

AVALANCHE CONTROL

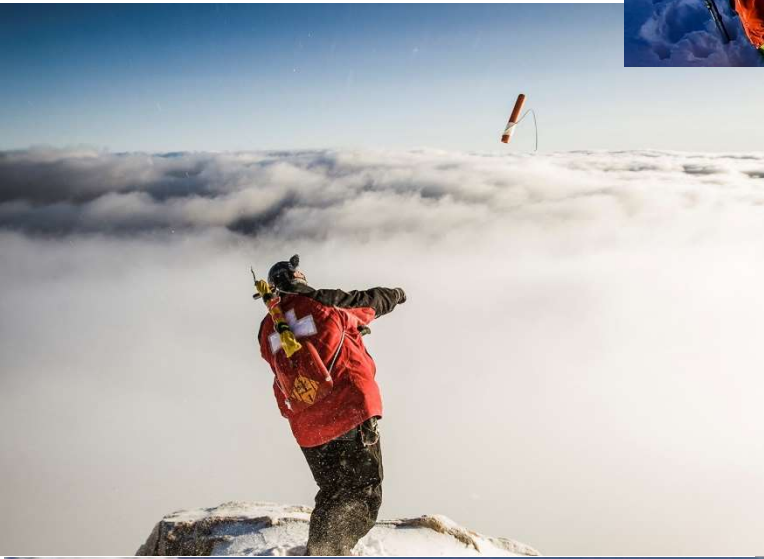


EXPLOSIVES

Recomended Safe Working Practices

CIL Explosive Avalanche Products

June 2021



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Recommendations within this document

This document contains recommendations for the use of explosives in avalanche control applications. These recommendations were derived from industry organizations and industry professionals that strive to create the safest and most practical solutions to fit most situations. These recommendations were never intended to cover every situation or unique conditions, but rather to provide guidance and insight to common avalanche mitigation protocol.

These recommendations should never be considered the final or only solution; it is up to each industry professional, organization or regulator to determine what technique or set of rules most appropriately meets their unique set of circumstances.

Introduction

The advice in this booklet is offered gratis with the main objective of keeping Avalanche professionals free from harm as a result of accidents caused by irregular or improper use of explosive materials.

The precautions are based on the collective experience of many individuals and organizations; the advice is given in good faith as representing the soundest safety advice in the use of CIL explosives products.

It is your responsibility to understand and adhere to specific Federal, State, Provincial and local requirements. Additionally, you should know that explosives procedures or policies may vary from one work site to another as a result of practical, operational, geographic, climatic, or other differences. You are advised to refer to and be familiar with your individual worksite's avalanche procedures policy or applicable operating plans. None of the guidelines suggested in this booklet are intended to supersede or countermand any Federal, State, Provincial, Territorial, Municipal or individual company regulations in the use of explosive products or procedures.

Why use explosives to mitigate avalanche danger?

Avalanche forecasters can predict when avalanches are likely to occur. Avalanche control workers then can intentionally trigger the avalanche early, when they are certain that people are not in the area, or while roads are closed, to prevent potentially fatal accidents.

Frequent explosive control usually ensures that snow is brought down in several small avalanches, rather than a large destructive one. Also, frequent avalanche releases prevent large, unpredictable natural avalanches later when the snowpack can become unstable.

Industry Contacts

Canada (AHJ):

- WorkSafe BC

[www.https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-21-blasting-operations](https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-21-blasting-operations)

- Alberta

www.alberta.ca

- Natural Resources Canada

www.nrcan.gc.ca

United States (AHJ):

- BATF

[www.atf.gov / explosives](http://www.atf.gov/explosives)

- DOT, CFR Title 49

[www.phmsa.dot.gov / hazmat / regs / sp-a / approvals / explosives](http://www.phmsa.dot.gov/hazmat/regs/sp-a/approvals/explosives)

- California OSHA, Article 121, Snow Avalanche Blasting

[www.https://www.dir.ca.gov/title8/5357.html](https://www.dir.ca.gov/title8/5357.html)

Industry Organizations

- National Ski Area Association (NSAA)

www.nsa.org

- Association of Professional Patrollers (APP)

www.propatrollers.org

- American Avalanche Association (AAA)

www.avalanche.org

- International Society of Explosive Engineers

www.isee.org

- Institute Makers of Explosives

www.ime.org

- Canadian Avalanche Association (CAA)

www.avalancheassociation.ca

Definition of Authorities Having Jurisdiction (AHJ)

Authority having jurisdiction (AHJ): Any Federal, State, Provincial or local regulatory agency governing the storage, use and documentation of avalanche control explosives.

Safety, Health & Environment

At CIL we believe that all work-related injuries, illnesses and environmental incidents are preventable. We will manage all our activities with concern for people and the environment and will conduct our business for the benefit of society without compromising the quality of life of future generations.

In particular we will:

- Strive to ensure that our facilities operate to the highest standards to protect our employees, contractors, neighbors, and the environment.
- Sell only those products that can be produced, transported, stored, used and disposed of safely.
- Provide appropriate information and/or training on the safe use and disposal of our products to our customers and consumers.
- Seek to develop new or improved products and processes to improve the contribution we make to the quality of people's lives and to minimize the impact on the environment.
- Require every employee and contractor working for us to comply with relevant legislation and with this policy, and we will provide them with the necessary training.
- Encourage employee initiatives that contribute to a safer and improved environment at work, at home and in the community.
- Set challenging targets and measure progress to ensure we continuously improve our safety, health and environmental performance.

General Blasting Safety Guidelines

The safety of a blasting operation depends on qualified, competent personnel using proper equipment and materials, observing correct blasting procedures, working in accordance with a well formulated plan. Failure of any one of these elements can lead to injury or death, not only to the blaster, but also to his co-workers and even the general public. People handling explosives must have intelligence, common sense and be trained in the use of explosives. Space limitations preclude the discussion of every potential hazard that could be encountered in a blasