,500	4,725	Excellent**	5	125
Hydrox ® 503 Blends:						
HEET 30	1.22	12,400	3,780	Good**	4	100
HEET 50	1.30	13,700	4,175	Excellent**	5	125

** 6" confined.*

*** When loaded in dry or dewatered holes.*

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Austinite & HEET Bulk

PRIMING
These products are booster sensitive explosives and must be in direct contact with an appropriate size cast booster. Additional primers may be required depending upon geological conditions and face height.

STANDARD PACKAGING DETAILS
Not applicable.

STANDARD TECHNICAL DESCRIPTION
Booster sensitive augered ANFO and emulsion / ANFO blends.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
These products are designed to be used as they are manufactured from the bulk truck.

TRANSPORTATION DATA
UN CLASSIFICATION
Austinite 15
Shipping Name: Ammonium Nitrate - Fuel Oil Mixture
Class & Division: 1.5D
ID Number: NA 0331

Hydromite 1100
Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.5D
ID Number: UN 0332

Hydrox 503
Shipping Name: Oxidizing liquid, n.o.s.
(contains Ammonium Nitrate / Fuel Oil Aqueous Emulsion)
Class & Division: 5.1
ID Number: UN 3375

US DOT REFERENCE NUMBER
EX-9303283 (Austinite 15)
EX-1993050178 (Hydromite 1100)
EX-1993030287 (Hydrox 503)

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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1/2/02 | r 01/31/2020

Austinite® Series

PRODUCT INFORMATION BROCHURE

Austinite is a series of ammonium nitrate/fuel oil blasting agent products for a variety of blasting applications.

ADVANTAGES

Austinite 15

- Contains only high-quality technical-grade ammonium nitrate
- Optimized fuel ratio for oxygen balanced detonation.
- Excellent free flowing handling characteristics.

Austinite WR 300

- Simply dewater borehole and load the WR300 before water returns.
- Provides full borehole coupling.
- 10% higher VOD than conventional ANFO.

Austinite 7 HE

- Aluminized ANFO product that produces higher heat of reaction than conventional ANFO.
- 37% higher energy than conventional ANFO.
- Expanded patterns are possible resulting in decrease blasting costs.

PROPERTIES

Product	Density [g/cc]	RBS‡	Water Resistance	VOD	
				[ft/s]	[m/s]
Austinite 15	0.82	100	Poor	13,000	3,962
Austinite WR 300	0.90	99	Good	14,300	4,380
Austinite 7 HE	0.85	137	Poor	12,500	3,818

‡ Energy is calculated using TIGER, a thermo-dynamic computer code used by Austin Powder Company. Other computer codes may give different values. ANFO = 100 @ 0.82 g/cc

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Austinite Series

PRIMING

Austinite products must be in direct contact with an appropriate size Red-D Prime® or cast booster. Additional primers may be required depending upon geological conditions and face height.

STANDARD PACKAGING DETAILS

Austinite Series products are packaged in 50 lb. multi-wall paper and 25 kg plastic valve bags.

STANDARD TECHNICAL DESCRIPTION

Ammonium nitrate/fuel oil mixture

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Three months from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type B

Class & Division: 1.5D

ID Number: UN 0331

US DOT REFERENCE NUMBER

EX-9303284

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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1/2/02 | r 01/31/2020

Coal Mine Construction™ Delay Detonators

PRODUCT INFORMATION BROCHURE

Coal Mine Construction electric detonators are designed to provide the precise control necessary to produce accurate and consistent blasting results in a variety of blasting applications in underground coal mine applications and other industries that require the use of a copper shell electric detonator.

ADVANTAGES

- 750 mg PETN base charge far exceeds the standard #8 strength detonator.
- Industries strongest copper shell reduces the possibility of water hammer effect.
- Anti-static PVC insulation for added protection from extraneous currents.
- Wide selection of delay intervals provide greater flexibility in blast design.

PROPERTIES

Coal Mine Construction Delay Detonator Sequence							
Delay #	1	2	3	4	5	6	7
MS Time	25	50	75	100	125	150	175
Coal Mine Construction Delay Detonator Sequence (continued)							
Delay #	8	9	10	11	12	13	14
MS Time	200	250	300	350	400	450	500

Coal Mine Construction Delay Detonator Recommended Firing Current				
Circuit Type	**Single Detonator**	**Single Series**	**Parallel Series**	**Parallel**
DC [Amps]	0.5	1.5	1.5	1.0–10.0/Detonator
AC [Amps]	0.5	2.0	2.0	1.0–10.0/Detonator

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Coal Mine Construction Delay Detonators

STANDARD PACKAGING DETAILS

Coal Mine Construction Delay Detonator Packaging & Resistance						
Length		Case Weight		Case Count	Total [Ω]*	Wire Configuration
[ft]	[m]	[lb]	[kg]			
16	4.9	13.2	6.0	100	1.5	Short Fold

** Includes fusehead resistance of 0.9 +/- 0.1 Ω.*

STANDARD TECHNICAL DESCRIPTION

Copper wire, copper shell electric detonators

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-0103067

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

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2/22/06 | 01/31/2020

Coal Mine Delay™ Detonators

PRODUCT INFORMATION BROCHURE

Austin Powder Company's Coal Mine Delays are specifically designed to provide the modern underground coal mine with the safest, highest quality detonator in the industry.

ADVANTAGES

- 720 mg PETN base charge far exceeds the standard #8 strength detonator.
- Thick copper shell resists dynamic compression.
- Accordion folded 23 AWG iron wire.
- Nine different color coded delays for easy delay identification.

PROPERTIES

Coal Mine Delay Sequence & Colors									
Delay #	1	2	3	4	5	6	7	8	9
MS Time	25	100	175	250	300	350	400	450	500
Color	White	Pink	Blue	Orange	Green	Gold	Red	Lt. Green	Lt. Blue

Coal Mine Delay Electrical Data				
No Fire Current [Amps]	**All Fire Impulse [mJ]**	**Series Ignition Current [mJ]**	**No Fire Impulse [mJ]**	**Electrostatic Sensitivity (wire to wire)**
0.45 Amps	16	18	8	10 [kV]/2000[pF]

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Coal Mine Delay Detonators

STANDARD PACKAGING DETAILS

Coal Mine Delay Packaging & Resistance						
Length		Case Weight		Case Count	Total* [Ω]	Wire Configuration
[ft]	[m]	[lb]	[kg]			
8	2.4	45	20	500	2.7	Short Fold
14	4.2	55	25	500	4.2	Short Fold

STANDARD TECHNICAL DESCRIPTION

MSHA approved eetonators for underground coal and “gassy“ mines

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-9303275

For more information and service locations in your area, please contact Austin Powder Company’s headquarters:

AUSTIN POWDER

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Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

2/22/06 | 01/31/2020

Coal★Star® Detonators

PRODUCT INFORMATION BROCHURE

Coal★Star Detonators are specifically designed to provide the modern underground coal mine with the safest, highest quality detonator in the industry.

ADVANTAGES

- 720 mg PETN base charge far exceeds the standard #8 strength detonator.
- Thick copper shell resists dynamic compression.
- Accordion folded 23 AWG iron wire.
- Nine different color coded delays for easy delay identification.

PROPERTIES

Coal★Star Delay Sequence & Colors									
Delay #	1	2	3	4	5	6	7	8	9
MS Time	25	100	175	250	300	350	400	450	500
Color	White	Pink	Blue	Orange	Green	Gold	Red	Lt. Green	Lt. Blue

Electrical Data	
No Fire Current	0.25 amps
All Fire Current	1.00 amps
Series Ignition Current	1.50 amps
No Fire Impulse	2.5 mJ/ohms
All Fire Impulse	5.5 mJ/ohms
Electrostatic Sensitivity	
Double Wire to Shell	10 kV/300 pF/15 mJ
Pin to Pin	10 kV/300 pF/15 mJ

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Coal★Star Detonators

PROPERTIES (cont)

Coal★Star Recommended Firing Current				
DC (Amps)	**Single Detonator**	**Single Series**	**Parallel Series**	**Parallel**
DC (Amps)	0.5	1.5	1.5	1.0-10.0/Detonator
AC (Amps)	0.5	2.0	2.0	1.0-10.0/Detonator

STANDARD PACKAGING DETAILS

Coal★Star Packaging & Resistance						
Length		**Case Weight**		**Case Count**	**Total* [Ω]**	**Wire Configuration**
[ft]	**[m]**	**[lb]**	**[kg]**			
16	4.9	6.1	2.8	40	3.75	Short Fold

STANDARD TECHNICAL DESCRIPTION

MSHA approved detonators for underground coal and “gassy“ mines.

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-9303275

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2/22/06 | 01/31/2020

DC Cast Boosters

PRODUCT INFORMATION BROCHURE

Austin DC Cast Boosters are high-density molecular explosives designed to produce high detonation pressures for optimum initiation of blasting agents. Austin Cast Boosters can be furnished with a cap well and cord channel that facilitate primer assembly. The DC family of Cast Boosters is sensitive to a #8 strength (450mg PETN) base charge detonator, or 15 grain per foot or greater detonating cord.

ADVANTAGES

- Austin DC Cast Boosters detonate in excess of 24,000 ft/sec (7,380 m/sec).
- Over 200 kb of detonation pressure ensures optimum steady state velocity for blasting agents.
- Excellent shelf life, highly resistant to water and oil.

PROPERTIES

Product Name	Weight [g]	Outside Diameter		Length		Case Count		Typical Uses
		[in]	[mm]	[in]	[mm]	Inner Carton	Case Total	
Gold Nugget ™	8	0.69	18	1.71	43	100	1,000	For priming all small diameter blasting agents underground. Use a detonator of at least a #8 strength.
Diamond Nugget ™	20	0.69	18	3.00	76	50	500	

Austin Powder Cast Boosters are manufactured with molecular explosives consisting of PETN, RDX, HMX and TNT, all of which are sensitive to severe impact, heat or friction. As with all explosives, cast boosters must be transported, stored and handled with care. Avoid any impact with solid surfaces or other cast boosters, as the potential for a premature detonation or misfire is possible.

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DC Cast Boosters

STANDARD TECHNICAL DESCRIPTION

High-density explosives for primer applications

STANDARD PACKAGING DETAILS

Product Name	Weight		Outside Diameter		Length		Case Count	Typical Uses
	[oz]	[g]	[in]	[mm]	[in]	[mm]	Outer Case	
90 Gram	3.2	90	1.06	27	4.50	114	120	Priming seismic charges. Also secondary up-hole boosters in small diameter holes. Detonator and cord initiation. Use at least 50 grain detonating cord.*
Green Cap DC	5.3	151	1.43	36	4.50	114	64	Priming blasting agents in holes of 2" diameter or larger. *Detonator and cord initiation. Use 15 grain or greater detonating cord.* (Packaging – 4 x 40 units)*
Brown Cap DC	8	227	1.70	43	4.50	114	64	Priming blasting agents in holes of 2 1/2" diameter or larger. *Detonator and cord initiation. Use at least 15 grain detonating cord or greater.* (Packaging – 2 x 50 units)*
Red Cap	12	340	3.00	76	2.10	53	60	Priming blasting agents in holes of 4" diameter or larger. *Use 15 grain or greater detonating cord.*
Black Cap DC	12	340	2.05	52	4.60	117	49	Priming blasting agents in holes of 3" diameter or larger. *Detonator and cord initiation.*
Purple Cap	16	454	3.06	78	2.60	66	60	Priming blasting agents in holes of 4" diameter or larger. *Use at least 15 grain detonating cord.*
Orange Cap DC	16	454	2.33	59	4.50	114	36	Heavier booster for priming blasting agents in holes of 3" diameter or larger. *Detonator and cord initiation. Use at least 15 grain detonating cord or greater*
White Cap DC	32	900	3.06	78	5.10	130	18	Heavier booster for priming blasting agents in holes of 4" diameter or larger. *Detonator and cord initiation. Use at least 15 grain detonating cord or greater*
Rock Crusher #1	16	454	5.00	127	2.50	63.5	16	Use in secondary blasting applications to reduce oversize. For use with at least 25 grain detonating cord or detonator sensitive (secured to tail of the 50 grain detonating cord) Rock Crushers can be ordered as "CW" for use as detonator only.
Rock Crusher #2	32	900	6.25	159	3.00	76	12	

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN0042

US DOT REFERENCE NUMBER

EX-1993030285

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Five years from date of manufacture under good storage conditions.

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

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Detonating Cord

PRODUCT INFORMATION BROCHURE

Austin Powder manufacturers a wide variety of detonating cord to meet the requirements of the mining, quarrying and construction industries. Detonating cord is used to initiate detonator sensitive commercial explosives such as cast boosters, dynamites and emulsions. Detonating cord is also used to provide a path of initiation to non-electric detonators. Detonating cord has a core of PETN (pentaerythritol tetranitrate) encased in multiple polypropylene yarns, over-extruded with a polyethylene jacket and high strength textile yarns.

ADVANTAGES

- Water and abrasion resistant.
- High tensile strength.
- Color coded for easy identification.
- Electronically and mechanically inspected.
- Insensitive to extraneous current.
- Assures reliable non-electric initiation.

STANDARD TECHNICAL DESCRIPTION

Lite Line® & Lite Line Slideline™ : Downline or upline under all but the most severe conditions.

A-Cord™ & A-Cord Slideline: Small, medium and large hole downlines and trunklines; secondary blasting and long hole blasting underground.

50 Reinforced™ : Excellent general purpose detonating cord for reliable blast initiation under virtually all conditions.

Heavy Duty 200™ : For severe conditions to meet a wide range of specialized applications. Well suited for dimensional stone and wall control.

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Detonating Cord

PROPERTIES and STANDARD PACKAGING DETAILS

Product Name	Grain Load		Outside Diameter [in]	Tensile Strength [lb]	Case Count	Weight [lb]	Color
	[gr/ft]	[g/m]					
Lite Line	15	3.2	0.155 +/- 0.015	230	(2) 2000' Spools	30	Pink
Lite Line Slideline	15	3.2	0.133 +/- 0.015	170	(2) 2000' Spools	30	Pink
A-Cord	25	5.3	0.165 +/- 0.015	230	(2) 1000' Spools	22	Green
	25	5.3	0.165 +/- 0.015	230	(2) 2000' Spools	41	Green
A-Cord Slideline	25	5.3	0.145 +/- 0.015	170	(2) 1000' Spools	22	Green
50 Reinforced	50	10.6	0.197 +/- 0.015	200	(2) 1000' Spools	30	Yellow
Heavy Duty 200	200	42.5	0.335 +/- 0.020	250	(1) 1000' Spool	57	Orange

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Cord, Detonating
Class & Division: 1.1D
ID Number: UN 0065

US DOT REFERENCE NUMBER

EX-9303282

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

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1/2/02 | r 02/11/2021

Dynamite Series

PRODUCT INFORMATION BROCHURE

Austin Powder Company's dynamites are specially formulated nitroglycerin based products that deliver superior results in many blasting applications. Their high quality and excellent energy characteristics make them an effective and efficient product.

ADVANTAGES

- Excellent water resistance.
- High velocity for rapid shattering action.
- All purpose explosive for many types of blasting.
- High density permits explosive power to be concentrated where the most energy is required.

PROPERTIES

Product	Density [g/cc]	Pressure [kb]	RBS‡	Fume Class	Water Resistance	VOD	
						[ft/s]	[m/s]
Apcogel B-1™ (Semi-Gel)	1.26	54	144	1	Good	15,400	4,700
60% Extra Gelatin	1.43	92	195	1	Excellent	17,700	5,400

‡ *Energy is calculated using TIGER, a thermo-dynamic computer code used by Austin Powder Company. Other computer codes may give different values. ANFO = 100 @ 0.82 g/cc.*

PRIMING

Use a high-strength detonator (Rock★Star®, Shock★Star® or equivalent).

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Dynamite Series

STANDARD PACKAGING DETAILS

Product	Cartridge Size		Weight – Lbs.	Sticks per Case
	[in]	[mm]	Per Case	
60% Extra Gelatin	1 x 8	25 x 200	45	140
	1 1/8 x 8	28 x 200	45	100
	1 ¼ x 8	32 x 200	44	88
	1 ½ x 16	38 x 400	42	30
	2 x 8	50 x 200	43	34
	2 x 16	50 x 400	43	17
	2 ½ x 16	65 x 400	40	10
Apcogel B-1	1 ¼ x 8	32 x 200	38	88
	1 ½ x 16	38 x 400	36	30
	2 x 8	50 x 200	39	34
	2 x 16	50 x 400	39	17
	2 ½ x 16	65 x 400	37	10

Note: All dimensions and weights are nominal.

STANDARD TECHNICAL DESCRIPTION

Nitroglycerin based products

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

One year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type A
Class & Division: 1.1D
ID Number: UN0081

US DOT REFERENCE NUMBER

EX-9303286

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

E★STAR Cast Boosters

PRODUCT INFORMATION BROCHURE

Austin E★STAR Cast Boosters are high-density molecular explosives designed to produce high detonation pressures for optimum initiation of blasting agents. Austin E★STAR Cast Boosters are specifically designed to accommodate the E★STAR electronic detonator and contains a detonator well of 4“ length (101.5mm). The detonator well contains an internal, precisely located brass sleeve. This sleeve is positioned to provide additional protection to the sensitive electronic components of the E★STAR detonator, while still insuring the high strength detonator base charge is in intimate contact with the sensitive cast booster explosive.

The E★STAR cast booster is designed for the E★STAR detonator. The use of any other detonator or detonating cord will result in misfires

ADVANTAGES

- Austin Cast Boosters detonate in excess of 24,000 ft/sec (7,380 m/sec).
- Over 230 kb of detonation pressure ensures optimum steady state velocity for blasting agents.
- Excellent shelf life, highly resistant to water and oil.
- High visibility “Yellow” cup to differentiate from standard Cast Boosters.
- Provides additional protection from transient pressure.

PROPERTIES

Product Name	Weight		Outside Diameter		Length		Units Per Case	Typical Uses Designed specifically for use with the E★STAR Electronic Detonator
	[oz]	[g]	[in]	[mm]	[in]	[mm]		
E★STAR 50	8.0	227	1.78	45.2	4.85	123.2	100	Priming blasting agents in holes of 2” diameter or larger. (Packaging – 2 x 50 units)
E★STAR 75	12.0	340	2.07	52.6	4.85	123.2	60	Priming blasting agents in holes of 2 1/2” diameter or larger.
E★STAR 100	16.0	454	2.35	59.7	4.85	123.2	50	Priming blasting agents in holes of 3” diameter or larger.
E★STAR 200	32.0	908	3.03	77	4.85	123.2	25	Priming blasting agents in holes of 4” diameter or larger.

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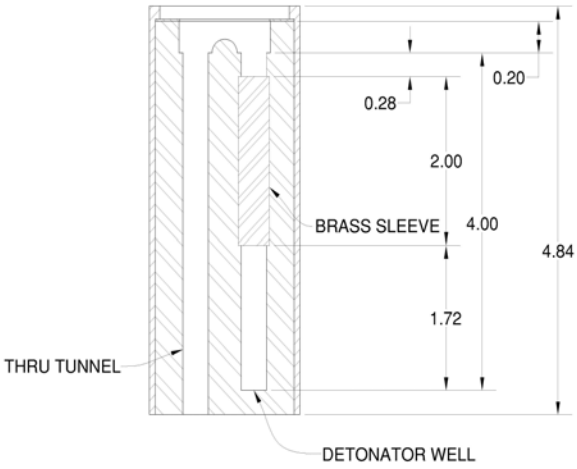
E★STAR Cast Boosters



E★STAR Cast Booster

The E★STAR cast booster contains a brass sleeve in the detonator well to provide additional protection from transient shock pressure to electronic detonator components. The brass sleeve is 2.0" long. The total length (depth) of the detonator well is 4". This design of a cast booster requires the electronic detonator to be fully inserted to the bottom of the detonator well to expose the base charge to the explosive cast booster mix. The bottom 1.72" of the detonator well does not contain the brass sleeve.

The E★STAR cast booster is designed for the E★STAR detonator. The use of any other detonator or detonating cord will result in misfires

STANDARD PACKAGING DETAILS

Product	Inner Carton*	Outer Case Volume (ft^3)	Outer Case Volume (m^3)	Total Gross case Weight (Lb)	Total Gross case Weight (Kg)	Total NEQ case Weight (Lb)	Total NEQ case Weight (Kg)
E★STAR 50	2 each	1.25	0.035	59	25.8	50	22.7
E★STAR 75	N/A	0.88	0.025	47	21.4	45	20.4
E★STAR 100	N/A	0.56	0.0158	32	14.5	30	13.6
E★STAR 200	N/A	0.90	0.0255	52	23.59	50	22.7

STANDARD TECHNICAL DESCRIPTION

High-density explosives for primer applications

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN0042

US DOT REFERENCE NUMBER

EX-1993030285

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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1/2/02 | r 01/31/2020

E*STAR Detonators

PRODUCT INFORMATION BROCHURE

E*STAR electronic detonators provide the highest level of quality, security, control and precise timing to provide consistent blasting results.

ADVANTAGES

- HDPE leg wires available in standard and heavy-duty configurations.
- Anti-slip friction grip (easy to use) connectors.
- Robust connector hinge.
- High accuracy delay from 1 - 20,000 ms.
- 3,200 detonator capacity (1,600 per blasting machine).
- Easy to open with one-hand weather-resistant, rugged connector.
- Surface and Underground applications.
- Dynamic pressure resistance.
- Multi-level, 100% detonator verification pre-blast.
- Copper shell.
- 750 mg explosive base charge.

E*STAR LOGGING /TESTING / BLASTING EQUIPMENT

LOGGER 2

TESTER LM-2

BLASTING MACHINE

WRFD WIRELESS REMOTE BLASTING SYSTEM

The use of this system requires specific training in all components. This training is in addition to the normal, required training that all blasters and blasting personnel have received.

Only equipment specifically designed for use with Austin Powder E*STAR detonators is permitted. An operator's manual is to be available at all times when using this equipment.

Temperature Specifications for Blasting Machine and Logger units:

Operating (use): -20ºC to 50ºC, -4ºF to 122ºF

Storage, long term: -20ºC to 35ºC, -4ºF to 95ºF

AUSTIN POWDER

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E★STAR Detonators

PRODUCT INFORMATION BROCHURE

STANDARD PACKAGING DETAILS

Quarry/Mine (QM) Packaging					
Length		Case Count	Case Wt		Wire Configuration
[ft]	[m]	Outer	[lb]	[kg]	
16	4.9	80	16.50	7.49	Fast 8
24	7.3	70	18.51	8.40	Fast 8
30	9.1	60	19.00	8.63	Fast 8
40	12.2	50	19.65	8.92	Fast 8
50	15.2	40	18.9	8.6	Fast 8
60	18.3	40	21.92	10	Fast 8
80	24.4	40	31.13	11.6	Fast 8
100	30.5	45	37.07	16.83	Spooled
120	36.6	12	21.76	6	Spooled
150	45.7	12	25.06	6.9	Spooled
175	53.4	12	28.36	7.8	Spooled
200	61.0	12	31.66	8.7	Spooled
225	68.6	12	29.22	9.6	Spooled
250	76.2	12	30.70	10.1	Spooled

Quarry/Mine (QM) / Heavy Duty (HD) Packaging					
Length		Case Count	Case Wt		Wire Configuration
[ft]	[m]	Outer	[lb]	[kg]	
40	12.2	40	16.98	7.77	Fast 8
60	18.3	30	19.29	8.75	Fast 8
65	19.8	30	20.88	9.47	Fast 8
60	18.3	45	30.40	13.79	Spooled
80	24.4	30	22.27	10.1	Spooled
100	30.5	12	13.56	6.15	Spooled
120	36.6	12	14.11	6.4	Spooled
150	45.7	12	16.31	7.4	Spooled
175	53.4	12	18.32	8.31	Spooled
200	61.0	12	20.50	9.3	Spooled
225	68.6	12	25.57	11.6	Spooled
250	76.2	12	27.12	12.3	Spooled

STANDARD TECHNICAL DESCRIPTION

Programmable electronic detonators

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-0103067

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive, Cleveland, OH 44122
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2/22/06 | 5/12/2021

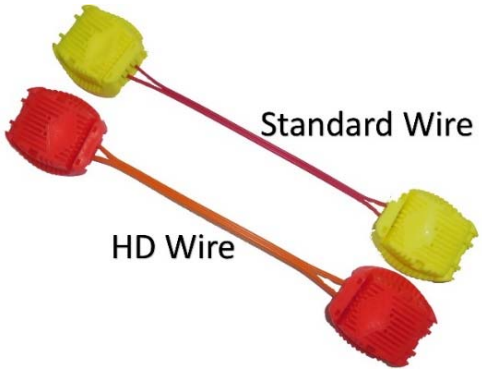
E★STAR Pronto Connector

PRODUCT INFORMATION BROCHURE

E★STAR Pronto Connector is an accessory provided for the E★STAR detonators. It is an assembly of two E★STAR connectors with an interconnecting wire. It can be used for connection of branches to the firing lines without the need of wire separation, stripping and joining. Simply attach one connector to the branch bus wire and the other to the firing line bus wire and the connection is made. It can also serve as a repair tool to repair a severed or damaged detonator leg wire.

ADVANTAGES

- Easy branch connection
- Easily repair damaged detonator wires
- No need for wire strippers or knives for connection
- Grease filled connectors ensure a water resistant tight seal



The E★STAR Pronto Connector is supplied in two versions (Standard and HD) and is compatible with #20 AWG (0.8 mm), Cu Austin Duplex bus wire and #22 AWG (0.6 mm) FeCu E★STAR detonator wires, both Standard and HD.

STANDARD TECHNICAL DESCRIPTION

Wire material	Copper coated Steel
Wire length	6 in (15 cm)
Temperature range for application	-22 ºF (-30 ºC) < T < 140 ºF (+60 ºC)

STANDARD PACKAGING DETAILS FOR STANDARD WIRES

The E★STAR Pronto Connector are packaged in a cardboard box with an outer dimension of 11.25 x 7.6 x 5 in (286 x 193 x 127 mm), containing 20 units. Total package weight is 2.2 lbs./1 kg.

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

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12/19/19 | r 01/31/2020

E★STAR Seismic Detonators

PRODUCT INFORMATION BROCHURE

E★STAR Seismic electronic detonators have been designed to provide the precise control necessary to produce the most accurate and consistent seismic record. The E★STAR Seismic detonator may be programmed in 1-millisecond increments from one (1) millisecond up to twenty (20) seconds. using the dedicated DLG 1600-100-S Logger. Unique serial number for each E★STAR Seismic detonator provides “Cradle to Grave“ traceability.

ADVANTAGES

- 750 mg PETN base charge far exceeds the standard #8 strength detonator.
- Industry’s most user-friendly and rugged electronic seismic detonator.
- Designed to fire pattern shots up to ten detonators simultaneously.
- Legwire – HDPE insulation for added protection from current leakage. 0.8 mm diameter copper wire (#20 AWG).
- Advanced pre-fire diagnostics coupled to the communication protocol.

PROPERTIES

E★STAR Seismic detonators contain a capacitor, a logic and timing circuit, and pyrotechnic ignition system manufactured by Austin Powder to provide a complete unit. When the capacitor is charged by the DBM 10-S Digital Blasting Machine, the internal capacitor provides the energy that initiates the “bridge wire“ and subsequently detonates the base charge.

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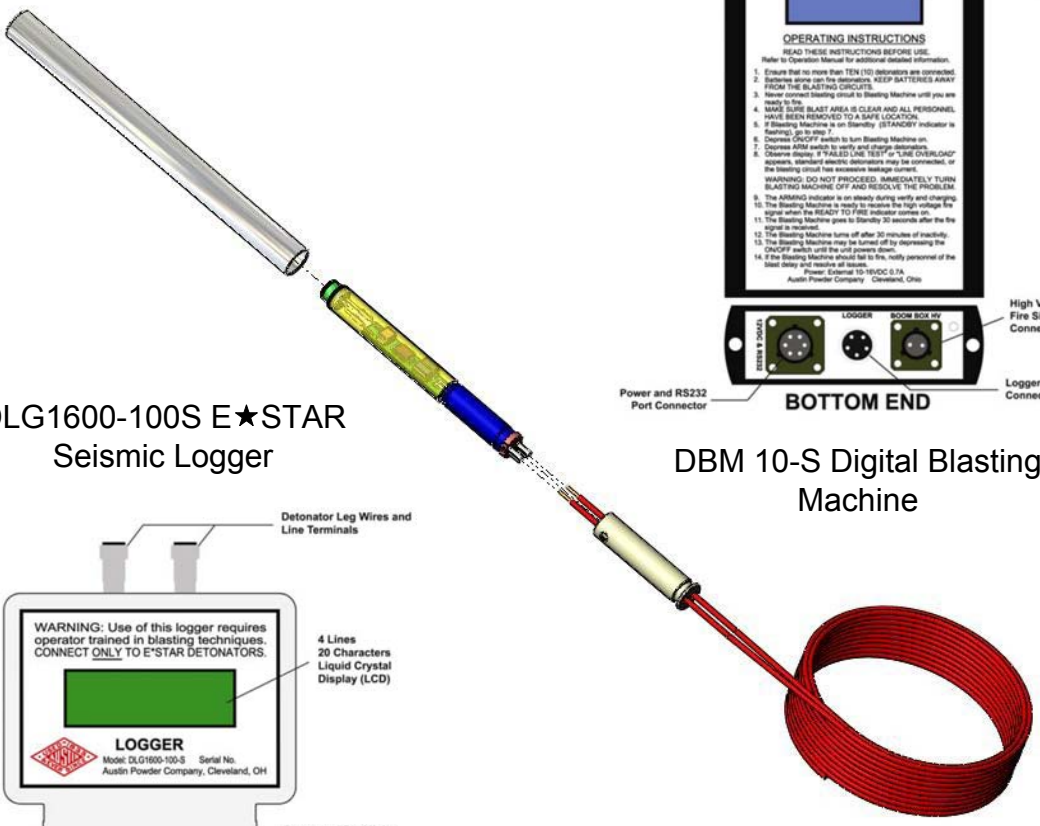
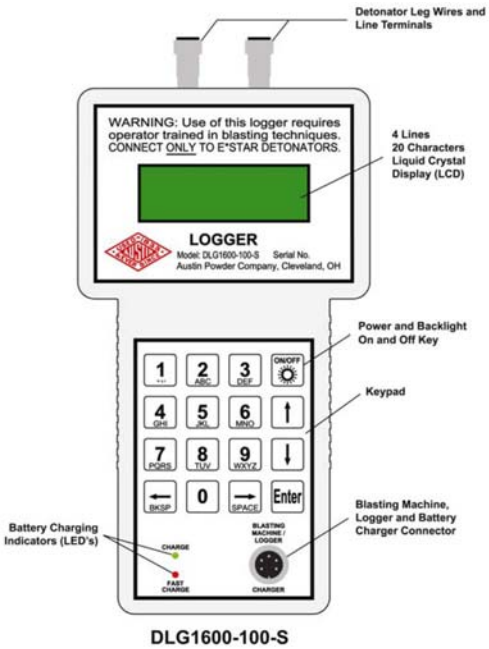
E★STAR Seismic Detonators



DLG1600-100S E★STAR Seismic Logger

DBM 10-S Digital Blasting Machine



DLG1600-100-S

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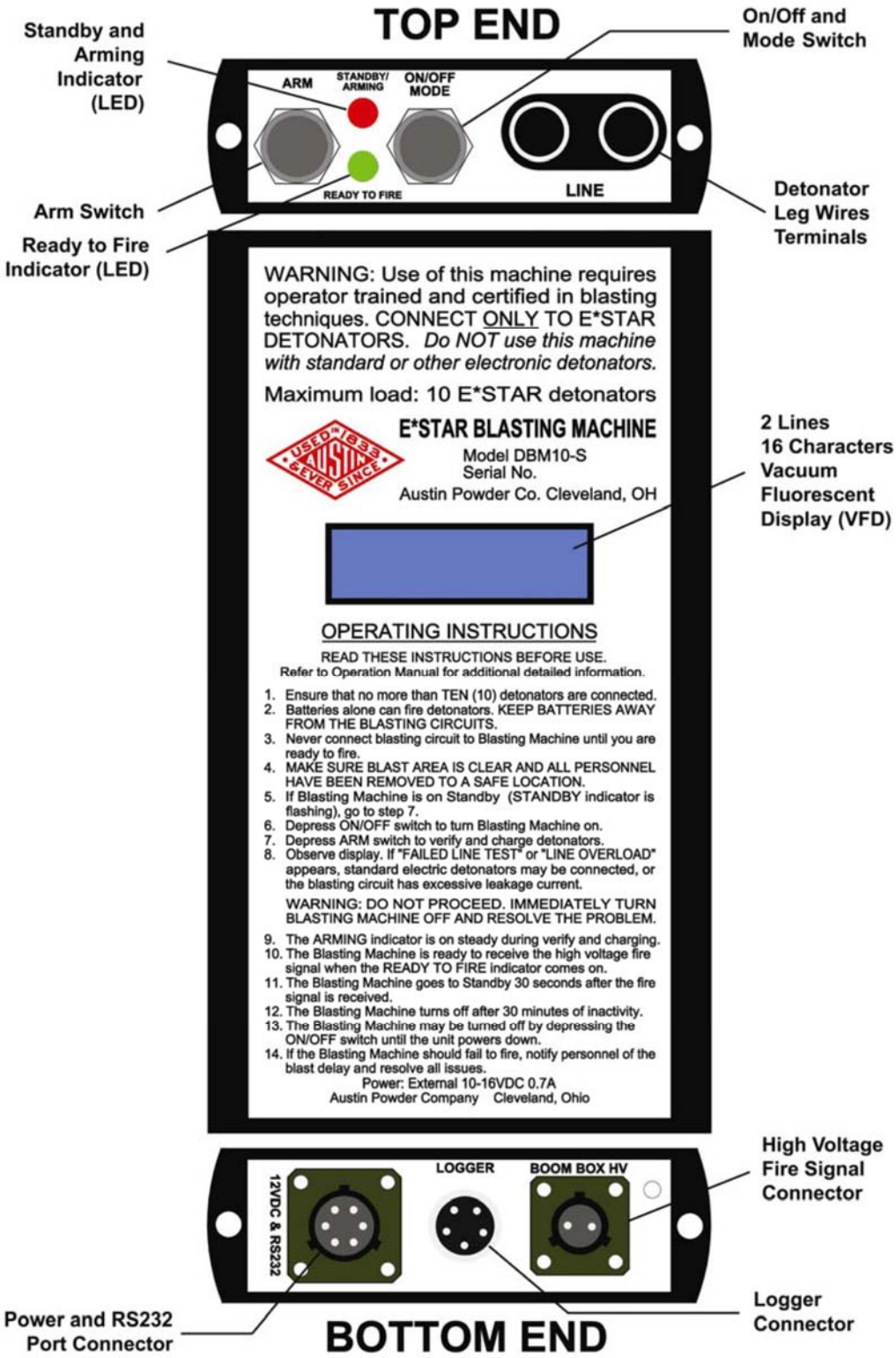
E★STAR DBM 10-S Digital Blasting Machine



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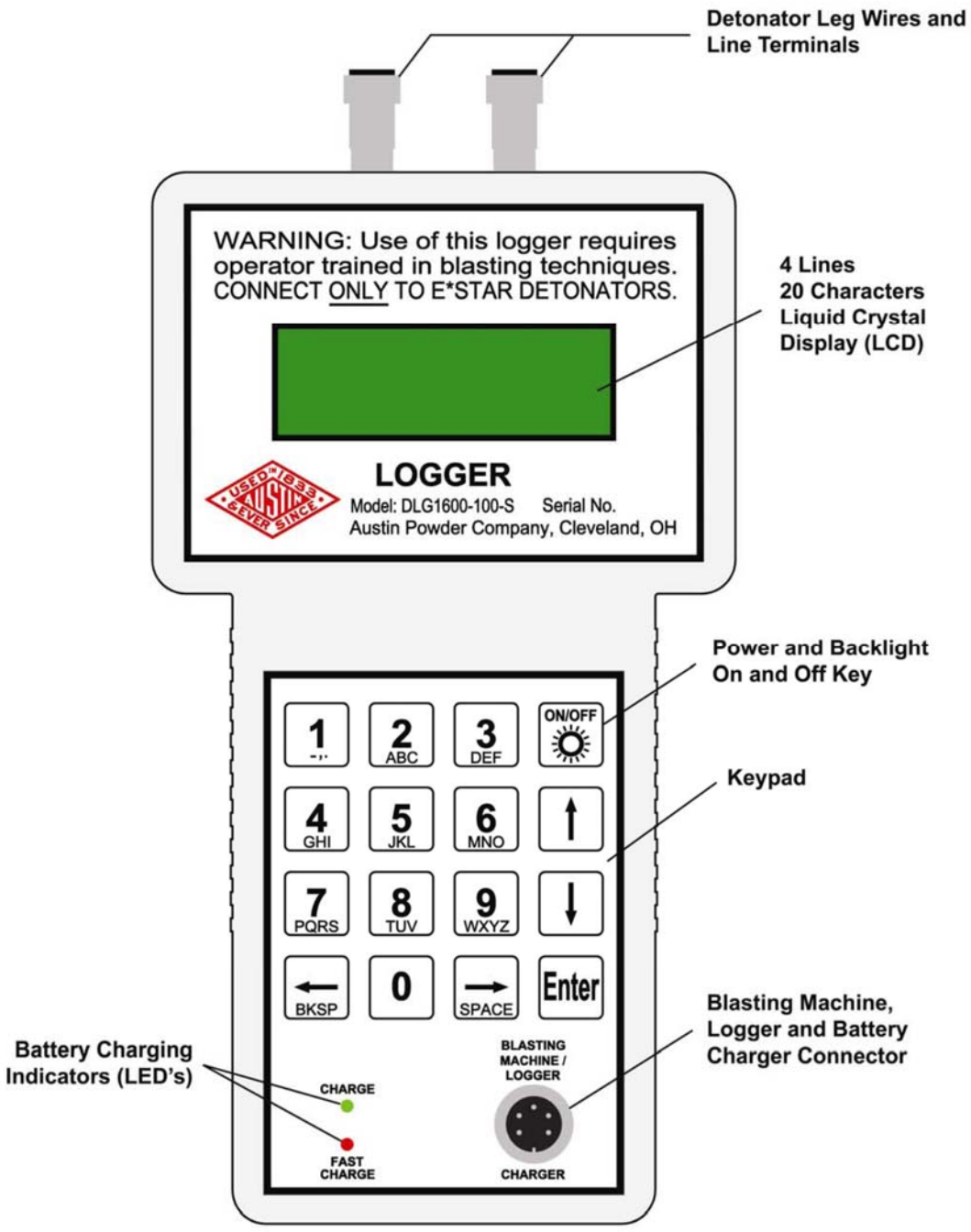
1/2/02 | r 01/31/2020

E★STAR DLG 1600-100-S Seismic Logger



DLG1600-100-S

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E★STAR Seismic Detonators

REQUIRED EQUIPMENT

The use of this system requires specific training in all components. This training is in addition to the normal, required training that all blasters and blasting personnel have received.

Only equipment specifically designed for use with Austin Powder E★STAR Seismic detonators is permitted. The currently approved equipment is a DLG 1600-100-S logger and a DBM 10-S Digital Blasting Machine* manufactured by Dan-Mar Co., Inc. An "operators" manual is to be available at all times when using this equipment.

*Warning: The DBM 10-S Digital Blasting Machine is designed for use only with E★STAR Seismic detonators. **Do Not attempt to use this blasting machine with any other detonator.** The misuse of this blasting machine with standard electric detonators may result in instantaneous detonator initiation.

STANDARD PACKAGING DETAILS

E★STAR Seismic Detonator Packaging					
Length		Case Wt		Case Count	Wire Configuration
[ft]	[m]	[lb]	[kg]		
25	7.6	21.52	9.77	70	Fast 8
35	10.7	24.76	11.24	60	Fast 8
45	13.7	26.03	11.82	50	Fast 8
55	16.8	25.34	11.51	40	Fast 8
65	19.8	34.12	15.49	45	Spooled
85	25.9	42.94	19.50	45	Spooled
100	30.5	49.56	22.50	45	Spooled
120	36.6	27.91	12.67	20	Spooled
140	42.7	31.83	14.45	20	Spooled
160	18.8	35.75	16.23	20	Spooled
180	54.9	39.67	18.01	20	Spooled
200	61.0	43.59	19.79	20	Spooled
220	67.1	47.51	21.57	15	Spooled
240	73.2	51.43	23.35	15	Spooled

STANDARD TECHNICAL DESCRIPTION

Electronic programmable detonators

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-0103067

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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1/2/02 | r 01/31/2020

Eagle®

PRODUCT INFORMATION BROCHURE

Austin's Eagle family of cast boosters are high-density molecular explosives designed to produce high detonation pressures for optimum initiation of blasting agents. Eagles can accommodate detonators up to 4" (101.5mm) in length. The Eagle family of cast boosters are designed to be initiated by non-electric, electric and electronic detonators that are classified as a minimum of #8 strength (450mg or greater PETN) base charge. ***Eagle boosters are not designed for use with detonating cord.***

ADVANTAGES

- Eagle cast boosters detonate in excess of 24,000 ft. /sec (7,380 m/sec).
- Over 225 kb of detonation pressure ensures optimum steady state velocity for blasting agents.
- Excellent shelf life, highly resistant to water and oil.
- Fully enclosed detonator well with internal detonator locking device and through tunnel.
- High visibility, impact resistant "fluorescent orange" polypropylene that is resistant to -40F to +150F for standard Eagle boosters.
- High visibility, impact resistant "yellow" polypropylene that is resistant to -40F to +150F for Eagle E★Star Boosters (internal brass sleeve).

PROPERTIES

Eagle cast boosters are manufactured with molecular explosives consisting of PETN and TNT, both of which are sensitive to severe impact, heat or friction. As with all explosives, Eagle boosters must be transported, stored and handled with care. Avoid any impact with solid surfaces.

STANDARD TECHNICAL DESCRIPTION

High-density cast explosive for primer applications.

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Eagle Cast Boosters

STANDARD PACKAGING DETAILS

Eagle boosters are not designed for use with detonating cord

Product Name	Weight		Outside Diameter		Length		Units Per Case	Typical Uses
	[oz]	[g]	[in]	[mm]	[in]	[mm]		
Eagle 150	5.3	150	1.6	41	4.6	117	64	Priming blasting agents in holes of 2“ diameter or larger.
Eagle 225	8	225	1.7	43	4.8	123	64	Priming blasting agents in holes of 2“ diameter or larger.
Eagle 340	12	340	2.1	53	4.8	123	49	Priming blasting agents in holes of 2.5“ diameter or larger.
Eagle 450	16	450	2.3	58	4.8	123	36	Priming blasting agents in holes of 3.0” diameter or larger.
Eagle 500	18	510	2.6	66	4.5	115	30	Double capwell (3-hole). Priming blasting agents in holes of 4” diameter or larger.
Eagle 900	32	900	3.1	78	4.8	123	18	Priming blasting agents in holes of 4” diameter or larger.

Product Name	Weight		Outside Diameter		Length		Units Per Case	Typical Uses
	[oz]	[g]	[in]	[mm]	[in]	[mm]		
Eagle E★Star 225	8	225	1.7	43	4.8	123	64	Priming blasting agents in holes of 2 “diameter or larger. *Electronic Detonator Only*
Eagle E★Star 340	12	340	2.1	53	4.8	123	49	Priming blasting agents in holes of 2.5 “diameter or larger. *Electronic Detonator Only*
Eagle E★Star 450	16	450	2.3	58	4.8	123	30	Priming blasting agents in holes of 3.0” diameter or larger. *Electronic Detonator Only*
Eagle E★Star 500	18	510	2.6	66	4.5	115	30	Double capwell (3-hole). Priming blasting agents in holes of 4” diameter or larger. *Electronic Detonator Only*
Eagle E★Star 900	32	900	3.1	78	4.8	123	18	Priming blasting agents in holes of 4” diameter or larger. *Electronic Detonator Only*

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN0042

US DOT REFERENCE NUMBER

EX-1993030285

For more information and service locations in your area, please contact Austin Powder Company’s headquarters:

AUSTIN POWDER

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1/2/02 | r 10/26/2020

Emulex® 900 Series

PRODUCT INFORMATION BROCHURE

Emulex 900 Series is a detonator sensitive emulsion explosive with putty like texture packaged in plastic film, tampable plastic film or rigid paper tube cartridges..

ADVANTAGES

- Excellent fragmentation when proper grade is matched to the rock conditions.
- >99% borehole coupling when loading cut or tamped cartridges.
- Excellent water resistance in all grades.
- Superior resistance to dynamic pre-compression.

PROPERTIES

Product	Density [g/cc]	RBS‡	Fume Class	Water Resistance	VOD	
					[ft/s]	[m/s]
Emulex 917	1.17	107	1	Excellent	17,000	5,577
Emulex 927	1.17	142	2	Excellent	16,500	5,413
Emulex 937	1.19	162	2	Excellent	15,500	5,085

‡ *Energy is calculated using TIGER, a thermo-dynamic computer code used by Austin Powder Company. Other computer codes may give different values. ANFO = 100 @ 0.82 g/cc.*

PRIMING

Use a high strength detonator (Rock★Star®, Shock★Star® or equivalent). If product temperature is below 0° F (-17° C), prime with a minimum of a Gold Nugget™ (8 gm) cast booster. This product is not designed for use with any strength of detonating cord.

AUSTIN POWDER

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Emulex 900 Series

STANDARD TECHNICAL DESCRIPTION

Detonator sensitive emulsion

STANDARD PACKAGING DETAILS

Cartridge Size		917	927	937	Cartridge Weight		Case Count
[in]	[mm]				[lb]	[kg]	50 lb/22.5 kg
1 x 12	25 x 300	V, PMP	V, PMP	---	0.38	0.17	132
1 ¼ x 12	32 x 300	V, PMP	V, PMP	---	0.67	0.30	75
1 ½ x 12	38 x 300	V, PMP	V, PMP	---	0.88	0.40	57
1 ¼ x 16	32 x 400	---	AT	---	0.89	0.40	56
1 ½ x 16	38 x 400	V, PMP	V, AT, PMP	---	1.28	0.58	39
1 ¾ x 16	44 x 400	V	V, AT	---	1.61	0.73	31
2 x 16	50 x 400	V	V, BN	V, BN	2.27	1.03	22
2 ¼ x 16	57 x 400	V	V, BN	V, BN	2.50	1.13	20
2 ½ x 16	63 x 400	V	V, BN	V, BN	3.33	1.51	15
2 ¾ x 16	69 x 400	V	V, BN	V, BN	3.85	1.75	13
3 x 16	75 x 400	V	V, BN	V, BN	4.55	2.06	11
3 ¼ x 16	82 x 400	V	V, BN	V, BN	5.00	2.27	10
3 ½ x 16	88 x 400	V	V, BN	V, BN	6.25	2.84	8

V = Plastic Film; PMP = Poly Mylar Poly Laminate Film (tampable);
AT, BN = Rigid Paper Tube
--- Not Available
Note: All dimensions and weights are nominal.

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

One year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.1D
ID Number: UN0241

US DOT REFERENCE NUMBER

EX-9305177

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

Enviroprime®

PRODUCT INFORMATION BROCHURE

Enviroprime offers the highest velocity of any commercially available explosive. The explosive contains a microbial innoculant that effectively bioremediates TNT, PETN, RDX and HMX explosives. When submerged in water for over one year, the microorganisms become active and begin to consume the explosive material.

ADVANTAGES

- High detonation velocity produces excellent seismic pulse images.
- Anaerobic bacteria are provided in a time release form, so that they are activated only after at least one year in the subsurface environment.
- Microbial nutrients are added to provide sufficient reducing power to degrade the unexploded charge if needed, yet not interfere with the explosive energy.

PROPERTIES

Density [g/cc]	Pressure [kb]	Water Resistance	VOD	
			[ft/s]	[m/s]
1.6	240	Excellent	27,000	8,300

PRIMING

Use a high-strength detonator (Static★Star®, E★Star® Seismic or equivalent).

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Enviroprime

STANDARD PACKAGING DETAILS

Cartridge Style	Cartridge Size*		Case Count	Case Weight
	[in]	[mm]		
Plastic Threaded Cartridges	2 ¼ x 1 lb	*	50	52 lb
Plastic Threaded Cartridges	2 ¼ x 2 ½ lb	*	20	52 lb
Plastic Threaded Cartridges	2 ¼ x 5 ½ lb	*	10	57 lb
Plastic Threaded Cartridges	*	60 x ½ kg	40	21.5 kg
Plastic Threaded Cartridges	*	60 x 1 kg	20	21.5 kg
Plastic Threaded Cartridges	*	60 x 2 kg	10	21.5 kg

** Available in other sizes upon request.*

STANDARD TECHNICAL DESCRIPTION

Cast explosive, bioremedian technology

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Indefinite from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN 0242

US DOT REFERENCE NUMBER

EX-1993030285

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

Enviroseis®

PRODUCT INFORMATION BROCHURE

Enviroseis is a detonator sensitive, high viscosity explosive packaged in paper shells or rigid plastic cartridges.

ADVANTAGES

- High detonation velocity produces excellent seismic pulse images.
- Does not contain molecular explosives, nitroglycerin or perchlorates.
- Predominate detonation by-products are water vapor, carbon dioxide and nitrogen.
- Desensitizes and decomposes in shorter time period as compared to conventional seismic explosives.

PROPERTIES

Density [g/cc]	Temperature Sensitivity	Pressure [kb]	Water Resistance	VOD	
				[ft/s]	[m/s]
1.16	-20 F / -29 C	100	Excellent	19,200	5,910

PRIMING

Use a high-strength detonator (Static★Star®, E★Star® Seismic or equivalent).

AUSTIN POWDER

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Enviroseis

STANDARD PACKAGING DETAILS

Cartridge Style	Cartridge Size		Cartridge Weight		Case Count	Case Weight	
	[in]	[mm]	[lb]	[kg]		[lb]	[kg]
Paper Tube	*	27 x 1/8 kg	.28	.13	160	44	20
Plastic Cartridge	*	51 x ¼ kg	.55	.25	80	44	20
Plastic Cartridge	*	51 x ½ kg	1.1	.50	40	44	20
Plastic Cartridge	*	51 x 1 kg	2.2	1.00	20	44	20
Plastic Cartridge	2 ¼ x 1.1 lb	*	1.1	.50	40	44	20
Plastic Cartridge	2 ¼ x 2 ½ lb	*	2.5	1.13	20	50	22.7
Plastic Cartridge	2 ¼ x 5 lb	*	5.0	2.27	10	50	22.7
Plastic Cartridge*	*	60 x ½ kg	1.1	.50	40	44	20
Plastic Cartridge*	*	60 x 1 kg	2.2	1.00	20	44	20
Plastic Cartridge*	*	60 x 2 kg	4.4	2.00	10	44	20

* 60 mm Plastic Cartridge has a threaded fast lock connector.

STANDARD TECHNICAL DESCRIPTION

Detonator sensitive emulsion

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

One year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.1D
ID Number: UN 0241

US DOT REFERENCE NUMBER

EX-9305177

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

HEET ® / Hydromite®
Packaged Blends

PRODUCT INFORMATION BROCHURE

Hydromite & HEET products are blasting agent mixtures of emulsion and ANFO packaged in woven poly-plastic cartridges.

ADVANTAGES

- Wide choice of energies to match blasting requirements.
- Develops excellent gas volume for heave displacement.
- Economical wet hole charge.
- Excellent water resistance in all grades (HEET dependent upon package integrity).
- Superior resistance to dynamic pre-compression.

PROPERTIES

Product	Density [g/cc]	RBS‡	VOD	
			[ft/s]	[m/s]
HEET 130	1.22	138	13,500	4,100
HEET 140	1.32	144	16,000	4,875
Hydromite 820	1.28	132	14,000	4,270
Hydromite 823	1.29	147	13,700	4,180
Hydromite 840	1.27	126	14,900	4,550
Hydromite 843	1.28	141	14,600	4,450
Hydromite 860	1.26	122	15,800	4,820
Hydromite 863	1.27	138	15,500	4,725

‡ *Energy is calculated using TIGER, a thermo-dynamic computer code used by Austin Powder Company. Other computer codes may give different values. ANFO = 100 @ 0.82 g/cc.*

PRIMING

These products are blasting agent explosives and must be in direct contact with an appropriate size cast booster (recommended minimum 1 lb). Additional primers may be required depending upon borehole or geological conditions.

AUSTIN POWDER

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HEET® / Hydromite Packaged Blends

STANDARD PACKAGING DETAILS

Cartridge Style	Cartridge Size (dia. x wt.)	
	Inch x lb	mm x kg
WPP	3 x 10	75 x 4.5
WPP	3 x 12	75 x 5.5
WPP	3 ½ x 15	90 x 6.8
WPP	3 ½ x 16	90 x 7.3
WPP	4 x 20	100 x 9.1
WPP	4 ½ x 25	114 x 11.4
WPP	5 x 30	127 x 13.6
WPP	5 ½ x 40	140 x 18.2
WPP	6 x 40	150 x 18.2
WPP	6 ½ x 50	165 x 22.7
WPP	7 x 50	178 x 22.7
WPP	7 ½ x 50	190 x 22.7
WPP	8 x 50	203 x 22.7
WPP	8 ½ x 50	216 x 22.7
WPP	9 x 50	229 x 22.7

WPP – Woven Polypropylene
Note: All dimensions and weights are nominal.

STANDARD TECHNICAL DESCRIPTION

Booster sensitive emulsion / ANFO blends

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Six months from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.5D
ID Number: UN0332

US DOT REFERENCE NUMBER

EX-1993050178

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

Hydromite® *Advance*

PRODUCT INFORMATION BROCHURE

Hydromite *Advance* bulk emulsion is specially formulated to provide the maximum advance in underground, underwater and other construction blasting applications.

ADVANTAGES

- 100% borehole coupling and high energy produce the maximum performance for each blast hole.
- Excellent water resistance and superior resistance to dynamic pre-compression assures performance even in the most critical situations.

PROPERTIES

Product	Density [g/cc]	RBS	VOD*		Fume Class	Minimum Diameter	
			[ft/s]	[m/s]		[in]	[mm]
Hydromite *Advance* 120 & 220	1.20	113	17,000	5,200	1	1 ¾ “	44
Hydromite *Advance* 125 & 225	1.25	117	18,000	5,500	1	2 ½ “	63

Hydromite *Advance* 200 series utilizes a mineral oil fuel to provide greater environmental compatibility.

RBS – Relative Bulk Strength (AN/FO @ 0.82 g/cc = 100)

**3” confined*

PRIMING

Hydromite *Advance* is a booster sensitive explosive and must be in direct contact with an appropriately sized Cast Booster or equivalent primer. Use with detonating cord is not recommended.

AUSTIN POWDER

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Hydromite *Advance*

STANDARD PACKAGING DETAILS
Not applicable.

STANDARD TECHNICAL DESCRIPTION
Booster sensitive bulk emulsion for underground, underwater and other construction blasting applications

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
Six months from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.5D
ID Number: UN0332

US DOT REFERENCE NUMBER
EX-2008120354

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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1/2/02 | r 01/31/2020

Hydromite® 880 Series

PRODUCT INFORMATION BROCHURE

Hydromite 880 Series is a blasting agent emulsion/anfo blend explosive with a putty like texture, packaged in plastic film cartridges.

ADVANTAGES

- Choice of energies to match rock conditions.
- Develops excellent gas volume for heave and displacement
- Good borehole coupling characteristics when cartridge is cut and tamped.
- Excellent water resistance in all grades.
- Superior resistant to dynamic pre-compression.

PROPERTIES

Product	Density [g/cc]	RBS‡	Water Resistance	VOD	
				[ft/s]	[m/s]
Hydromite 880	1.26	122	Excellent	15,800	4,850
Hydromite 883	1.27	138	Excellent	15,500	4,725
Hydromite 886	1.27	154	Excellent	15,300	4,630

‡ *Energy is calculated using TIGER, a thermo-dynamic computer code used by Austin Powder Company. Other computer codes may give different values. ANFO = 100 @ 0.82 g/cc.*

PRIMING

These products must be in direct contact with an appropriate size Red-D Prime™ or cast booster (recommended minimum 1/3 lb). Additional primers may be required depending upon borehole or geological conditions.

AUSTIN POWDER

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Hydromite 880 Series

STANDARD PACKAGING DETAILS

Cartridge Style	Cartridge Size		Cartridge Weight		Case Count 50 lb / 22.5 kg
	[in]	[mm]	[lb]	[kg]	
Plastic Film	2 x 16	50 x 400	2.38	1.08	21
	2 ¼ x 16	56 x 400	2.63	1.19	19
	2 ½ x 16	63 x 400	3.33	1.51	15
	2 ¾ x 16	69 x 400	4.17	1.89	12
	3 x 16	75 x 400	5.00	2.27	10
	3 ¼ x 16	81 x 400	5.56	2.52	9
	3 ½ x 16	88 x 400	7.14	3.24	7

Note: All dimensions and weights are nominal.

STANDARD TECHNICAL DESCRIPTION

Booster sensitive emulsion/anfo blend

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Six months from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.5D
ID Number: UN0332

US DOT REFERENCE NUMBER

EX-2005010243 Hydromite 880
EX-2005010258 Hydromite 883
EX-2005010259 Hydromite 886

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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1/2/02 | r 01/31/2020

Hydromite® Bulk Products

PRODUCT INFORMATION BROCHURE

Bulk hydromites are pumpable blends of Hydromite 1100 and Austinite® 15 that provide excellent water resistance and performance to meet any application requirements.

ADVANTAGES

- Loading bulk pumpable products can reduce the time needed to load shots increasing efficiency.

- In wet boreholes, Hydromite bulk products are pumped to the bottom of the borehole, displacing the water to providing 100% borehole coupling.

  Chemically sensitized products have a natural density gradient resulting in a higher density at the bottom of the borehole where the energy is needed the most.

PROPERTIES

Product	Density [g/cc]	VOD*		Water Resistance	Minimum Hole Diameter	
		[ft/s]	[m/s]		[in]	[mm]
Microsphere Sensitized:						
Hydromite 3200	1.28	16,220	4,945	Excellent	5	125
Hydromite 3400	1.27	17,660	5,400	Excellent	4	100
Hydromite 3600	1.26	17,660	5,400	Excellent	3 ½	87
Chemically Sensitized:						
Hydromite 4100	1.18	19,000	5,800	Excellent	2 ½	62
Hydromite 4400	1.18	18,000	5,500	Excellent	2 ½	62

**6" confined*

PRIMING

These products are booster sensitive explosives and must be in direct contact with an appropriate size cast booster. Additional primers may be required depending upon geological conditions and face height.

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Hydromite Bulk Products

STANDARD PACKAGING DETAILS
Not applicable.

STANDARD TECHNICAL DESCRIPTION
Pumpable booster sensitive bulk emulsion and emulsion / ANFO blend

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
These products are designed to be used as they are manufactured from the bulk truck.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.5D
ID Number: UN0332

US DOT REFERENCE NUMBER
EX-1993050178

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

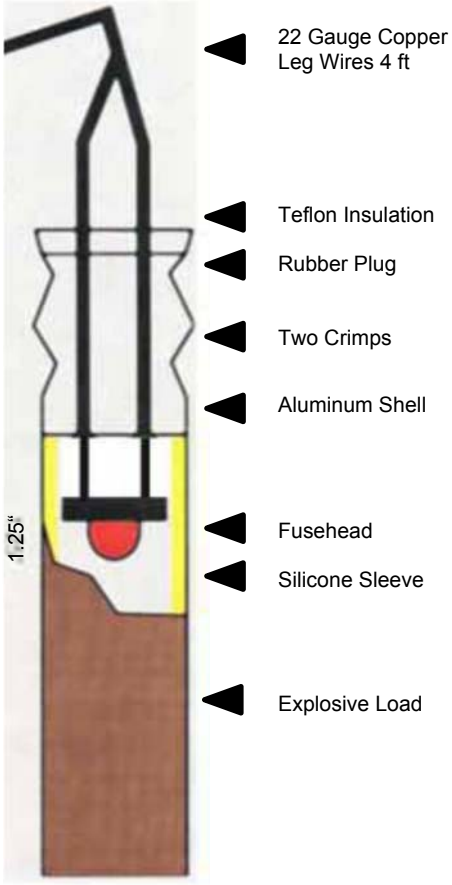
Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

Oil★Star® Detonators

A-2B

PRODUCT INFORMATION BROCHURE



PROPERTIES

A-2B	
Shell Length	32 mm / 1.25 “
Base Charge	5 grains RDX (0.325 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	0.8 ± 0.1 ohm + 0.27/0.32 ohm
High Temperature Performance	1 hr. at 350ºF
Pressure Rating per 24 Hours	1 hr. at 100 psi
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	78 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

Instantaneous RDX detonator

AUSTIN POWDER

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Oil★Star Detonators
A-2B

STANDARD PACKAGING DETAILS
Oil★Star A-2B detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-199511002

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

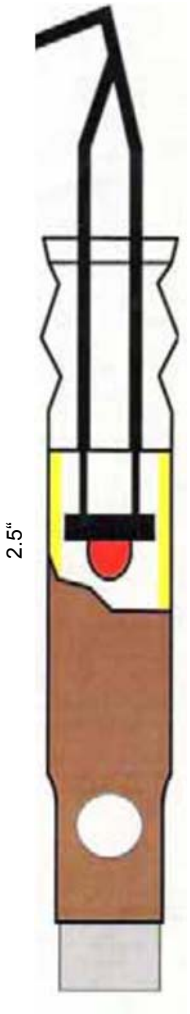
Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

03/02 | r 01/31/2020

Oil★Star® Detonators

A-84

PRODUCT INFORMATION BROCHURE



22 Gauge Copper Leg Wires 4 ft

Teflon Insulation

Rubber Plug

Two Crimps

Aluminum Shell

Fusehead

Silicone Sleeve

Explosive Load

Copper Connector

Fluid Disabling

Explosive Load

Aluminum Shell for Crimping to 80 grain cord

PROPERTIES

A-84	
Shell Length	64 mm / 2.5”
Base Charge	7.4 grains RDX (0.480 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	0.8 ± 0.1 ohm + 0.27/0.32 ohm
High Temperature Performance	1 hr. at 350ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	78 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

Fluid disabled resistorized instantaneous RDX detonator

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

Oil★Star Detonators
A-84

STANDARD PACKAGING DETAILS
Oil★Star A-84 detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255
UN0456

US DOT REFERENCE NUMBER
EX-199511002
EX-2014090049

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

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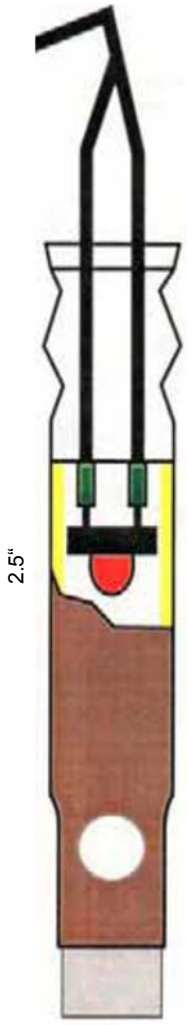
Oil★Star® Detonators

A-85

PRODUCT INFORMATION BROCHURE



- 22 Gauge Copper Leg Wires 4 ft
- Teflon Insulation
- Rubber Plug
- Two Crimps
- Aluminum Shell
- Two 27 ohm Resistors
- Fusehead
- Silicone Sleeve
- Explosive Load
- Copper Connector
- Fluid Disabling
- Explosive Load
- Aluminum Shell for Crimping to 80 grain cord

PROPERTIES

A-85	
Shell Length	64 mm / 2.5”
Base Charge	7.4 grains RDX (0.480 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
High Temperature Performance	1 hr. at 350ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

Fluid disabled resistorized instantaneous RDX detonator

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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Oil★Star Detonators
A-85

STANDARD PACKAGING DETAILS
Oil★Star A-85 detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255
UN0456

US DOT REFERENCE NUMBER
EX-199511002
EX-2014090049

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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Austin Powder Company, 25800 Science Park Drive
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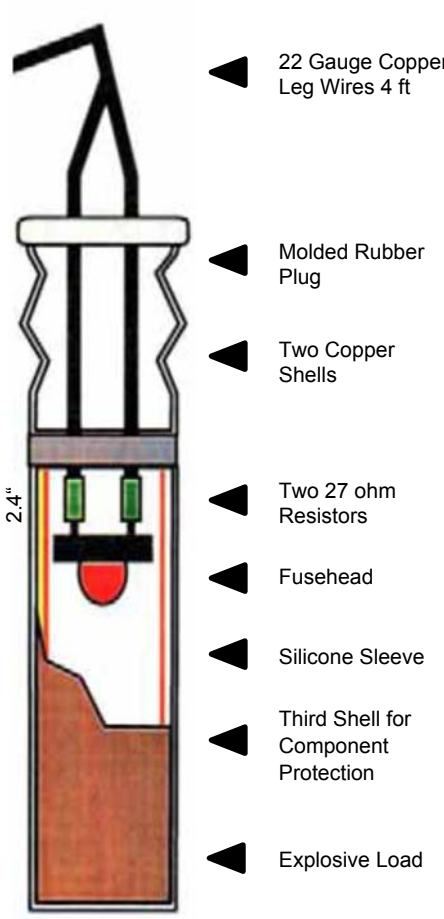
03/02 | r 01/31/2020

Oil★Star® Detonators

A-96

PRODUCT INFORMATION BROCHURE



PROPERTIES

A-96	
Shell Length	61 mm / 2.4 "
Base Charge	11 grains RDX (0.713 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
Pressure Resistance at 325ºF	15,000 PSI/1 hr.
High Temperature Performance	1 hr. at 325ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

High pressure resistorized instantaneous RDX detonator

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Austin Powder Company, 25800 Science Park Drive
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Oil★Star Detonators
A-96

STANDARD PACKAGING DETAILS
Oil★Star A-96 detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-199511002

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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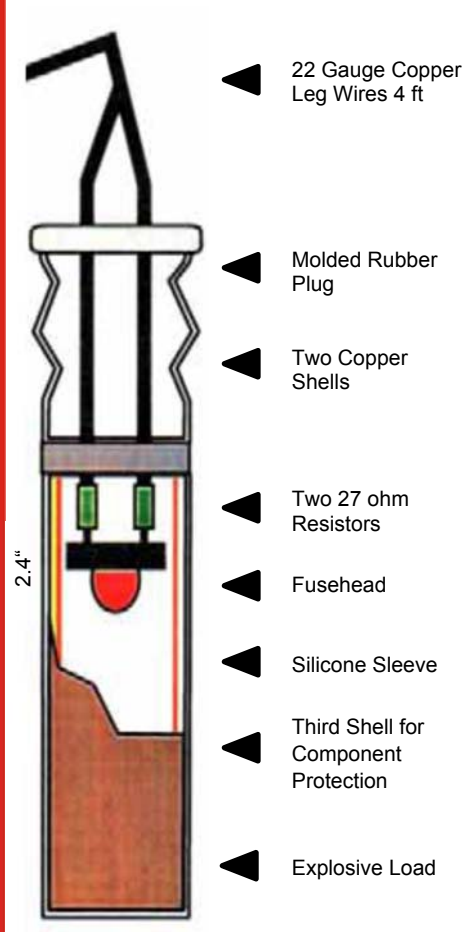
04/02 | r 01/31/2020

Oil★Star® Detonators

A-96 L

PRODUCT INFORMATION BROCHURE



PROPERTIES

A-96 L	
Shell Length	61 mm / 2.4 "
Base Charge	7 grains RDX (0.454 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
Pressure Resistance at 325ºF	15,000 PSI/1 hr.
High Temperature Performance	1 hr. at 325ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

High pressure resistorized instantaneous RDX detonator

AUSTIN POWDER

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Oil★Star Detonators
A-96 L

STANDARD PACKAGING DETAILS
Oil★Star A-96 L detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-199511002

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

04/02 | r 01/31/2020

Oil★Star® Detonators

A-105

PRODUCT INFORMATION BROCHURE

22 Gauge Copper Leg Wires 4 ft

Molded Rubber Plug

Two Copper Shells

Two 27 ohm Resistors

Fusehead

Silicone Sleeve

Third Shell for Component Protection

Explosive Load

Explosive Load

Aluminum Shell for Crimping to 80 grain cord

PROPERTIES

A-105	
Shell Length	90 mm / 3.5”
Base Charge	15 grains RDX (0.972 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
Pressure Resistance at 325ºF	15,000 PSI/1 hr.
Temp. Performance / Ambient Pressure	1 hr. at 325ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Nylon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

High pressure resistorized instantaneous RDX detonator

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

Oil★Star® Detonators
A-105

STANDARD PACKAGING DETAILS
Oil★Star A-105 detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-199511002

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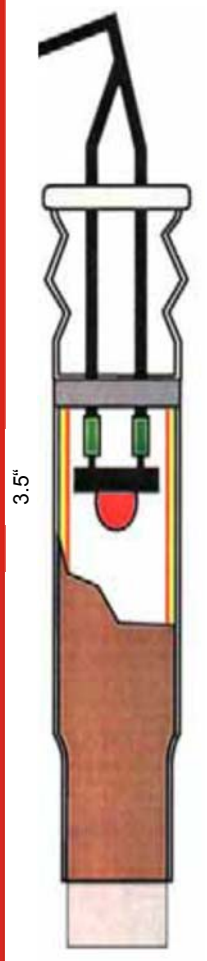
1/2/02 | r 01/31/20

Oil★Star® Detonators

A-105-100

PRODUCT INFORMATION BROCHURE



22 Gauge Copper Leg Wires 4 ft

Molded Rubber Plug

Two Copper Shells

Two 27 ohm Resistors

Fusehead

Silicone Sleeve

Third Shell for Component Protection

Explosive Load

Explosive Load

Aluminum Shell for Crimping to 100 grain cord

PROPERTIES

A-105-100	
Shell Length	90 mm / 3.5”
Base Charge	15 grains RDX (0.972 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
Pressure Resistance at 325ºF	15,000 PSI/1 hr.
Temp. Performance / Ambient Pressure	1 hr. at 325ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Nylon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

High pressure resistorized instantaneous RDX detonator

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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Oil★Star Detonators
A-105-100

STANDARD PACKAGING DETAILS
Oil★Star A-105-100 detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-199511002

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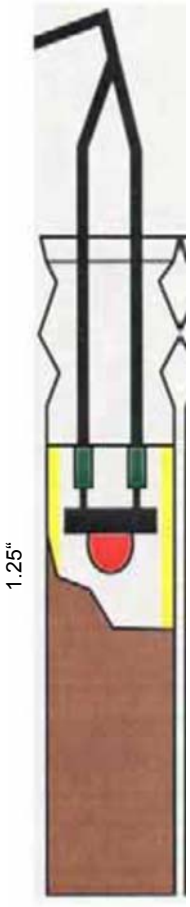
Oil★Star® Detonators

A-140

PRODUCT INFORMATION BROCHURE



22 Gauge Copper Leg Wires 4 ft

Teflon Insulation

Rubber Plug

Two Crimps

Aluminum Shell

Two 27 ohm Resistors

Fusehead

Silicone Sleeve

Explosive Load

PROPERTIES

A-140	
Shell Length	32 mm / 1.25”
Base Charge	5 grains RDX (0.325 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
High Temperature Performance	1 hr. at 350ºF
Pressure Rating	1 hr. at 100 psi
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

Resistorized instantaneous RDX detonator

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Oil★Star Detonators
A-140

STANDARD PACKAGING DETAILS
Oil★Star A-140 detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-199511002

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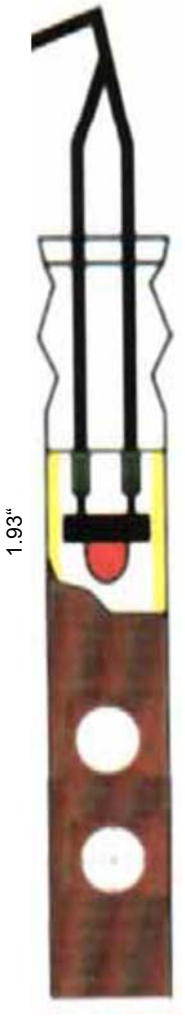
Oil★Star® Detonators

A-140 F

PRODUCT INFORMATION BROCHURE



PROPERTIES

A-140 F	
Shell Length	49 mm / 1.93”
Base Charge	5 grains RDX (0.325 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
High Temperature Performance	1 hr. at 350ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

DO NOT REMOVE TAPE UNTIL IMMEDIATELY PRIOR TO USE!

STANDARD TECHNICAL DESCRIPTION

Fluid disabled resistorized instantaneous RDX detonator

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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Oil★Star Detonators
A-140 F

STANDARD PACKAGING DETAILS
Oil★Star A-140 F detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-200006204
EX-2014090051

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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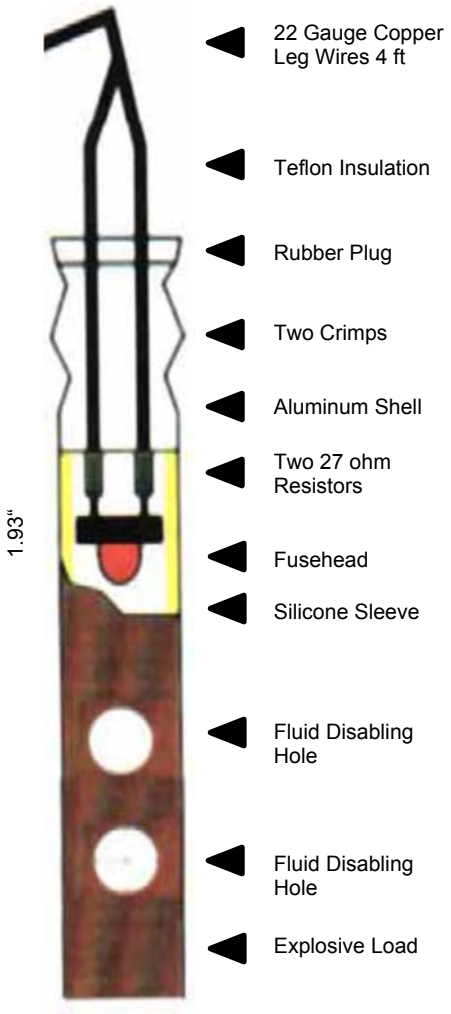
Oil★Star® Detonators

A-140 F & Block

PRODUCT INFORMATION BROCHURE



A-140 F Detonator

Block with Retaining Wire

PROPERTIES

A-140 F Detonator	
Shell Length	49 mm / 1.93"
Base Charge	5 grains RDX (0.325 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
Resistors in Series with Bridgewire	(2) 27 ohm
Leg to Leg Resistance Plus 0.032 for each foot of duplex wire	51 to 60 ohm + 0.27/0.32 ohm
High Temperature Performance	1 hr. at 350ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

ADVANTAGES

- Antistatic sleeve and spark gap protect against static electricity.
- Leg wires are high temperature Teflon insulated 22 gauge four feet long copper leg wires.

STANDARD TECHNICAL DESCRIPTION

Fluid disabled resistorized instantaneous RDX detonator

AUSTIN POWDER

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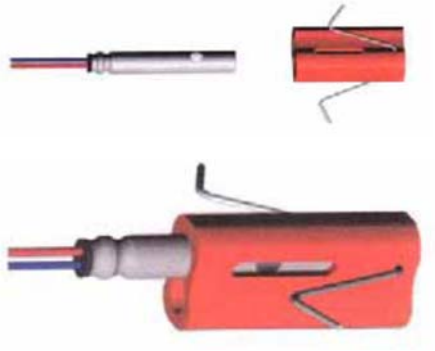
Oil★Star Detonators
A-140 F & Block

RDX Explosive

Following Your Company's Arming Procedure for Safe Explosive Handling and Arming of a Gun



Fluid Desensitized 350 ºF for 1 Hour

A-140 F & Block
Detonator & Block Assembly

- Place A-140 F Detonator into Safety Tube *before* removing the detonator shunt
- Connect the ground lead wire and the hot lead wire of the detonator to the gun
- *Remove the tape covering the fluid disabling holes of the detonator*
- Slide the detonator into the slotted hole of the block, aligning the holes with the slot. Detonators should bottom out on the retaining wire
- Slide cord through the cord hole of the block as you push the block into the gun
- To remove detonator, only pull on the shell of the detonator.

Never pull on the leg wires !

STANDARD PACKAGING DETAILS

Oil★Star A-140 F & Block detonators are packaged 22 detonators per inner package, 220 detonators per case.

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-199511002

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

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Oil★Star® Detonators

A-161

PRODUCT INFORMATION BROCHURE

PROPERTIES

A-161	
Detonatorl Length	53 mm / 2.1”
Base Charge	6.2 grains HNS (0.402 gram)
No-Fire Current (approx.) (Based on a constant voltage for 1 minute)	0.2 amperes
All-Fire Current (approx.)	0.8 amperes
Minimum Firing Current (approx.)	0.5 amperes
51 to 60 Ohm Resistance	API 51 Ohm
High Temperature Performance	1 hr. at 460ºF
Electrostatic Sensitivity Energy Value (Double leg to shell capacitor discharge energy level)	781 mJ

- Desensitized in Fluid After 5 Minutes
- HNS Explosive Base Load – 6.2 Grains
- Rated to 460ºF for 1 hour

ADVANTAGES

- Teflon insulated 22 gauge copper leg wires – four feet
- Molded rubber plug
- Aluminum shell with two fluid holes
- Aluminum tape covering fluid holes

DO NOT REMOVE TAPE UNTIL IMMEDIATELYL PRIOR TO USE !

STANDARD TECHNICAL DESCRIPTION

Ultra high temperature resistorized fluid disabled detonator

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

Oil★Star Detonators
A-161

STANDARD PACKAGING DETAILS
Oil★Star A-161 F detonators are packaged 50 detonators per inner package, 500 detonators per case.

STORAGE
Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE
For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA
UN CLASSIFICATION
Shipping Name: Detonators, electric, for blasting
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER
EX-200107065

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

03/02 | r 01/31/2020

Overbreak Control Products

PRODUCT INFORMATION BROCHURE

Emuline® and Red-D Lite-E™ are explosive products especially designed for controlled blasting applications requiring de-coupling of the explosive charge such as pre-splitting, trim blasting or smoothwall technique.

ADVANTAGES

- Emuline is a continuous length of emulsion packaged in tough film cartridges with an attached line of detonating cord. The continuous length can be easily cut to desired length.

- Red-D Lite-E is an emulsion packaged in rigid paper cartridges with couplers that quickly connect together.

PROPERTIES

Product	Density [g/cc]	Pressure [kb]	Water Resistance	VOD	
				[ft/s]	[m/s]
Emuline	1.05	57	Excellent	14,000	4,270
Red-D Lite-E	1.06	58	Excellent	15,000	4,570

PRIMING

Emuline: Use a high strength detonator (Rock★Star®, Shock★Star® or equivalent) or A-Cord™ (25 gr/ft) detonating cord secured to the product's attached detonating cord.

Red-D Lite-E: Use a high strength detonator (Rock★Star, Shock★Star or equivalent). If product temperature is below 20° F (-6° C), prime with a minimum of a Gold Nugget™ (8 gm) cast booster. This product is not designed for use with any strength of detonating cord.

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Overbreak Control Products

STANDARD PACKAGING DETAILS

Product	Cartridge Size		Cartridge Weight		Case Quantity 50 lb / 22.5 kg	
	[in]	[mm]	[lb/ft]	[kg/m]	[ft]	[m]
Emuline	7/8 x 16	22 x 400	0.31	0.47	163 ± 6	49.7 ± 1.8
Emuline	1 ¼ x 16	32 x 400	0.59	0.88	87 ± 3	26.5 ± 0.9

Product	Cartridge Size		Cartridge Weight		Case Quantity 50 lb / 22.5 kg
	[in]	[mm]	[lb/ft]	[kg/m]	[Ctg]
Red-D Lite-E	7/8 x 24	22 x 600	0.30	0.43	83

Note: All dimensions and weights are nominal.

STANDARD TECHNICAL DESCRIPTION

Detonator sensitive emulsion

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

One year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.1D
ID Number: UN0241

US DOT REFERENCE NUMBER

EX-9305177 (Emuline)
EX-1993050177 (Red-D Lite-E)

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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Permissible Products

PRODUCT INFORMATION BROCHURE

Austin Powder Company has developed a variety of permissible products to meet virtually every application. Each of these products offer superior performance and are MSHA approved for use in underground coal mines or where a permissible explosive is desired.

***Coalmex*™** is a detonator sensitive emulsion explosive with a paste like consistency packaged in plastic film cartridges.

***Red-D Gel-B*™** is a high velocity dynamite designed for blasting hard coal and difficult rock applications, such as overcasts and undercasts.

***Rockbuster II*™** is a non-incendive sheathed explosive for unconfined blasting of large boulders and rock slabs in underground coal mines.

ADVANTAGES

Coalmex

- All Purpose emulsion explosive for blasting coal, partings, rock binders and overcasts.
- Resistant to dynamic pre-compression.

Red-D Gel-B

- High density and velocity dynamite.
- Dependable under extreme conditions.
- Delivers high energy for difficult blasting.

Rockbuster II

- Completely enclosed unit does not require drilling or stemming.
- Easy to handle, prime and place.
- Flexible package conforms to the surface.
- Saves money by reducing longwall downtime.

PROPERTIES

Product	Density [g/cc]	RBS‡	Water Resistance	VOD	
				[ft/s]	[m/s]
Coalmex	1.12	130	Excellent	16,800	5,120
Red-D Gel-B	1.35	166	Excellent	16,000	4,876
Rockbuster	NA	NA	Excellent	15,750	4,800

‡ *Energy is calculated using TIGER, a thermo-dynamic computer code used by Austin Powder Company. Other computer codes may give different values. ANFO = 100 @ 0.82 g/cc.*

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Permissible Products

PRIMING

Use a high strength permissible detonator (Coal★Star®, Coal Mine Delay, Coal Mine Construction Delay, or equivalent).

PACKAGING

Product	Cartridge Size		Case Count 50 lb / 20 kg
	[in]	[mm]	
Coalmex	1 ¼ x 16	32 x 400	60
	1 ½ x 16	38 x 400	48
Red-D Gel-B	1 ¼ x 8	32 x 200	88
	1 ¼ x 16	32 x 400	44
Rockbuster II	13 x 8.5 x 3.5	330 x 215 x 89	4

Note: All dimensions and weights are nominal.

STANDARD TECHNICAL DESCRIPTION

MSHA approved explosives for underground coal and "gassy" mines

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

One year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Coalmex
Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.1D
ID Number: UN0241

Red-D Gel-B
Shipping Name: Explosive, Blasting, Type A
Class & Division: 1.1D
ID Number: UN0081

Rockbuster
Shipping Name: Rockbuster II
Class & Division: 1.1D
ID Number: UN0081

US DOT REFERENCE NUMBER

Coalmex (EX-1993050177)
Red-D Gel-B (EX-9303286)
Rockbuster II (EX-9303286)

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

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Red-D Prime™

PRODUCT INFORMATION BROCHURE

Red-D Prime is a detonator sensitive emulsion explosive with a putty like texture packaged in plastic film or rigid paper tube cartridges for priming small to medium diameter blast holes

ADVANTAGES

- Resistant to dynamic pre-compression
- Good detonation pressure
- Economical primer for:
  - Austinite® Series (ANFO, WR-300)
  - Hydromite® Advance (pumpable bulk emulsion)
  - Hydromite 600 & 880 Series (medium diameter cartridges)

PROPERTIES

Density [g/cc]	Pressure [kb]	Water Resistance	VOD	
			[ft/s]	[m/s]
1.15	91	Excellent	18,500	5,640

PRIMING

Use a high strength detonator (Rock★Star®, Shock★Star® or equivalent). If product temperature is below 0°F (-17°C), prime with a minimum of a Gold Nugget ™ (8 gm) cast booster. This product is not designed for use with any strength of detonating cord.

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Red-D Prime

STANDARD PACKAGING DETAIL

Cartridge Style	Cartridge Size		Cartridge Weight		Case Count 50 lb / 22.5 kg
	[in]	[mm]	[lb]	[kg]	
Plastic Film Or Rigid Paper Tube	1 ¼ x 8	32 x 200	0.42	0.19	118
	1 ½ x 8	38 x 200	0.58	0.26	86
	1 ¾ x 8	44 x 200	0.83	0.38	60
	2 x 8	50 x 200	1.04	0.47	48
	3 x 8	75 x 200	2.2	1.0	23

Note: All dimensions and weights are nominal.

STANDARD TECHNICAL DESCRIPTION

Detonator sensitive emulsion

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

One year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.1D
ID Number: UN0241

US DOT REFERENCE NUMBER

EX-1993050177

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
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1/2/02 | r 01/31/2020

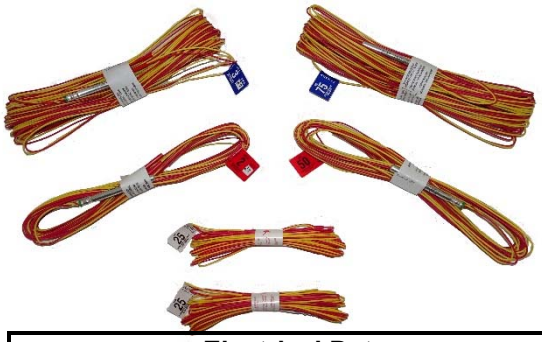
Rock★Star®Detonators

PRODUCT INFORMATION BROCHURE

Rock★Star electric detonators are designed to provide the precise control necessary to produce accurate and consistent blasting results in a variety of blasting applications in the mining, quarrying and construction industries.

ADVANTAGES

- 900 mg PETN base charge far exceeds the standard #8 strength detonator.
- Industries strongest aluminum shell reduces the possibility of water hammer effect.
- HDPE insulation for added protection from extraneous currents.
- Wide selection of delay intervals provide greater flexibility in blast design.



Electrical Data	
No Fire Current	0.25 amps
All Fire Current	1.00 amps
Series Ignition Current	1.50 amps
No Fire Impulse	2.5 mJ/ohms
All Fire Impulse	5.5 mJ/ohms
Electrostatic Sensitivity	
Double Wire to Shell	10 kV/300 pF/15 mJ
Pin to Pin	10 kV/300 pF/15 mJ

PROPERTIES

Rock★Star MS Delay Sequence													
Delay #	0	1	2	3	4	5	6	7	8	9	10	11	12
MS Time	0	25	50	75	100	125	150	175	200	225	250	275	300
Delay #	13	14	15	16	17	18	19	20	22	24	26	28	30
MS Time	325	350	375	400	425	450	475	500	600	700	800	900	1000

Length	**[ft]**	16	20	24	30	40	60	80
	[m]	4.9	6.1	7.3	9.1	12.2	18.3	24.4
Total Resistance [Ω]*		1.6	1.78	1.9	1.65	1.85	2.25	2.7

Rock★Star LP Delay Sequence*														
Delay #	0	1	2	3	4	5	6	7	8	9	10	11	12	13
MS Time	0	50	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500

** Available in 20' length only*

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Rock★Star Detonators

STANDARD TECHNICAL DESCRIPTION

Electric millisecond and long period delay detonators

STANDARD PACKAGING DETAIL

Rock★Star MS and LP Packaging						
Length		Case Weight		Case Count	NEQ per Case [gr]	Wire Configuration
[ft]	[m]	[lb]	[kg]			
16	4.9	6.1	2.8	40	40	Short Fold
20	6.1	6.6	3.0	40	40	Short Fold
24	7.3	5.5	2.5	40	40	Short Fold
30	9.1	6.6	3.0	15	15	Long Fold
40	12.2	6.6	3.0	15	15	Long Fold
60	18.3	6.6	3.0	10	10	Long Fold
80	24.4	7.7	3.5	10	10	Long Fold

** All Rock ★Star 24' (7.3 m) and less, have 22 AWG (0.6 mm) copper wire.*
*** All Rock ★Star 30' (9.1 m) and more, have 20 AWG (0.8 mm) copper wire.*

Rock★Star MS and LP Recommended Firing Current				
Circuit Type	Single Detonator	Single Series	Parallel Series	Parallel
DC [Amps]	0.5	1.5	1.5	1.0–10.0/Detonator
AC [Amps]	0.5	2.0	2.0	1.0–10.0/Detonator

Case Dimension:	11 ¼" x 7 5/8" x 5"
	286mmx x194mm x 127mm

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-2014020188

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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2/22/06 | 01/31/2020

Seis-Gel™

PRODUCT INFORMATION BROCHURE

Seis-Gel is a high velocity, 60% seismic explosive. The special formulation of this nitroglycerin based product assures reliable detonation after prolonged immersion under high hydrostatic pressures. Seis-Gel is characterized by high velocity and consistent performance under severe winter conditions or in hot, humid areas.

ADVANTAGES

- Detonates consistently to produce a sharp pulse of seismic energy.
- Available in plastic threaded cartridges or paper shell.
- Ideal for deep hole work and prolonged sleep time.

PROPERTIES

Density [g/cc]	Pressure [kb]	Water Resistance	VOD	
			[ft/s]	[m/s]
1.5	115	Excellent	20,000	6,100

PRIMING

Use a high-strength detonator (Static★Star, E★Star Seismic or equivalent).

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Seis-Gel

PACKAGING

Cartridge Style	Cartridge Size*		Case Count	Case Weight
	[in]	[mm]		
Paper Shell	*	51 x ¼ kg	80	20 kg
Paper Shell	*	51 x ½ kg	40	20 kg
Paper Shell	*	51 x 1 kg	20	20 kg
Paper Shell	*	51 x 2 kg	10	20 kg
Plastic Threaded Cartridge	2 ¼ x 1 lb	*	50	50 lb
Plastic Threaded Cartridge	2 ¼ x 2 ½ lb	*	20	50 lb
Plastic Threaded Cartridge	2 ¼ x 5 lb	*	10	50 lb
Plastic Threaded Cartridge	*	60 x ½ kg	40	20 lb
Plastic Threaded Cartridge	*	60 x 1 kg	20	20 lb
Plastic Threaded Cartridge	*	60 x 2 kg	10	20 lb

STANDARD TECHNICAL DESCRIPTION

60% high velocity seismic dynamite

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Two years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type A
Class & Division: 1.1D
ID Number: UN 0081

US DOT REFERENCE NUMBER

EX-1984110031

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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1/2/02 | r 01/31/2020

Seismic Detonating Cord

PRODUCT INFORMATION BROCHURE

Austin Powder manufacturers a wide variety of detonating cord to meet the requirements of the seismic industry. Detonating cord is used to initiate detonator sensitive seismic explosives. Detonating cord is also used to provide a path of initiation for non-electric initiation. Detonating cord has a core of PETN (pentaerythritol tetranitrate) encased in multiple polypropylene yarns, over-extruded with a polyethylene jacket and high strength textile yarns.

ADVANTAGES

- Water and abrasion resistant.
- High tensile strength.
- Color coded for easy identification.
- Electronically and mechanically inspected.
- Insensitive to extraneous current.
- Assures reliable non-electric initiation.
- Ideally suited for use with Static★Star.

STANDARD TECHNICAL DESCRIPTION

Lite Line® : Downline under all but the most severe conditions.

A-Cord™ : Small, medium and large hole downlines.

50 Reinforced ™ : Excellent general purpose detonating cord for reliable blast initiation under virtually all conditions.

100 Grain : All detonating cords are available with *"FS" (Flash Suppresant outer jacket)* upon request.

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Seismic Detonating Cord

PROPERTIES and STANDARD PACKAGING DETAIL

Product Name	Grain Load		Outside Diameter [in]	Tensile Strength [lb]	Case Count	Weight [lb]	Color
	[gr/ft]	[g/m]					
Lite Line	15	3.2	0.155 +/- 0.015	230	(2) 2000' Spools	30	Pink
A-Cord	25	5.3	0.165 +/- 0.015	230	(2) 1000' Spools	22	Green
50 Reinforced	50	10.6	0.197 +/- 0.015	250	(2) 1000' Spools	30	Yellow
100 Grain	100	20.0	0.220 +/- 0.020	175	(1) 1000' Spool	57	Red

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Cord, Detonating
Class & Division: 1.1D
ID Number: UN 0065

US DOT REFERENCE NUMBER

EX-9303282

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1/2/02 | r 01/31/2020

Seisprime™

PRODUCT INFORMATION BROCHURE

Seisprime is formulated of a composite of high density, high velocity molecular explosives. Seisprime is engineered to produce over 240 kilo bars of detonation pressure. The rigid threaded plastic Seisprime cartridge is designed to accept an anchor point or top anchor, and is provided with two detonator wells. Seisprime has the longest “sleep time” of any commercial seismic explosive. The formulation suits the requirements of mini-hole, as well as deep hole seismic exploration. Use a high-strength seismic detonator of 720mg PETN or greater for reliable initiation.

ADVANTAGES

- 24,500 fps detonation velocity produces excellent seismic pulse images.
- Formulated to achieve a higher detonation temperature and lower post detonation gas production than standard seismic pentolite, dynamites or emulsions.
- Does not contain nitroglycerine or perchlorates.
- Full function reliability in all typical geophysical hole depths/water conditions.

PROPERTIES

Velocity of Detonation (mps / fps)	Detonation Pressure* (kilo bars)	Total Gas Generation* (liters / kg)	Energy* (MJ/kg)	Density (grams/cc)	Water Resistance
7,538 / 24,500	240	619	6.33	1.73	Excellent

*Detonation pressure, total gas generation and energy values are calculated using Tiger ™, a well established thermodynamic computer code. Other computer codes may give different values.

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Seisprime

STANDARD PACKAGING DETAIL

Product (kg / lbs.)	Cartridge Size* (mm / in.)	Quantity per case	Case Weigh (kg / lbs.)	Case Size (cm / inches)
Seisprime (0.5 / 1.1)	57 / 2 ¼	40	21.5 / 47.4 lb	32.4 x 44.4 x 29.8 12 ¾ x 17 ½ x 11 ¾
Seisprime (1.0 / 2.2)	57 / 2 ¼	20	21.5 / 47.4 lb	32.4 x 44.4 x 29.8 12 ¾ x 17 ½ x 11 ¾
Seisprime (2.0 / 4.4)	57 / 2 ¼	10	21.5 / 47.4 lb	33 x 78.1 x 11.7 13 x 30 ¾ x 4 ⅝
Seisprime (2.5 / 5.5)	57 / 2 ¼	10	25.9 / 57.0 lb	33 x 78.1 x 11.7 13 x 30 ¾ x 4 ⅝

** Available in other sizes upon request.*

STANDARD TECHNICAL DESCRIPTION

High-density molecular explosive

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Indefinite from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN 0242

US DOT REFERENCE NUMBER

EX-1993030285

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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1/2/02 | r 01/31/2020

Shock★Star ® Dual-Delays

PRODUCT INFORMATION BROCHURE

Shock★Star Dual-Delays combine In-Hole Delays and Quick-Relay Connectors in one product. This combination offers convenience for storage and inventorying of one product instead of two and often reduces space requirements for transportation. Connecting of blast patterns is generally faster with Dual-Delays as fewer connections are required in total. Additionally, fewer individual products used in the blast pattern reduces clutter at connection points and makes visual inspections easier. For millisecond delay blasting, Dual-Delays are available in a variety of delay configurations.

ADVANTAGES

- 900 mg base charge of PETN to ensure strong initiation energy under even the most extreme conditions (in-hole detonator only).
- Delay composition encased in a zinc jacket to prevent performance loss due to transient pressure from nearby detonating holes.
- Equipped with a tear-proof color-coded delay tag that lists DSC, delay time, delay period and length of the detonator.
- Manufactured with bright yellow shock tube for high visibility.
- Surface connector has eight tube capacity and is color-coded to surface delay time.
- Locking tabs positioned on the side of the block snap closed, securely locking tubing in place.

STANDARD TECHNICAL DESCRIPTION

Non-electric, millisecond delay detonators

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Shock★Star Dual-Delays

STANDARD PACKAGING DETAILS

Dual-Delay Detonators (DDD)

Length (ft)	Length (m)	Coil Style	Quantity	NEQ Grams
12	3.7	Fast 8	70	105
16	4.9	Fast 8	70	105
20	6.1	Fast 8	60	90
24	7.3	Fast 8	60	90
30	9.2	Fast 8	50	75
40	12.2	Fast 8	50	75
50	15.3	Fast 8	40	60
60	18.3	Fast 8	30	45
80	24.4	Fast 8 X	30	45
100	30.5	Fast 8 X	20	30
120	36.6	Fast 8 X	20	30
140	42.7	Fast 8 X	20	30
160	48.8	Spool	8	12
225	68.6	Spool	8	12

Available Delay Configurations		
17/350	25/350	42/350
17/375	25/375	42/375
17/450	25/450	42/450
17/475	25/475	42/475
17/500	25/500	42/500
17/700	25/700	42/700
Long Period (LP) – 200/5000		

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within three years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators Assemblies, Non-Electric
Class & Division: 1.4B
ID Number: UN 0361

US DOT REFERENCE NUMBER

EX-2012070728
EX-2012081112

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

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1/2/02 | r 08/28/20

Shock★Star® LP Detonators

PRODUCT INFORMATION BROCHURE

Shock★Star long period detonator products include LP In-Hole Delays and LP Dual-Delay Detonators.

Shock★Star LP In-Hole Delays are available in a sequence of 26 whole number periods from instantaneous (0 ms) to 9600 ms. Austin's LP delay sequence is appropriate for applications such as tunneling and shaft or raise mining where long delays are required between holes to allow for movement of broken rock. They are designed to be used as down-hole detonators for the initiation of cast boosters, high explosives or pneumatically loaded AN/FO. In-Hole delays come equipped with a T-Connector for compatibility with detonating cord initiation.

Shock★Star LP Dual-Delays with the 200/5000 ms configuration are designed to allow the efficiency of dual-delay detonators to be used in LP delay applications. They achieve high inventory efficiency by replacing an entire series of delay detonators with a single product. Dual-Delays are equipped with the patented eight tube capacity Quick-Relay Connector with a white colored end cap for better visibility in low light workplaces

ADVANTAGES

- 900 mg base charge of PETN to ensure strong initiation energy under even the most extreme conditions (down-hole detonator only).
- Delay composition encased in a zinc jacket to prevent performance loss due to transient pressure from nearby detonating holes.
- Equipped with a tear-proof delay tag that lists DSC, delay time, delay period and length of the detonator.
- Manufactured with bright yellow shock tubing for high visibility.
- Surface connector has eight tube capacity and is color-coded to surface delay time.

LP In-Hole Delays

LP Dual Delays

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Shock★Star® LP Detonators

STANDARD TECHNICAL DESCRIPTION

Non-electric, long period delay detonators

STANDARD PACKAGING DETAIL

LP IN-HOLE DELAYS LP - IHD				
Length		Coil Style	Quantity	NEQ Grams
(ft)	(m)			
8	2.4	Lariat	180	180
12	3.7	Lariat	150	150
16	4.9	Lariat	120	120
20	6.1	Lariat	120	120
24	7.3	Lariat	80	80
LP DUAL-DELAYS LP-DDD				
Length		Coil Style	Quantity	NEQ Grams
(ft)	(m)			
12	3.7	Fast 8	70	105
16	4.9	Fast 8	70	105
24	7.3	Fast 8	60	90

Available Periods – MS Delays

Period#	0	1	2	3	4
Delay, ms	0	200	400	600	800
Period#	5	6	7	8	9
Delay, ms	1000	1200	1400	1600	1800
Period#	10	11	12	13	14
Delay, ms	2000	2500	3000	3500	4000
Period#	15	16	17	18	19
Delay, ms	4500	5000	5500	6000	6500
Period#	20	21	22	23	24
Delay, ms	7000	7500	8000	8500	9000
Period#	25				
Delay, ms	9600				

LP – Dual Delay	200ms / 5000ms

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within one year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators Assemblies, Non-Electric
Class & Division: 1.1B LP IHD / 1.4B LP-DDD
ID Number: UN 0360

US DOT REFERENCE NUMBER

EX-2012070727
EX-2012070728
EX-2012081113
EX-2012081112

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1/2/02 | r 01/31/2020

Shock★Star® MS Detonators

PRODUCT INFORMATION BROCHURE

Shock★Star MS Series In-Hole Delays are available in a sequence of 31 whole number periods from instantaneous (0 ms) to 1000 ms. They are designed to be used as down-hole detonators for the initiation of cast boosters, high explosives or pneumatically loaded ANFO. In-Hole Delays come equipped with a T-Connector for compatibility with detonating cord initiation or can be initiated by an electric or non-electric detonator or approved shock tube starter device.

ADVANTAGES

- 900 mg base charge of PETN to ensure strong initiation energy under even the most extreme conditions.
- Delay composition encased in a zinc jacket to prevent performance loss due to transient pressure from nearby detonating holes.
- Equipped with a tear-proof delay tag that lists DSC, delay time, delay period and length of the detonator.
- Manufactured with bright yellow shock tubing for high visibility.

STANDARD TECHNICAL DESCRIPTION

Non-electric, millisecond delay detonators

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Shock★Star® MS Detonators

STANDARD PACKAGING DETAIL

IN-HOLE MS DETONATORS				
Length		Coil Style	Quantity	NEQ Grams
(ft)	(m)			
12	3.7	Fast 8	70	70
16	4.9	Fast 8	70	70
20	6.1	Fast 8	60	60
30	9.2	Fast 8	60	60
40	12.2	Fast 8	50	50
50	15.3	Fast 8	40	40
60	18.3	Fast 8	40	40
80	24.4	Fast 8X	30	30
100	30.5	Fast 8X	20	20
120	36.6	Fast 8X	20	20
130	39.7	Spool	10	10
150	45.8	Spool	10	10
160	48.8	Spool	10	10
180	54.9	Spool	10	10
200	61.0	Spool	10	10

Available Periods – MS Delays

Period#	0	1	2	3	4	5
Delay (ms)	0	25	50	75	100	125
Period#	6	7	8	9	10	11
Delay (ms)	150	175	200	225	250	275
Period#	12	13	14	15	16	17
Delay (ms)	300	325	350	375	400	425
Period#	18	19	20	22	24	26
Delay (ms)	450	475	500	600	700	800
Period#	28	30				
Delay (ms)	900	1000				

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within three years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators Assemblies, Non-Electric
Class & Division: 1.1B, 1.4B (depending on case count)
ID Number: UN 0361

US DOT REFERENCE NUMBER

EX-2012070727
EX-2012081113

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Shock★Star® Signal Transmission Lines

PRODUCT INFORMATION BROCHURE

Shock★Star Surface Connectors include Lead-In-Line, Quick★Start and STD (shock tube with detonator).

Shock★Star Lead-In-Line is used to allow a completely non-electric blasting system from the Blaster's point of initiation all the way through the blast. Lead-In-Line permits a single splice free signal line between the Blaster and the blast pattern. Polyethylene splicers are included with each case of Lead-In-Line for connecting the shock tube's open end to a non-electric detonator used for starting the blast.

Shock★Star Quick★Start is equipped with a Quick Relay Connector detonator for convenient splice-free starting at the first hole in a shock tube blast pattern.

Shock★Star STDs are used for starting detonating cord trunklines.

ADVANTAGES

- Constructed from Austin's three layered shock tube with a white colored jacket for good visibility and differentiation from delay detonator assemblies.
- Initiate consistently and silently at 6,200 ft/s (1,900 m/s)
- Packaged on sturdy spools for durability during shipping and multiple uses.

STANDARD TECHNICAL DESCRIPTION

Shock tube products for non-electric lead-in from blaster's initiation point to blast site.

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Shock★Star Signal Transmission Lines

STANDARD PACKAGING DETAILS

→ Q Quick★Start (200 mg) ★ STD – (450 mg)				
Length		Coil Style	Quantity	NEQ Grams
(ft)	(m)			
200	61.0	Spool	8	14
500	152.5	Spool	4	13
1000	305.0	Spool	2	12
2500	762.5	Spool	2	28
Lead-In-Line - LIL				
Length		Coil Style	Quantity	NEQ Grams
(ft)	(m)			
200	61.0	Spool	8	14
500	152.5	Spool	4	13
1000	305.0	Spool	2	12
2500	762.5	Spool	2	28

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within one year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name:

Articles, Explosive, n.o.s. (Lead-In-Line)
Detonator Assemblies, Non-Electric (STD)

Class & Division:

1.4S (Lead-in-Line)
1.4B (STD)

ID Number:

UN 0349 (Lead-In-Line)
UN 0361 (STD)

US DOT REFERENCE NUMBER

EX-2004040259 (200-1000 ft spool Lead-In-Line)
EX-1994040156 (2,500 ft. spool Lead-In-Line)
EX-2012091493 (QRC, Quick★Start)
EX-2001030064 (STD, QRC)

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1/2/02 | r 01/31/2020

Shock★Star® Surface Connectors

PRODUCT INFORMATION BROCHURE

Shock★Star Surface Connectors include Quick-Relay Connectors and Surface Delay Connectors.

Shock★Star Quick-Relay Connectors are especially designed for the initiation of other shock tube detonators as a delay between holes or decks within a hole. Quick-Relay Connectors are equipped with connector blocks able to contain 8 outgoing shock tubes yet have a lowered base charge to reduce noise levels and shrapnel cut-off concerns. These detonators are available in 9 delays from instantaneous (0 ms) to 200 ms. **(Quick-Relay Connectors should never be used to attempt initiation of detonating cord)**.

Shock★Star Surface Delay Connectors are powerful, versatile detonators designed for compatibility with both shock tube and detonating cord initiation systems. Connector blocks are able to hold up to 8 outgoing shock tubes or initiate 10 to 200 grain detonating cord. These detonators are available in 8 delays from instantaneous (0 ms) to 200 ms.

ADVANTAGES

- Connector blocks color-coded to the delay time of the detonator.
- Equipped with a tear-proof delay tag that lists DSC, delay time and length of the detonator as well as being color coded to match the connector block.
- Manufactured with red shock tubing for easy differentiation from down-hole detonators when visually inspecting a connected blast pattern.

Quick-Relay Connector

Surface Delay Connector

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Shock★Star® Surface Connectors

STANDARD TECHNICAL DESCRIPTION

Non-electric, millisecond delay detonators for inter-deck, inter-hole or inter-row connections

STANDARD PACKAGING DETAILS

Quick Relay Connectors QRC & SDC				
Length		Coil Style	Quantity	NEQ Grams
(ft)	(m)			
12	3.7	Lariat	100	50
20	6.1	Lariat	100	50
30	9.2	Lariat	80	40
40	12.2	Lariat	60	30
50	15.3	Lariat	40	20
60	18.3	Lariat	40	20

Quick Relay Color Codes	
9 ms	Green
17 ms	Yellow
25 ms	Red
33 ms	Orange
42 ms	White
67 ms	Light Blue
100 ms	Purple
200 ms	Black

H-PAK Optional Packaging				
Length		Coil Style	Quantity	NEQ Grams
(ft)	(m)			
12	3.7	Lariat	15	7.5
20	6.1	Lariat	15	7.5
30	9.2	Lariat	10	5
40	12.2	Lariat	10	5
50	15.3	Lariat	10	5
60	18.3	Lariat	10	5

Quick Relay Connector Available Delays			
9 ms	17 ms	25 ms	33 ms
42 ms	67 ms	100 ms	200 ms
Surface Delay Available Delays			
9 ms	17 ms	25 ms	42 ms
67 ms	100 ms	200 ms	

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within one year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonator Assemblies, Non-Electric
Class & Division: 1.4B
ID Number: UN 0361

US DOT REFERENCE NUMBER

EX-2014080651

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive, Cleveland, OH 44122
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 07/15/2020

Static★Star™

PRODUCT INFORMATION BROCHURE

The Static★Star detonator is specifically designed for the harsh conditions encountered in a modern 3-D seismic survey. The two part pressed fit sealing plug, combined with a newly designed adhesion compound, ensures protection from the environment of salt and brackish waters for extended periods of time. With the largest base charge in the industry, Static★Star electric detonators will initiate all detonator sensitive seismic explosives.

ADVANTAGES

- 900 mg PETN base charge far exceeds the standard #8 strength detonator.
- Designed for extended sleep time in salt / brackish water use.
- Consistent break time when firing with 3-10 amperes DC current.
- No fire current of 0.45 amperes for extra protection from electrostatic discharge.
- Two part sealing plug for protection from water.
- Resistant to temperature extremes from -40°F / -40ºC to 150°F / 66ºC.
- # 20 AWG, high abrasion resistant, Yellow HDPE insulated wire.
- Protected primary explosive charge.

STANDARD TECHNICAL DESCRIPTION

Electric seismic detonator for the geophysical industry

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Static★Star

PROPERTIES and STANDARD PACKAGING DETAILS

Length		Ohms Resistance (Ω)	Case Count	Case Weight		NEQ per Case (gr)	Wire Configuration
Ft	Mt			Lbs	Kg		
12	3.7	0.84	20	5.3	2.4	20	Figure 8
24	7.3	1.08	20	5.7	2.6	20	Figure 8
35	10.7	1.31	15	5.7	2.6	15	Figure 8
45	13.7	1.50	10	4.5	2.1	10	Figure 8
55	16.8	1.72	10	5.4	2.5	10	Figure 8
65	19.8	1.92	10	6.3	2.9	10	Figure 8
85	25.9	2.33	10	8.8	4.0	10	Spooled
100	30.5	2.64	10	10.2	4.6	10	Spooled
120	36.6	3.05	10	11.6	5.2	10	Spooled
140	42.7	3.46	3	5.1	11.2	3	Spooled
160	48.8	3.87	3	5.7	12.6	3	Spooled
200	61.0	4.69	3	6.8	14.9	3	Spooled

*Other lengths available upon request

Electrical Data*	
No Fire Current	0.45 amps
All Fire Current	1.50 amps
Series Ignition Current	6.00 amps
No Fire Impulse	8 mJ/ohms
All Fire Impulse	16 mJ/ohms
Electrostatic Sensitivity	
Double Wire to Shell	20 kV/500 pF/100 mJ
Pin to Pin	10kV/500 pF/25mJ

* Meets or exceeds the IAGC and CAGC Recommended Product Testing Methods and Specifications for Conventional Bridge-wire type Electric Seismic Detonators for Use in Seismic Operations

Case Dimension:	11 ¼" x 7 5/8" x 5"
	286mmx x194mm x 127mm

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-2014020188

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2/22/06 | 01/31/2020

Trenchprime®

PRODUCT INFORMATION BROCHURE

Trenchprime Cast Boosters are high-density molecular explosives designed to produce high detonation pressures for optimum initiation of blasting agents. Trenchprime is specifically designed to accomadate detonators up to 4" (101.5mm) in length. The Trenchprime family of cast boosters is designed to be initiated by non-electric, electric and electronic detonators that are classified as a minimum of #8 strength (450mg or greater PETN) base charge.

ADVANTAGES

- Trenchprime Cast Boosters detonate in excess of 24,000 ft/sec (7,380 m/sec).
- Over 230 kb of detonation pressure ensures optimum steady state velocity for blasting agents.
- Excellent shelf life, highly resistant to water and oil.
- Optimized initiation energy for all booster sensitive explosives

PROPERTIES

Trenchprime Cast Boosters are manufactured with molecular explosives consisting of PETN and TNT, both of which are sensitive to severe impact, heat or friction. As with all explosives, Trenchprime must be transported, stored and handled with care. Avoid any impact with solid surfaces.

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Trenchprime Cast Boosters

STANDARD PACKAGING DETAIL

Product	Weight		Outside Diameter		Length		Units per Case	Typical Uses
	[oz]	[g]	[in]	[mm]	[in]	[mm]		
Trenchprime 33	5.3	151	1.43	36.0	4.50	114	64	Priming blasting agents in holes of 1.5 “diameter or larger.
Trenchprime 50	8	227	1.70	43.0	4.5	114	64	Priming blasting agents in holes of 2 “diameter or larger.
Trenchprime 75	12	340	2.05	52.0	4.6	117	49	Priming blasting agents in holes of 3.0” diameter or larger.
Trenchprime 100	16	454	2.33	59.0	4.50	114	36	Priming blasting agents in holes of 4” diameter or larger

STANDARD TECHNICAL DESCRIPTION

High-density explosive for priming pipeline, trenching, underwater and other severe blasting applications

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN 0042

US DOT REFERENCE NUMBER

EX-1993030285

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1/2/02 | r 01/31/2020

Trenchpro®

PRODUCT INFORMATION BROCHURE

Trenchpro bulk emulsion is specifically formulated to provide maximum energy and resistance to transient shock pressure in pipeline, trenching, underwater and other severe blasting applications.

ADVANTAGES

- 100% borehole coupling and high energy produce the maximum performance for each blast hole.
- Bulk delivery improves efficiency in the time required to load blast patterns.
- Completely water resistance, load from bottom to displace water in holes.
- Excellent water resistance and superior resistance to dynamic pre-compression assures performance even in the most difficult geologies and blast patterns.

PROPERTIES

Product	Density [g/cc]	RBS	VOD*		Fume Class	Minimum Diameter	
			[ft/s]	[m/s]		[in]	[mm]
Trenchpro	1.20	117	17,800	5,400	1	1 ¾ “	44

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Trenchpro

PRIMING

Trenchpro is a booster sensitive explosive and must be in direct contact with an appropriately sized Trenchprime® or equivalent cast booster. Use with detonating cord is not recommended.

STANDARD TECHNICAL DESCRIPTION

Booster sensitive bulk emulsion for pipelines, trenches, underwater and other severe blasting applications

STANDARD PACKAGING DETAIL

Not applicable.

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Six months from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.5D
ID Number: UN 0332

US DOT REFERENCE NUMBER

EX-2008120354

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THE

BLASTER'S GUIDE

A Resource for the Explosives and Blasting Industry

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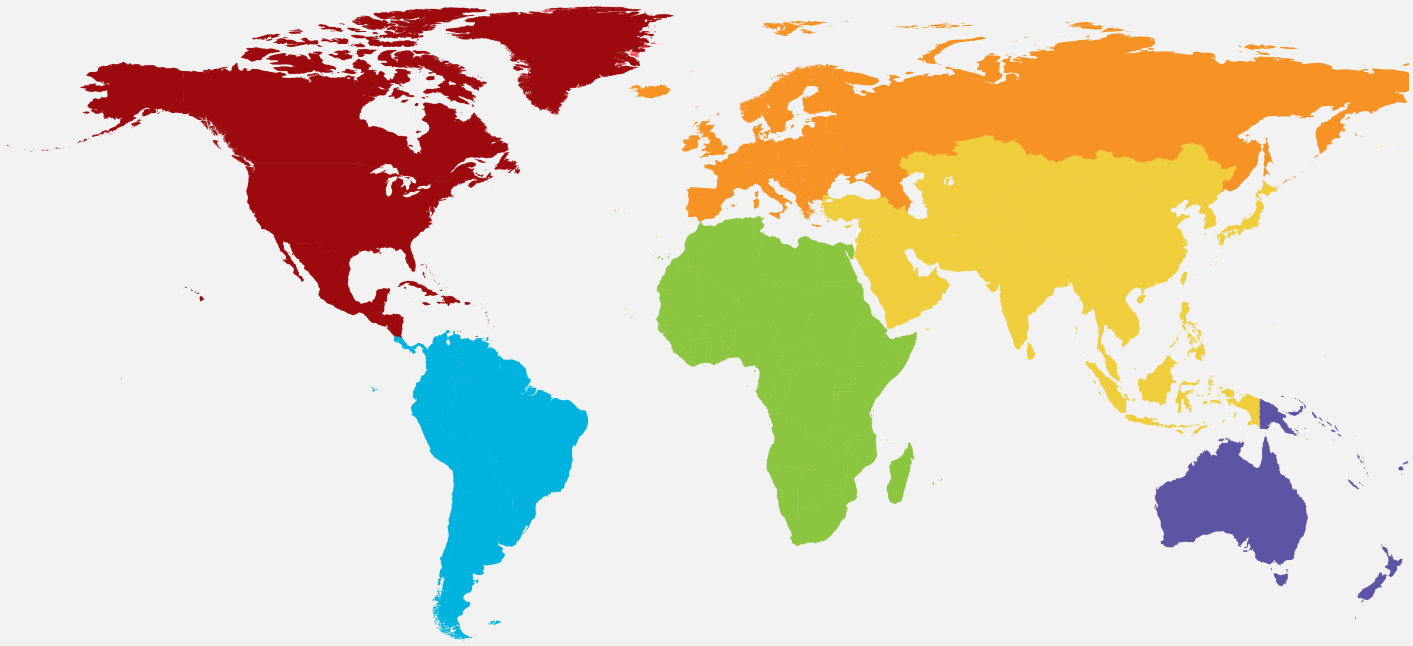
Blasters Guide – Austin Powder Company

Seismic Product Information Bulletins

2021 Seismic PIB Catalog

USED IN 1833 & EVER SINCE



Seismic PIB Catalog Index

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E★STAR Seismic Detonators

PRODUCT INFORMATION BROCHURE

E★STAR Seismic electronic detonators have been designed to provide the precise control necessary to produce the most accurate and consistent seismic record. The E★STAR Seismic detonator may be programmed in 1-millisecond increments from one (1) millisecond up to twenty (20) seconds. using the dedicated DLG 1600-100-S Logger. Unique serial number for each E★STAR Seismic detonator provides “Cradle to Grave“ traceability.

ADVANTAGES

- 750 mg PETN base charge far exceeds the standard #8 strength detonator.
- Industry’s most user-friendly and rugged electronic seismic detonator.
- Designed to fire pattern shots up to ten detonators simultaneously.
- Legwire – HDPE insulation for added protection from current leakage. 0.8 mm diameter copper wire (#20 AWG).
- Advanced pre-fire diagnostics coupled to the communication protocol.

PROPERTIES

E★STAR Seismic detonators contain a capacitor, a logic and timing circuit, and pyrotechnic ignition system manufactured by Austin Powder to provide a complete unit. When the capacitor is charged by the DBM 10-S Digital Blasting Machine, the internal capacitor provides the energy that initiates the “bridge wire“ and subsequently detonates the base charge.

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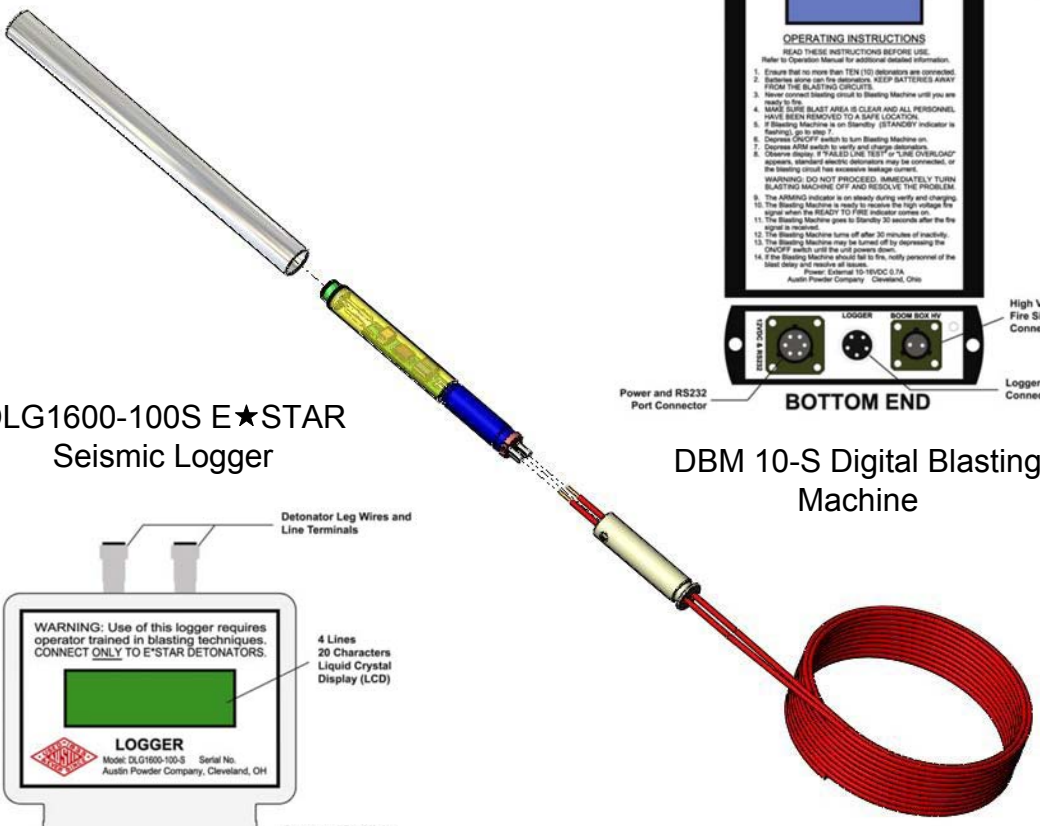
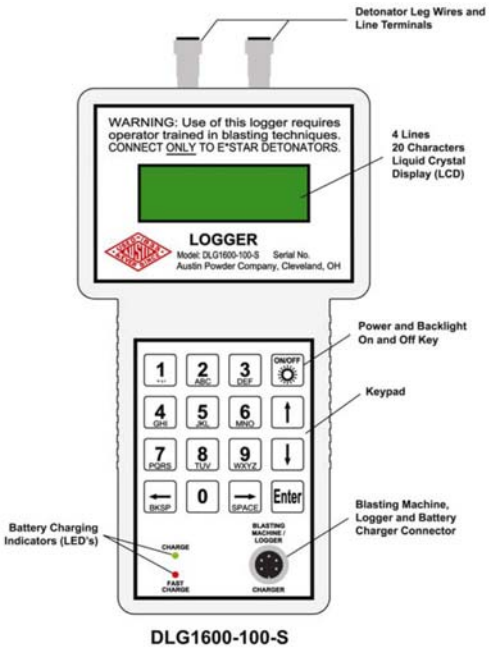
E★STAR Seismic Detonators



DLG1600-100S E★STAR Seismic Logger

DBM 10-S Digital Blasting Machine



DLG1600-100-S

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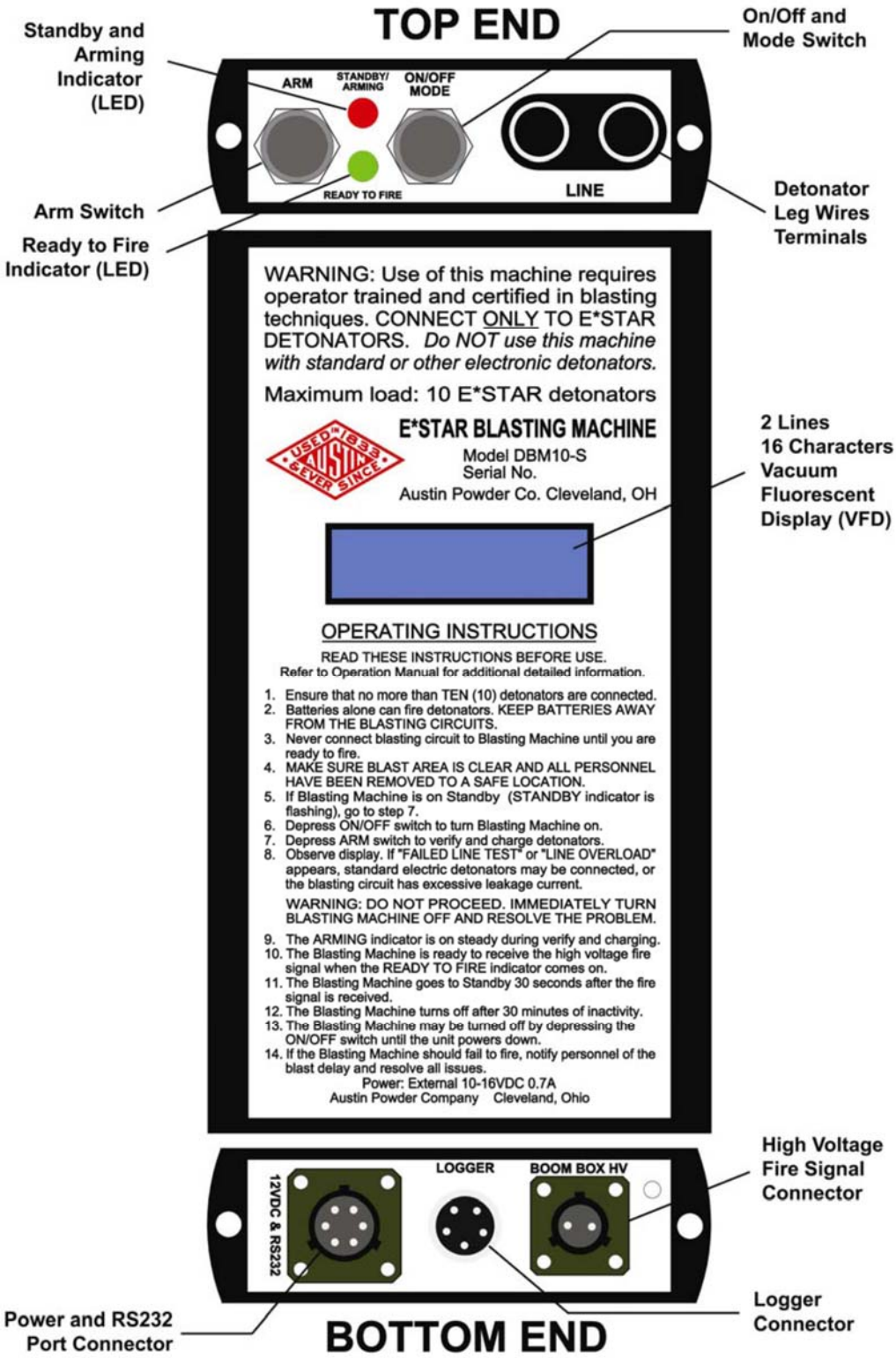
E★STAR DBM 10-S Digital Blasting Machine



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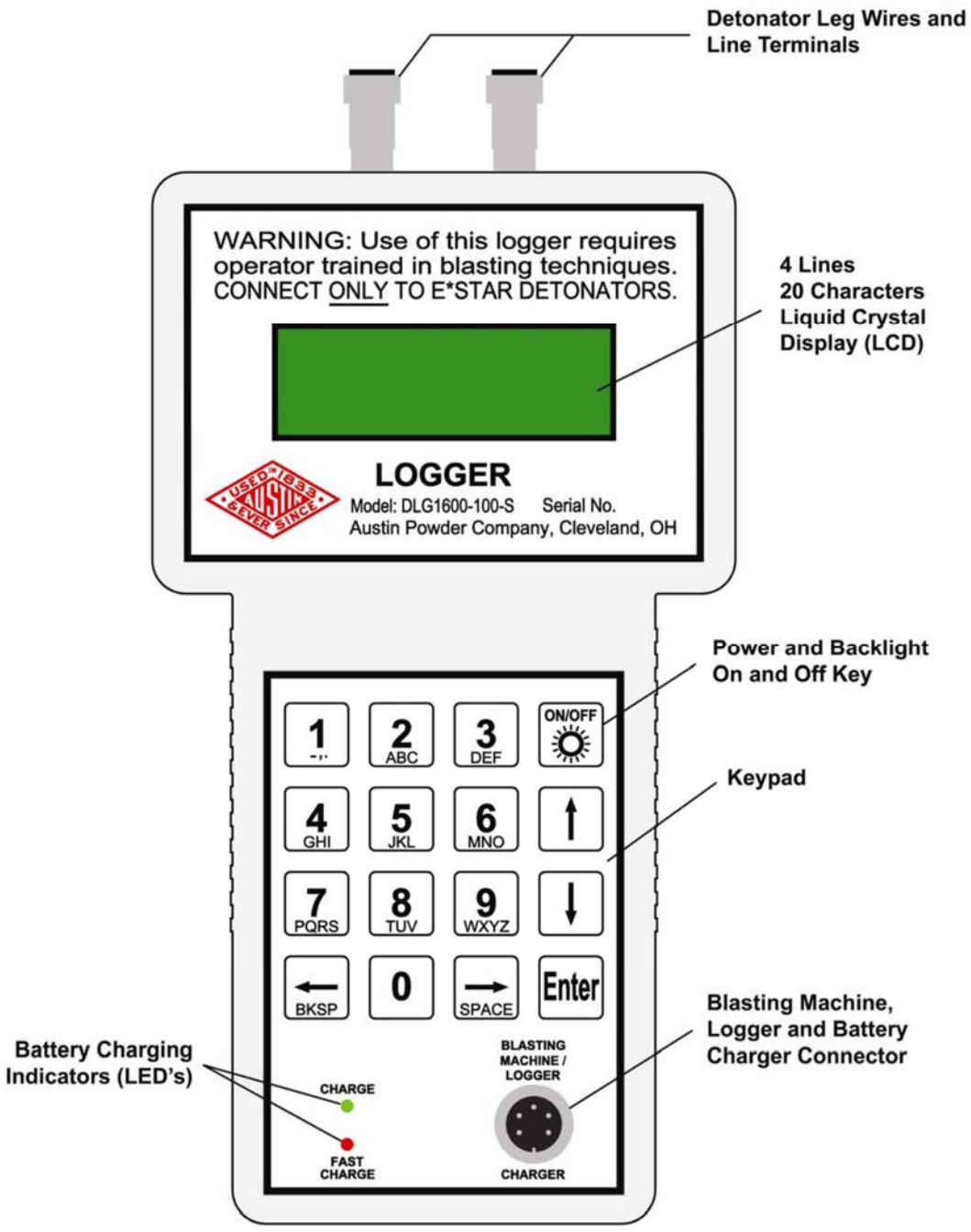
E★STAR DLG 1600-100-S Seismic Logger



DLG1600-100-S

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E★STAR Seismic Detonators

REQUIRED EQUIPMENT

The use of this system requires specific training in all components. This training is in addition to the normal, required training that all blasters and blasting personnel have received.

Only equipment specifically designed for use with Austin Powder E★STAR Seismic detonators is permitted. The currently approved equipment is a DLG 1600-100-S logger and a DBM 10-S Digital Blasting Machine* manufactured by Dan-Mar Co., Inc. An "operators" manual is to be available at all times when using this equipment.

*Warning: The DBM 10-S Digital Blasting Machine is designed for use only with E★STAR Seismic detonators. **Do Not attempt to use this blasting machine with any other detonator.** The misuse of this blasting machine with standard electric detonators may result in instantaneous detonator initiation.

STANDARD PACKAGING DETAILS

E★STAR Seismic Detonator Packaging					
Length		Case Wt		Case Count	Wire Configuration
[ft]	[m]	[lb]	[kg]		
25	7.6	21.52	9.77	70	Fast 8
35	10.7	24.76	11.24	60	Fast 8
45	13.7	26.03	11.82	50	Fast 8
55	16.8	25.34	11.51	40	Fast 8
65	19.8	34.12	15.49	45	Spooled
85	25.9	42.94	19.50	45	Spooled
100	30.5	49.56	22.50	45	Spooled
120	36.6	27.91	12.67	20	Spooled
140	42.7	31.83	14.45	20	Spooled
160	18.8	35.75	16.23	20	Spooled
180	54.9	39.67	18.01	20	Spooled
200	61.0	43.59	19.79	20	Spooled
220	67.1	47.51	21.57	15	Spooled
240	73.2	51.43	23.35	15	Spooled

STANDARD TECHNICAL DESCRIPTION

Electronic programmable detonators

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-0103067

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

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1/2/02 | r 01/31/2020

Enviroprime®

PRODUCT INFORMATION BROCHURE

Enviroprime offers the highest velocity of any commercially available explosive. The explosive contains a microbial innoculant that effectively bioremediates TNT, PETN, RDX and HMX explosives. When submerged in water for over one year, the microorganisms become active and begin to consume the explosive material.

ADVANTAGES

- High detonation velocity produces excellent seismic pulse images.
- Anaerobic bacteria are provided in a time release form, so that they are activated only after at least one year in the subsurface environment.
- Microbial nutrients are added to provide sufficient reducing power to degrade the unexploded charge if needed, yet not interfere with the explosive energy.

PROPERTIES

Density [g/cc]	Pressure [kb]	Water Resistance	VOD	
			[ft/s]	[m/s]
1.6	240	Excellent	27,000	8,300

PRIMING

Use a high-strength detonator (Static★Star®, E★Star® Seismic or equivalent).

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Enviroprime

STANDARD PACKAGING DETAILS

Cartridge Style	Cartridge Size*		Case Count	Case Weight
	[in]	[mm]		
Plastic Threaded Cartridges	2 ¼ x 1 lb	*	50	52 lb
Plastic Threaded Cartridges	2 ¼ x 2 ½ lb	*	20	52 lb
Plastic Threaded Cartridges	2 ¼ x 5 ½ lb	*	10	57 lb
Plastic Threaded Cartridges	*	60 x ½ kg	40	21.5 kg
Plastic Threaded Cartridges	*	60 x 1 kg	20	21.5 kg
Plastic Threaded Cartridges	*	60 x 2 kg	10	21.5 kg

** Available in other sizes upon request.*

STANDARD TECHNICAL DESCRIPTION

Cast explosive, bioremedian technology

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Indefinite from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN 0242

US DOT REFERENCE NUMBER

EX-1993030285

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AUSTIN POWDER

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1/2/02 | r 01/31/2020

Enviroseis®

PRODUCT INFORMATION BROCHURE

Enviroseis is a detonator sensitive, high viscosity explosive packaged in paper shells or rigid plastic cartridges.

ADVANTAGES

- High detonation velocity produces excellent seismic pulse images.
- Does not contain molecular explosives, nitroglycerin or perchlorates.
- Predominate detonation by-products are water vapor, carbon dioxide and nitrogen.
- Desensitizes and decomposes in shorter time period as compared to conventional seismic explosives.

PROPERTIES

Density [g/cc]	Temperature Sensitivity	Pressure [kb]	Water Resistance	VOD	
				[ft/s]	[m/s]
1.16	-20 F / -29 C	100	Excellent	19,200	5,910

PRIMING

Use a high-strength detonator (Static★Star®, E★Star® Seismic or equivalent).

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Enviroseis

STANDARD PACKAGING DETAILS

Cartridge Style	Cartridge Size		Cartridge Weight		Case Count	Case Weight	
	[in]	[mm]	[lb]	[kg]		[lb]	[kg]
Paper Tube	*	27 x 1/8 kg	.28	.13	160	44	20
Plastic Cartridge	*	51 x ¼ kg	.55	.25	80	44	20
Plastic Cartridge	*	51 x ½ kg	1.1	.50	40	44	20
Plastic Cartridge	*	51 x 1 kg	2.2	1.00	20	44	20
Plastic Cartridge	2 ¼ x 1.1 lb	*	1.1	.50	40	44	20
Plastic Cartridge	2 ¼ x 2 ½ lb	*	2.5	1.13	20	50	22.7
Plastic Cartridge	2 ¼ x 5 lb	*	5.0	2.27	10	50	22.7
Plastic Cartridge*	*	60 x ½ kg	1.1	.50	40	44	20
Plastic Cartridge*	*	60 x 1 kg	2.2	1.00	20	44	20
Plastic Cartridge*	*	60 x 2 kg	4.4	2.00	10	44	20

* 60 mm Plastic Cartridge has a threaded fast lock connector.

STANDARD TECHNICAL DESCRIPTION

Detonator sensitive emulsion

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

One year from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type E
Class & Division: 1.1D
ID Number: UN 0241

US DOT REFERENCE NUMBER

EX-9305177

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1/2/02 | r 01/31/2020

Seis-Gel™

PRODUCT INFORMATION BROCHURE

Seis-Gel is a high velocity, 60% seismic explosive. The special formulation of this nitroglycerin based product assures reliable detonation after prolonged immersion under high hydrostatic pressures. Seis-Gel is characterized by high velocity and consistent performance under severe winter conditions or in hot, humid areas.

ADVANTAGES

- Detonates consistently to produce a sharp pulse of seismic energy.
- Available in plastic threaded cartridges or paper shell.
- Ideal for deep hole work and prolonged sleep time.

PROPERTIES

Density [g/cc]	Pressure [kb]	Water Resistance	VOD	
			[ft/s]	[m/s]
1.5	115	Excellent	20,000	6,100

PRIMING

Use a high-strength detonator (Static★Star, E★Star Seismic or equivalent).

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Seis-Gel

PACKAGING

Cartridge Style	Cartridge Size*		Case Count	Case Weight
	[in]	[mm]		
Paper Shell	*	51 x ¼ kg	80	20 kg
Paper Shell	*	51 x ½ kg	40	20 kg
Paper Shell	*	51 x 1 kg	20	20 kg
Paper Shell	*	51 x 2 kg	10	20 kg
Plastic Threaded Cartridge	2 ¼ x 1 lb	*	50	50 lb
Plastic Threaded Cartridge	2 ¼ x 2 ½ lb	*	20	50 lb
Plastic Threaded Cartridge	2 ¼ x 5 lb	*	10	50 lb
Plastic Threaded Cartridge	*	60 x ½ kg	40	20 lb
Plastic Threaded Cartridge	*	60 x 1 kg	20	20 lb
Plastic Threaded Cartridge	*	60 x 2 kg	10	20 lb

STANDARD TECHNICAL DESCRIPTION

60% high velocity seismic dynamite

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Two years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Explosive, Blasting, Type A
Class & Division: 1.1D
ID Number: UN 0081

US DOT REFERENCE NUMBER

EX-1984110031

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1/2/02 | r 01/31/2020

Seismic Detonating Cord

PRODUCT INFORMATION BROCHURE

Austin Powder manufacturers a wide variety of detonating cord to meet the requirements of the seismic industry. Detonating cord is used to initiate detonator sensitive seismic explosives. Detonating cord is also used to provide a path of initiation for non-electric initiation. Detonating cord has a core of PETN (pentaerythritol tetranitrate) encased in multiple polypropylene yarns, over-extruded with a polyethylene jacket and high strength textile yarns.

ADVANTAGES

- Water and abrasion resistant.
- High tensile strength.
- Color coded for easy identification.
- Electronically and mechanically inspected.
- Insensitive to extraneous current.
- Assures reliable non-electric initiation.
- Ideally suited for use with Static★Star.

STANDARD TECHNICAL DESCRIPTION

Lite Line® : Downline under all but the most severe conditions.

A-Cord™ : Small, medium and large hole downlines.

50 Reinforced ™ : Excellent general purpose detonating cord for reliable blast initiation under virtually all conditions.

100 Grain : All detonating cords are available with *"FS" (Flash Suppresant outer jacket)* upon request.

AUSTIN POWDER

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Seismic Detonating Cord

PROPERTIES and STANDARD PACKAGING DETAIL

Product Name	Grain Load		Outside Diameter [in]	Tensile Strength [lb]	Case Count	Weight [lb]	Color
	[gr/ft]	[g/m]					
Lite Line	15	3.2	0.155 +/- 0.015	230	(2) 2000' Spools	30	Pink
A-Cord	25	5.3	0.165 +/- 0.015	230	(2) 1000' Spools	22	Green
50 Reinforced	50	10.6	0.197 +/- 0.015	250	(2) 1000' Spools	30	Yellow
100 Grain	100	20.0	0.220 +/- 0.020	175	(1) 1000' Spool	57	Red

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Cord, Detonating
Class & Division: 1.1D
ID Number: UN 0065

US DOT REFERENCE NUMBER

EX-9303282

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

Seisprime™

PRODUCT INFORMATION BROCHURE

Seisprime is formulated of a composite of high density, high velocity molecular explosives. Seisprime is engineered to produce over 240 kilo bars of detonation pressure. The rigid threaded plastic Seisprime cartridge is designed to accept an anchor point or top anchor, and is provided with two detonator wells. Seisprime has the longest “sleep time” of any commercial seismic explosive. The formulation suits the requirements of mini-hole, as well as deep hole seismic exploration. Use a high-strength seismic detonator of 720mg PETN or greater for reliable initiation.

ADVANTAGES

- 24,500 fps detonation velocity produces excellent seismic pulse images.
- Formulated to achieve a higher detonation temperature and lower post detonation gas production than standard seismic pentolite, dynamites or emulsions.
- Does not contain nitroglycerine or perchlorates.
- Full function reliability in all typical geophysical hole depths/water conditions.

PROPERTIES

Velocity of Detonation (mps / fps)	Detonation Pressure* (kilo bars)	Total Gas Generation* (liters / kg)	Energy* (MJ/kg)	Density (grams/cc)	Water Resistance
7,538 / 24,500	240	619	6.33	1.73	Excellent

*Detonation pressure, total gas generation and energy values are calculated using Tiger ™, a well established thermodynamic computer code. Other computer codes may give different values.

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Seisprime

STANDARD PACKAGING DETAIL

Product (kg / lbs.)	Cartridge Size* (mm / in.)	Quantity per case	Case Weigh (kg / lbs.)	Case Size (cm / inches)
Seisprime (0.5 / 1.1)	57 / 2 ¼	40	21.5 / 47.4 lb	32.4 x 44.4 x 29.8 12 ¾ x 17 ½ x 11 ¾
Seisprime (1.0 / 2.2)	57 / 2 ¼	20	21.5 / 47.4 lb	32.4 x 44.4 x 29.8 12 ¾ x 17 ½ x 11 ¾
Seisprime (2.0 / 4.4)	57 / 2 ¼	10	21.5 / 47.4 lb	33 x 78.1 x 11.7 13 x 30 ¾ x 4 ⅝
Seisprime (2.5 / 5.5)	57 / 2 ¼	10	25.9 / 57.0 lb	33 x 78.1 x 11.7 13 x 30 ¾ x 4 ⅝

** Available in other sizes upon request.*

STANDARD TECHNICAL DESCRIPTION

High-density molecular explosive

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

Indefinite from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Boosters
Class & Division: 1.1D
ID Number: UN 0242

US DOT REFERENCE NUMBER

EX-1993030285

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

1/2/02 | r 01/31/2020

Static★Star™

PRODUCT INFORMATION BROCHURE

The Static★Star detonator is specifically designed for the harsh conditions encountered in a modern 3-D seismic survey. The two part pressed fit sealing plug, combined with a newly designed adhesion compound, ensures protection from the environment of salt and brackish waters for extended periods of time. With the largest base charge in the industry, Static★Star electric detonators will initiate all detonator sensitive seismic explosives.

ADVANTAGES

- 900 mg PETN base charge far exceeds the standard #8 strength detonator.
- Designed for extended sleep time in salt / brackish water use.
- Consistent break time when firing with 3-10 amperes DC current.
- No fire current of 0.45 amperes for extra protection from electrostatic discharge.
- Two part sealing plug for protection from water.
- Resistant to temperature extremes from -40°F / -40ºC to 150°F / 66ºC.
- # 20 AWG, high abrasion resistant, Yellow HDPE insulated wire.
- Protected primary explosive charge.

STANDARD TECHNICAL DESCRIPTION

Electric seismic detonator for the geophysical industry

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

Static★Star

PROPERTIES and STANDARD PACKAGING DETAILS

Length		Ohms Resistance (Ω)	Case Count	Case Weight		NEQ per Case (gr)	Wire Configuration
Ft	Mt			Lbs	Kg		
12	3.7	0.84	20	5.3	2.4	20	Figure 8
24	7.3	1.08	20	5.7	2.6	20	Figure 8
35	10.7	1.31	15	5.7	2.6	15	Figure 8
45	13.7	1.50	10	4.5	2.1	10	Figure 8
55	16.8	1.72	10	5.4	2.5	10	Figure 8
65	19.8	1.92	10	6.3	2.9	10	Figure 8
85	25.9	2.33	10	8.8	4.0	10	Spooled
100	30.5	2.64	10	10.2	4.6	10	Spooled
120	36.6	3.05	10	11.6	5.2	10	Spooled
140	42.7	3.46	3	5.1	11.2	3	Spooled
160	48.8	3.87	3	5.7	12.6	3	Spooled
200	61.0	4.69	3	6.8	14.9	3	Spooled

*Other lengths available upon request

Electrical Data*	
No Fire Current	0.45 amps
All Fire Current	1.50 amps
Series Ignition Current	6.00 amps
No Fire Impulse	8 mJ/ohms
All Fire Impulse	16 mJ/ohms
Electrostatic Sensitivity	
Double Wire to Shell	20 kV/500 pF/100 mJ
Pin to Pin	10kV/500 pF/25mJ

* Meets or exceeds the IAGC and CAGC Recommended Product Testing Methods and Specifications for Conventional Bridge-wire type Electric Seismic Detonators for Use in Seismic Operations

Case Dimension:	11 ¼" x 7 5/8" x 5"
	286mmx x194mm x 127mm

STORAGE

Store in accordance with all applicable local, state, provincial and federal laws.

SHELF LIFE

For optimum accuracy, use within five years from date of manufacture under good storage conditions.

TRANSPORTATION DATA

UN CLASSIFICATION

Shipping Name: Detonators, Electric
Class & Division: 1.4B
ID Number: UN 0255

US DOT REFERENCE NUMBER

EX-2014020188

Disclaimer of Warranties and Limitations of Liabilities: Products described in this bulletin are sold by Austin Powder Company without warranty; express, implied or statutory or as to MERCHANTABILITY, except as expressly stated in Austin Powder's straight bill of lading. Under no circumstances shall seller be liable for loss of anticipated profits, consequential damages or incidental damages.

For more information and service locations in your area, please contact Austin Powder Company's headquarters:

AUSTIN POWDER

Austin Powder Company, 25800 Science Park Drive
Phone: 1-800-321-0752| Fax: 1-216-464-4418 | Email: info@austinpowder.com | www.austinpowder.com

2/22/06 | 01/31/2020

THE

BLASTER'S GUIDE

A Resource for the Explosives and Blasting Industry

Legal Disclaimer: Neither Austin Powder nor any of its affiliates shall be responsible for the use of any product, services or information referred to herein. Any users of information contained in this guide assume the risk of relying on such information. Austin Powder makes no representations or warranties as to the information provided herein or with respect to products or services referred to in this guide. The information contained herein may contain inaccuracies and is subject to change without notice. Users of products of Austin Powder are referred to Safety Data Sheets and Austin Powder technical information bulletins for further important information.

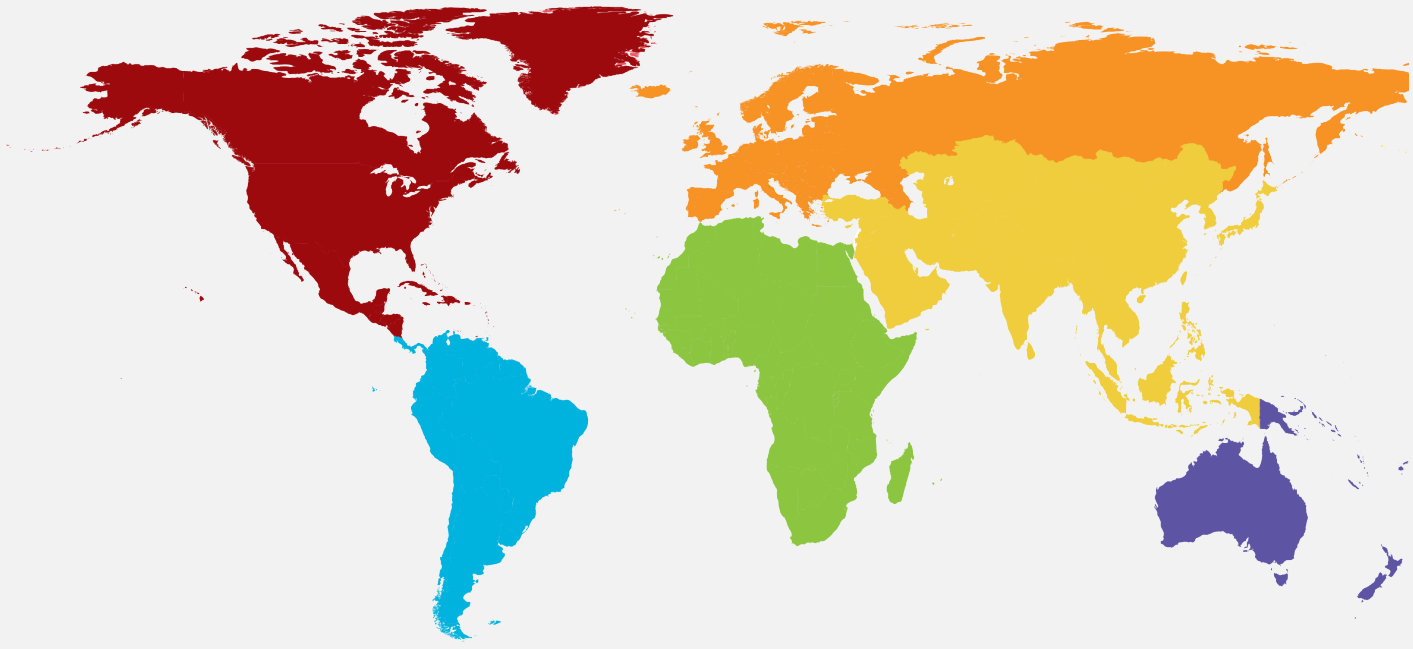
Austin Powder Company
25800 Science Park Drive
Cleveland, Ohio, USA 44122
Phone: 216-464-2400
Fax: 216-464-4418

Email: info@austinpowder.com
Blasters Guide – Austin Powder Company

Safety Data Sheets (SDS)

2021 SDS Catalog

USED IN 1833 & EVER SINCE



SDS Catalog Index

SDS Name	Reference Number	Catalog Page Number
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SECTION 1: IDENTIFICATION

Product Identifier: Ammonium Nitrate Solution
Product Names and Synonyms: Ammonium Nitrate Solution, ANS, ANSOL
Intended Use: As an ingredient in commercial explosives.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H272	Oxidizing Liquid	3
H303	Acute Toxicity, oral	5
H315	Skin Corrosion / Irritation	2
H319	Serious eye damage / eye irritation	2A
H335	Specific target organ toxicity, single exposure; Respiratory tract irritation	3

Label Elements

Warning

Hazard Statements

May intensify fire; oxidizer
May be harmful if swallowed
Causes skin irritation
Causes eye irritation
May cause respiratory irritation

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe fumes.
Wear eye protection, protective gloves recommended.

IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention. Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area.

Exposure reaction may be aggravated for those with pre-existing eye, skin, or respiratory conditions. Causes 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.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	CAS No.	% (w/w)
Ammonium nitrate	CAS No. 6484-52-2	75-90

SECTION 4: FIRST AID MEASURES

General: This material may be hot during transportation and storage, up to 115°C (240°F); take the proper precautions. Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: When symptoms occur: move to open air, keep at rest and in a position comfortable for breathing. Get medical attention. Ventilate suspected area.

Skin Contact: Wash contact areas with soap and water. Remove contaminated clothing. Wash contaminated clothing before reuse.

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

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: May cause irritation to the respiratory tract, symptoms include: sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing.

Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe irritation or allergic reaction in sensitive individuals.

Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Ingestion: Ammonium nitrate ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by blue lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death

due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Symptoms: May cause irritation to the respiratory tract.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Ammonium Nitrate. There is an extreme risk that ammonium nitrate involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of ammonium nitrate is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving ammonium nitrate, becomes intense. General extinguishers may be used on the initial fire, not involving ammonium nitrate, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool ammonium nitrate not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 140 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near ammonium nitrate solution, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: There is an extreme risk that ammonium nitrate involved in a fire may detonate. In a fire, the water portion of the solution boils off quickly, leaving solid or molten ammonium nitrate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of ammonium nitrate solution stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving ammonium nitrate, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area. This material may be hot during transportation and storage, up to 115ºC (240ºF), take the proper precautions.

For Non-Emergency Personnel

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

Emergency Procedures: Isolate the area from unnecessary personnel.

For Emergency Personnel

Protective Equipment: Provide cleanup crew with proper PPE.

Emergency Procedures: Ventilate area.

Emergency Precautions: Stop the discharge if safe to do so. Ventilate area.

Methods and Material for Containment and Cleaning Up: Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed: Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on ammonium nitrate process equipment, storage areas or containers related to the intended use.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: May be corrosive to metals. Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.

Storage Conditions: Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All ammonium nitrate storage sites must comply with ATF, OSHA or NRCAN regulations.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Special Rules on Packaging: Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ammonium nitrate, CAS No. 6484-52-2		
USA ACGIH (nuisance dust)	ACGIH TWA (mg/m^3)	10 mg/m^3 – Inhalable particulate
USA OSHA (nuisance dust)	OHSA PEL (TWA) (mg/m^3)	5 mg/m^3 – Respirable (particulate)

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemical and heat resistant gloves.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Clear liquid
Odor:	Slight ammonia odor
Odor threshold:	Not available
Vapor density:	Not relevant
pH:	4-6
Freezing point (Crystal point):	75% solution – 40°C (105°F) 90% solution – 95°C (202°F)
Initial boiling point and boiling range:	Not available
Flash point:	Not relevant
Evaporation rate:	Not available
Flammability:	Will not burn
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Bulk Density:	75% solution – 1.35 g/cc (11.3 lb/gal) 90% solution – 1.41 g/cc (11.8 lb/gal)
Solubility (for ammonium nitrate in water):	118 g/100 ml @ 0°C (32°F)
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not available
Decomposition temperature:	210°C (410°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Not sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Hazardous Decomposition Products: No unusual fumes or decomposition products expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: See section 2

LD50 and LC50 Data: Not classified

Skin Corrosion/Irritation: May cause skin irritation

Eye Damage/Irritation: May cause serious eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness or dizziness

Specific Target Organ Toxicity (Repeated Exposure): Not classified.

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Harmful if inhaled, causes methemoglobinemia. Symptoms may include headache, dizziness, nausea and a loss of coordination.

Symptoms/Injuries after Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe or allergic reaction in sensitive individuals.

Symptoms/Injuries after Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Symptoms/Injuries after Ingestion: Burning sensation. Abdominal pain. Abdominal cramps. Vomiting. Ammonium nitrate ingestion may cause methemoglobinemia.

Chronic Symptoms: Although none are expected under normal conditions, inhalation exposure may cause methemoglobinemia and may damage respiratory tract.

LD50 and LC50 Data (ingredients):

Ammonium nitrate, CAS No. 6484-52-2	
LD50 Oral Rat	2,217 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN2426	Ammonium nitrate, liquid, *(hot concentrated solution).*	5.1	5.1	--	No	ERG-140
Canadian TDG	UN2426	Ammonium nitrate liquid, *(hot concentrated solution).*	5.1	5.1	--	No	--
IMDG (Vessel)	UN1942	Ammonium nitrate, liquid	5.1	5.1	--	No	EmS-No, Fire: F-H Spillage: S-Q
IATA (Air)	Contact the manufacturer						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

Ammonium nitrate, CAS No. 6484-52-2

SARA Section 311/312	Reactive Hazard Fire Hazard Health Hazard
TSCA	Listed on the United States TSCA inventory

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

Ammonium nitrate, CAS No. 6484-52-2

DSL	Listed on the Canadian DSL
WHMIS Classification	Class C – Oxidizing Substance Class D, Division 2, Subdivision B – Toxic material causing other toxic effects.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-2 Initial Issue Date: 6/1/2015 Last Revision Date: 06/03/2015 Version: 5

Party Responsible for the Preparation of this Document:
Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Austinite Series
Product Names and Synonyms: Austinite 15, VX-100, VX-101, Austinite WR series, Austinite HE series
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H205	Explosives	Division 1.5
H227	Flammable Liquid	4
H272	Oxidizing Solid	3
H303	Acute Toxicity, oral	5
H315	Skin Corrosion / Irritation	2
H319	Serious eye damage / eye irritation	2A
H333	Acute Toxicity, inhalation	5
H335	Specific target organ toxicity, single exposure; Respiratory tract irritation	3

Label Elements

Danger

Hazard Statements

May mass explode in a fire
Combustible Liquid
May intensify fire; oxidizer
May be harmful if swallowed
Causes skin irritation
Causes eye irritation
May be harmful if inhaled
May cause respiratory irritation

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe dust or fumes.
Do not subject to grinding, friction, impact or shock.
Wash hands and other contact areas thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.
IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention.
Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Exposure reaction may be aggravated for those with pre-existing eye, skin, or respiratory conditions.
Causes 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.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Ammonium nitrate	CAS No. 6484-52-2	85-95%
Fuels, diesel, no.2	CAS No. 68476-34-6	4-6%
Aluminum	CAS No. 7429-90-5	0-10%
Guar gum	CAS No. 9000-30-0	0-5%
Sodium carboxymethyl cellulose	CAS No. 9004-32-4	0-5%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: When symptoms occur: move to open air, keep at rest and in a position comfortable for breathing. Get medical attention. Ventilate suspected area.

Skin Contact: Wash contact areas with soap and water. Remove contaminated clothing. Wash contaminated clothing before reuse.

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

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: May cause irritation to the respiratory tract, symptoms include:
sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing.

Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe irritation or allergic reaction in sensitive individuals.

Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Ingestion: Ammonium nitrate ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by blue lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Symptoms: May cause irritation to the respiratory tract. May cause damage to organs through exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Ammonium Nitrate. There is an extreme risk that ammonium nitrate involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of ammonium nitrate is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving ammonium nitrate, becomes intense. General extinguishers may be used on the initial fire, not involving ammonium nitrate, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool ammonium nitrate not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 140 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.
For Non-Emergency Personnel	
Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.
For Emergency Personnel	
Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Procedures:	Stop the discharge if safe to do so. Ventilate area.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up	Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	May be corrosive to metals. Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.
Incompatible Materials:	Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.
Special Rules on Packaging:	Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ammonium nitrate, CAS No. 6484-52-2		
USA ACGIH (nuisance dust)	ACGIH TWA (mg/m^3)	10 mg/m^3 – Inhalable particulate
USA OSHA (nuisance dust)	OHSA PEL (TWA) (mg/m^3)	5 mg/m^3 – Respirable (particulate)

Fuels, diesel, no. 2, CAS No. 68476-34-6		
US ACGIH	ACGIH TWA	100 mg/m^3 (inhalable fraction and vapor)
Alberta	OEL TWA	100 mg/m^3
British Columbia	OEL TWA	100 mg/m^3 (aerosol, inhalable, and vapor)
Manitoba	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Newfoundland & Labrador	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Nova Scotia	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Ontario	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Prince Edward Island	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Saskatchewan	OEL STEL	150 mg/m^3 (inhalable fraction and vapor)
Saskatchewan	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)

Aluminum granules, CAS No. 7429-90-5		
USA ACGIH	ACGIH TWA	1 mg/m^3 (respirable fraction)
USA ACGIH	ACGIH category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA)	15 mg/m^3 (total dust), 5 mg/m^3 (respirable fraction)
USA NIOSH	NIOSH REL (TWA)	10 mg/m^3 (total dust), 5 mg/m^3 (respirable dust)
Alberta	OEL TWA	10 mg/m^3 (dust)
British Columbia	OEL TWA	1.0 mg/m^3 (respirable)
Manitoba	OEL TWA	1 mg/m^3 (respirable fraction)
New Brunswick	OEL TWA	10 mg/m^3 (metal dust)
Newfoundland & Labrador	OEL TWA	1 mg/m^3 (respirable fraction)
Nova Scotia	OEL TWA	1 mg/m^3 (respirable fraction)
Nunavut	OEL STEL	20 mg/m^3
Nunavut	OEL TWA	10 mg/m^3
Northwest Territories	OEL STEL	20 mg/m^3
Northwest Territories	OEL TWA	10 mg/m^3
Ontario	OEL TWA	1 mg/m^3 (respirable)
Prince Edward Island	OEL TWA	1 mg/m^3 (respirable fraction)
Québec	VEMP	10 mg/m^3
Saskatchewan	OEL STEL	20 mg/m^3 (dust)
Saskatchewan	OEL TWA	10 mg/m^3 (dust)

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemically resistant gloves are recommended, but not required.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Solid, small spheres
Odor:	Fuel
Odor threshold:	Not available
Vapor density:	Not available
pH:	Not relevant
Melting point (ammonium nitrate):	165°C (330°F)
Initial boiling point and boiling range:	Not available
Flash point:	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Bulk Density:	0.75 – 0.95 g/cc (49 - 59 lb/cf)
Solubility:	Soluble in water
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not available
Decomposition temperature:	>210°C (>410°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Not sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: May cause skin irritation

Eye Damage/Irritation: May cause serious eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Specific Target Organ Toxicity (Repeated Exposure): May cause drowsiness or dizziness

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Harmful if inhaled, causes methemoglobinemia. Symptoms may include headache, dizziness, nausea and a loss of coordination.

Symptoms/Injuries after Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe or allergic reaction in sensitive individuals.

Symptoms/Injuries after Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Symptoms/Injuries after Ingestion: Burning sensation. Abdominal pain. Abdominal cramps. Vomiting. Ammonium nitrate ingestion may cause methemoglobinemia.

Chronic Symptoms: Although none are expected under normal conditions, inhalation exposure may cause methemoglobinemia and may damage respiratory tract.

LD50 and LC50 Data (ingredients):

Ammonium nitrate, CAS No. 6484-52-2	
LD50 Oral Rat	2,217 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

Fuels, diesel, no. 2, CAS No 68476-34-6	
LD50 Oral Rat	>5000 mg/kg
LD50 Dermal Rabbit	>2000 mg/kg
LC50 Inhalation Rat	1 - 5 mg/l/4h

Guar gum, CAS No 9000-30-0	
LD50 Oral Rat	6,770 mg/kg

Sodium carboxymethyl cellulose, CAS No 9004-32-4	
LD50 Oral Rat	27,000 mg/kg
LC50 Dermal Rabbit	> 2,000 mg/l/4h
LC50 Inhalation Rat	> 5,800 mg/l/4h

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Austinite 15, VX-100, VX-101

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	NA0331	Ammonium nitrate-fuel oil mixture *containing only prilled ammonium nitrate and fuel oil.*	1.5D	1.5D		No	ERG-112
Canadian TDG	UN0331	Explosive, blasting, type B	1.5D	1.5D		No	--
IMDG (Vessel)	UN0331	Explosive, blasting, type B	1.5D	1.5D		No	EmS-No, Fire: F-B Spillage: S-Y
IATA (Air)	Contact the manufacturer.						

Austinite WR Series, Austinite HE series

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0331	Explosive, blasting, type B	1.5D	1.5D		No	ERG-112
Canadian TDG	UN0331	Explosive, blasting, type B	1.5D	1.5D		No	--
IMDG (Vessel)	UN0331	Explosive, blasting, type B	1.5D	1.5D		No	EmS-No, Fire: F-B Spillage: S-Y
IATA (Air)	Contact the manufacturer.						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Reactive hazard Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

Ammonium nitrate (CAS No. 6484-52-2)

WHMIS Classification	Class C – Oxidizing Substance Class D, Division 2, Subdivision B – Toxic material causing other toxic effects.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-3 Initial Issue Date: 06/01/2015 Last Revision Date: 07/05/2016 Version: 7

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: 1.5D Emulsion Explosives
Product Names and Synonyms: Hydromite series, Hydromite Advance series, HEET series, VX series AXE series, Trenchpro
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H205	Explosives	Division 1.5
H227	Flammable Liquid	4
H272	Oxidizing Solid / Oxidizing Liquid	3
H303	Acute Toxicity, oral	5
H315	Skin Corrosion / Irritation	2
H319	Serious eye damage / eye irritation	2A
H333	Acute Toxicity, inhalation	5
H335	Specific target organ toxicity, single exposure; Respiratory tract irritation	3

Label Elements

Danger

Hazard Statements

May mass explode in a fire
Combustible Liquid
May intensify fire; oxidizer
May be harmful if swallowed
Causes skin irritation
Causes eye irritation
May be harmful if inhaled
May cause respiratory irritation

Precautionary Statements

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe dust or fumes.
Do not subject to grinding, friction, impact or shock.
Wash hands and other contact areas thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.
IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention. Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Exposure reaction may be aggravated for those with pre-existing eye, skin, or respiratory conditions. Causes 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.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Ammonium nitrate	CAS No. 6484-52-2	70-95%
Petroleum distillates, hydrotreated light	CAS No. 64742-47-8	0-6%
Distillates, petroleum, hydrotreated middle	CAS No. 64742-46-7	0-6%
White Mineral Oil	CAS No. 8042-47-5	0-6%
Fuels, diesel, no.2	CAS No. 68476-34-6	0-6%
Aluminum	CAS No. 7429-90-5	0-10%
Polyolefin alkanolamine ester emulsifier	CAS No. Proprietary	<1%
Glass microspheres	CAS No. 65997-17-3	0-2%
Plastic microspheres	CAS No. Proprietary	0-0.5%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: When symptoms occur: move to open air, keep at rest and in a position comfortable for breathing. Get medical attention. Ventilate suspected area.

Skin Contact: Wash contact areas with soap and water. Remove contaminated clothing. Wash contaminated clothing before reuse.

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

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: May cause irritation to the respiratory tract, symptoms include: sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing.

Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe irritation or allergic reaction in sensitive individuals.

Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Ingestion: Ammonium nitrate ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by blue lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Symptoms: May cause irritation to the respiratory tract. May cause damage to organs through exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.
For Non-Emergency Personnel	
Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.
For Emergency Personnel	
Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Procedures:	Stop the discharge if safe to do so. Ventilate area.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up:	Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	May be corrosive to metals. Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.
Incompatible Materials:	Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.
Special Rules on Packaging:	Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ammonium nitrate, CAS No. 6484-52-2		
USA ACGIH (nuisance dust)	ACGIH TWA (mg/m^3)	10 mg/m^3 – Inhalable particulate
USA OSHA (nuisance dust)	OHSA PEL (TWA) (mg/m^3)	5 mg/m^3 – Respirable (particulate)

Fuels, diesel, no. 2, CAS No. 68476-34-6		
US ACGIH	ACGIH TWA	100 mg/m^3 (inhalable fraction and vapor)
Alberta	OEL TWA	100 mg/m^3
British Columbia	OEL TWA	100 mg/m^3 (aerosol, inhalable, and vapor)
Manitoba	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Newfoundland & Labrador	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Nova Scotia	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Ontario	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Prince Edward Island	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Saskatchewan	OEL STEL	150 mg/m^3 (inhalable fraction and vapor)
Saskatchewan	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)

Aluminum granules, CAS No. 7429-90-5		
USA ACGIH	ACGIH TWA	1 mg/m^3 (respirable fraction)
USA ACGIH	ACGIH category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA)	15 mg/m^3 (total dust), 5 mg/m^3 (respirable fraction)
USA NIOSH	NIOSH REL (TWA)	10 mg/m^3 (total dust), 5 mg/m^3 (respirable dust)
Alberta	OEL TWA	10 mg/m^3 (dust)
British Columbia	OEL TWA	1.0 mg/m^3 (respirable)
Manitoba	OEL TWA	1 mg/m^3 (respirable fraction)
New Brunswick	OEL TWA	10 mg/m^3 (metal dust)
Newfoundland & Labrador	OEL TWA	1 mg/m^3 (respirable fraction)
Nova Scotia	OEL TWA	1 mg/m^3 (respirable fraction)
Nunavut	OEL STEL	20 mg/m^3
Nunavut	OEL TWA	10 mg/m^3
Northwest Territories	OEL STEL	20 mg/m^3
Northwest Territories	OEL TWA	10 mg/m^3
Ontario	OEL TWA	1 mg/m^3 (respirable)
Prince Edward Island	OEL TWA	1 mg/m^3 (respirable fraction)
Québec	VEMP	10 mg/m^3
Saskatchewan	OEL STEL	20 mg/m^3 (dust)
Saskatchewan	OEL TWA	10 mg/m^3 (dust)

Glass, oxide, CAS No. 65997-17-3		
USA OSHA	OSHA PEL (TWA)	15 mg/m^3 (total dust) 5 mg/m^3 (inhalable fraction)
USA NIOSH	NIOSH REL (TWA)	5 mg/m^3 (total dust)
Yukon	OEL TWA	30 mg/m^3 (inhalable fraction) 10 mg/m^3 (dust)

Plastic microspheres, CAS No. Proprietary		
US ACGIH	ACGIH TWA	15 mg/m^3 (dust)

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemically resistant gloves are recommended, but not required.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Opaque, viscous (thick) creamy substance
Odor:	Fuel
Odor threshold:	Not available
Vapor density:	Not available
pH:	Not relevant
Melting point (ammonium nitrate):	165°C (330°F)
Initial boiling point and boiling range:	Not available
Flash point:	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Bulk Density:	1.02 – 1.30 g/cc (9.2 – 10.8 lb/gal)
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not available
Decomposition temperature:	>210°C (>410°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Not sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: May cause skin irritation

Eye Damage/Irritation: May cause serious eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness or dizziness

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Harmful if inhaled, causes methemoglobinemia. Symptoms may include headache, dizziness, nausea and a loss of coordination.

Symptoms/Injuries after Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe or allergic reaction in sensitive individuals.

Symptoms/Injuries after Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Symptoms/Injuries after Ingestion: Burning sensation. Abdominal pain. Abdominal cramps. Vomiting. Ammonium nitrate ingestion may cause methemoglobinemia.

Chronic Symptoms: Although none are expected under normal conditions, inhalation exposure may cause methemoglobinemia and may damage respiratory tract.

LD50 and LC50 Data (ingredients):

Ammonium nitrate, CAS No. 6484-52-2	
LD50 Oral Rat	2,217 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

Fuels, diesel, no. 2, CAS No 68476-34-6	
LD50 Oral Rat	>5000 mg/kg
LD50 Dermal Rabbit	>2000 mg/kg
LC50 Inhalation Rat	1 - 5 mg/l/4h

Petroleum distillates, hydrotreated light, CAS No. 64742-47-8	
LD50 Oral Rat	> 5,000 mg/kg
LD50 Dermal Rabbit	> 2,000 mg/kg
ATE US (mist)	>< 5.2 mg/l/4h

Distillates, petroleum, hydrotreated middle, CAS No. 64742-46-7	
LD50 Oral Rat	27,000 mg/kg
LC50 Dermal Rabbit	> 2,000 mg/l/4h
LC50 Inhalation Rat	> 5,800 mg/l/4h

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0332	Explosive, blasting, type E	1.5D	1.5D		No	ERG-112
Canadian TDG	UN0332	Explosive, blasting, type E	1.5D	1.5D		No	--
IMDG (Vessel)	UN0332	Explosive, blasting, type E	1.5D	1.5D		No	EmS-No, Fire: F-B Spillage: S-Y
IATA (Air)	Contact the manufacturer.						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Reactive hazard Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

Ammonium nitrate (CAS No. 6484-52-2)

WHMIS Classification	Class C – Oxidizing Substance Class D, Division 2, Subdivision B – Toxic material causing other toxic effects.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-4 Initial Issue Date: 06/01/2015 Last Revision Date: 05/21/2018 Version: 8

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Hydrox Emulsion
Product Names and Synonyms: Hydrox series, VX-Matrix, AXE series.
Intended Use: As an ingredient in an commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture (GHS-US)

Code	Hazard Class	Hazard Category
H227	Flammable Liquid	4
H272	Oxidizing Liquid	3
H303	Acute Toxicity, oral	5
H315	Skin Corrosion / Irritation	2
H319	Serious eye damage / eye irritation	2A
H333	Acute Toxicity, inhalation	5
H335	Specific target organ toxicity, single exposure; Respiratory tract irritation	3

Additional Classification of the Substance or Mixture (GHS-Canada)

Code	Hazard Class	Hazard Category
H205	Explosives	Division 1.5

Label Elements

Danger

Hazard Statements

Combustible Liquid
May intensify fire; oxidizer
May be harmful if swallowed
Causes skin irritation
Causes eye irritation
May be harmful if inhaled
May cause respiratory irritation

Additional Hazard Statement (GHS-Canada)

May mass explode in a fire

Precautionary Statements

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe dust or fumes.
Do not subject to grinding, friction, impact or shock.
Wash hands and other contact areas thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.

IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention.
Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Exposure reaction may be aggravated for those with pre-existing eye, skin, or respiratory conditions. Causes 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.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Ammonium nitrate	CAS No. 6484-52-2	70-85%
Petroleum distillates, hydrotreated Light	CAS No. 64742-47-8	0-8%
Distillates, petroleum, hydrotreated Middle	CAS No. 64742-46-7	0-8%
White Mineral Oil *	CAS No. 8042-47-5	0-8%
Fuels, diesel, no.2	CAS No. 68476-34-6	0-8%
Polyolefin alkanolamine ester emulsifier	CAS No. Proprietary	<1%

* Hydrox 505 contains only this oil, no other distillate or fuel is used.

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: When symptoms occur: move to open air, keep at rest and in a position comfortable for breathing. Get medical attention. Ventilate suspected area.

Skin Contact: Wash contact areas with soap and water. Remove contaminated clothing. Wash contaminated clothing before reuse.

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

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: May cause irritation to the respiratory tract, symptoms include: sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing.

Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe irritation or allergic reaction in sensitive individuals.

Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Ingestion: Ammonium nitrate ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by blue lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Symptoms: Exposure may cause irritation to the respiratory tract or damage to organs.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire, not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 140 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard:	There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures:	It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.
Firefighting Instructions:	When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.
Hazardous Combustion Products:	No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.

For Non-Emergency Personnel

Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.

For Emergency Personnel

Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Procedures:	Stop the discharge if safe to do so. Ventilate area.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up:	Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on ammonium nitrate process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	May be corrosive to metals. Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual

trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All ammonium nitrate storage sites must comply with ATF, OSHA or NRCAN regulations.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Special Rules on Packaging: Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ammonium nitrate, CAS No. 6484-52-2		
USA ACGIH (nuisance dust)	ACGIH TWA (mg/m^3)	10 mg/m^3 – Inhalable particulate
USA OSHA (nuisance dust)	OHSA PEL (TWA) (mg/m^3)	5 mg/m^3 – Respirable (particulate)

Fuels, diesel, no. 2, CAS No. 68476-34-6		
US ACGIH	ACGIH TWA	100 mg/m^3 (inhalable fraction and vapor)
Alberta	OEL TWA	100 mg/m^3
British Columbia	OEL TWA	100 mg/m^3 (aerosol, inhalable, and vapor)
Manitoba	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Newfoundland & Labrador	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Nova Scotia	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Ontario	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Prince Edward Island	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)
Saskatchewan	OEL STEL	150 mg/m^3 (inhalable fraction and vapor)
Saskatchewan	OEL TWA	100 mg/m^3 (inhalable fraction and vapor)

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemically resistant gloves are recommended, but not required.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Opaque, viscous (thick) creamy substance
Odor:	Fuel
Odor threshold:	Not available
Vapor density:	Not available
pH:	Not relevant
Melting point:	Not available
Initial boiling point and boiling range:	Not available
Flash point:	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Bulk Density:	1.27 – 1.36 g/cc (10.6 – 11.3 lb/gal)
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not available
Decomposition temperature:	>210°C (>410°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Not sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Hazardous Decomposition Products: No unusual fumes or decomposition products expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: May cause skin irritation

Eye Damage/Irritation: May cause serious eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness or dizziness

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Harmful if inhaled, causes methemoglobinemia. Symptoms may include headache, dizziness, nausea and a loss of coordination.

Symptoms/Injuries after Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe or allergic reaction in sensitive individuals.

Symptoms/Injuries after Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Symptoms/Injuries after Ingestion: Burning sensation. Abdominal pain. Abdominal cramps. Vomiting. Ammonium nitrate ingestion may cause methemoglobinemia.

Chronic Symptoms: Although none are expected under normal conditions, inhalation exposure may cause methemoglobinemia and may damage respiratory tract.

LD50 and LC50 Data (ingredients):

Ammonium nitrate, CAS No. 6484-52-2	
LD50 Oral Rat	2,217 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

Fuels, diesel, no. 2, CAS No 68476-34-6	
LD50 Oral Rat	>5000 mg/kg
LD50 Dermal Rabbit	>2000 mg/kg
LC50 Inhalation Rat	1 - 5 mg/l/4h

Petroleum distillates, hydrotreated light, CAS No. 64742-47-8	
LD50 Oral Rat	> 5,000 mg/kg
LD50 Dermal Rabbit	> 2,000 mg/kg
ATE US (mist)	>< 5.2 mg/l/4h

Distillates, petroleum, hydrotreated middle, CAS No. 64742-46-7	
LD50 Oral Rat	27,000 mg/kg
LC50 Dermal Rabbit	> 2,000 mg/l/4h
LC50 Inhalation Rat	> 5,800 mg/l/4h

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN3375	Ammonium nitrate emulsion, *intermediate for blasting explosives*	5.1	5.1	II	No	ERG-140
Canadian TDG	UN0332	Explosive, blasting, type E	1.5D	1.5D		No	--
IMDG (Vessel)	UN3375	Ammonium nitrate emulsion, *intermediate for blasting explosives*	5.1	5.1	II	No	EmS-No, Fire: F-H Spillage: S-Q
IATA (Air)	Contact the manufacturer						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Reactive hazard Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

Ammonium nitrate (CAS No. 6484-52-2)

WHMIS Classification	Class C – Oxidizing Substance Class D, Division 2, Subdivision B – Toxic material causing other toxic effects.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-5 Initial Issue Date: 06/01/2015 Last Revision Date: 07/05/2016 Version: 6

Party Responsible for the Preparation of This Document:
Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: 1.1D Emulsion Explosives
Product Names and Synonyms: Emulex series, Red-D Prime, Coalmex, Enviroseis, Red-D-Lite E, Thrifty Snowlauncher, AXE series
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H201	Explosives	Division 1.1
H272	Oxidizing Liquid	3
H303	Acute Toxicity, oral	5
H315	Skin Corrosion / Irritation	2
H319	Serious eye damage / eye irritation	2A
H333	Acute Toxicity, inhalation	5
H335	Specific target organ toxicity, single exposure; Respiratory tract irritation	3

Label Elements

Danger

Hazard Statements

Explosive; mass explosion hazard
May intensify fire; oxidizer
May be harmful if swallowed
Causes skin irritation
Causes eye irritation
May be harmful if inhaled
May cause respiratory irritation

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe dust or fumes.
Do not subject to grinding, friction, impact or shock.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.

IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention.
Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Exposure reaction may be aggravated for those with pre-existing eye, skin, or respiratory conditions. Causes 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.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Ammonium nitrate	CAS No. 6484-52-2	70-80%
Sodium nitrate	CAS No. 7631-99-4	0-10%
Aluminum	CAS No. 7429-90-5	0-6%
Paraffin oils (petroleum), catalytic dewaxed, light	CAS No. 64742-71-8	0-4%
Distillates, petroleum, hydrotreated heavy, naphthenic	CAS No. 64742-52-5	0-5%
Polyolefin alkanolamine ester emulsifier	CAS No. Proprietary	0-2%
Glass microspheres	CAS No. 65997-17-3	0-2%
Plastic microspheres	CAS No. Proprietary	0-0.5%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: When symptoms occur: move to open air, keep at rest and in a position comfortable for breathing. Get medical attention. Ventilate suspected area.

Skin Contact: Wash contact areas with soap and water. Remove contaminated clothing. Wash contaminated clothing before reuse.

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

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: May cause irritation to the respiratory tract, symptoms include: sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing.

Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe irritation or allergic reaction in sensitive individuals.

Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Ingestion: Ammonium nitrate ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by blue lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Symptoms: May cause irritation to the respiratory tract or damage to organs.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire, not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 140 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.
For Non-Emergency Personnel	
Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.
For Emergency Personnel	
Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Procedures:	Stop the discharge if safe to do so. Ventilate area.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up:	Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	May be corrosive to metals. Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.
Incompatible Materials:	Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.
Special Rules on Packaging:	Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ammonium nitrate, CAS No. 6484-52-2		
USA ACGIH (nuisance dust)	ACGIH TWA (mg/m^3)	10 mg/m^3 – Inhalable particulate
USA OSHA (nuisance dust)	OHSA PEL (TWA) (mg/m^3)	5 mg/m^3 – Respirable (particulate)

Aluminum granules, CAS No. 7429-90-5		
USA ACGIH	ACGIH TWA	1 mg/m^3 (inhalable fraction)
USA ACGIH	ACGIH category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA)	15 mg/m^3 (total dust) 5 mg/m^3 (inhalable fraction)
USA NIOSH	NIOSH REL (TWA)	10 mg/m^3 (total dust) 5 mg/m^3 (inhalable dust)
Alberta	OEL TWA	10 mg/m^3 (dust)
British Columbia	OEL TWA	1.0 mg/m^3 (inhalable)
Manitoba	OEL TWA	1 mg/m^3 (inhalable fraction)
New Brunswick	OEL TWA	10 mg/m^3 (metal dust)
Newfoundland & Labrador	OEL TWA	1 mg/m^3 (inhalable fraction)
Nova Scotia	OEL TWA	1 mg/m^3 (inhalable fraction)
Nunavut	OEL STEL	20 mg/m^3
Nunavut	OEL TWA	10 mg/m^3
Northwest Territories	OEL STEL	20 mg/m^3
Northwest Territories	OEL TWA	10 mg/m^3
Ontario	OEL TWA	1 mg/m^3 (inhalable)
Prince Edward Island	OEL TWA	1 mg/m^3 (inhalable fraction)
Québec	VEMP	10 mg/m^3
Saskatchewan	OEL STEL	20 mg/m^3 (dust)
Saskatchewan	OEL TWA	10 mg/m^3 (dust)

Glass, oxide, CAS No. 65997-17-3		
USA OSHA	OSHA PEL (TWA)	15 mg/m^3 (total dust) 5 mg/m^3 (inhalable fraction)
USA NIOSH	NIOSH REL (TWA)	5 mg/m^3 (total dust)
Yukon	OEL TWA	30 mg/m^3 (inhalable fraction) 10 mg/m^3 (dust)

Plastic Microspheres, CAS No. Propriety		
USA ACGIH	ACGIH TWA	15 mg/m^3 (dust)

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemically resistant gloves are recommended, but not required.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Paste or putty like material
Odor:	None
Odor threshold:	Not available
Vapor density:	Not available
pH:	Not relevant
Melting point (ammonium nitrate):	165°C (330°F)
Initial boiling point and boiling range:	Not available
Flash point:	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Density:	1.05 – 1.25 g/cc
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not available
Decomposition temperature:	>210°C (>410°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Not sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: May cause skin irritation

Eye Damage/Irritation: May cause serious eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness or dizziness

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not classified

Symptoms/Injuries after Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe or allergic reaction in sensitive individuals.

Symptoms/Injuries after Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Symptoms/Injuries after Ingestion: Burning sensation. Abdominal pain. Abdominal cramps. Vomiting. Ammonium nitrate ingestion may cause methemoglobinemia.

Chronic Symptoms: Although none are expected under normal conditions, inhalation exposure may cause methemoglobinemia and may damage respiratory tract.

LD50 and LC50 Data (ingredients):

Ammonium nitrate, CAS No. 6484-52-2	
LD50 Oral Rat	2,217 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

Sodium nitrate, CAS No. 7631-99-4	
LD50 Oral Rat	1,267 mg/kg of body weight

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0241	Explosive, blasting, type E	1.1D	1.1D		No	ERG-112
Canadian TDG	UN0241	Explosive, blasting, type E	1.1D	1.1D		No	--
IMDG (Vessel)	UN0241	Explosive, blasting, type E	1.1D	1.1D		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	Contact the manufacturer.						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III

Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)

Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

Ammonium nitrate (CAS No. 6484-52-2)

WHMIS Classification	Class C – Oxidizing Substance Class D, Division 2, Subdivision B – Toxic material causing other toxic effects.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-6 Initial Issue Date: 06/01/2015 Last Revision Date: 07/05/2016 Version: 6

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Cast Boosters
Product Names and Synonyms: ACP Booster Series, Orange Cap Series, Red Cap Series, Black Cap Series, Blue Cap Series, Brown Cap Series, Green Cap Series, Purple Cap Series, White Cap Series, Gray Cap Series, NDS Booster Series, ADP Booster Series, Gold Nugget, Diamond Nugget, DES Series, DES Pentolite Charges, DES Shaped Charges, Rock Crushers, 60, 90, 110 Gram Booster, Prime Gel, Renforcateurs, HDP Series, Snow Launcher Series, Delta K Series, Avalanche Guard, Hornet Series, Enviroprime Series, Electro Star Series, E-Star Series, Seisprime Series, Oil Well Special Series, DP Series, Crack Shot Series, Eagle Series, Trenchprime Series
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H201	Explosives	Division 1.1
H301	Acute toxicity, oral	3
H311	Acute toxicity, dermal	3
H361	Reproductive toxicity	2
H372	Specific target organ toxicity, repeated exposure	1

Label Elements

Danger

Hazard Statements

Explosive, mass explosion hazard
Toxic if swallowed
Toxic in contact with skin
Suspected of damaging fertility or the unborn child
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe dust or fumes.
Do not subject to grinding, friction, impact or shock.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.
IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention.
Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
2,4,6-Trinitrotoluene (TNT)	CAS No. 118-96-7	30-70%
Cyclonite (RDX)	CAS No. 121-82-4	0-70%
Pentaerythritol tetranitrate (PETN)	CAS No. 78-11-5	0-70%
Octogen (HMX)	CAS No. 2691-41-0	0-70%
Aluminum	CAS No. 7429-90-5	0-20%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: Not expected to be a hazard under normal conditions of use.

Skin Contact: Not expected to be a hazard under normal conditions of use.

Eye Contact: Not expected to be a hazard under normal conditions of use.

Ingestion: Not expected to be a hazard under normal conditions of use.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: None expected.

Skin Contact: None expected.

Eye Contact: None expected.

Ingestion: None expected.

Chronic Symptoms: None expected.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.

For Non-Emergency Personnel

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

Emergency Procedures: Isolate the area from unnecessary personnel.

For Emergency Personnel

Protective Equipment: Provide cleanup crew with proper PPE.

Emergency Procedures: Stop the discharge if safe to do so. Ventilate area.

Emergency Precautions: Avoid release to the environment.

Methods and Material for Containment and Cleaning Up: Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed: Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: May be corrosive to metals. Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.

Storage Conditions: Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Special Rules on Packaging: Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

2,4,6-Trinitrotoluene (TNT), CAS N0. 118-96-7		
USA ACGIH	ACGIH TWA	0.1 mg/m³
USA OSHA	OSHA PELTWA)	1.5 mg/m³
USA NIOSH	NIOSH REL (TWA)	0.5 mg/m³
USA IDLH	US IDLH	500 mg/m³
Alberta	OEL TWA	0.1 mg/m³
British Columbia	OEL TWA	0.1 mg/m³
Manitoba	OEL TWA	0.1 mg/m³
New Brunswick	OEL TWA	0.1 mg/m³
Newfoundland & Labrador	OEL TWA	0.1 mg/m³
Nova Scotia	OEL TWA	0.1 mg/m³
Nunavut	OEL Ceiling	0.5 mg/m³
Northwest Territories	OEL Ceiling	0.5 mg/m³
Ontario	OEL TWA	0.1 mg/m³
Prince Edward Island	OEL TWA	0.1 mg/m³
Québec	VEMP	0.5 mg/m³
Saskatchewan	OEL STEL	0.3 mg/m³
Saskatchewan	OEL TWA	0.1 mg/m³
Yukon	OEL Ceiling	0.5 mg/m³

Cyclonite (RDX), CAS No. 121-82-4		
USA ACGIH	ACGIH TWA	0.5 mg/m³
USA NIOSH	NIOSH REL (TWA)	1.5 mg/m³
USA NIOSH	NIOSH REL (STEL)	3 mg/m³
Alberta	OEL TWA	0.5 mg/m³
British Columbia	OEL TWA	0.5 mg/m³
Manitoba	OEL TWA	0.5 mg/m³
New Brunswick	OEL TWA	0.5 mg/m³
Newfoundland & Labrador	OEL TWA	0.5 mg/m³
Nova Scotia	OEL TWA	0.5 mg/m³
Nunavut	OEL STEL	3 mg/m³
Nunavut	OEL TWA	1.5 mg/m³
Northwest Territories	OEL STEL	3 mg/m³
Northwest Territories	OEL TWA	1.5 mg/m³
Ontario	OEL TWA	0.5 mg/m³
Prince Edward Island	OEL TWA	0.5 mg/m³
Québec	VEMP	1.5 mg/m³
Saskatchewan	OEL STEL	1.5 mg/m³
Saskatchewan	OEL TWA	0.5 mg/m³
Yukon	OEL STEL	3 mg/m³
Yukon	OEL TWA	1.5 mg/m³

Aluminum granules, CAS No. 7429-90-5		
USA ACGIH	ACGIH TWA	1 mg/m³ (inhalable fraction)
USA ACGIH	ACGIH category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA)	15 mg/m³ (total dust) 5 mg/m³ (inhalable fraction)
USA NIOSH	NIOSH REL (TWA)	10 mg/m³ (total dust) 5 mg/m³ (inhalable dust)
Alberta	OEL TWA	10 mg/m³ (dust)
British Columbia	OEL TWA	1.0 mg/m³ (inhalable)
Manitoba	OEL TWA	1 mg/m³ (inhalable fraction)
New Brunswick	OEL TWA	10 mg/m³ (metal dust)
Newfoundland & Labrador	OEL TWA	1 mg/m³ (inhalable fraction)
Nova Scotia	OEL TWA	1 mg/m³ (inhalable fraction)
Nunavut	OEL STEL	20 mg/m³
Nunavut	OEL TWA	10 mg/m³
Northwest Territories	OEL STEL	20 mg/m³
Northwest Territories	OEL TWA	10 mg/m³
Ontario	OEL TWA	1 mg/m³ (inhalable)
Prince Edward Island	OEL TWA	1 mg/m³ (inhalable fraction)
Québec	VEMP	10 mg/m³
Saskatchewan	OEL STEL	20 mg/m³ (dust)
Saskatchewan	OEL TWA	10 mg/m³ (dust)

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemically resistant gloves are recommended, but not required.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Solid
Odor:	None
Odor threshold:	Not available
Vapor density:	Not available
pH:	Not relevant
Melting point:	70°C - 75°C (158°F - 167°F)
Initial boiling point and boiling range:	Not available
Flash point (oil):	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Density:	1.5 – 1.7 g/cc
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not Available
Decomposition temperature:	210°C (410°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Not sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available for product

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): None

Specific Target Organ Toxicity (Repeated Exposure): None

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries. after Skin Contact: Not expected to be a hazard under normal conditions of use

Symptoms/Injuries after Eye Contact: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries after Ingestion: Not expected to be a hazard under normal conditions of use.

Chronic Symptoms: None

LD50 and LC50 Data (ingredients):

2,4,6-Trinitrotoluene (TNT), CAS No. 118-96-7	
ATE US (oral)	100 mg/kg of body weight
ATE US (dermal)	300 mg/kg of body weight
ATE US (dust)	0.5 mg/kg of body weight
IARC	3

Cyclonite (RDX), CAS No. 121-82-4	
LD50 Oral Rat	100 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

Octogen (HMX), CAS No. 2691-41-0	
LD50 Oral Rat	1,670 mg/kg
LD50 Dermal Rat	982 mg/kg species: New Zealand White

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0042	Boosters, *without detonator*	1.1D	1.1D		No	ERG-112
Canadian TDG	UN0042	Boosters, *without detonator*	1.1D	1.1D		No	--
IMDG (Vessel)	UN0042	Boosters, *without detonator*	1.1D	1.1D		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	Contact the manufacturer.						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-7 Initial Issue Date: 06/01/2015 Last Revision Date: 05/21/2018 Version: 8

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Detonating Cord
Product Names and Synonyms: Lite Line, Scotch Cord, A-Cord, No. 10 to No. 400 cord series, Seismic Detonating Cord, Slide Line Series, Special Series, Detonating Cords, *Cordeau detonant fuse*
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H201	Explosives	Division 1.1
H302	Acute toxicity, oral	4

Label Elements

Danger

Hazard Statements

Explosive, mass explosion hazard
Harmful if swallowed

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe dust or fumes.
Do not subject to grinding, friction, impact or shock.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Pentaerythritol tetranitrate (PETN)	CAS No. 78-11-5	20 - 80%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: Not expected to be a hazard under normal conditions of use.

Skin Contact: Not expected to be a hazard under normal conditions of use.

Eye Contact: Not expected to be a hazard under normal conditions of use.

Ingestion: Not expected to be a hazard under normal conditions of use.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: None expected.

Skin Contact: None expected.

Eye Contact: None expected.

Ingestion: None expected.

Chronic Symptoms: None expected.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard:	There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures:	It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.
Firefighting Instructions:	When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.
Hazardous Combustion Products:	No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.

For Non-Emergency Personnel

Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.

For Emergency Personnel

Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Procedures:	Stop the discharge if safe to do so. Ventilate area.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up:	Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.
Incompatible Materials:	Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.
Special Rules on Packaging:	Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:	Not available
Exposure Controls:	
Appropriate Engineering Controls:	Product should be handled and used under strictly controlled conditions.
Personal Protective Equipment:	
Hand Protection:	Chemically resistant gloves are recommended, but not required.
Eye Protection:	Safety glasses with side shields or safety goggles.
Respiratory Protection:	Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Small diameter rope with white powdery core
Odor:	None
Odor threshold:	Not available
Vapor density:	Not available
pH:	Not relevant
Melting point:	140°C (284°F)
Initial boiling point and boiling range:	Not available
Flash point (oil):	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Density:	Not relevant
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not Available
Decomposition temperature:	>150°C (300°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Strong acids

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available for product

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): None

Specific Target Organ Toxicity (Repeated Exposure): None

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries. after Skin Contact: Not expected to be a hazard under normal conditions of use

Symptoms/Injuries after Eye Contact: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries after Ingestion: Not expected to be a hazard under normal conditions of use.

Chronic Symptoms: None

LD50 and LC50 Data (ingredients): Not available

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0065	Cord, detonating, *flexible*	1.1D	1.1D		No	ERG-112
Canadian TDG	UN0065	Cord, detonating, *flexible*	1.1D	1.1D		No	
IMDG (Vessel)	UN0065	Cord, detonating, *flexible*	1.1D	1.1D		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	Contact the manufacturer						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden release of pressure hazard.
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	Pentaerythritol tetranitrate (PETN) is listed on the Canadian DSL

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-8 Initial Issue Date: 06/01/2015 Last Revision Date: 07/05/2016 Version: 6

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Electric & Electronic Detonators
Product Names and Synonyms: Rock*Star series, Coal Mine Delay, Coal*Star, E*Star series, Static Star, Oil*Star Series, Rockbuster Special
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Item ("Article"):

Code	Hazard Class	Hazard Category
H204	Explosives	Division 1.4

Label Elements

Warning

Hazard Statements

Fire or projection hazard

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not subject to grinding, friction, impact or shock.
Do not eat, drink or smoke when using this product.
Wear eye protection.
In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards: None expected

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

The hazardous substances are sealed inside the metal detonator capsule. The values in column 3 are shown as a percent of the total detonator shell weight, not including the coated wire to the detonator.

Name	Product Identifier	% (w/w)
Zinc	CAS No. 7440-66-6	0-60%
Copper	CAS No. 7440-50-8	0-60%
Aluminum	CAS No. 7429-90-5	0-40%
Cyclonite (RDX)	CAS No. 121-82-4	0-15%
Hexanitrostilbene (HNS)	CAS No. 20062-22-0	0-15%
Pentaerythritol tetranitrate (PETN)	CAS No. 78-11-5	0-15%
Barium chromate	CAS No. 10294-40-3	0-5%
Boron	CAS No. 7440-42-8	0-5%
Lead Azide	CAS No. 13424-46-9	0-5%
Lead tetraoxide	CAS No. 1314-41-6	0-5%
Tungsten (W)	CAS No. 7440-33-7	0-5%
Silicon	CAS No. 7440-21-3	0-2%

SECTION 4: FIRST AID MASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: Not an expected route of exposure.

Skin Contact: Not an expected route of exposure.

Eye Contact: Not an expected route of exposure.

Ingestion: Not an expected route of exposure.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: Not an expected route of exposure.

Skin Contact: Not an expected route of exposure.

Eye Contact: Not an expected route of exposure.

Ingestion: Not an expected route of exposure.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.

For Non-Emergency Personnel

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

Emergency Procedures: Isolate the area from unnecessary personnel.

For Emergency Personnel

Protective Equipment: Provide cleanup crew with proper PPE.

Emergency Precautions: Avoid release to the environment.

Methods and Material for Containment and Cleaning Up Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed: Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when preforming hot work on explosive process equipment, storage areas or containers related to the intended use.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.

Storage Conditions: Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.

Incompatible Materials: Strong acids, strong bases and organic solvents.

Special Rules on Packaging: Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits: Not applicable, sealed item

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions.

Personal Protective Equipment:

Hand Protection: Not required.

Eye Protection: Safety glasses.

Respiratory Protection: Not required.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Plastic coated wire attached to a sealed metal detonator capsule
Odor:	None
Odor threshold:	Not relevant
Vapor density:	Not relevant
pH:	Not relevant
Melting point:	Not relevant
Initial boiling point and boiling range:	Not relevant
Flash point (oil):	Not relevant
Evaporation rate:	Not relevant
Flammability:	Not relevant

Upper / lower flammability or explosive limits:	Not relevant
Vapor pressure:	Not relevant
Density:	Not relevant
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not relevant
Auto-ignition temperature:	Not relevant
Decomposition temperature):	Not relevant
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Strong acids, strong bases and organic solvents.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not classified

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): None

Specific Target Organ Toxicity (Repeated Exposure): None

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries. after Skin Contact: Not expected to be a hazard under normal conditions of use

Symptoms/Injuries after Eye Contact: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries after Ingestion: Not expected to be a hazard under normal conditions of use.

Chronic Symptoms: None

LD50 and LC50 Data (ingredients):

Boron, CAS No. 7440-42-8	
LD50 Oral Rat	650 mg/kg of body weight

Copper, CAS No. 7440-50-8	
LD50 Oral (mouse)	413 mg/kg of body weight

Cyclonite (RDX), CAS No. 121-82-4	
LD50 Oral Rat	71 mg/kg of body weight

Lead azide, CAS No. 13424-46-9	
LD50 Oral Rat	500 mg/kg of body weight
LC50 Inhalation Rat	1.5 mg/l/4h

Lead tetraoxide, CAS No. 1314-41-6	
LD50 Oral Rat	500 mg/kg of body weight
LC50 Inhalation Rat	1.5mg/l/4h
Included in OSHA Hazard Communication Carcinogen List	

Silicon, CAS No. 7440-21-3	
LD50 Oral Rat	3,160 mg/kg of body weight

Pentarythritol tetranitrate (PETN), CAS No. 78-11-5	
LD50 Oral Rat 19500 mg/kg of	LD50 Oral Rat 19500 mg/kg of body

Tungsten (W) CAS No. 7440-33-7	
LD50 Oral Rat 2000 mg/kg of	LD50 Oral Rat 2000 mg/kg of body

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0255	Detonators, electric, *for blasting.*	1.4B	1.4B		No	ERG-114
Canadian TDG	UN0255	Detonators, electric, *for blasting.*	1.4B	1.4B		No	--
IMDG (Vessel)	UN0255	Detonators, electric, *for blasting.*	1.4B	1.4B		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	UN0255	Detonators, electric, *for blasting.*	1.4B	1.4B		No	See Note 1

Note 1: Aircraft shipment of material is for Cargo Aircraft Only and each package not to exceed 75kg (165 lbs.) Net Explosive Weight. See 49CFR 172.101 HMT, Column 9.

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:
Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-9 Initial Issue Date: 06/01/2015 Last Revision Date: 01/24/2019 Version: 11

Party Responsible for the Preparation of This Document:
Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Non-Electric Detonators
Product Names and Synonyms: Shock*Star series, In-Hole Delays, Surface Delay Connectors, Quick-Relay Connectors, Dual*Delays, Shorty, Long Period Delays, STD (Shock Tube with Detonator), Quick*Start, MS Connector
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Item ("Article"):

Code	Hazard Class	Hazard Category
H201	Explosives	Division 1.1

Label Elements

Danger

Hazard Statements

Explosive, mass explosion hazard

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not subject to grinding, friction, impact or shock.
Do not eat, drink or smoke when using this product.
Wear eye protection.
In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards: None expected

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

The hazardous substances in Table 1 are sealed inside the metal detonator capsule. The values in column 3 are shown as a percent of the total detonator capsule weight and do not include the tube leading to the detonator capsule.

Table 1

Name	Product Identifier	% (w/w)
Copper	CAS No. 7440-50-8	0-60%
Zinc	CAS No. 7440-66-6	0-60%
Aluminum	CAS No. 7429-90-5	0-40%
Hexanitrostilbene (HNS)	CAS No. 20062-22-0	0-15%
Cyclonite (RDX)	CAS No. 121-82-4	0-15%
Pentaerythritol tetranitrate (PETN)	CAS No. 78-11-5	0-15%
Barium chromate	CAS No. 10294-40-3	0-5%
Boron	CAS No. 7440-42-8	0-5%
Lead Azide	CAS No. 13424-46-9	0-5%
Lead tetraoxide	CAS No. 1314-41-6	0-5%
Tungsten (W)	CAS No. 7440-33-7	0-5%
Silicon	CAS No. 7440-21-3	0-2%

The hazardous substances in Table 2 are sealed inside the plastic tube. The values in column 3 are shown as a percent of the total weight of tube. The tube length may vary depending on the specific product.

Table 2

Name	Product Identifier	% (w/w)
Aluminum	CAS No. 7429-90-5	0-0.2%
Octogen (HMX)	CAS No. 2691-41-0	0-0.4%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: Not an expected route of exposure.

Skin Contact: Not an expected route of exposure.

Eye Contact: Not an expected route of exposure.

Ingestion: Not an expected route of exposure.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: Not an expected route of exposure.

Skin Contact: Not an expected route of exposure.

Eye Contact: Not an expected route of exposure.

Ingestion: Not an expected route of exposure.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Item ("Article"):

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.

For Non-Emergency Personnel

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

Emergency Procedures: Isolate the area from unnecessary personnel.

For Emergency Personnel

Protective Equipment: Provide cleanup crew with proper PPE.

Emergency Precautions: Avoid release to the environment.

Methods and Material for Containment and Cleaning Up Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed: Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.

Storage Conditions: Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.

Incompatible Materials: Strong acids, strong bases and organic solvents.

Special Rules on Packaging: Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits: Not applicable, sealed item

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions.

Personal Protective Equipment:

Hand Protection: Not required.

Eye Protection: Safety glasses.

Respiratory Protection: Not required.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Long plastic tube that may be attached to a sealed metal capsule
Odor:	None
Odor threshold:	Not relevant
Vapor density:	Not relevant
pH:	Not relevant
Melting point:	Not relevant
Initial boiling point and boiling range:	Not relevant
Flash point (oil):	Not relevant
Evaporation rate:	Not relevant
Flammability:	Not relevant
Upper / lower flammability or explosive limits:	Not relevant
Vapor pressure:	Not relevant
Density:	Not relevant
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not relevant
Auto-ignition temperature:	Not relevant
Decomposition temperature):	Not relevant
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Strong acids, strong bases and organic solvents.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not classified

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): None

Specific Target Organ Toxicity (Repeated Exposure): None

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries. after Skin Contact: Not expected to be a hazard under normal conditions of use

Symptoms/Injuries after Eye Contact: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries after Ingestion: Not expected to be a hazard under normal conditions of use.

Chronic Symptoms: None

LD50 and LC50 Data (ingredients):

Boron, CAS No. 7440-42-8	
LD50 Oral Rat	650 mg/kg of body weight

Octogen (HMX), CAS No. 2691-41-0	
LD50 Oral Rat	1,670 mg/kg of body weight
LD50 Dermal Rat	982 mg/kg species: New Zealand White

Cyclonite (RDX), CAS No. 121-82-4	
LD50 Oral Rat	71 mg/kg of body weight

Lead azide, CAS No. 13424-46-9	
LD50 Oral Rat	500 mg/kg of body weight
LC50 Inhalation Rat	1.5 mg/l/4h

Copper, CAS No. 7440-50-8	
LD50 Oral Mouse	413 mg/kg of body weight

Lead tetraoxide, CAS No. 1314-41-6	
LD50 Oral Rat	500 mg/kg of body weight
LC50 Inhalation Rat	1.5mg/l/4h
Included in OSHA Hazard Communication Carcinogen List	

Silicon, CAS No. 7440-21-3	
LD50 Oral Rat	3,160 mg/kg of body weight

Pentarythritol tetranitrate (PETN), CAS No. 78-11-5	
LD50 Oral Rat	19500 mg/kg of body weight

Tungsten (W) CAS No. 7440-33-7	
LD50 Oral Rat	2000 mg/kg of body weight

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Depending on product and packaging configuration, these products may be classified as either a 1.1B, 1.4B or 1.4S.

When packaged as a 1.1B:

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0360	Detonator assemblies, non-electric, *for blasting.*	1.1B	1.1B		No	ERG-112
Canadian TDG	UN0360	Detonator assemblies, non-electric, *for blasting.*	1.1B	1.1B		No	--
IMDG (Vessel)	UN0360	Detonator assemblies, non-electric, *for blasting.*	1.1B	1.1B		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	Contact the manufacturer						

When packaged as a 1.4B:

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0361	Detonator assemblies, non-electric, *for blasting.*	1.4B	1.4B		No	ERG-114
Canadian TDG	UN0361	Detonator assemblies, non-electric, *for blasting.*	1.4B	1.4B		No	--
IMDG (Vessel)	UN0361	Detonator assemblies, non-electric, *for blasting.*	1.4B	1.4B		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	Contact the manufacturer						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-10 Initial Issue Date: 6/1/2015 Last Revision Date: 03/08/2019 Version: 8

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Dynamite
Product Names and Synonyms: Apcogel series, Extra Gelatin series, 60% Seis Gel, AL series, Red-D Gel B, Rockbuster II, Red Diamond series, NG product
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H201	Explosives	Division 1.1

Label Elements

Danger

Hazard Statements

May mass explode in a fire

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not subject to grinding, friction, impact or shock.
Do not breathe dust or fumes.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.
IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention. Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

Exposure reaction may be aggravated for those with pre-existing eye, skin, or respiratory conditions. Causes 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.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Ammonium nitrate	CAS No. 6484-52-2	Note 1
Sodium nitrate	CAS No. 7631-99-4	Note 1
Ethylene dinitrate / nitroglycol	CAS No. 628-96-6	Note 1
Glycerol trinitrate / nitroglycerine	CAS No. 55-63-0	Note 1
Nitrocellulose	CAS No. 9004-70-0	Note 1
Sulfur	CAS No. 7704-34-9	Note 1

Note 1: For the listed ingredients exact percentages are being withheld as CBI (confidential business information).

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: When symptoms occur: move to open air, keep at rest and in a position comfortable for breathing. Get medical attention. Ventilate suspected area.

Skin Contact: Wash contact areas with soap and water. Remove contaminated clothing. Wash contaminated clothing before reuse.

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

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: Prolonged exposure may cause irritation to the respiratory tract, symptoms include: sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing.

Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe irritation or allergic reaction in sensitive individuals.

Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Ingestion: May cause vasodilatory effect. Ammonium nitrate ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by blue lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Symptoms: Prolonged exposure may cause irritation to the respiratory tract. May cause damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.
For Non-Emergency Personnel	
Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.
For Emergency Personnel	
Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Procedures:	Stop the discharge if safe to do so. Ventilate area.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up	Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling	Open and handle receptacle with care. Avoid jolting, friction and impact, use only in well ventilated areas
Additional Hazards when Processed:	Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.
Incompatible Materials:	Protect from humidity and water.
Special Rules on Packaging:	Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ethylene glycol, dinitrate, CAS No. 628-96-6		
USA ACGIH	ACGIH TWA	0.05 ppm
USA OSHA	OSHA PEL (TWA)	1 mg/m³
USA NIOSH	NIOSH REL (STEL)	0.1 mg/m³
Alberta	OEL TWA	0.3 mg/m³
British Columbia	OEL TWA	0.05 ppm
Manitoba	OEL TWA	0.05 ppm
New Brunswick	OEL TWA	0.31 mg/m³
Newfoundland & Labrador	OEL TWA	0.05 ppm
Nova Scotia	OEL TWA	0.05 ppm
Nunavut	OEL STEL	0.31 mg/m³
Nunavut	OEL TWA	1.2 mg/m³
Northwest Territories	OEL STEL	0.31 mg/m³
Northwest Territories	OEL TWA	1.2 mg/m³
Ontario	OEL TWA	0.05 ppm
Prince Edward Island	OEL TWA	0.05 ppm
Québec	PLAFOND	1.2 mg/m³
Saskatchewan	OEL STEL	0.15 ppm
Saskatchewan	OEL TWA	0.05 ppm

Nitroglycerine, CAS No. 55-63-0		
USA ACGIH	ACGIH TWA	0.05 ppm
USA OSHA	OSHA PEL	2 mg/m³
USA NIOSH	NIOSH REL (STEL)	0.1 mg/m³
Alberta	OEL TWA	0.5 mg/m³
British Columbia	OEL TWA	0.05 ppm
Manitoba	OEL TWA	0.05 ppm
New Brunswick	OEL TWA	0.46 mg/m³
Newfoundland & Labrador	OEL TWA	0.05 ppm
Nova Scotia	OEL TWA	0.05 ppm
Nunavut	OEL STEL	0.46 mg/m³
Nunavut	OEL TWA	1.9 mg/m³
Northwest Territories	OEL STEL	0.46 mg/m³
Northwest Territories	OEL TWA	1.9 mg/m³
Ontario	OEL TWA	0.05 ppm
Prince Edward Island	OEL TWA	0.05 ppm
Québec	PLAFOND	1.86 mg/m³
Saskatchewan	OEL STEL	0.15 ppm
Saskatchewan	OEL TWA	0.05 ppm

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemically resistant gloves are recommended, but not required.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Solid material
Odor:	None
Vapor density:	Not available
pH:	Not relevant
Melting point (ammonium nitrate):	Not relevant
Initial boiling point and boiling range:	Not available
Flash point (oil):	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Density:	Variable depending on product
Solubility:	Variable depending on product
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not available
Decomposition temperature	Not determined
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: No information available

Hazardous Decomposition Products: No unusual decomposition products expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available for product

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: May cause serious eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Suspected of causing cancer

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): None

Specific Target Organ Toxicity (Repeated Exposure): None

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries. after Skin Contact: Not expected to be a hazard under normal conditions of use

Symptoms/Injuries after Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Symptoms/Injuries after Ingestion: Burning sensation. Abdominal pain. Abdominal cramps. Vomiting. Ammonium nitrate ingestion may cause methemoglobinemia.

Chronic Symptoms: None

LD50 and LC50 Data (ingredients):

Ammonium nitrate, CAS No. 6484-52-2	
LD50 Oral Rat	2,217 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

Sodium nitrate, CAS No. 7631-99-4	
LD50 Oral Rat	1,267 mg/kg of body weight

Nitroglycerine, CAS No. 55-63-0	
LD50 Oral Rat	105 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0081	Explosive, blasting, type A	1.1D	1.1D		No	ERG-112
Canadian TDG	UN0081	Explosive, blasting, type A	1.1D	1.1D		No	--
IMDG (Vessel)	UN0081	Explosive, blasting, type A	1.1D	1.1D		No	EmS-No, Fire: F-B Spillage: S-Y
IATA (Air)	Contact the manufacturer.						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-11 Initial Issue Date: 6/1/2015 Last Revision Date: 03/21/2018 Version: 7

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Emuline
Product Names and Synonyms: Emuline Series
Intended Use: As a commercial explosive.
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H201	Explosives	Division 1.1
H272	Oxidizing Liquid	3
H303	Acute Toxicity, oral	5
H315	Skin Corrosion / Irritation	2
H319	Serious eye damage / eye irritation	2A
H333	Acute Toxicity, inhalation	5
H335	Specific target organ toxicity, single exposure; Respiratory tract irritation	3

Label Elements

Danger

Hazard Statements

Explosive; mass explosion hazard
May intensify fire; oxidizer
May be harmful if swallowed
Causes skin irritation
Causes eye irritation
May be harmful if inhaled
May cause respiratory irritation

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe dust or fumes.
Do not subject to grinding, friction, impact or shock.
Do not eat, drink or smoke when using this product.
Wear eye protection, protective gloves recommended.

IF SWALLOWED: Get immediate medical attention. DO NOT induce vomiting.
IF ON SKIN: Wash contact area with soap and water. If irritation occurs, get medical attention.
Take off contaminated clothing and wash before reuse.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards:

In case of fire: Extreme risk of explosion. Evacuate area. **DO NOT** fight fire when fire reaches explosives.

Exposure reaction may be aggravated for those with pre-existing eye, skin, or respiratory conditions.
Causes 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.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Ammonium nitrate	CAS No. 6484-52-2	70-80%
Paraffin oils (petroleum), catalytic dewaxed, light	CAS No. 64742-71-8	0-4%
Light napthenic hydrotreated distillates	CAS No. 64742-53-6	0-6%
Polyolefin alkanolamine ester emulsifier	CAS No. Proprietary	0-1%
Glass microspheres	CAS No. 65997-17-3	0-4%
Plastic microspheres	CAS No. Proprietary	0-0.5%
Pentaerythritol tetranitrate (PETN)	CAS No. 78-11-5	1 – 4%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: When symptoms occur: move to open air, keep at rest and in a position comfortable for breathing. Get medical attention. Ventilate suspected area.

Skin Contact: Wash contact areas with soap and water. Remove contaminated clothing. Wash contaminated clothing before reuse.

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

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: May cause irritation to the respiratory tract, symptoms include: sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing.

Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe irritation or allergic reaction in sensitive individuals.

Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Ingestion: Ammonium nitrate ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by blue lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Symptoms: May cause irritation to the respiratory tract or damage to organs.

Indication of Any Immediate Medical Attention and Special Treatment Needed:

If exposed, concerned or you don't feel well, get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures: It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.

Firefighting Instructions: When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.
For Non-Emergency Personnel	
Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.
For Emergency Personnel	
Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Procedures:	Stop the discharge if safe to do so. Ventilate area.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up:	Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	May be corrosive to metals. Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.
Incompatible Materials:	Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.
Special Rules on Packaging:	Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ammonium nitrate, CAS No. 6484-52-2		
USA ACGIH (nuisance dust)	ACGIH TWA (mg/m^3)	10 mg/m^3 – Inhalable particulate
USA OSHA (nuisance dust)	OHSA PEL (TWA) (mg/m^3)	5 mg/m^3 – Respirable (particulate)

Glass, oxide, CAS No. 65997-17-3		
USA OSHA	OSHA PEL (TWA)	15 mg/m³ (total dust) 5 mg/m³ (inhalable fraction)
USA NIOSH	NIOSH REL (TWA)	5 mg/m³ (total dust)
Yukon	OEL TWA	30 mg/m³ (inhalable fraction) 10 mg/m³ (dust)

Plastic Microspheres, CAS No. Propriety		
USA ACGIH	ACGIH TWA	15 mg/m³ (dust)

Exposure Controls:

Appropriate Engineering Controls: Product should be handled and used under strictly controlled conditions. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure, but are not required.

Personal Protective Equipment:

Hand Protection: Chemically resistant gloves are recommended, but not required.

Eye Protection: Safety glasses with side shields or safety goggles.

Respiratory Protection: Approved respiratory protection should be worn when recommended by a risk assessment or if irritation is experienced.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Casing (filled with paste or putty like material) with attached cord (filled with powdery substance)
Odor:	None
Odor threshold:	Not available
Vapor density:	Not available
pH:	Not relevant
Melting point (ammonium nitrate):	165°C (330°F)
Initial boiling point and boiling range:	Not available
Flash point:	Not available
Evaporation rate:	Not relevant
Flammability:	Not available
Upper / lower flammability or explosive limits:	Not available
Vapor pressure:	Not available
Density:	1.05 – 1.25 g/cc
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not available
Auto-ignition temperature:	Not available
Decomposition temperature:	>210°C (>410°F)
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Cord sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Emulsion not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Avoid contamination with combustible or flammable materials, strong acids, strong bases, strong oxidizing agents, reducing agents, chlorinated compounds, copper (any alloys like bronze and brass), metal powders and peroxides.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: May cause skin irritation

Eye Damage/Irritation: May cause serious eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness or dizziness

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not classified

Symptoms/Injuries after Skin Contact: May cause mild skin irritation. Symptoms may include: redness, pain, swelling, itching, burning, dryness and dermatitis. May cause a more severe or allergic reaction in sensitive individuals.

Symptoms/Injuries after Eye Contact: May cause serious eye irritation. Symptoms may include redness, pain, swelling, itching, burning, tearing and blurred vision.

Symptoms/Injuries after Ingestion: Burning sensation. Abdominal pain. Abdominal cramps. Vomiting. Ammonium nitrate ingestion may cause methemoglobinemia.

Chronic Symptoms: Although none are expected under normal conditions, inhalation exposure may cause methemoglobinemia and may damage respiratory tract.

LD50 and LC50 Data (ingredients):

Ammonium nitrate, CAS No. 6484-52-2	
LD50 Oral Rat	2,217 mg/kg of body weight
LC50 Inhalation Rat	> 88.8 mg/l/4h

Sodium nitrate, CAS No. 7631-99-4	
LD50 Oral Rat	1,267 mg/kg of body weight

Pentaerythritol tetranitrate (PETN), CAS No. 78-11-5	
LD50 Oral Rat, oral	3,224 mg/kg of body weight

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0241	Explosive, blasting, type E	1.1D	1.1D		No	ERG-112
Canadian TDG	UN0241	Explosive, blasting, type E	1.1D	1.1D		No	--
IMDG (Vessel)	UN0241	Explosive, blasting, type E	1.1D	1.1D		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	Contact the manufacturer.						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden Release of pressure hazard. Immediate (acute) health hazard Delayed (chronic) health hazard
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:

Domestic Substances List (DSL) Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

Ammonium nitrate (CAS No. 6484-52-2)

WHMIS Classification	Class C – Oxidizing Substance Class D, Division 2, Subdivision B – Toxic material causing other toxic effects.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-12 Initial Issue Date: 06/03/2015 Last Revision Date: 07/05/2016 Version: 2

Party Responsible for the Preparation of This Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Aqua Ammonia
Product Names and Synonyms: Ammonia water, Aqueous ammonia, Ammonium hydrate, Ammonium hydroxide
Intended Use: Industrial applications
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H302	Acute toxicity, oral	4
H332	Acute toxicity, inhalation	4
H314	Skin corrosion / irritation	1A
H318	Serious eye damage / eye irritation	1

Label Elements

Danger

Hazard Statements

Harmful if swallowed
Harmful if inhaled
Causes severe skin burns and eye damage
Causes serious eye damage

Precautionary Statements

Wash skin thoroughly after handling.
Avoid release to the environment.
Wear protective gloves/ protective clothing/ eye protection/ face protection.

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting.

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.

Immediately call a POISON CENTER/doctor.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
If exposed or concerned, or you do not feel well: Get medical attention.
Wash contaminated clothing before reuse.
Store locked up.
Dispose of contents/container to an approved waste disposal plant.

Other Hazards:

Lachrymator.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Ammonium hydroxide	CAS No. 1336-21-6	10-19.5

SECTION 4: FIRST AID MEASURES

General: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

Inhalation: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

Skin Contact: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

Eye Contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

Ingestion: Rinse mouth. DO NOT induce vomiting. Get medical attention.

Most Important Symptoms and Effects both Acute and Delayed:

The most important known symptoms and effects are described in the labeling (see section 2) and/or in section 11

Indication of Any Immediate Medical Attention and Special Treatment Needed:

No data available

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Use water spray

Unsuitable Extinguishing Media: Reacts violently with fire extinguishing agents such as carbon dioxide (CO_2)

Special Hazards Arising from the Substance or Mixture

Fire Hazard:	Not flammable. Under conditions of fire this material may produce: Nitrogen oxides, nitrogen, ammonia.
Explosion hazard:	Ammonia vapor concentrations between 16% and 25% can explode on contact with ignition source.
Advice for Firefighters:	Keep upwind. Use water spray or fog for cooling exposed containers. Wear self-contained breathing apparatus for firefighting if necessary.
Other information:	Do not allow run-off from fire fighting to enter drains or water ways.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Keep away from open flames, hot surfaces and sources of ignition. No smoking. Avoid all contact with skin, eyes, or clothing. Do NOT breathe vapor, mist, spray.

For Non-Emergency Personnel

Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Evacuate unnecessary personnel. Eliminate ignition sources.

For Emergency Personnel

Protective Equipment:	Equip cleanup crew with proper protection.
Emergency Procedures:	Stop leak if safe to do so. Ventilate area.
Emergency Precautions:	Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters.
Methods and Material for Containment and Cleaning Up:	Stop the flow of material, if this is without risk. Ventilate area. Contain any spills with dikes or absorbents. Clean up spills immediately and dispose of waste safely. Never neutralize spill with acid.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Do NOT enter (storage areas, confined spaces) unless adequately ventilated. Emits ammonia vapors. Flammable gas. Ammonium hydroxide reacts with many heavy metals and their salts forming explosive compounds. The solution in water is a strong base, it reacts violently with acids.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with soap and water before eating, drinking, or smoking and again when leaving work. Wash contaminated clothing before reuse.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	Any proposed use of this product in elevated-temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. Ensure adequate ventilation. Comply with applicable regulations.

Storage Conditions: Store in a dry, cool and well-ventilated place. Storage containers should have safety relief valves. Store locked up.

Incompatible Materials: Forms explosive compounds with calcium hypochlorite, bleaches, gold, mercury, silver, chlorine and other halogens.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Ammonia, CAS No. 7664-41-7		
USA ACGIH	ACGIH TWA	25 ppm
USA ACGIH	ACGIH STEL	35 ppm
USA OSHA	OSHA PEL (TWA)	50 ppm
USA NIOSH	NIOSH REL (TWA)	25 ppm
USA NIOSH	NIOSH REL (STEL)	35 ppm
Alberta	TWA / STEL	25 ppm(TWA), 35 ppm
British Columbia	TWA / STEL	25 ppm(TWA), 35 ppm
Manitoba	TWA / STEL	25 ppm(TWA), 35 ppm
New Brunswick	TWA / STEL	25 ppm(TWA), 35 ppm
Newfoundland & Labrador	TWA / STEL	25 ppm(TWA), 35 ppm
Northwest Territories	TWA / STEL	25 ppm(TWA), 35 ppm
Nova Scotia	TWA / STEL	25 ppm(TWA), 35 ppm
Nunavut	TWA / STEL	25 ppm(TWA), 35 ppm
Ontario	TWA / STEL	25 ppm(TWA), 35 ppm
Prince Edward Island	TWA / STEL	25 ppm(TWA), 35 ppm
Québec	TWA / STEL	25 ppm(TWA), 35 ppm
Saskatchewan	TWA / STEL	25 ppm(TWA), 35 ppm
Yukon	TWA / STEL	25 ppm(TWA), 35 ppm

Exposure Controls:

Appropriate Engineering Controls: Provide sufficient ventilation to keep ammonia vapors below the permissible exposure limit. Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure.

Personal Protective Equipment:

Hand Protection: Chemical resistant gloves.

Eye Protection: Chemical safety goggles and face shield.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respirator protection should be worn.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Colorless
Odor:	Pungent
Odor threshold:	1 – 50 ppm
Vapor density:	0.6
pH:	12 - 14
Evaporation Rate:	Not available
Melting Point:	-77 °C (-105 °F) (< 44% NH_3)
Freezing Point:	-38 °C (-36 °F)
Flash point:	Not relevant
Auto-ignition Temperature:	651 °C (1,204 °F)
Decomposition Temperature:	Not available
Flammability (solid, gas):	Not available
Lower Flammable Limit:	16% (ammonia vapor)
Upper Flammable Limit:	25% (ammonia vapor)
Vapor Pressure:	49642.2 Pa at 68 °F (20 °C)
Relative Vapor Density at 20 °C:	0.6 (ammonia vapor over aqua ammonia at 0°C)
Relative Density:	Not available
Specific Gravity:	0.90 at 60 °F (19% NH_3)
Solubility:	Soluble in water.
Partition Coefficient: n-Octanol/water:	-1.14 at 25 °C
Auto-ignition temperature:	Not available
Viscosity:	Not relevant

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Forms explosive compounds with calcium hypochlorite, bleaches, gold, mercury, silver, chlorine and other halogens. Contact with strong oxidizers can result in fires and explosions. Corrosive to copper, brass, silver, zinc, and galvanized steel. Stable under recommended handling and storage conditions (see section 7).

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Direct sunlight. Extremely high or low temperatures. Heat. Sources of ignition.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Hypochlorites.

Hazardous Decomposition Products: Thermal decomposition generates: Ammonia, Nitrogen oxides, Nitrogen.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Oral: Harmful if swallowed Inhalation: Harmful if inhaled.

LD50 and LC50 Data: derived: LD50 Oral Rat: 1842 mg/kg (19% Ammonium hydroxide solution)

Skin Corrosion/Irritation: Causes severe skin burns and eye damage

Eye Damage/Irritation: Causes serious eye damage.

Respiratory or Skin Sensitization: May cause respiratory irritation.

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): May cause respiratory irritation.

Specific Target Organ Toxicity (Repeated Exposure): Not classified.

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Symptoms may include: Sneezing, coughing, burning sensation of throat with constricting sensation of the larynx and difficulty in breathing. Damage to lungs. Harmful if inhaled.

Symptoms/Injuries after Skin Contact: Corrosive. Causes burns. Symptoms may include: Redness. Pain. Serious skin burns. Blisters.

Symptoms/Injuries after Eye Contact: Causes serious eye damage. Symptoms may include: Redness. Pain. Blurred vision. Severe burns. Causes permanent damage to the cornea, iris, or conjunctiva.

Symptoms/Injuries after Ingestion: Harmful if swallowed. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: None known.

LD50 and LC50 Data (ingredients):

Ammonium hydroxide, CAS No. 1336-21-6	
LD50 Oral Rat	350 mg/kg
ATE US (gases)	10,256.41 ppmV/4h

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN2672	Ammonia Solutions (with more than 10% but not more than 35% ammonia)	8	8	III	Yes	ERG-154
Canadian TDG	UN2672	Ammonia Solutions (with more than 10% but not more than 35% ammonia)	8	8	III	Yes	---
IMDG (Vessel)	UN2672	Ammonia Solutions (with more than 10% but not more than 35% ammonia)	8	8	III	Yes	MP(P) F-A S-B
IATA (Air)	Contact the manufacturer						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

Ammonium hydroxide, CAS No. 1336-21-6

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

Ammonium hydroxide, CAS No. 1336-21-6

Listed on the United States TSCA (Toxic Substance Control Act) Inventory

Canadian Regulations:

Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

Ammonium hydroxide, CAS No. 1336-21-6

DSL IDL	Listed on the Canadian DSL Listed on the Canadian IDL
IDL Concentration	1%
WHMIS Classification	Class E – Corrosive Material Class D Division 1 Subdivision A – Very toxic material causing immediate and serious toxic effects.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-14 Initial Issue Date: 09/28/2016 Last Revision Date: n/a Version: 1

Party Responsible for the Preparation of this Document:

Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Shockstar™ Shock Tubing
Product Names and Synonyms: Lead-in-Line, L-I-L, Signal Transmission Tubing
Intended Use: As part of an commercial explosives device initiation system
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Item ("Article"):

Code	Hazard Class	Hazard Category
H204	Explosives	Division 1.4

Label Elements

Warning

Hazard Statements

Fire or projection hazard

Precautionary Statements

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not subject to grinding, friction, impact or shock.
Do not eat, drink or smoke when using this product.
Wear eye protection.
In case of fire: Evacuate area. Explosion risk in case of fire.
Store locked-up in a ventilated space, in accordance with all applicable regulations.
Dispose of contents/container in accordance with all applicable regulations.

Other Hazards: None expected

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

The hazardous substances are sealed inside a plastic tube. The values in column 3 are shown as a percent of the total weight of tube. The tube length may vary depending on the specific product.

Name	Product Identifier	% (w/w)
Aluminum	CAS No. 7429-90-5	0-0.2%
Octogen (HMX)	CAS No. 2691-41-0	0-0.4%

SECTION 4: FIRST AID MEASURES

General: Never give anything by mouth to an unconscious person. If you feel unwell, get medical attention, show the label where possible.

Inhalation: Not an expected route of exposure.

Skin Contact: Not an expected route of exposure.

Eye Contact: Not an expected route of exposure.

Ingestion: Not an expected route of exposure.

Most Important Symptoms and Effects both Acute and Delayed:

Inhalation: Not an expected route of exposure.

Skin Contact: Not an expected route of exposure.

Eye Contact: Not an expected route of exposure.

Ingestion: Not an expected route of exposure.

SECTION 5: FIRE FIGHTING MEASURES

DO NOT fight fires involving Explosives. There is an extreme risk that explosives involved in a fire may detonate, especially if confined. Evacuate the area in all directions for one (1) mile or more if any amount of explosives is involved in a fire. Evacuation is recommended if the initial (incipient) fire, not involving explosives, becomes intense. General extinguishers may be used on the initial fire not involving explosives, such as electrical equipment fires, tire fires or a general plant fire. Water may be used to cool explosives not involved in the initial fire. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information.

Extinguishing Media

Suitable Extinguishing Media: None.

Unsuitable Extinguishing Media: For fires near explosives, dry chemical, foams, steam and smothering devices are not effective, can lead to possible explosion and must not be used.

Special Hazards Arising from the Item ("Article"):

Fire Hazard:	There is an extreme risk that explosives involved in a fire may detonate.

Advice for Firefighters

Precautionary Measures:	It is recommended that the amount and location of any explosives stored near a fire be determined prior to committing firefighters to fight the fire.
Firefighting Instructions:	When fighting the initial fire, not involving explosives, firefighters should follow standard firefighting procedures for the materials involved.
Hazardous Combustion Products:	No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures:	Contact the manufacturer or CHEMTREC. No smoking, open flames or flame/spark producing items in the area.

For Non-Emergency Personnel

Protective Equipment:	Use appropriate personal protection equipment (PPE).
Emergency Procedures:	Isolate the area from unnecessary personnel.

For Emergency Personnel

Protective Equipment:	Provide cleanup crew with proper PPE.
Emergency Precautions:	Avoid release to the environment.
Methods and Material for Containment and Cleaning Up	Pick up containers or units by hand. Contact manufacturer or CHEMTREC.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards when Processed:	Avoid heating explosives in a confined space. Any proposed use of this product in elevated temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. A "hot work" program consistent with OSHA requirements at 29 CFR 1910.252 must be used when performing hot work on explosive process equipment, storage areas or containers related to the intended use.
Hygiene Measures:	Handle in accordance with good industrial hygiene and safety procedures.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures:	Smoking, open flames, and unauthorized sparking or flame-producing devices are prohibited.
Storage Conditions:	Storage areas should be inspected regularly by an individual trained to identify potential hazards and ensure that all safety and security control measures are being properly implemented. All explosives storage sites must comply with ATF, OSHA or NRCAN regulations.
Incompatible Materials:	Strong acids, strong bases and organic solvents.
Special Rules on Packaging:	Packaging in accordance with USDOT or NRCAN regulations.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:	Not applicable, sealed item
Exposure Controls:	
Appropriate Engineering Controls:	Product should be handled and used under strictly controlled conditions.
Personal Protective Equipment:	
Hand Protection:	Not required.
Eye Protection:	Safety glasses.
Respiratory Protection:	Not required.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Flexible ionomer resin plastic tubing with minute amount of very fine silver colored powder on interior tube wall
Odor:	None
Odor threshold:	Not relevant
Vapor density:	Not relevant
pH:	Not relevant
Melting point:	Not relevant
Initial boiling point and boiling range:	Not relevant
Flash point (oil):	Not relevant
Evaporation rate:	Not relevant
Flammability:	Not relevant
Upper / lower flammability or explosive limits:	Not relevant
Vapor pressure:	Not relevant
Density:	Not relevant
Solubility:	Not soluble in water
Partition coefficient: n-octol/water:	Not relevant
Auto-ignition temperature:	Not relevant
Decomposition temperature):	Not relevant
Viscosity:	Not relevant
Explosive properties:	Mass detonation hazard when involved in a fire
Explosion Data – Sensitivity to Mechanical Impact:	Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Stable and non-reactive under normal conditions of transportation, storage, handling and use.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Open flame and elevated temperatures.

Incompatible Materials: Strong acids, strong bases and organic solvents.

Hazardous Combustion Products: No unusual combustion products are expected. However, toxic fumes will be present.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Not classified

LD50 and LC50 Data: Not classified

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): None

Specific Target Organ Toxicity (Repeated Exposure): None

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries. after Skin Contact: Not expected to be a hazard under normal conditions of use

Symptoms/Injuries after Eye Contact: Not expected to be a hazard under normal conditions of use.

Symptoms/Injuries after Ingestion: Not expected to be a hazard under normal conditions of use.

Chronic Symptoms: None

SECTION 12: ECOLOGY INFORMATION

Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Call manufacturer or CHEMTREC.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	Proper Shipping Name	Hazard Class	Label Codes	PG	Marine Pollutant	Other
US DOT	UN0349	Articles, Explosives, N.O.S.	1.4S	1.4S		No	ERG-112
Canadian TDG	UN0349	Articles, Explosives, N.O.S.	1.4S	1.4S		No	--
IMDG (Vessel)	UN0349	Articles, Explosives, N.O.S.	1.4S	1.4S		No	EmS-No, Fire: F-B Spillage: S-X
IATA (Air)	Contact the manufacturer						

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:
Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

SARA Section 311/312	Fire hazard Sudden Release of pressure hazard.
TSCA	All the ingredients are on the United States TSCA inventory.

Canadian Regulations:
Domestic Substances List (DSL)
Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification	Note: Explosives are regulated by NRCAN and not classified under WHMIS
DSL	All ingredients are listed on the Canadian DSL

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) and Canadian (WHMIS 2015) requirements.

SDS: P-15 Initial Issue Date: 10/01/2016 Last Revision Date: n/a Version: 1

Party Responsible for the Preparation of This Document:
Austin Powder Company
Cleveland, OH 44122
216-464-2400

This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

SECTION 1: IDENTIFICATION

Product Identifier: Anhydrous Ammonia
Product Names and Synonyms: Ammonia
Intended Use: Manufacture of fertilizer, explosive, chemicals, synthetic fibers, Refrigerant, Cleaning solutions, Pollution Control
Intended Users: For use only under strictly controlled conditions and only by qualified personnel who are fully trained in the handling and use of this product.

Name, Address, and Telephone of the Responsible Party:

Austin Powder Company
25800 Science Park Dr.
Cleveland, OH 44122
216-464-2400 during normal business hours
877-836-8286 Toll Free 24/7
www.austinpowder.com

In Case of Emergency Call CHEMTREC – TOLL FREE 24/7
800-424-9300 DOMESTIC
1-703-527-3887 INTERNATIONAL AND MARINE

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture:

Code	Hazard Class	Hazard Category
H221	Flammable gas	2
H280	Gases under pressure, liquefied gas	Liquefied gas
H314	Skin corrosion/irritation	1B
H332	Acute Toxicity, inhalation	4
H335	Specific target organ toxicity, single exposure. Respiratory tract irritation	3
H400	Aquatic Toxicity (acute)	1

Label Elements

Danger

Hazard Statements

Flammable gas
Contains gas under pressure; may explode if heated
Causes severe skin burns and eye damage
Harmful if inhaled
May cause respiratory irritation
Very toxic to aquatic life

Precautionary Statements

Keep away from heat, hot surfaces, open flames, sparks. No smoking.
Do not breathe mist, spray, vapors, gas.
Wash hands, forearms, and exposed areas thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Avoid release to the environment.
Wear eye protection, protective clothing, and protective gloves.

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. Immediately call a poison center or doctor.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air. Keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Wash contaminated clothing before reuse.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.
Collect spillage.
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Protect from sunlight. Store in a well-ventilated place. Wear protective gloves/ protective clothing/ eye protection/ face protection.

Other Hazards:

Ammonia vapor, in concentrations of 16-25% volume by weight in air, is flammable, toxic by inhalation and corrosive. Take all appropriate precautions.

Unknown Acute Toxicity: Not available

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Name	Product Identifier	% (w/w)
Anhydrous Ammonia	CAS No. 7664-41-7	99 - 100

SECTION 4: 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). If frostbite or freezing occurs, immediately flush with plenty of lukewarm water to GENTLY warm the affected area. Do not use hot water. Do not rub affected area. Get immediate medical attention.

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Immediately call a POISON CENTER or doctor/physician.

Skin Contact: FROSTBITE: Immediately flush skin with plenty of water for at least 60 minutes. Remove contaminated clothing. Immediately call a POISON CENTER or doctor/physician. Wash contaminated clothing before reuse.

Eye Contact: FROSTBITE: Rinse cautiously with water for at least 60 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention.

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

Most Important Symptoms and Effects both Acute and Delayed

The most important known symptoms and effects are described in the labeling (see section 2) and/or in section 11.

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Water spray, fog.

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire. Do not use water directly on liquid ammonia as this will increase formation of ammonia vapors.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Flammable gas. Ammonia concentrations in the range of 16-25% by volume in air can be ignited if heated to the auto-ignition temperature. Oil or other combustible materials increases the fire hazard.

Explosion Hazard: Forms explosive compounds with calcium hypochlorite, bleaches, gold, mercury, silver, chlorine and other halogens. Contact with strong oxidizers can result in fires and explosions.

Reactivity: Corrosive to copper, brass, silver, zinc and galvanized steel.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire. Do not allow ammonia vapors to accumulate in confined areas where ignition may occur.

Firefighting Instructions: Stop leak if safe to do so. For a serious leak, use fire hose with fog nozzle and plenty of water to absorb ammonia vapors. Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Water spray may be useful in minimizing or dispersing vapors and to protect persons shutting off flow. Cool equipment exposed to fire with water, if it can be done with minimal risk. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection during Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection. Firefighters must use full bunker gear including NIOSH-approved positive-pressure self-contained breathing apparatus to protect against potential hazardous combustion and decomposition products.

Hazardous Combustion Products: Nitrogen oxides.

Other Information: Compressed gas or refrigerated liquid. Intense heating particularly in contact with hot metallic surfaces may cause decomposition of ammonia generating hydrogen, a flammable gas. Note that many materials, particularly plastics, become brittle upon contact with liquid ammonia.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Cleanup workers should stay upwind and keep out of low areas where ammonia vapors can accumulate. Keep away from open flames, hot surfaces and sources of ignition. Use special care to avoid static electric charges. No smoking. Do not get in eyes, on skin, or on clothing. Do not breathe gas. If small spill, allow to vaporize or absorb vapor in water. For a large spill refer to section 5.3 for advice. Neutralization with acid is NOT recommended.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE). Persons without proper PPE should be restricted from the spill area until cleanup has been completed.

Emergency Procedures: Evacuate unnecessary personnel. Eliminate ignition sources.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Stop leak if safe to do so. Ventilate area.

Environmental Precautions: Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up

For Containment: Stop the flow of material, if this is without risk. Ventilate area.

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. Allow to vaporize or absorb the vapor in water. Use only non-sparking tools.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: Do NOT enter storage areas unless adequately ventilated. Emits ammonia vapors. Flammable gas. Ammonium hydroxide reacts with many heavy metals and their salts forming explosive compounds. It may attack metals forming flammable/explosive gas. The solution in water is a strong base, it reacts violently with acids.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Contents under pressure. The use of explosion proof equipment is recommended. Anhydrous ammonia is a product which must be handled in approved equipment and by trained personnel. Any proposed use of this product in elevated-temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained. Ensure adequate ventilation. Proper grounding procedures to avoid static electricity should be followed. System design and training programs must comply with applicable regulations and in addition to good engineering practices. Pressure vessels, piping and appurtenances should be regularly inspected and tested using methods designed to reveal external and internal deterioration or defects that may impair integrity of the equipment such that an unintended release of anhydrous ammonia may result. Consult with State Department of Agriculture and other experts, as applicable, concerning methods that would be appropriate given the particular circumstances. Refer to 29 CFR 1910.111 Storage and Handling of Anhydrous Ammonia, 29 CFR 1910.119 Process Safety Management of Highly Hazardous Materials and the current ANSI/CGA G-2.1-2014 standard, *Requirements for the Storage and Handling of Anhydrous Ammonia* for additional information.

Storage Conditions: Store in a dry, cool and well-ventilated place. Keep in fireproof place. Store locked up. Storage containers should have safety relief valves. Note that many materials, particularly plastics, become brittle upon contact with liquid ammonia.

Incompatible Materials: Forms explosive compounds with calcium hypochlorite, bleaches, gold, mercury, silver, chlorine and other halogens. Contact with strong oxidizers can result in fires and explosions. Corrosive to copper, brass, silver, zinc and galvanized steel.

Storage Area: Post readily visible warning signs in the storage area listing emergency measures. Water hoses should be readily available to disperse vapors in case of a spill.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:

Anhydrous ammonia, CAS No. 7664-41-7		
USA ACGIH	ACGIH TLV/STEL	25 ppm/35 ppm (15 minutes)
USA OSHA	OHSA PEL (TWA)	50 ppm

Exposure Controls

Appropriate Engineering Controls: Gas detectors should be used when flammable gases/vapors may be released. Gas detectors should be used when toxic gases may be released. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Use explosion-proof equipment. Ensure all national/local regulations are observed.

Personal Protective Equipment: Protective goggles. Gloves. Protective clothing. Insufficient ventilation: wear respiratory protection. Face shield.

Materials for Protective Clothing: Chemically resistant materials and fabrics.

Hand Protection: Wear chemically resistant protective gloves.

Eye Protection: Chemical safety goggles.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn.

Thermal Hazard Protection: Wear cold insulating gloves.

Other Information: When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Physical and Chemical Properties:

Appearance:	Colorless liquid or gas
Upper/Lower Flammability/Explosive Limits:	Flammability limits: 16-25% (vol/vol)
Odor:	Pungent odor considered suffocating
Vapor Pressure:	756 kPa at 68 °F
Odor threshold:	5 – 50 ppm in humans
Vapor density:	Relative vapor density (air=1): 0.77
pH:	>12 (10% solution) 10.6 – 11.6 (0.02-1.7% solution)
Relative Density:	Specific gravity liquid: 0.682 (water=1); Specific gravity of gas: 0.770 (air=1)
Evaporation Rate:	Not available
Melting Point/Freezing Point:	-108 °F
Solubility:	in water: 51 g at 68 °F
Flash point:	Not applicable
Auto-ignition Temperature:	1,204 °F
Decomposition Temperature:	Not available
Flammability (solid, gas):	Not available
Vapor Pressure:	8.5 atm at 68 °F
Specific Gravity:	Specific gravity liquid: 0.682 (water=1); Specific gravity of gas: 0.770 (air=1)
Partition Coefficient: n-Octanol/water:	Not applicable
Viscosity:	0.475 cP at -92 °F
Explosion Data – Sensitivity to Mechanical Impact:	Not sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge:	Not sensitive to static discharge

SECTION 10: STABILITY AND REACTIVITY

Reactivity and Chemical Stability: Forms explosive compounds with calcium hypochlorite, bleaches, gold, mercury, silver, chlorine and other halogens. Contact with strong oxidizers can result in fires and explosions. Corrosive to copper, brass, silver, zinc, and galvanized steel.

Possibility of Hazardous Reactions: Polymerization will not occur.

Conditions to Avoid: Extremely high or low temperatures. Open flame. Overheating. Heat. Sparks.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Hypochlorites.

Hazardous Decomposition Products: Nitrogen oxides.

SECTION 11: TOXICOLOGY INFORMATION

Acute Toxicity: Inhalation

LD50 and LC50 Data: see table below

Skin Corrosion/Irritation: Causes severe skin burns and eye damage

Serious Eye Damage/Irritation: Causes serious eye damage.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): May cause respiratory irritation.

Aspiration Hazard: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified.

Aspiration Hazard: Not classified

Symptoms/Injuries after Inhalation: Harmful if inhaled.

Symptoms/Injuries after Skin Contact: Corrosive. Causes burns. Symptoms may include: Redness. Pain. Serious skin burns. Blisters.

Symptoms/Injuries after Eye Contact: Causes serious eye damage. Symptoms may include: Redness. Pain. Blurred vision. Severe burns. Causes permanent damage to the cornea, iris, or conjunctiva.

Symptoms/Injuries after Ingestion: Ingestion is an unlikely route of exposure for a gas.

LD50 and LC50 Data:

Anhydrous Ammonia, CAS No. 7664-41-7	
LC50 Inhalation Rat	7338 - 16600 / 60 min exposure
LC50 Inhalation Rat	3669 – 8300 / 4h exposure
LD50 oral Rat	350 mg/kg

SECTION 12: ECOLOGY INFORMATION

Toxicity

Ecology - General: Toxic to aquatic life with long lasting effects. Very toxic to aquatic life.

Anhydrous Ammonia, CAS No. 7664-41-7	
LC50 Daphnia magna (water flea)	25.4 mg/l in 48 h
LC50 rainbow trout	Adults: 0.097 mg/l in 24 h

Persistence and Degradability: Not established

Bioaccumulative Potential: Not established

Mobility in Soil: Not available

Other Adverse Effects: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Handle empty containers with care because residual vapors are flammable. Prevent runoff from entering drains, sewers or waterways.

Ecology – Waste Materials: This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

SECTION 14: TRANSPORTATION INFORMATION

Agency	UN Number	UN Proper Shipping Name	Hazard Class	Marine Pollutant
TDG	UN1005	Ammonia, Anhydrous	2.3	Yes*
US DOT	UN1005	Ammonia, Anhydrous	2.2	Yes*
IMDG	UN1005	Ammonia, Anhydrous	2.3	Yes

*The marine pollutant mark is not required when transported by road or rail

** This product is not regulated as a marine pollutant when transported on inland waterways in sizes of≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packaging meet the general provisions of§§ 173.24 and 173.24a.

SECTION 15: REGULATORY INFORMATION

US Federal Regulations:

Emergency Planning and Community Right-To-Know Act (EPCRA), a/k/a Superfund Amendments and Reauthorization Act (SARA) Title III
Toxic Substances Control Act (TSCA)
TSCA Section 8

Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on the United States SARA Section 302 Listed on United States SARA Section 313	
SARA Section 302 Threshold Planning Quantity (TPQ)	500
SARA Section 311/312 Hazard Classes	Fire hazard Immediate (acute) health hazard Sudden release of pressure hazard
SARA Section 313 – Emission Reporting	1.0% (includes anhydrous Ammonia and aqueous Ammonia from water dissociable Ammonium salts and other sources, 10% of total aqueous Ammonia is reportable under this listing)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF LAST REVISION

This SDS was prepared in accordance with US (29 CFR 1900.1200) requirements.

SDS: P-16 Initial Issue Date: 05/01/2015 Last Revision Date: 11/07/2016 Version: 2

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This information is based on Austin Powder Company's current knowledge and is intended to describe the product for the purposes of health and safety requirements only. It should not be construed as guaranteeing any specific property of the product.

THE

BLASTER'S GUIDE

A Resource for the Explosives and Blasting Industry

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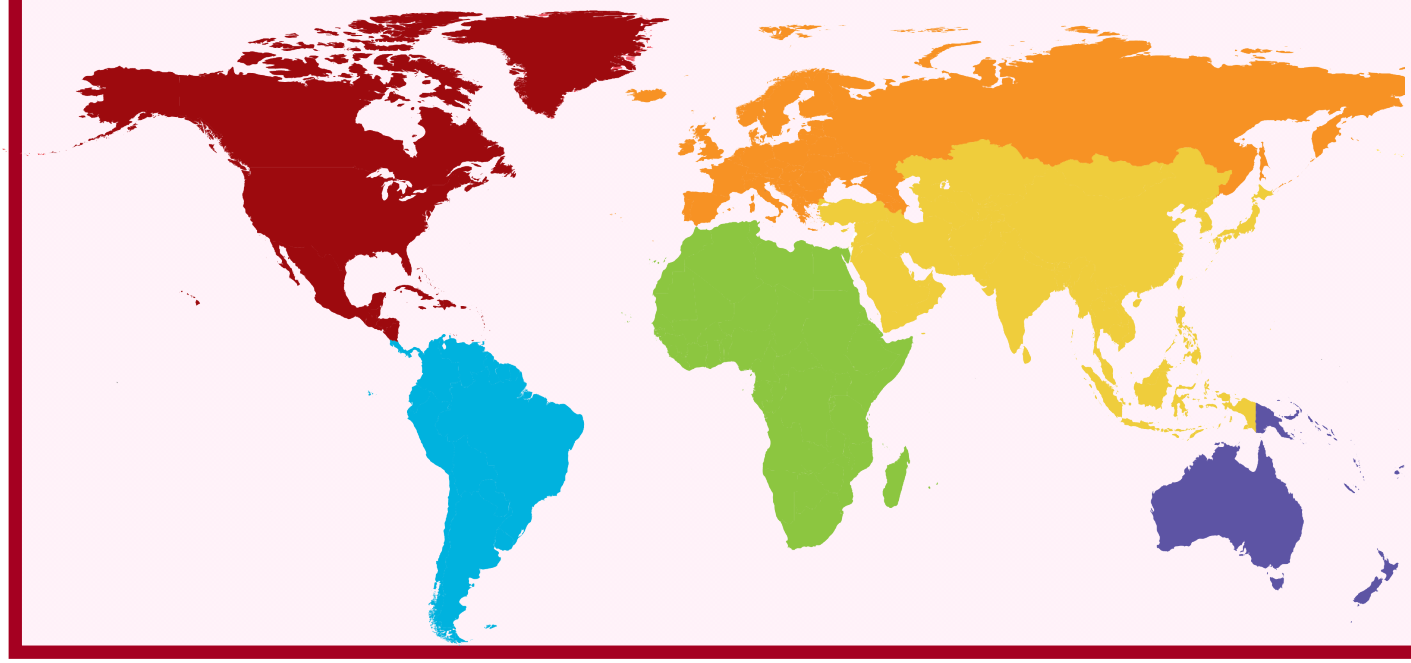


Website Information

Alabama – www.alabama.gov

State Fire Marshal
www.aldoi.gov

Alabama Surface Mining Commission
www.surface-mining.state.al.us

Alaska – www.state.ak.us

Dept. of Labor and Workforce Development
Division of Labor Standards and Safety
www.labor.state.ak.us/lss/home.htm

Department of Natural Resources
Division of Mining, Land & Water
www.dnr.alaska.gov

Alaska State Fire Marshal
www.dps.state.ak.us/Fire

Arizona – www.az.gov

Arizona Homeland Security
www.azdohs.gov

Dept. of Mines & Mineral Resources
www.admmr.state.az.us

Department of Mines
State Mine Inspector
www.asmi.az.gov

Arkansas – www.state.ar.us

Department of Labor
www.arkansas.gov/labor

State Police www.asp.state.ar.us

California – www.state.ca.us

Homeland Security
www.homeland.ca.gov

Division of Occupational Safety & Health
www.dir.ca.gov/dosh

State Fire Marshal
www.osfm.fire.ca.gov

Colorado – www.colorado.gov

Homeland Security
www.csp.state.co.us/ops.cfm

Licensing and Permits/Explosives
Div. of Oil & Public Safety Expl. Program
www.oil.cdle.state.co.us

Connecticut – www.ct.gov

Homeland Security & Emergency Mngmt
www.ct.gov/demhs

Department of Public Safety
www.ct.gov/dps

Delaware – http://delaware.gov

State Fire Marshal
www.statefiremarshal.delaware.gov

District of Columbia – www.dc.gov

Office of Homeland Security & Emergency
Management Agency
www.hsema.dc.gov

Fire and Emergency Medical Services Dept.
www.fems.doc.gov

Florida – www.myflorida.com

Florida Homeland Security & Emergency Mgt
www.floridadisaster.org

State Fire Marshal
www.myfloridacfo.com/sfm

Georgia – www.georgia.com

Georgia Homeland Security
Emergency Management Agency
www.gema.ga.gov

State Fire Marshal
www.gainsurance.org/firemarshal

Hawaii – www.ehawaii.gov

Homeland Security – HI State Civil Defense
www.scd.hawaii.gov

Department of Land & Natural Resources
Division of Forestry and Wildlife
www.hawaii.gov/dhr/dofaw

Idaho – www.idaho.gov

State Fire Marshal
www.doi.idaho.gov

Illinois – www.illinois.gov

Illinois Homeland Security
Emergency Management Agency
www.state.il.us/iema

State Fire Marshal
www.state.il.us/osfm

Department of Natural Resources
Office of Mines & Minerals
www.dnr.state.il.us/mines

Indiana – www.in.gov

Homeland Security
www.in.gov/dhs

Indiana Dept. of Natural Resource
Division of Reclamation
www.in.gov/dnr/reclamation/2900.htm

Iowa – www.iowa.gov

Iowa Homeland Security & Emergency Mgmt
www.iowahomelandsecurity.org

State Fire Marshal
www.dps.state.ia.us/fm

Kansas – www.kansas.gov

State Fire Marshal
www.kansas.gov/firemarshal

Kentucky – www.kentucky.gov

Kentucky Homeland Security
www.homelandsecurity.ky.gov

Office of Mine Safety & Licensing
www.omsl.ky.gov

Div. of Mine Reclamation and Enforcement
www.dmre.ky.gov

Louisiana – www.louisiana.gov

Homeland Security & Emergency Preparedness
www.ohsep.louisiana.gov

State Fire Marshal
www.dps.lousiana.gov/sfm

Maine – www.maine.gov

Homeland Security
Maine Emergency Management Agency
www.maine.gov/mema/homeland

State Fire Marshal
www.maine.gov/dps/fmo/index.htm

Maryland – www.maryland.gov

State Fire Marshal
www.firemarshal.state.md.us

Massachusetts – www.mass.gov

State Fire Marshal
www.mass.gov/dfs/index/shtm

Michigan – www.michigan.gov

Michigan Homeland Security
www.michigan.gov/homeland

Department of Labor & Economic Growth
Bureau of Fire Services
www.michigan.gov/bfs

Minnesota – www.state.mn.us

Homeland Security & Emergency Mgmt
www.hsem.state.mn.us

State Fire Marshal
www.dps.state.mn.us

Mississippi – www.ms.gov

Office of Homeland Security
www.homelandsecurity.ms.gov

Missouri – www.mo.gov

Missouri Homeland Security
www.dps.mo.gov/HomelandSecurity

Montana – www.mt.gov

State Fire Marshal's Office
www.doj.mt.gov/enforcement/fireprevention/default.asp

Nebraska – www.nebraska.gov

Homeland Security
NE Emergency Management Agency (NEMA)
www.nema.ne.gov

State Fire Marshal
www.sfm.ne.gov

Nevada – www.nv.gov

Nevada Homeland Security
www.homelandsecurity.nv.gov

State Fire Marshal's Office
www.fire.state.nv.us

New Hampshire – www.nh.gov

Homeland Security & Emergency Mgt.
www.nh.gov/safety/divisions/bem

Division of Fire Safety – Incident Mgmt Center
www.nh.gov/safety/divisions/firesafety

New Jersey – www.state.nj.us

Office of Homeland Security & Preparedness
www.njohsp.gov/contactus.html

State Fire Marshal
www.state.nj.us/dca/dfs

Div of Labor and Workforce Development
Safety Compliance Unit – Mine Safety
http://lwd.dol.state.nj.us/labor/lsse/employee/Mine_Safety_Section.html

New Mexico – www.newmexico.gov

Homeland Security & Emergency Mgmt
www.nmdhsem.org

State Fire Marshal
www.nmprc.state.nm.us/sfm.htm

Energy, Minerals and Natural Resources Dept.
www.emnrd.state.nm.us/MMD/index.htm

New York – www.ny.gov

Office of Homeland Security
www.security.state.ny.us

New York Department of State
Office of Fire Prevention & Control
www.dos.state.ny.us/fire/firewww.html

New York City – www.nyc.gov

NYC Fire Dept.
www.nyc.gov/html/fdny/html/cda/cda_fdny.shtml

North Carolina – www.ncgov.com

Department of Insurance
www.ncdoi.com/osfm

North Dakota – www.nd.gov

Ohio – http://ohio.gov

Homeland Security – OH Dept. of Public Safety
www.homelandsecurity.ohio.gov/contacts.stm

Department of Natural Resources
Division of Mineral Resources Management
www.dnc.state.oh.us

State Fire Marshal
www.com.state.oh.us/sfm/fire_contacts.aspx

Cleveland – www.city.cleveland.oh.us

Oklahoma – www.ok.gov

Oklahoma's Office of Homeland Security
www.ok.gov/homeland

State Fire Marshal
www.firemar.state.ok.us

Department of Mines
www.mines.state.ok.us

Oregon – www.oregon.gov

Department of State Police
Counter-Terrorism Section
http://www.oregon.gov/OSP/CTS/contact_us.shtml

Bureau of Labor and Industries
www.boli.state.or.us

Pennsylvania – www.pa.gov

Office of Homeland Security
http://www.homelandsecurity.state.pa.us/

Department of Environmental Protection
Bureau of Mining & Reclamation
Protection Blasting Information:
www.dep.state.pa.us/dep/deputate/miners/bmr/programs/blasting.htm

State Fire Commissioner
www.osfc.state.pa.us

Puerto Rico –
http://www.gobierno.pr/gprportal/inicio

Rhode Island – www.ri.gov

Defense & Homeland Security Industry
www.riedc.com/industry-sectors/defense-and-homeland-security

State Fire Marshal
www.fire-marshal.ri.gov

South Carolina – www.sc.gov

Dept. of Labor, Licensing & Regulation
www.llr.state.sc.us

State Fire Marshal
www.llr.state.sc.us/firemarshal.asp

South Dakota – www.sd.gov

Office of Homeland Security
www.state.sd.us/homeland/working/contact.asp

State Fire Marshal
www.state.sd.us/dps/fire

Tennessee – www.tn.gov

Office of Homeland Security
www.tennessee.gov/homelandsecurity

Department of Commerce and Insurance
Fire Prevention
Permits and Licensing Section
www.tennessee.gov/commerce/sfm/contact.html

Texas – www.texasonline.com

Homeland Security Contact Information
www.texashomelandsecurity.com

State Fire Marshal
www.tdi.state.tx.us/fire/index.html

Utah – www.utah.gov

State Fire Marshal
www.publicsafety.utah.gov/firemarshal/contact.html

Vermont – http://vermont.gov

State Fire Marshal
http://www.dps.state.vt.us/fire/berlin.htm

Virginia – www.myvirginia.org

Department of Emergency Management
Office of Homeland Security
www.vaemergency.com

Department of Mines, Minerals & Energy (DMME)
www.mme.state.va.us

Washington – www.access.wa.gov

Office of Homeland Security
http://www.emd.wa.gov/index.shtml

West Virginia – www.wv.gov

Homeland Security & Emergency Mgmt
http://www.wvdhsem.gov

State Fire Marshal
www.firemarshal.wv.gov

Department of Environmental Protection
www.dep.wv.gov

Wisconsin – www.wisconsin.gov

Wisconsin Homeland Security
http://homelandsecurity.wi.gov

Department of Justice, Division of
www.doj.state.wi.us/dci/arson

Wyoming – http://wyoming.gov

Office of Homeland Security
http://wyohomelandsecurity.state.wy.us

State Fire Marshal
http://wyofire.state.wy.us

Department of Environmental Quality
Abandoned Mine Land Division
www.deq.state.wy.us

FEDERAL WEBSITES

US Department of Homeland Security
www.dhs.gov

Mine Safety and Health Administration
(MSHA)
www.msha.gov

Office of Surface Mining - OSM
www.osmre.gov

Bureau of Alcohol, Tobacco and Firearms
www.atf.gov

Occupational Safety and Health Administration
(OSHA)
www.osha.gov

IME
www.ime.org

State Contact Information

Alabama – www.alabama.gov

Alabama Homeland Security
PO Box 304115
Montgomery, AL 36130
Tel: 334-353-3050
Fax: 334-353-3071

Alabama Department of Insurance
State Fire Marshal
PO Box 303352
Montgomery, AL 36130-3352
Tel: 334-241-4166
Fax: 334-241-4158
www.aldoi.gov

Alabama Surface Mining Commission
Inspector in Charge of Blasters Licensing
PO Box 2390
Jasper, AL 35502
Tel: 205-221-4130
Fax: 205-221-5077
www.surface-mining.state.al.us

Alaska – www.state.ak.us

Alaska Homeland Security &
Emergency Management
PO Box 5750
Ft. Richardson, AK 99505
Tel: 907-428-7000
Fax: 907-428-7009

Dept. of Labor and Workforce Development
Division of Labor Standards and Safety
1111 W. 8th St. Rm 304
Juneau, AK 99811
Tel: 907-465-4855
Fax: 907-465-6012
www.labor.state.ak.us/lss/home.htm

Department of Natural Resources
Division of Mining, Land & Water
550 W. 7th Ave, Ste 1070
Anchorage, AK 99501
Tel: 907-269-8600
Fax: 907-269-8904
www.dnr.alaska.gov

Alaska State Fire Marshal
Department of Public Safety
5700 E. Tudor Rd.
Anchorage, AK 99507
Tel: 907-269-5491
Fax: 907-338-4375
www.dps.state.ak.us/Fire

Arizona – www.az.gov

Arizona Homeland Security
1700 W. Washington
Phoenix, AZ 85007
Tel: 602-542-7030
Fax: 602-364-1521
www.azdohs.gov

Department of Building & Fire Safety
Office of State Fire Marshal
1110 West Washington, Ste 100
Phoenix, AZ 85007
Tel: 602-364-1003
Fax: 602-364-1052

Dept. of Mines & Mineral Resources
1502 W. Washington
Phoenix, AZ 85007
Tel: 602-771-1600
Fax: 602-771-1616
www.admmr.state.az.us

Department of Mines
State Mine Inspector
1700 W. Washington, 4th Floor
Phoenix, AZ 85007
Tel: 602-542-5971
Fax: 602-542-5335
www.asmi.az.gov

Arkansas – www.state.ar.us

Arkansas Homeland Security
Department of Emergency Management
Bldg #9501 – Camp Joseph T. Robinson
North Little Rock, AR 72199-9600
Tel: 501-683-6700
Fax: 501-683-7890

Department of Labor
10421 W. Markham
Little Rock, AR 72205
Tel: 501-682-4500
Fax: 501-682-4535
www.arkansas.gov/labor

Office of State Fire Marshal
Licensing & Permitting
1 State Police Plaza Dr.
Little Rock, AR 72209
Tel: 501-618-8624
Fax: 501-618-8621

State Police www.asp.state.ar.us

California – www.state.ca.us

Homeland Security
State Capitol
Sacramento, CA 95814
Tel: 916-324-8908
www.homeland.ca.gov

Division of Occupational Safety & Health
1515 Clay Street, Ste 1901
Oakland, CA 94612
Tel: 510-286-7000
Fax: 510-286-7037
www.dir.ca.gov/dosh

State Fire Marshal
PO Box 944246, 1131 "S" Street
Sacramento, CA 94244
Tel: 916-445-8200
Fax: 916-445-8509
www.osfm.fire.ca.gov

Colorado – www.colorado.gov

Homeland Security
Office of Preparedness
Security and Fire Safety
9195 E. Mineral Ave., Ste 234
Centennial, CO 80112
Tel: 720-852-6705
Fax: 720-852-6751
www.csp.state.co.us/ops.cfm

Department of Public Safety
700 Kipling St. #1000
Denver, CO 80215
Tel: 303-239-4425
Fax: 303-239-4670

Licensing and Permits/Explosives
Div. of Oil & Public Safety Expl. Program
633 17th St., Ste. 500
Denver, CO 80202
Tel: 303-318-8500
Fax: 303-318-8546
www.oil.cdle.state.co.us

Connecticut – www.ct.gov

Homeland Security & Emergency Mngmt
25 Sigourney Street – 6th Floor
Hartford, CT 06106-5042
Tel: 860-256-0800
Toll Free: 800-397-8876
Fax: 860-256-0815
www.ct.gov/demhs

Department of Public Safety
State Fire Marshal
1111 Country Club Rd.
Middletown, CT 06457
Tel: 860-685-8380
Fax: 860-685-8359
www.ct.gov/dps

Bureau of Licensing & Permits – Explosives
Tel: 860-685-8470

Delaware – http://delaware.gov

Homeland Security & Safety
303 Transportation Circle
PO Box 818
Dover, DE 19903
Tel: 302-744-2680
Fax: 302-739-4874

State Fire Marshal
1537 Chestnut Grove Rd.
Dover, DE 19904-1544
Tel: 302-739-5665
Fax: 302-739-3696
www.statefiremarshal.delaware.gov

District of Columbia – www.dc.gov

Office of Homeland Security & Emergency Management Agency
Unified Communications Center
2720 Martin Luther King Jr. Ave. SE
Washington, DC 20032
Tel: 202-727-6161
Fax: 202-673-2290
www.hsema.dc.gov

Fire and Emergency Medical Services Dept.
1923 Vermont Ave NW, Ste 201
Washington, DC 20001
Tel: 202-673-3331
Fax: 202-673-3188
www.fems.doc.gov

Florida – www.myflorida.com

Florida Homeland Security & Emergency Mgt
2555 Shumard Oak Blvd
Tallahassee, FL 32399-2100
Tel: 850-413-9900
Fax: 850-488-7841
www.floridadisaster.org

Florida Department of Financial Services
Division of State Fire Marshal's Office
200 E. Gaines St.
Tallahasse, FL 32399-0340
Tel: 850-413-3170
Fax: 850-410-2467
www.myfloridacfo.com/sfm

Florida Dept. of Environmental Protection
Bureau of Mine Reclamation
2600 Blair Stone Rd. MS 3500
Tallahasse, FL 32399-2400
Tel: 850-245-8335
Fax: 850-245-8356

Georgia – www.georgia.com

Georgia Homeland Security
Emergency Management Agency
935 E. Confederate Ave., Bldg 2
PO Box 18055
Atlanta, GA 30316
Tel: 404-635-7000
Fax: 404-635-7005
www.gema.ga.gov

Office of the Commissioner of Insurance
State Fire Marshal
Two Martin Luther King Jr. Dr.
West Tower Ste 716
Atlanta, GA 30334
Tel: 404-656-2064
Toll Free: 800-656-2298
Fax: 404-657-6971
www.gainsurance.org/firemarshal

Hawaii – www.ehawaii.gov

Homeland Security – HI State Civil Defense
3949 Diamond Head Rd.
Honolulu, HI 96816-4495
Tel: 808-733-4300
Fax: 808-733-4287
www.scd.hawaii.gov

Department of Land & Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl, Rm 325
Honolulu, HI 96813
Tel: 808-587-0166
Fax: 808-587-0160
www.hawaii.gov/dhr/dofaw

Idaho – www.idaho.gov

Bureau of Homeland Security
4040 Guard St., Bldg 600
Boise, ID 83705
Tel: 208-422-3040
Fax: 208-422-3044

Department of Lands
Bureau of Minerals
300 N. 6th St., Ste 103
PO Box 83720
Boise, ID 83720-0050
Tel: 208-334-0200
Fax: 208-334-2339

Department of Insurance
State Fire Marshal
700 W. State St.
PO Box 83720
Boise, ID 83720-0043
Tel: 208-334-4250
Fax: 208-334-4375
www.doi.idaho.gov

Illinois – www.illinois.gov

Illinois Homeland Security
Emergency Management Agency
2200 S. Dirksen Pkwy
Springfield, IL 62703
Tel: 217-558-1344
www.state.il.us/iema

State Fire Marshal
1035 Stevenson Drive
Springfield, IL 62703
Tel: 217-785-0969
Fax: 217-782-1062
www.state.il.us/osfm

Department of Natural Resources
Office of Mines & Minerals
One Natural Resources Way
Springfield, IL 62702-1271
Tel: 217-782-9976
Fax: 217-524-4819
www.dnr.state.il.us/mines

Indiana – www.in.gov

Homeland Security
Indiana Government Center South
302 W. Washington St., Rm E208
Indianapolis, IN 46204
Tel: 317-232-6632
Fax: 317-232-3895
www.in.gov/dhs

State Fire Marshal
402 W. Washington St., Rm E241
Indianapolis, IN 46204
Tel: 317-232-2222
Fax: 317-233-0307

Indiana Dept. of Natural Resource
Division of Reclamation
RR #2, Box 129
Jasonville, IN 47438-9517
Tel: 812-665-2207
Fax: 812-665-5041
www.in.gov/dnr/reclamation/2900.htm

Iowa – www.iowa.gov

Iowa Homeland Security & Emergency Mgmt
7105 NW 70th Ave
Camp Dodge Bldg W-4
Johnston, IA 50131
Tel: 515-725-3231
www.iowahomelandsecurity.org

State Fire Marshal
Department of Public Safety
215 E 7th St.
Des Moines, IA 50319
Tel: 515-725-6145
Fax: 515-725-6140
www.dps.state.ia.us/fm

Kansas – www.kansas.gov

Homeland Security & Emergency Mgmt
2800 SW Topeka
Topeka, KS 66611-1287
Tel: 785-274-1409
Fax: 785-274-1426

State Fire Marshal's Office
700 SW Jackson, Suite 600
Topeka, KS 66603-3714
Tel: 785-296-3401
Fax: 785-296-0151
www.kansas.gov/firemarshal

Kentucky – www.kentucky.gov

Kentucky Homeland Security
200 Mero St.
Frankfort, KY 40622
Tel: 502-564-2081
Fax: 502-564-7764
www.homelandsecurity.ky.gov

Office of Mine Safety & Licensing
1025 Capital Center Dr.
Frankfort, KY 40601
Tel: 502-573-0140
Fax: 502-573-0152
www.omsl.ky.gov

Div. of Mine Reclamation and Enforcement
2 Hudson Hollow Rd.
Frankfort, KY 40601
Tel: 502-564-2340
Fax: 502-564-5848
www.dmre.ky.gov

Louisiana – www.louisiana.gov

Homeland Security & Emergency Preparedness
7667 Independence Blvd
Baton Rouge, LA 70806
Tel: 225-925-7500
Fax: 225-925-7501
www.ohsep.louisiana.gov

Office of the State Fire Marshal
8181 Independence Blvd
Baton Rouge, LA 70806
Tel: 800-256-5452
www.dps.lousiana.gov/sfm

Maine – www.maine.gov

Homeland Security
Maine Emergency Management Agency
72 State House Station
Augusta, ME 04333
Tel: 207-624-4400
Toll Free: 877-789-0200
www.maine.gov/mema/homeland

State Fire Marshal
52 State House Station
Augusta, ME 04333
Tel: 207-626-3870
Fax: 207-287-6251
www.maine.gov/dps/fmo/index.htm

Maryland – www.maryland.gov

Maryland Homeland Security
Jeffrey Building
16 Francis St.
Annapolis, MD 21401
Tel: 410-974-2389
Toll Free: 800-492-8477

State Fire Marshal
1201 Reisterstown Rd.
Pikesville, MD 21208
Tel: 410-653-8980
Fax: 410-653-8988
www.firemarshal.state.md.us

Massachusetts – www.mass.gov

Massachusetts Homeland Security
Dept. of Public Safety
1 Ashburton Place
13th Fl, Rm 1301
Boston, MA 02108
Tel: 616-727-3200
Fax: 617-727-5732

State Fire Marshal
Tel: 978-567-3111
Fax: 978-567-3121
www.mass.gov/dfs/index/shtm

Michigan – www.michigan.gov

Michigan Homeland Security
www.michigan.gov/homeland
Department of Labor & Economic Growth
Bureau of Fire Services
300 N. Washington Square
Lansing, MI 48913
Tel: 517-241-8847
Fax: 517-335-4061
www.michigan.gov/bfs

Minnesota – www.state.mn.us

Homeland Security & Emergency Mgmt
444 Cedar St., Ste 223
St. Paul, MN 55101
Tel: 651-201-7400
Fax: 651-296-0459
www.hsem.state.mn.us

State Fire Marshal
444 Cedar St., Ste 145
St. Paul, MN 55101
Tel: 651-201-7200
Fax: 651-215-0525
www.dps.state.mn.us

Mississippi – www.ms.gov

Office of Homeland Security
PO Box 958
Jackson, MS 39205
Tel: 601-346-1499
www.homelandsecurity.ms.gov

Mississippi Insurance Department
State Fire Marshal
PO Box 79
Jackson, MS 39205-0079
Tel: 888-648-0877
Fax: 601-359-1076

Missouri – www.mo.gov

Missouri Homeland Security
Department of Public Safety
PO Box 749
Jefferson City, MO 65102
Tel: 573-522-3007
Fax: 573-522-6109
www.dps.mo.gov/HomelandSecurity

State Fire Marshal
PO Box 844
2401 E. McCarty
Jefferson City, MO 65102
Tel: 573-751-2930
Fax: 573-751-5710

Montana – www.mt.gov

Montana Homeland Security
1956 Mt. Majo St.
PO Box 4789
Fort Harrison, MT 59636-4789
Tel: 406-324-3000
Fax: 406-841-3965

Fire Prevention & Investigation Section
Division of Criminal Investigation
State Fire Marshal's Office
2225 11th Ave.
PO Box 201415
Helena, MT 59620-1415
Tel: 406-444-2050
Fax: 406-444-2759
www.doj.mt.gov/enforcement/fireprevention/default.asp

Department of Labor & Industry
PO Box 1728
Helena, MT 59624-1728
Tel: 406-444-2840
Fax: 406-444-1394

Nebraska – www.nebraska.gov

Homeland Security
NE Emergency Management Agency (NEMA)
1300 Military Rd.
Lincoln, NE 68508-1090
Tel: 402-471-7421
Fax: 402-471-7433
www.nema.ne.gov

State Fire Marshal
246 South 14th St.
Lincoln, NE 68508
Tel: 402-471-2027
Fax: 402-471-3118
www.sfm.ne.gov

Nevada – www.nv.gov

Nevada Homeland Security
101 N. Carson St.
Carson City, NV 89701
Tel: 775-684-5678
www.homelandsecurity.nv.gov

State Fire Marshal's Office
Nevada Department of Public Safety
107 Jacobsen Way
Carson City, NV 89711
Tel: 775-684-7500
Fax: 775-684-7507
www.fire.state.nv.us

New Hampshire – www.nh.gov

Homeland Security & Emergency Mgt.
Tel: 603-271-2231
Fax: 603-223-3609
www.nh.gov/safety/divisions/bem

Division of Fire Safety – Incident Mgmt Center
110 Smokey Bear Blvd.
Concord, NH 03301
Tel: 603-271-3294
Fax: 603-223-4289
www.nh.gov/safety/divisions/firesafety

New Jersey – www.state.nj.us

Office of Homeland Security & Preparedness
PO Box 091
Trenton, NJ 08625-0091
Tel: 609-584-4000
Fax: 609-631-4916
www.njohsp.gov/contactus.html

Dept of Community Affairs – Div of Fire Safety
State Fire Marshal
PO Box 809
Trenton, NJ 08625-0800
Tel: 609-633-6106
Fax: 609-633-6134
www.state.nj.us/dca/dfs

Div of Labor and Workforce Development
Safety Compliance Unit – Mine Safety
Tel: 609-292-2096
http://lwd.dol.state.nj.us/labor/lsse/employee/Mine_Safety_Section.html

New Mexico – www.newmexico.gov

Homeland Security & Emergency Mgmt
13 Bataan Blvd
PO Box 27111
Santa Fe, NM 87504
Tel: 505-476-9600
www.nmdhsem.org

State Fire Marshal's Division
Public Regulation Commission
604 West San Mateo
PO Box 1269
Santa Fe, NM 87504-1269
Tel: 505-827-3550
Fax: 505-827-3778
www.nmprc.state.nm.us/sfm.htm

Energy, Minerals and Natural Resources Dept.
1220 S. St. Francis Dr.
Santa Fe, NM 87505
Tel: 505-476-3400
Fax: 505-476-3402
www.emnrd.state.nm.us/MMD/index.htm

New Mexico Regulation & Licensing Dept.
Toney Anaya Building
2550 Cerrillos Rd.
Santa Fe, NM 87505
Tel: 505-476-4500
Fax: 505-476-4511

New York – www.ny.gov

Office of Homeland Security
633 Third Ave
New York City, NY 10017
Tel: 212-867-7060
www.security.state.ny.us

Licensing & Certification
Division of Safety & Health
State Office Campus, Rm 288
Albany, NY 12240
Tel: 518-485-4263

New York Department of State
Office of Fire Prevention & Control
99 Washington Ave, Ste 500
Albany, NY 12231-0001
Tel: 518-474-6746
Fax: 518-474-3240
www.dos.state.ny.us/fire/firewww.html

New York City – www.nyc.gov

NYC Fire Dept.
www.nyc.gov/html/fdny/html/cda/cda_fdny.shtml

North Carolina – www.ncgov.com

North Carolina Homeland Security
Department of Crime Control & Public Safety
4701 Mail Service Center
Raleigh, NC 27699-4701
Tel: 919-733-2126

Department of Insurance
State Fire Marshal
322 Chapanoke Rd.
Raleigh, NC 27603
Tel: 919-661-5880
Toll Free: 800-634-7854
www.ncdoi.com/osfm

North Dakota – www.nd.gov

Office of Homeland Security
Department of Emergency Services
PO Box 5511
Bismarck, ND 58504
Tel: 701-328-8100
Fax: 701-328-8181

State Fire Marshal
PO Box 1054
Bismarck, ND 58502-1054
Tel: 701-325-5555

Ohio – http://ohio.gov

Homeland Security – OH Dept. of Public Safety
Charles D Shipley Building
1970 W. Broad St.
Columbus, OH 43223
Tel: 614-387-6171
Fax: 614-752-2419
www.homelandsecurity.ohio.gov/contacts.stm

Department of Natural Resources
Division of Mineral Resources Management
2045 Morse Rd., Bldg H-3
Columbus, OH 43229-6693
Tel: 614-265-6633
Fax: 614-265-7998
www.dnc.state.oh.us

Department of Commerce
State Fire Marshal
8895 E. Main St.
Reynoldsburg, OH 43068
Tel: 614-752-8200
www.com.state.oh.us/sfm/fire_contacts.aspx

Explosives Information
Bureau of Testing & Registration
6606 Tussing Rd.
PO Box 529
Reynoldsburg, OH 43068
Tel: 614-752-7126
Fax: 614-995-4206

Cleveland – www.city.cleveland.oh.us

Permits for Hazardous Substances & Explosives
1645 Superior
Cleveland, OH 44114
Tel: 216-664-6664
Fax: 216-664-6681

Oklahoma – www.ok.gov

Oklahoma's Office of Homeland Security
PO Box 11415
Oklahoma City, OK 73136
Tel: 405-425-7296
Fax: 405-425-7295
www.ok.gov/homeland

State Fire Marshal
2401 23rd St., Ste 4
Oklahoma City, OK 73107
Tel: 405-522-5005
Toll Free: 800-522-8666
Fax: 405-522-5028
www.firemar.state.ok.us

Department of Mines
2915 N. Classen Blvd., Ste 213
Oklahoma City, OK 73106
Tel: 405-427-3859
Fax: 405-427-9646
www.mines.state.ok.us

Oregon – www.oregon.gov

Department of State Police
Counter-Terrorism Section
255 Capitol NE, 4th Floor
Salem, OR 97310
Tel: 503-934-0242
http://www.oregon.gov/OSP/CTS/contact_us.shtml

State Fire Marshal
4760 Portland Rd. NE
Salem, OR 97305
Tel: 503-378-3473
Fax: 503-373-1825

Nevada – www.nv.gov

Nevada Homeland Security
101 N. Carson St.
Carson City, NV 89701
Tel: 775-684-5678
www.homelandsecurity.nv.gov

State Fire Marshal's Office
Nevada Department of Public Safety
107 Jacobsen Way
Carson City, NV 89711
Tel: 775-684-7500
Fax: 775-684-7507
www.fire.state.nv.us

New Hampshire – www.nh.gov

Homeland Security & Emergency Mgt.
Tel: 603-271-2231
Fax: 603-223-3609
www.nh.gov/safety/divisions/bem

Division of Fire Safety – Incident Mgmt Center
110 Smokey Bear Blvd.
Concord, NH 03301
Tel: 603-271-3294
Fax: 603-223-4289
www.nh.gov/safety/divisions/firesafety

New Jersey – www.state.nj.us

Office of Homeland Security & Preparedness
PO Box 091
Trenton, NJ 08625-0091
Tel: 609-584-4000
Fax: 609-631-4916
www.njohsp.gov/contactus.html

Dept of Community Affairs – Div of Fire Safety
State Fire Marshal
PO Box 809
Trenton, NJ 08625-0800
Tel: 609-633-6106
Fax: 609-633-6134
www.state.nj.us/dca/dfs

Div of Labor and Workforce Development
Safety Compliance Unit – Mine Safety
Tel: 609-292-2096
http://lwd.dol.state.nj.us/labor/lsse/employee/Mine_Safety_Section.html

New Mexico – www.newmexico.gov

Homeland Security & Emergency Mgmt
13 Bataan Blvd
PO Box 27111
Santa Fe, NM 87504
Tel: 505-476-9600
www.nmdhsem.org

State Fire Marshal's Division
Public Regulation Commission
604 West San Mateo
PO Box 1269
Santa Fe, NM 87504-1269
Tel: 505-827-3550
Fax: 505-827-3778
www.nmprc.state.nm.us/sfm.htm

Energy, Minerals and Natural Resources Dept.
1220 S. St. Francis Dr.
Santa Fe, NM 87505
Tel: 505-476-3400
Fax: 505-476-3402
www.emnrd.state.nm.us/MMD/index.htm

New Mexico Regulation & Licensing Dept.
Toney Anaya Building
2550 Cerrillos Rd.
Santa Fe, NM 87505
Tel: 505-476-4500
Fax: 505-476-4511

New York – www.ny.gov

Office of Homeland Security
633 Third Ave
New York City, NY 10017
Tel: 212-867-7060
www.security.state.ny.us

Licensing & Certification
Division of Safety & Health
State Office Campus, Rm 288
Albany, NY 12240
Tel: 518-485-4263

New York Department of State
Office of Fire Prevention & Control
99 Washington Ave, Ste 500
Albany, NY 12231-0001
Tel: 518-474-6746
Fax: 518-474-3240
www.dos.state.ny.us/fire/firewww.html

New York City – www.nyc.gov

NYC Fire Dept.
www.nyc.gov/html/fdny/html/cda/cda_fdny.shtml

Massachusetts – www.mass.gov

Massachusetts Homeland Security
Dept. of Public Safety
1 Ashburton Place
13th Fl, Rm 1301
Boston, MA 02108
Tel: 616-727-3200
Fax: 617-727-5732

State Fire Marshal
Tel: 978-567-3111
Fax: 978-567-3121
www.mass.gov/dfs/index/shtm

Michigan – www.michigan.gov

Michigan Homeland Security
www.michigan.gov/homeland
Department of Labor & Economic Growth
Bureau of Fire Services
300 N. Washington Square
Lansing, MI 48913
Tel: 517-241-8847
Fax: 517-335-4061
www.michigan.gov/bfs

Minnesota – www.state.mn.us

Homeland Security & Emergency Mgmt
444 Cedar St., Ste 223
St. Paul, MN 55101
Tel: 651-201-7400
Fax: 651-296-0459
www.hsem.state.mn.us

State Fire Marshal
444 Cedar St., Ste 145
St. Paul, MN 55101
Tel: 651-201-7200
Fax: 651-215-0525
www.dps.state.mn.us

Mississippi – www.ms.gov

Office of Homeland Security
PO Box 958
Jackson, MS 39205
Tel: 601-346-1499
www.homelandsecurity.ms.gov

Mississippi Insurance Department
State Fire Marshal
PO Box 79
Jackson, MS 39205-0079
Tel: 888-648-0877
Fax: 601-359-1076

Missouri – www.mo.gov

Missouri Homeland Security
Department of Public Safety
PO Box 749
Jefferson City, MO 65102
Tel: 573-522-3007
Fax: 573-522-6109
www.dps.mo.gov/HomelandSecurity

State Fire Marshal
PO Box 844
2401 E. McCarty
Jefferson City, MO 65102
Tel: 573-751-2930
Fax: 573-751-5710

Montana – www.mt.gov

Montana Homeland Security
1956 Mt. Majo St.
PO Box 4789
Fort Harrison, MT 59636-4789
Tel: 406-324-3000
Fax: 406-841-3965

Fire Prevention & Investigation Section
Division of Criminal Investigation
State Fire Marshal's Office
2225 11th Ave.
PO Box 201415
Helena, MT 59620-1415
Tel: 406-444-2050
Fax: 406-444-2759
www.doj.mt.gov/enforcement/fireprevention/default.asp

Department of Labor & Industry
PO Box 1728
Helena, MT 59624-1728
Tel: 406-444-2840
Fax: 406-444-1394

Nebraska – www.nebraska.gov

Homeland Security
NE Emergency Management Agency (NEMA)
1300 Military Rd.
Lincoln, NE 68508-1090
Tel: 402-471-7421
Fax: 402-471-7433
www.nema.ne.gov

State Fire Marshal
246 South 14th St.
Lincoln, NE 68508
Tel: 402-471-2027
Fax: 402-471-3118
www.sfm.ne.gov

Bureau of Labor and Industries
800 NE Oregon St., Ste 1045
Portland, OR 97232
Tel: 971-673-0761
Fax: 971-673-0762
www.boli.state.or.us

Pennsylvania – www.pa.gov

Office of Homeland Security
2605 Interstate Dr., Ste 380
Harrisburg, PA 17110
Tel: 717-651-2715
http://www.homelandsecurity.state.pa.us/

Department of Environmental Protection
Bureau of Mining & Reclamation
Richard L. Lamkie
Chief Explo & Safety Section
Rachel Carson State Office Bldg – 5th Floor
Harrisburg, PA 17105
Tel: 717-787-5103
Fax: 717-783-4675

Protection Blasting Information:
www.dep.state.pa.us/dep/deputate/miners/bmr/programs/blasting.htm

State Fire Commissioner
2605 Interstate Dr.
Harrisburg, PA 17110
Tel: 717-651-2201
Fax: 717-651-2210
www.osfc.state.pa.us

Puerto Rico – http://www.gobierno.pr/gprportal/inicio

Homeland Security Contact Information
La Fortaleza
PO Box 9020082
San Juan, PR 00902-0082
Tel: 787-977-7730
Fax: 787-977-7731

Division of Explosives
PO Box 70166
San Juan, PR 00936-8166
Tel: 809-729-1234

Rhode Island – www.ri.gov

Defense & Homeland Security Industry
315 Iron Horse Way, Ste 101
Providence, RI 02908
Tel: 401-278-9100
Fax: 401-273-8270
www.riedc.com/industry-sectors/defense-and-homeland-security

State Fire Marshal
118 Parade St.
Providence, RI 02909
Tel: 401-462-4200
Fax: 401-462-4250
www.fire-marshal.ri.gov

South Carolina – www.sc.gov

Office of Homeland Security
Emergency Management Division
2779 Fish Hatchery Rd.
West Columbia, SC 29172
Tel: 803-737-8500

Dept. of Labor, Licensing & Regulation
PO Box 11329
Columbia, SC 29211
Tel: 803-896-4300
www.llr.state.sc.us

State Fire Marshal
Tel: 803-896-9800
www.llr.state.sc.us/firemarshal.asp

South Dakota – www.sd.gov

Office of Homeland Security
Department of Public Safety
118 W. Capital Ave.
Pierre, SD 57501
Tel: 605-773-3450
Fax: 605-773-3018
www.state.sd.us/homeland/working/contact.asp

State Fire Marshal
Tel: 605-773-3562
Fax: 605-773-6631
www.state.sd.us/dps/fire

Tennessee – www.tn.gov

Department of Safety
Office of Homeland Security
Wm. R. Snodgrass TN Tower, 25th Floor
Nashville, TN 37243
Tel: 615-532-7825
Fax: 615-253-5379
www.tennessee.gov/homelandsecurity

Department of Commerce and Insurance
Fire Prevention
Permits and Licensing Section
500 James Robertson Pkwy, 3rd Floor
Nashville, TN 37243
Tel: 615-741-2981
Fax: 615-741-1583
www.tennessee.gov/commerce/sfm/contact.html

Federal Contact Information

Department of Homeland Security

US Department of Homeland Security
Washington, DC 20528
www.dhs.gov

Mine Safety and Health Administration (MSHA)

An agency of the Department of Labor concerned with promulgation and enforcement of health and safety regulations in the mining field.
To notify MSHA of a mine accident or emergency, call your local MSHA office. If you are unable to contact your local MSHA office, call (800) 746-1553. To report a hazardous condition at a mine to MSHA, call (800) 746-1553. You do not need to identify yourself.

Dept. of Labor, MSHA, Public Affairs
Office of the Administrator
1100 Wilson Blvd., 21st Floor
Arlington, VA 22209
Tel: 202-693-9400
Fax: 202-693-9401
www.msha.gov

Metal/Nonmetal Mine Safety & Health
Office of the Administrator
1100 Wilson Blvd., Room 2470
Arlington, VA 22209-3939
Tel: 202-693-9600
Fax: 202-693-9601

Office of Surface Mining (OSM)

An agency of the U.S. Department of the Interior regulating surface coal mining and the surface effects of underground coal mining.

Office of Surface Mining - OSM
1951 Constitution Ave. N.W.
Washington, D.C. 20240
202-208-2719
www.osmre.gov

Bureau of Alchohol, Tobacco, & Firearms (ATF)

An agency of the Department of Treasury having responsibility for the promulgation and enforcement of regulations related to the unlawful use of explosive materials under 18 U.S.C. Chapter 40, Section 847.

Bureau of Alcohol, Tobacco and Firearms
Explosives Industry Programs Branch
99 New York Ave. NE, Room 6E 405
Washington, DC 20226
Tel: 202-648-7120
www.atf.gov

Occupational Safety & Health Administration (OSHA)

An agency of the Department of Labor active in eliminating occupational hazards and promoting employee health and safety.

U.S. Department of Labor
Occupational Safety
and Health Administration (OSHA)
200 Constitution Avenue,
Washington, D.C. 20210
Tel: 202-693-2020
Fax: 202-693-1689
www.osha.gov

The Institute of Makers of Explosives (IME)

IME is the safety association of the commercial explosives industry in the United States and Canada.

IME
1120 Nineteenth Street NW, Suite 310
Washington, DC 20036-3605
Tel: 202-429-9280
Fax: 202-293-2420
www.ime.org

THE

BLASTER'S GUIDE

A Resource for the Explosives and Blasting Industry

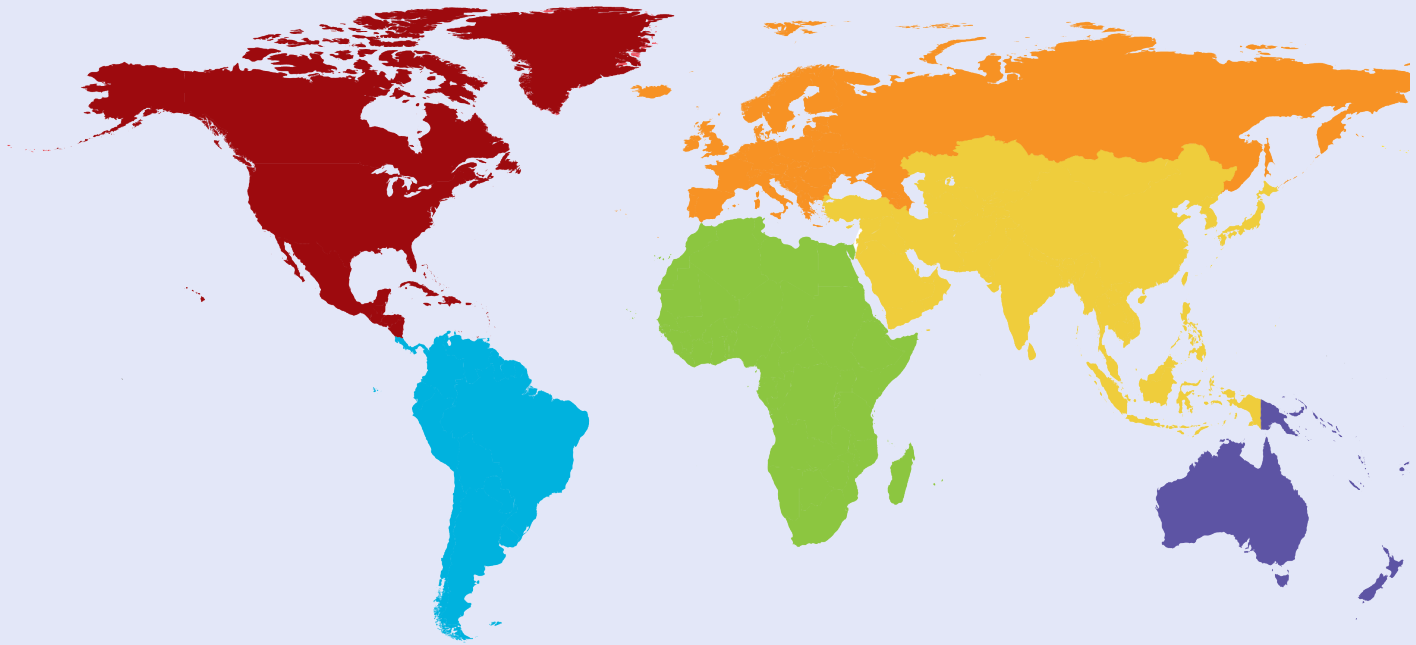
Austin Powder Company, Inc.
25800 Science Park Drive
Cleveland, Ohio, USA 44122
Phone: 216-464-2400
Fax: 216-464-4418

Email: info@austinpowder.com

IME Glossary

The complete IME Glossary of Commercial Explosives Industry Terms. This information is the copyrighted intellectual property of the Institute of Makers of Explosives (IME) and is reprinted herein with the express permission of IME.

Words used in the singular shall include the plural and in the plural shall include the singular.



AC Alternating current.

ACCEPTOR A charge of explosives or blasting agent receiving an impulse from an exploding donor charge.

ADOBE CHARGE A mud covered or unconfined charge fired in contact with a rock surface without the use of a borehole. Synonymous with BULLDOZE, MUDCAPPING, and PLASTER.

AIRBLAST The airborne shock wave or acoustic transient generated by an explosion.

"ALWAYS AND NEVER" List of precautions (IME Safety Library Publication No. 4) printed by the Institute of Makers of Explosives pertaining to the transportation, storage, handling and use of explosive materials. Formerly titled "DO'S AND DON'TS".

AMERICAN TABLE OF DISTANCES A quantity distance table, prepared and approved by IME, for storage of explosive materials to determine safe distances from inhabited buildings, public highways, passenger railways, and other stored explosive materials.

AMMONIUM NITRATE The ammonium salt of nitric acid represented by the formula NH4NO3.

AMPERE A unit of electrical current produced by 1 volt acting through a resistance of 1 ohm.

ANFO An explosive material consisting of ammonium nitrate and fuel oil. Synonymous with prills and oil.

ANSI American National Standards Institute - a nongovernmental organization concerned with developing safety and health standards for industry.

APPROPRIATE AUTHORITY See COMPETENT AUTHORITY.

APPROVED, APPROVAL, OR AUTHORIZED Terms which mean APPROVED, APPROVAL, or AUTHORIZED by the authority having jurisdiction.

ARTIFICIAL BARRICADE An artificial mound or revetted wall of earth of minimum thickness of three feet.

AUTHORIZED PERSON An individual approved or assigned by management to perform a specific duty or duties or to be at a specific location or locations.

AUTHORITY HAVING JURISDICTION The governmental agency, office, or individual responsible for approving equipment, an installation, or a procedure.

AVAILABLE ENERGY The energy from an explosive material that is capable of performing useful work.

BACKBREAK Rock broken beyond the limits of the last row of holes in a blast. Synonymous with OVERBREAK.

BALLISTIC MORTAR A laboratory instrument used for measuring the relative power or strength of an explosive material.

BARRICADED The effective screening of a building containing explosive materials from a magazine or other building, railway, or highway by a natural or an artificial barrier. A straight line from the top of any sidewall of the building containing explosive materials to the eave line of any magazine or other building or to a point twelve feet above the center of a railway or highway shall pass through such barrier.

BASE CHARGE The main explosive charge in the base of a detonator.

BATF See BUREAU OF ALCOHOL, TOBACCO AND FIREARMS.

BENCH A horizontal ledge from which holes are drilled vertically down into the material to be blasted: benching is a process of excavating where a highwall is worked in steps or lifts.

BENCH HEIGHT The vertical distance from the top of a bench to the floor or to the top of the next lower bench.

BLACK POWDER A deflagrating or low explosive compound of an intimate mixture of sulfur, charcoal, and an alkali nitrate, usually potassium or sodium nitrate.

BLAST, (BLASTING) The firing of explosive materials for such purposes as breaking rock or other material, moving material, or generating seismic waves.

BLAST AREA The area of a blast within the influence of flying rock missiles, gases, and concussion.

BLASTHOLE See DRILL HOLE and BOREHOLE.

BLAST PATTERN The plan of the drill holes as laid out for blasting: an expression of the burden distance and the spacing distance and their relationship to each other. Synonymous with DRILL PATTERN.

BLAST PATTERN The area where explosive material is handled during loading, including the perimeter of blast holes and 50 feet in all directions from loaded holes and contiguous holes that are to be loaded on the present shift. In underground mines, 15 feet of solid rib or pillar can be substituted for the 50 foot distance.

BLASTER That qualified person in charge of, and responsible for, the loading and firing of a blast. Synonymous with SHOT FIRER.

BLASTING ACCESSORIES Non-explosive devices and materials used in blasting, such as, but not limited to, cap crimpers, tamping bags, blasting machines, blasting galvanometers, and cartridge punches.

BLASTING AGENT An explosive material which meets prescribed criteria for insensitivity to initiation. For storage, Title 27, Code of Federal Regulations, Section 55.11 defines a blasting agent as any material or mixture consisting of a fuel and oxidizer, intended for blasting, not otherwise defined as an explosive, provided that the finished product, as mixed for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined. (Bureau of Alcohol, Tobacco and Firearms Regulation). For transportation, Title 49 Code of Federal Regulations defines a blasting agent as a material designed for blasting which has been tested in accordance with Section 173.114a and found to be so insensitive that there is very little probability of accidental initiation to explosion or transition from deflagration to detonation (US Department of Transportation Regulation).

BLASTING CAP A detonator which is initiated with a safety fuse. Synonymous with FUSE CAP, also see DETONATOR.

BLASTING CREW A group of persons who assist the blaster in loading, tying-in, and firing a blast.

BLASTING GALVANOMETER An electrical resistance instrument designed specifically for testing electric detonators and circuits containing them. It is used to check electrical continuity. Other acceptable instruments for this purpose are Blasting Ohmmeters and Blasters' Multimeters.

BLASTING LOG A written record of information about a specific blast as may be required by law or regulation.

BLASTING MACHINE An electrical or electromechanical device which provides electrical energy for the purpose of energizing detonators in an electric blasting circuit. Also used in reference to certain nonelectric systems. (Sometimes called exploder or battery.)

BLASTING MACHINE - CD TYPE See CAPACITORDISCHARGE BLASTING MACHINE.

BLASTING MACHINE - GENERATOR TYPE A hand operated electromechanical device which provides an output current to energize electric detonators.

BLASTING MACHINE - RHEOSTAT A graduated electrical resistance device used to simulate electric detonator resistances for the testing of generator type blasting machines.

BLASTING MAT A mat of woven steel wire, rope, scrap tires, or other suitable material or construction to cover blastholes for the purpose of preventing flying rock missiles.

BLASTING VIBRATIONS The energy from a blast that manifests itself in vibrations which are transmitted through the earth away from the immediate blast area.

BLOCKHOLING The breaking of boulders by loading and firing small explosive charges in small-diameter drilled holes.

BOOSTER An explosive charge, usually of high detonation velocity and detonation pressure, designed to be used in the explosive initiation sequence between an initiator or primer and the main charge.

BOOTLEG The part of a drilled blasthole that remains when the force of the explosion does not break the rock completely to the bottom of the hole. Synonymous with SOCKET.

BOREHOLE A hole drilled in the material to be blasted, for the purpose of containing an explosive charge, also called BLASTHOLE or DRILL HOLE.

BREAKAGE A term used to describe the size distribution of the rock fragments created by a blast.

BRIDGEWIRE A resistance wire connecting the ends of the leg wires inside an electric detonator and which is imbedded in the ignition charge of the detonator.

BRISANCE The shattering power of an explosive material as distinguished from its total work capacity.

BULK MIX A mass of explosive material prepared for use in bulk form without packaging.

BULK MIX DELIVERY EQUIPMENT Equipment (usually a motor vehicle with or without a mechanical delivery device) that transports explosive materials in bulk form for mixing or loading directly into blastholes, or both.

BULK STRENGTH The strength per unit volume of an explosive calculated from its weight strength and density.

BULLDOZE See ADOBE CHARGE. Synonymous with MUDCAPPING and PLASTER.

BULLET-RESISTANT Magazine walls or doors of construction resistant to penetration of a bullet of 150 grain M2 ball ammunition having a nominal muzzle velocity of 2700 feet per second fired from a .30 caliber rifle from a distance of 100 feet perpendicular to the wall or door. When a magazine ceiling or roof is required to be bullet-resistant, the ceiling or roof shall be constructed of materials comparable to the side walls or of other materials which will withstand penetration of the bullet described above when fired at an angle of 45 degrees from the perpendicular. Tests to determine bullet resistance shall be conducted on test panels or empty magazines which shall resist penetration of 5 out of 5 shots placed independently of each other in an area at least 3 feet by 3 feet.

BULLET-SENSITIVE EXPLOSIVE MATERIAL Explosive materials that can be detonated by 150 grain M2 ball ammunition having a nominal muzzle velocity of 2700 feet per second fired when the bullet is fired from a .30 caliber rifle from a distance of 100 feet and the test material, at a temperature of 70 to 75oF, is placed against a blacking material of 1/2-inch steel plate.

BUREAU OF EXPLOSIVES A bureau of the Association of American Railroads which the U.S. Department of Transportation may consult for recommendations on classification of explosive materials for the purpose of interstate transportation.

BURDEN The distance from the borehole and the nearest free face or the distance between boreholes measured perpendicular to the spacing. Also, the total amount of material to be blasted by a given hole, usually measured in cubic yards or tons.

BUREAU OF ALCOHOL, TOBACCO, AND FIREARMS (BATF) A bureau of the Department of Treasury having responsibility for the promulgation and enforcement of regulations related to the unlawful use of explosive materials under 18 U.S.C. Chapter 40, Section 847.

BUREAU OF MINES See U.S. BUREAU OF MINES.

BUS WIRE Expendable heavy gage bare copper wire used to connect detonators or series of detonators in parallel.

CAP CRIMPER A mechanical device for crimping the metallic shell of a fuse detonator or igniter cord connector securely to a section of inserted safety fuse. May be a hand or bench tool.

CAP SENSITIVE EXPLOSIVE MATERIAL An explosive material which will detonate with an IME No. 8 TEST DETONATOR when the material is unconfined.

CAPACITOR- DISCHARGE BLASTING MACHINE A blasting machine in which electrical energy, stored on a capacitor, is discharged into a blasting circuit containing electric detonators.

CARTON A lightweight inner container for explosive materials, usually encased in a substantial shipping container called a case.

CARTRIDGE An individual closed shell, bag, or tube of circular cross section containing explosive material.

CARTRIDGE COUNT (STICK COUNT) The number of cartridges in a standard case. A standard case typically contains about 50 pounds of explosive material.

CARTRIDGE PUNCH A wooden, plastic, or non-sparking metallic device used to punch an opening in an explosive to accept a detonator or a section of detonating cord. Synonymous with POWDER PUNCH.

CARTRIDGE STRENGTH Synonymous with BULK STRENGTH.

CASE An outer substantial shipping container meeting DOT specifications for explosive materials.

CASE INSERT A set of printed, precautionary instructions, including the IME "Instructions and Warnings" which is included in a case of explosive materials.

CASE LINER A separate barrier inside a shipping case, used to prevent the escape of explosive materials. A liner may also restrict fumes from escaping from the case and protect the explosive materials from moisture.

CAST, EXTRUDED, OR PRESSED BOOSTER A cast, extruded or pressed solid high explosive. (See BOOSTER)

CERTIFIED BLASTER A blaster certified by a governmental agency to prepare, execute, and supervise blasting.

CFM An abbreviation for cubic feet per minute, a measure of the volume of flow. Usually refers to air flow in mining usage.

CHEMICAL MANUFACTURERS ASSOCIATION (CMA) A non-profit chemical trade organization of companies in the U.S. and Canada who manufacture chemicals for sale.

CIRCUIT A completed path for conveying electrical current. See series circuit, parallel circuit, and series in parallel circuit. (Some nonelectric systems also use the word circuit.)

CLASS A EXPLOSIVES Explosives, as defined by the U.S. Department of Transportation, which possess detonating or otherwise maximum hazard; such as, but not limited to, dynamite, nitroglycerin, lead azide, blasting caps and detonating primers.

CLASS B EXPLOSIVES Explosives, as defined by the U.S. Department of Transportation, which possess flammable hazards; such as, but not limited to, propellant explosives, photographic flash powders, and some special fireworks.

CLASS C EXPLOSIVES Explosives, as defined by the U.S. Department of Transportation, which contain Class A or Class B explosives, or both, as components but in restricted quantities.

COLLAR The mouth or opening of a borehole or shaft.

COLUMN CHARGE A charge of explosives in a blasthole in the form of a long continuous unbroken column.

COLUMN DEPTH/ COLUMN HEIGHT The length of each portion of a blasthole filled with explosive materials.

COMMERCIAL EXPLOSIVES Explosives designed, produced, and used for commercial or industrial applications rather than for military purposes.

COMPETENT AUTHORITY A national agency responsible under its national law for the control or regulation of a particular aspect of the transportation of hazardous materials. Also referred to as APPROPRIATE AUTHORITY (Ref. 49 CFR).

CONFINED DETONATION VELOCITY The detonation velocity of an explosive material in a substantial container or a borehole.

CONNECTING WIRE Wire used to extend the firing line or leg wires in an electric blasting circuit.

CONTINUITY CHECK (CIRCUIT CONTINUITY CHECK) a determination made by instrumentation where possible, and visually in all cases, to show that an initiation system is continuous and contains no breaks or improper connections that could cause stoppage or failure of the initiation process.

CONTOUR BLASTING A blasting technique used to produce smooth walls and reduce overbreak in underground blasting. The cushion holes have light, well distributed charges and are fired on the last delay period in the round.

CORE LOAD The explosive core of detonating cord, expressed as the weight in grains of explosive per foot.

COUPLING The degree to which an explosive fills the cross-section of a borehole; bulk-loaded explosives are completely coupled; untamped cartridges are decoupled.

COYOTE SHOOTING A method of blasting using a number of relatively large concentrated charges of explosives placed in one or more small tunnels driven in a rock formation.

CRIMP The folded ends of paper explosive cartridges; the circumferential depression at the open end of a fuse cap or igniter cord connector which serves to secure the fuse; or the circumferential depression in the blasting cap shell that secures a sealing plug or sleeve into electric or nonelectric detonators.

CRIMPING The act of securing a fuse cap or igniter cord connector to a section of a safety fuse by compressing the metal shell of the cap against the fuse by means of a cap crimper.

CRITICAL DIAMETER The minimum diameter for propagation of a detonation wave at a stable velocity. Critical diameter is affected by conditions of confinement, temperature and pressure on the explosive.

CURRENT LEAKAGE Portion of the firing current bypassing part of the blasting circuit through unintended paths.

CURRENT LIMITING DEVICE An electric or electromechanical device that limits (1) current amplitude; (2) duration of current flow; or (3) total energy of the current delivered to an electric blasting circuit.

CUSHION BLASTING A blasting technique used to produce competent slopes or smooth walls. The cushion holes, fired after the main charge, have a reduced spacing and employ decoupled charges.

CUTOFF A break in a path of detonation or initiation caused by extraneous interference, such as flyrock or shifting ground.

DATE-SHIFT CODE A code, required by Federal regulation (BATF), applied by manufacturers to the outside shipping containers, and, in many instances, to the immediate containers of explosive materials to aid in their identification and tracing.

D'AUTRICHE METHOD- DETONATION VELOCITY A method of determining the detonation velocity of an explosive material by employing detonating cord and a witness plate.

DC Direct current.

DECIBEL A unit of air overpressure commonly used to measure air blast.

DECK LOADING (DECKING) A method of loading blastholes in which the explosive charges, called decks or deck charges, in the same hole are separated by stemming or an air cushion.

DECK An explosive charge that is separated from other charges in the blasthole by stemming or an air cushion.

DECOUPLING The use of cartridged explosive products significantly smaller in diameter than the diameter of the blasthole. Decoupling or the use of decoupling charges is designed to reduce the charge concentration in the blasthole and minimize stresses exerted on the walls of the blasthole.

DEFLAGRATION An explosive reaction such as a rapid combustion that moves through an explosive material at a velocity less than the speed of sound in the material.

DELAY A distinct pause of predetermined time between detonation or initiation impulses, to permit the firing of explosive charges separately.

DELAY BLASTING The practice of initiating individual explosive decks, boreholes or rows of boreholes at predetermined time intervals using delay detonators, or other delaying means, as compared to instantaneous blasting where all holes are fired essentially at the same time.

DELAY DETONATOR An electric or nonelectric detonator used to introduce a predetermine lapse of time between the application of a firing signal and the detonation of the base charge.

DELAY ELEMENT The device in a delay detonator that produces the predetermined time lapse between the application of a firing signal and detonation.

DELAY INTERVAL The nominal time between the detonations of delay detonators of adjacent periods in a delay series; the nominal time between successive detonations in a blast.

DELAY PERIOD A designation given to a delay detonator to show its relative or absolute delay time in a given series.

DELAY SERIES A series of delay detonators designed to satisfy specific blasting requirements. There are basically two types of delay series: millisecond (MS) or short period (SP) with delay intervals on the order of milliseconds and long period (LP) with delay time on the order of seconds.

DELAY TAG A tag, band, or marker on a delay detonator that denotes the delay series, delay period and/or delay time of the detonator.

DELAY TIME The lapse of time between the application of a firing signal and the detonation of the base charge of a delay detonator.

DENSITY The mass of an explosive per unit volume, usually expressed in grams per cubic centimeter or pounds per foot. (Also see SPECIFIC GRAVITY).

DEPARTMENT OF TRANSPORTATION (DOT) A cabinet-level agency of the Federal Government. It has the responsibility for the comprehensive regulation of transportation safety and issues regulations governing interstate shipments of explosives and other hazardous materials.

DETONATING CORD A flexible cord containing a center core of high explosive which may be used to initiate other high explosives.

DETONATING CORD DOWNLINE the section of detonating cord that extends within the blasthole from the ground surface down to the explosive charge.

DETONATING CORD MS CONNECTORS Nonelectric short-interval (millisecond) delay devices for use in delaying blasts which are initiated by detonating cord.

DETONATING CORD TRUNKLINE The line of detonating cord that is used to connect and initiate other lines of detonating cord.

DETONATING PRIMER A name applied for transportation purposes to a device consisting of a detonator and an additional charge of explosives, assembled as a unit.

DETONATION An explosive reaction that moves through an explosive material at a velocity greater than the speed of sound in the material.

DETONATION PRESSURE The pressure produced in the reaction zone of a detonating explosive.

DETONATING VELOCITY The velocity at which detonation progresses through an explosive.

DETONATOR Any device containing an initiating or primary explosive that is used for initiating detonation in another explosive material. A detonator may not contain more than 10 grams of total explosives by weight, excluding ignition or delay charges. The term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses, detonating cord delay connectors, and nonelectric instantaneous and delay blasting caps which use detonating cord, shock tube, or any otherreplacement for electric leg wires. Unless specifically classified otherwise, detonators are Class A Explosives.

DETONATORS, CLASS C EXPLOSIVE Initiating devices which will not mass detonate when packaged for shipment. (See MASS DETONATE)

DIAMETER The cross-sectional width of a borehole or an explosive cartridge.

DITCH BLASTING The formation of a ditch by the detonation of a series of explosive charges.

DITCHING DYNAMITE A nitroglycerin type explosive especially designed to propagate sympathetically from hole to hole in ditch blasting.

DONOR An exploding charge producing an impulse that impinges upon and explosive "acceptor" charge.

DOPE Individual, dry, nonexplosive ingredients that comprise a portion of an explosive formulation.

DO'S AND DON'TS Former name of a list of precautions (IME Safety Library Publication No. 4) printed by the Institute of Makers of Explosives pertaining to the transportation, storage, handling and use of explosive materials and included in cases of explosive materials. Recently renamed, "ALWAYS AND NEVER".

DOWNLINE A line of detonating cord or plastic tubing in a blasthole which transmits the detonation from the trunkline or surface delay system down the hole to the primer.

DRILL HOLE A hole drilled in the material to be blasted for the purpose of containing an explosive charge, also called BLASTHOLE or BOREHOLE.

DRILLING PATTERN The location of blastholes in relationship to each other and the free face.

DUMMY A cylindrical unit of clay, sand, or other inert material used to confine or separate explosive charges in a borehole.

DYNAMITE A high explosive used for blasting, consisting essentially of a mixture of, but not limited to, nitroglycerin, nitrocellulose, ammonium nitrate, sodium nitrate, and carbonaceous materials.

ELECTRIC BLASTING CIRCUIT An electric circuit containing electric detonators and associated wiring. Also see PARALLEL SERIES, and SERIES IN PARALLEL BLASTING CIRCUITS.

ELECTRIC DETONATOR A detonator designed for, and capable of, initiation by means of an electric current.

ELECTRICAL STORM An atmospheric disturbance characterized by intense electrical activity producing lightning strokes and strong electric and magnetic field. Synonymous with THUNDERSTORM and LIGHTNING STORM.

EMERGENCY PROCEDURE CARD Instructions carried on a vehicle transporting explosive materials and giving specific procedures in case of emergency.

EMULSION An explosive material containing substantial amounts of oxidizer dissolved in water droplets, surrounded by an immiscible fuel, or droplets of an immiscible fuel surrounded by water containing substantial amounts of oxidizer.

ENERGY A measure of the potential for an explosive to do work.

EXPLOSION A chemical reaction involving an extremely rapid expansion of gases usually associated with the liberation of heat.

EXPLOSIVE Any chemical compound, mixture or device, the primary or common purpose of which is to function by explosion.

EXPLOSIVE- ACTUATED DEVICE Any tool or special mechanized device which is actuated by explosives. The term does not include propellant-actuated devices. (Also see PROPELLANT-ACTUATED POWER DEVICE.) Examples of explosive-actuated devices are jet-tappers and jet perforators.

EXPLOSIVE CHARGE The quantity of explosive material used in a blasthole, coyote tunnel, or explosive device.

EXPLOSIVE LOADING FACTOR The amount of explosive used per unit of rock. Also called POWDER FACTOR.

EXPLOSIVE MATERIALS These include explosives, blasting agents and detonators. The term includes, but is not limited to, dynamite and other high explosives, slurries, emulsions, and water gels; black powder and pellet powder; initiating explosives; detonators (blasting caps); safety fuse; squibs; detonating cord; igniter cord; and igniters. A list of explosive materials determined to be within the coverage of 18 USC Chapter 40, "Importation, Manufacturer, Distribution, and Storage of Explosive Materials" is issued at least annually by the Director of the Bureau of Alcohol, Tobacco, and Firearms of the Department of the Treasury. The United States Department of Transportation classifications of Explosive Materials used in commercial blasting operations are not identical with the statutory definitions of the Organized Crime Control Act of 1970, Title 18 USC, Section 841. To achieve uniformity in transportation the definitions of the United States Department of Transportation in Title 49 Code of Federal Regulations Parts 1-999 subdivides these materials into: Class A Explosives–detonating or otherwise maximum hazard Class B Explosives - flammable hazard Class C Explosives - minimum hazard Blasting Agents - See definition of blasting agent.

EXPLOSIVE OILS Liquid explosive sensitizers for explosive materials. Examples include nitroglycerin, ethylene glycol dinitrate, and metriol trinitrate.

EXPLOSIVE STRENGTH The amount of energy released by an explosive upon detonation which is an indication of the capacity of the explosive to do the work.

EXTRA (AMMONIA) DYNAMITE A dynamite in which part of the nitroglycerine is replaced by ammonium nitrate in sufficient quantity to result in the same weight strength.

EXTRANEOUS ELECTRICITY Electrical energy, other than actual firing current or the test current from a blasting galvanometer, that is present at a blast site and that could enter an electric blasting circuit. It includes stray current, static electricity, RF (electromagnetic) waves and time-varying electric and magnetic fields.

FERTILIZER GRADE AMMONIUM NITRATE A grade of ammonium nitrate as defined by The Fertilizer Institute.

FIRE EXTINGUISHER RATING A rating set forth in the National Fire Code which may be identified on an extinguisher by a number (5, 20, 70, etc.) indicating the extinguisher's relative effectiveness followed by a letter (A, B, C, etc.) indicating the class or classes of fires for which the extinguisher has been found to be effective.

FIRE-RESISTANT Construction designed to offer reasonable protection against fire.

FIREWORKS Combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible effects.

FIRING CURRENT An electric current of recommended magnitude and duration to sufficiently energize and electric detonator or a circuit of electric detonators.

FIRING LINE The wire(s) connecting the electrical power source with the electric blasting circuit.

FLAG-DANGER Flags, usually red, which may or may not be imprinted with a warning and used to caution personnel around explosives operations, or displayed on trucks transporting explosives.

FLAMMABILITY The ease with which an explosive material may be ignited by flame and heat.

FLARE A pyrotechnic device designed to produce a single source of intense light.

FLASHOVER The sympathetic detonation between explosive charges or between charged blastholes.

FLASH POINT The lowest temperature at which vapors from a volatile combustible substance ignite in air when exposed to flame, as determined in an apparatus specifically designed for such testing.

FLYROCK Rocks propelled from the blast area by the force of an explosion.

FORBIDDEN OR NOT ACCEPTABLE EXPLOSIVES Explosives which are forbidden or not acceptable for transportation by common, contract, or private carriers, by rail freight, rail express, highway, air or water in accordance with the regulations of the U.S. Department of Transportation.

FRAGMENTATION The breaking of a solid mass into pieces by blasting.

FREE FACE A rock surface exposed to air or water which provides room for expansion upon fragmentation; sometimes called open face.

FUEL A substance which may react with oxygen to produce combustion.

FUME CLASSIFICATION See IME FUME CLASSIFICATION.

FUMES The gaseous products of an explosion. For the purpose of determining the fume classification of explosive materials, only poisonous or toxic gases are considered.

FUSE See SAFETY FUSE

FUSE CAP A detonator which is initiated by a safety fuse; also referred to as an ordinary blasting cap. Synonymous with BLASTING CAP, also see DETONATOR.

FUSE CUTTER A mechanical device for cutting safety fuse clean and at right angles to its long axis.

FUSE LIGHTERS Pyrotechnic devices for the rapid and certain lighting of safety fuse.

GAGE (WIRE) A series of standard sizes such as the American Wire Gage (AWG), used to specify the diameter of wire.

GALVANOMETER See BLASTING GALVANOMETER.

GAP SENSITIVITY The maximum length of gap across which a detonation wave will travel and initiate a second or receptor cartridge. Both primer and receptor cartridge should be of the same composition, diameter, and weight. Usually refers to gap in air but other media may be used.

GELATIN DYNAMITE A type of highly water-resistant dynamite characterized by its gelatinous or plastic consistency.

GEOLOGY A description of the types and arrangement of rock in an area; the description usually includes the dip and strike, the type and extent of pre-existing breaks in the rock, and the hardness and massiveness of the rock, as these affect blast design.

GRAINS In the avoirdupois system of weight measurement 7000 grains are equivalent to one standard 16 ounce pound (0.45 kg.). A grain is 0.0648 grams in both the avoirdupois and the troy system.

GROUND FAULT An electrical path between parts of the blasting circuit and earth.

GROUND VIBRATION Shaking the ground, by elastic waves emanating from a blast; usually measured in inches per second of particle velocity.

GVW Gross vehicle weight.

HANGFIRE The detonation of an explosive charge at some non-predictable time after its normally designed firing time.

HARDWOOD Red oak, white oak, hard maple, ash or hickory, free from loose knots, wind shakes, or similar defects.

HERTZ (Hz) Synonymous with "cycles per second."

HIGH EXPLOSIVES Explosives which are characterized by a very high rate of reaction, high pressure development, and the presence of a detonation wave in the explosive.

HIGHWALL A nearly vertical face at the edge of a bench, bluff, or ledge on a surface excavation.

HIGHWAY Any public street, public alley, or public road.

HOLE DIAMETER The cross-sectional width of the borehole.

IGNITER CORD A small-diameter pyrotechnic cord that burns at a uniform rate with an external flame and used to ignite a series of safety fuses.

IME FUME CLASSIFICATION A classification indicating the amount of carbon monoxide and hydrogen sulfide produced by an explosive or blasting agent. Explosives with positive oxygen balances are not considered as being acceptable in these classifications.

Cubic Feet of Poisonous Gases per (1 1/4" x 8") Cartridge of Explosive

Fume Class	Material
1	Less than 0.16
2	0.16 to 0.33
3	0.33 to 0.67

INCENDIVITY The property of an igniting agent (e.g. spark, flame or hot solid) which indicates it is of sufficient intensity to ignite flammable material or explosive gases.

INHABITED BUILDING A building regularly occupied in whole or part as a habitation for human beings, or any church, school house, railroad station, store, or other structure where people are accustomed to assembly, except any building or structure occupied in connection with the manufacture, transportation, storage or use of explosive materials.

INITIATION The start of deflagration or detonation in an explosive material.

INITIATOR A detonator, detonating cord or similar device used to start detonation or deflagration in an explosive material.

INSTANTANEOUS DETONATOR A detonator that has a firing time of essentially zero seconds as compared to delay detonators with firing times of from several milliseconds to several seconds.

INSTITUTE OF MAKERS OF EXPLOSIVES (IME) A non-profit, safety-oriented trade association representing producers of commercial explosive materials in the U.S. and Canada and dedicated to safety in the manufacture, transportation, storage, handling and use of explosive materials.

INSTITUTE OF MAKERS OF EXPLOSIVES NO. 8 TEST DETONATOR IME No. 8 test detonator has 0.40 to 0.45 grams PETN base charge pressed to a specific gravity of 1.4 g/cc and primed with standard weights of primer, depending on manufacturer.

INVENTORY A listing of all explosive materials stored in a magazine.

ISSUING AUTHORITY The governmental agency, office, or official vested with the authority to issue permits or licenses.

KELLY BAR A hollow bar attached to the top of the drill column in rotary drilling; also called grief joint, kelly joint, kelly stem.

LEADING (LEAD) LINES OR WIRES The wire(s) connecting the electrical power source with the circuit containing electric detonators. See FIRING LINE.

LEAKAGE RESISTANCE The resistance between the blasting circuit (including lead wires) and the ground.

LEG WIRES The two single wires or one duplex wire extending out from an electric detonator.

LIGHTNING STORM See ELECTRICAL STORM.

LIQUID FUELS Fuels in a liquid state. They may be used with oxidizers to form explosive materials.

LOADING Placing explosive material in a blasthole or against the material to be blasted.

LOADING DENSITY The weight of explosive loaded per unit length of borehole occupied by the explosive, expressed as pounds/foot or kilometers/meter of borehole.

LOADING POLE A non-metallic pole used to assist the placing and compacting of explosive charges in boreholes.

LOW EXPLOSIVES Explosives which are characterized by deflagration or a low rate of reaction and the development of low pressure. See DEFLAGRATION.

MAGAZINE Any building, structure, or container, other than an explosives manufacturing building, approved for the storage of explosive materials.

MAGAZINE KEEPER A person responsible for the inventory and safe storage of explosive materials, including the proper maintenance of explosive materials, storage magazines and areas.

MAGAZINE, SURFACE A specially designed and constructed structure for the storage of explosive materials on the surface of the ground.

MAGAZINE, UNDERGROUND A specially designed and constructed structure for the storage of explosive materials underground.

MAIN EXPLOSIVE CHARGE The explosive material that performs the major work of blasting.

MANUFACTURING CODES Code markings stamped on explosive materials packages, indicating among other information, the date of manufacture.

MANTRIP A trip on which personnel are transported to and from a work area.

MASS DETONATE (MASS EXPLODE) Explosive materials mass detonate (mass explode) when a unit or any part of a larger quantity of explosive material explodes and causes all or a substantial part of the remaining material to detonate or explode simultaneously. With respect to detonators "mass detonate" means that more than 90 percent of the devices or more than 25 grams of the explosive materials in the shipping container explode practically simultaneously.

MAXIMUM RECOMMENDED FIRING CURRENT The highest electric current which will result in the safe and effective performance of an electric detonator.

METALLIC SLITTER A device containing a sharp edge, such as a safety razor blade, used for slitting open fiberboard cases.

MILLISECOND One thousandth part of a second (.001 1/1000 sec.)

MINE SAFETY AND HEALTH ADMINISTRATION (MSHA) An agency of the Department of Labor concerned with promulgation and enforcement of health and safety regulations in the mining field.

MINIATURIZED DETONATING CORD Detonating cord with a coreload of 5 grains or less of explosives per foot.

MINIMUM RECOMMENDED FIRING CURRENT The lowest recommended electric current to ensure reliable performance of an electric detonator.

MINIMUM GAP SENSITIVITY An air gap, measure in inches or centimeters, which determines whether the explosive material is within specific tolerances for gap sensitivity. Also see GAP SENSITIVITY.

MISFIRE A blast or specific borehole that failed to detonate as planned. Also, the explosive material itself that failed to detonate as planned.

MONROE EFFECT The concentration of explosive action through the use of a shaped charge.

MOTOR VEHICLE A vehicle, machine, tractor, trailer, or semi trailer propelled or drawn by mechanical power. Does not include vehicles operated exclusively on rail.

MS CONNECTORS Nonelectric, short-interval (milliseconds) delay devices for use in delaying blasts which are initiated by detonating cord. Same as DETONATING CORD MS CONNECTORS.

MSHA APPROVAL A document issued by MSHA which states that an explosive or explosive unit has met MSHA requirements and which authorizes an approval marking identifying the explosive or explosive unit as approved as permissible.

MUCKPILE The pile of broken material resulting from a blast.

MUDCAPPING (MUDCAP) See ADOBE CHARGE. Synonymous with BULLDOZE, MUDCAP and PLASTER.

MULTIPLE PATH TRUNKLINE SYSTEM Duplication or repetition of trunkline elements in a blast initiation system to provide alternate paths of initiation.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS Standards for explosive materials and ammonium nitrate issued by the National Fire Protection Association.

NATIONAL SAFETY COUNCIL (NSC) A non-profit organization charged by Congress to provide a regular information service on the causes of accidents and ways to prevent them.

NATURAL BARRICADE Natural features of the ground such as hills, or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare.

NITROGLYCERIN An explosive chemical compound used as a sensitizer in dynamite and represented by the formula $C_3H_5(ONO_2)_3$.

NO. 8 TEST CAP See INSTITUTE OF MAKERS OF EXPLOSIVES NO. 8 TEST DETONATOR.

NONELECTRIC DETONATOR A detonator that does not require the use of electric energy to function.

NONSPARKING METAL A metal that will not produce a spark when struck with other tools, rock, or hard surfaces.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA) An agency of the Department of Labor active in eliminating occupational hazards and promoting employee health and safety.

OFFICE OF SURFACE MINING (OSM) An agency of the U.S. Department of the Interior regulating surface coal mining and the surface effects of underground coal mining.

OVERBREAK See BACKBREAK.

OVERBURDEN Material of any nature laying on top of a deposit of material which is to be mined.

OXIDIZER OR OXIDIZING MATERIAL A substance, such as a nitrate, that readily yields oxygen or other oxidizing substances to promote the combustion of organic matter or other fuel.

OXYGEN BALANCE The percentage of oxygen in an explosive material or ingredient thereof in excess of (+) or less than (-) that which is needed to produce ideal reaction products.

PARALLEL BLASTING CIRCUIT An electric blasting circuit in which one leg wire of each detonator is connected to one of the wires from the source of firing current and the other leg wire of each detonator is connected to the other wire from the firing current source. (Can also be used to refer to certain nonelectric systems.)

PARALLEL SERIES CIRCUIT See SERIES IN PARALLEL BLASTING CIRCUIT.

PARTICLE BOARD A composition board made of small pieces of wood, bonded together.

PARTICLE VELOCITY A measure of the intensity of ground vibration, specifically the velocity of motion of the ground particles as they are excited by the wave energy.

PARTING A rock mass located between two seams of coal; a joint or crack in rock.

PASSENGER RAILWAY Any steam, electric, or other railroad or railway which carries passengers for hire.

PELLET POWDER Black powder pressed into cylindrical pellets 2 inches in length and 1 1/4 inches in diameter.

PERMISSIBLE DIAMETER (SMALLEST) The smallest allowable diameter of a particular permissible explosive, as approved by the Mine Safety and Health Administration (MSHA).

PERMISSIBLE EXPLOSIVES (MSHA APPROVED EXPLOSIVES) Explosives that are approved by the Mine Safety and Health Administration for use in gassy and dusty atmospheres, Permissible explosives must be used and stored in accordance with certain conditions specified by the Mine Safety and Health Administration (MSHA).

PERSON Any individual, corporation, company, association, firm, partnership, society, or joint stock company.

PETN An abbreviation for the name of the explosive pentaerythritol tetranitrate.

PLACARDS Signs placed on vehicles transporting hazardous materials (including explosive materials) indicating the nature of the cargo.

PLASTER See ADOBE CHARGE. Synonymous with BULLDOZE and MUDCAPPING.

PLYWOOD Exterior construction-grade plywood.

PNEUMATIC LOADING The loading of explosive materials into a borehole using compressed air as the loading or conveying force.

POWDER A common synonym for explosive materials.

POWDER PUNCH See CARTRIDGE PUNCH.

POWDER FACTOR The amount of explosive used per unit of rock. Also called EXPLOSIVE LOADING FACTOR.

POWER SOURCE The source of power for energizing electric blasting circuits; e.g., a blasting machine or power line.

PREBLAST SURVEY A documentation of the existing condition of structures near an area where blasting is to be conducted.

PREMATURE FIRING The detonation of an explosive charge before the intended time.

PRESPLITTING (PRESHEARING) A smooth blasting method in which cracks for the final contour are created by firing a single row of holes prior to the initiation of the rest of the holes in the blast pattern.

PRILLED AMMONIUM NITRATE Ammonium nitrate in a pelleted or prilled form.

PRIMARY BLAST A blast used to fragment and displace material from its original position to facilitate subsequent handling and crushing.

PRIMARY EXPLOSIVE A sensitive explosive which nearly always detonates by simple ignition from such means as spark, flame, impact, friction, or other primary heat sources of appropriate magnitude.

PRIMER A unit, package, or cartridge of explosives used to initiate other explosives or blasting agents, and which contains (1) a detonator; or (2) detonating cord to which is attached a detonator designed to initiate the detonating cord.

PROPAGATION The detonation of an explosive charge by an impulse received from an adjacent or nearby explosive charge.

PROPELLANT EXPLOSIVE An explosive material that normally functions by deflagration and is used for propulsion purposes. It may be a Class A or Class B explosive, depending upon its susceptibility to detonation.

PROPELLANT- ACTUATED POWER DEVICE Any tool or special mechanized device or gas generator system which is actuated by a propellant or which releases and directs work through a propellant charge.

PUBLIC CONVEYANCE Any railroad car, streetcar, ferry, cab, bus, aircraft, or other vehicle which is carrying passengers for hire.

PYROTECHNICS Any combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible effects. Also see FIREWORKS.

QUANTITY- DISTANCE TABLE A table listing minimum recommended distances from explosive materials stores of various weights to a specific location.

RADIO FREQUENCY ENERGY (RF) The energy radiated as electromagnetic waves in the radio frequency spectrum.

RADIO FREQUENCY TRANSMITTER An electronic transmitting device which radiates radio frequency waves. The transmitting device may be fixed (stationary) or mobile, and includes car telephones, citizen band radios, AM and FM radio transmitters, television transmitters and radar transmitters.

RAILWAY Any steam, electric or other railroad or railway.

RECEPTOR (ACCEPTOR) A charge of explosive materials receiving an impulse from an exploding donor charge.

REGULATIONS- FEDERAL, STATE, LOCAL Regulations promulgated by federal, state or local regulatory agencies governing the manufacture, transportation, storage, sale, possession, handling and use of explosive materials.

RELIEF The effective distance from a blasthole to the nearest free face.

RESISTANCE The measure of opposition to the flow of electrical current, expressed in ohms.

ROTATIONAL FIRING Delay blasting system used so that the detonating explosives will successively displace the burden into the void created by previously detonated explosives in holes which fired at an earlier delay period.

ROUND A group of boreholes fired or intended to be fired in a continuous sequence with the application of initiating energy.

SAFETY FUSE A flexible cord containing solid flammable material by which fire or flame is conveyed at a continuous and uniform rate from the point of ignition to a cut end. A fuse detonator is usually attached to that end, although safety fuse may be used without a detonator to ignite material such as deflagrating explosives.

SAFETY STANDARD Suggested precautions relative to the safety practices to be employed in the manufacture, transportation, storage, handling and use of explosive materials.

SCALED DISTANCE A factor relating similar blast effects from various weight charges of explosive material at various distances. Scaled distance referring to blasting effects is obtained by dividing the distance of concern by a fractional power of the weight of the explosive materials.

SEAM A stratum or bed of coal or other material. May also refer to a crack or joint in a blast area which may be filled with mud or other material. A seam may be in any orientation.

SECONDARY BLASTING Blasting to reduce the size of boulders resulting from a primary blast.

SEISMOGRAPH An instrument, useful in monitoring blasting operation, which records ground vibration. Particle velocity, displacement, or acceleration is generally measured and recorded in three mutually perpendicular directions.

SEMI-CONDUCTIVE HOSE A hose used for pneumatic conveying of explosive materials having an electrical resistance high enough to limit flow of stray currents to safe levels yet not so high as to prevent drainage of static electric charges to ground. Hose of not more than 2 megohms resistance over its entire length and of not less than 1,000 ohms per foot meets the requirements.

SENSITIVENESS A measure of an explosive's cartridge to cartridge propagating ability under certain test conditions. It is expressed as the distance through air at which a primed half-cartridge (donor) will detonate an unprimed half-cartridge (receptor). Also see GAP SENSITIVITY.

SENSITIVITY A physical characteristic of an explosive material classifying its ability to be initiated upon receiving an external impulse such as impact, shock, flame, friction, or other influences which can cause explosive decomposition.

SEPARATION DISTANCES Minimum recommended distances from explosive materials accumulations to other specified locations.

SEQUENTIAL BLASTING MACHINE A blasting machine designed to actuate separate series of detonators at accurately timed intervals. Also called SEQUENTIAL TIMER.

SEQUENTIAL TIMER See SEQUENTIAL BLASTING MACHINE.

SERIES BLASTING CIRCUIT An electric blasting circuit that provides one continuous path for the current through all caps in the circuit.

SERIES IN PARALLEL BLASTING CIRCUIT A circuit in which electric detonators are divided into two or more balanced groups being connected together in series and the groups being connected together in parallel.

SHAPED CHARGE An explosive with a shaped cavity, specifically designed to produce a high velocity cutting or piercing jet of product reaction; usually lined with metal to create a jet of molten liner material. Also see MONROE EFFECT.

SHEATHED CHARGE (MSHA APPROVED SHEATHED EXPLOSIVE UNIT) A device consisting of an approved or permissible explosive covered by a sheath encased in a sealed covering and designated to be fired outside the confines of a borehole.

SHELF LIFE The maximum storage period during which an explosive material retains adequate performance or physical characteristics.

SHOCK TUBE A small diameter plastic tube used for initiating detonators. It contains only a limited amount of reactive material so that the energy that is transmitted through the tube by means of a detonation wave is guided through and confined within the walls of the tube.

SHOCK WAVE A transient pressure pulse that propagates at supersonic velocity.

SHORT DELAY BLASTING The practice of detonating blastholes in successive intervals where the time difference between any two successive detonations is measured in milliseconds.

SHOT ANCHOR A device that anchors explosive material charges in the borehole so that the charges will not be blown out by the detonation of other charges. SHOT FIRER See BLASTER. (A shot firer usually refers to an underground coal mine blaster).

SHUNT (SHUNTING) The shorting together of the free ends of (1) electric detonator leg wires, or (2) the wire ends of an electric blasting circuit or part thereof. The term also applies to an electrical shorting device applied to the free ends of electric detonators by the manufacturer.

SIGNS-EXPLOSIVE (PLACARDS) Signs, called placards, placed on vehicles transporting explosives denoting the character of the cargo, or sign placed near storage areas as a warning to unauthorized personnel.

SILVER CHLORIDE CELL A special battery of relatively low current output used in some blasting galvanometers.

SLURRY An explosive material containing substantial portions of a liquid, oxidizers and fuel, plus a thickener.

SMALL ARMS AMMUNITION Any cartridge for shotgun, rifle, pistol, revolver, and cartridges for propellant-actuated power devices and industrial guns. Military-type ammunition containing explosive bursting charges or any incendiary, tracer, spotting, or pyrotechnic projectile is excluded from this definition.

SMALL ARMS AMMUNITION PRIMERS Small percussion-sensitive explosive charges encased in a cap or capsule and used to ignite propellant powder. SMOKE The airborne suspension of solid particles from the products of detonation or deflagration.

SMOKELESS PROPELLANT (SMOKELESS POWDER) Solid propellant, commonly called smokeless powder in the trade, used in small arms ammunition, cannons, rockets, propellant-actuated power devices, etc.

SNAKEHOLE A borehole drilled in a slightly downward direction from the horizontal into the floor elevation of a quarry face. Also, a hole driven under a boulder.

SOCKET See BOOTLEG.

SOFTWOOD Douglas fir or other wood of equal bullet resistance and free from loose knots, wind shakes or similar defects.

SPACING The distance between boreholes. In bench blasting, the distance is measured parallel to the free face and perpendicular to the burden.

SPECIFIC GRAVITY The ratio of the weight of any volume of substance to the weight of an equal volume of pure water.

SPRINGING The practice of enlarging the bottom of a blasthole by firing a relatively small charge of explosive material. Typically use din order that a larger charge of explosive material can be subsequently loaded in the same borehole.

SQUIB A firing device that burns with an external flash. Used for igniting black powder or pellet powder.

STABILITY The ability of an explosive material to retain chemical and physical properties specified by the manufacturer when exposed to specific environmental conditions over a particular period of time.

STATIC ELECTRICITY Electric charge at rest on a person or object. It is most often produced by the contact and separation of dissimilar insulating materials.

STEADY STATE VELOCITY The characteristic velocity at which a specific explosive at a given charge diameter will detonate.

STEEL General purpose (hot or cold rolled) low-carbon steel such as specification ASTM A366 or equivalent.

STEMMING Inert material placed in a borehole on top of or between separate charges of explosive material. Used for the purpose of confining explosive materials or to separate charges of explosive material in the same borehole.

STORAGE The safekeeping of explosive materials, usually in specially designed structures called magazines.

STRAY CURRENT A flow of electricity outside an insulated conductor system.

SUBDRILLING The practice of drilling boreholes below floor level or working elevation to insure breakage of rock to working elevation.

SUBSONIC Less than the speed of sound in air at the elevation in question.

SUPERSONIC Greater than the speed of sound in air at the elevation in question.

SYMPATHETIC DETONATION The detonation of an explosive material as the result of receiving an impulse from another detonation through air, earth or water. Synonymous with SYMPATHETIC PROPAGATION.

SYMPATHETIC PROPAGATION See SYMPATHETIC DETONATION.

TABLE OF RECOMMENDED SEPARATION DISTANCES OF AMMONIUM NITRATE AND BLASTING AGENTS FROM EXPLOSIVES OR BLASTING AGENTS A quantity-distance table from National Fire Protection Association Standard No. 495.

TACHOGRAPH A recording device in a truck that indicates on a time basis the running and stopping times of a vehicle.

TAMPING The action of compacting the explosive charge or the stemming in a blasthole. Sometimes refers to the stemming material itself.

TAMPING BAGS Cylindrical bags containing stemming material and used in boreholes to confine the explosive material charge.

TAMPING POLES A wooden or plastic pole used to compact explosive charges or stemming.

TEST BLASTING CAP NO. 8 See INSTITUTE OF MAKERS OF EXPLOSIVES NO. 8 TEST DETONATOR.

THEFT-RESISTANT Construction designed to deter illegal entry into facilities used for the storage of explosive materials.

THUNDERSTORM See ELECTRICAL STORM.

TOE In bench blasting, excessive burden measured at the floor level of the bench.

TRUNKLINE See DETONATING CORD TRUNKLINE. (Certain shock tube or gas-initiated nonelectric initiating systems also use the term TRUNKLINE).

UNBARRICADED The absence of a natural or artificial barricade around explosive storage areas of facilities.

UNCONFINED DETONATION VELOCITY The detonation velocity of an explosive material fired without confinement: for example, a charge fired in the open. (Paper tubes are generally not considered as confinement.)

UNDERWRITERS LABORATORY, INC. (UL) A nationally recognized incorporated testing laboratory qualified and equipped to conduct the necessary tests to determine compliance with appropriate standards and the satisfactory performance of materials or equipment in actual usage.

U.S. BUREAU OF MINES (USBM) A bureau of the Department of the Interior active in promoting safety in coal mines and in carrying out broad programs in mining and related fields.

VOLT The unit of electromotive force. It is the difference in potential required to make a current of one ampere flow through a resistance of one ohm.

VOLUME STRENGTH Synonymous with CARTRIDGE STRENGTH. See BULK STRENGTH.

WARNING SIGNAL A visual or audible signal which is used for warning personnel in the vicinity of the blast area of the impending explosion.

WASTE ACID Residual or spent acid from a nitration process.

WATER GEL An explosive material containing substantial portion of water, oxidizers and fuel, plus a cross-linking agent.

WATER RESISTANCE The ability of an explosive to withstand the desensitizing effect of water penetration.

WATER STEMMING BAGS Water filled plastic bags with a self-sealing valve approved as a permissible stemming device by the Mine Safety and Health Administration (MSHA).

WATT A unit of electrical power equal to one joule per second.

WEATHER-RESISTANT Construction designed to offer reasonable protection against weather.

WEIGHT STRENGTH The energy of an explosive material per unit of weight. Often expressed as a percentage of the energy per unit of weight of a specified explosive standard.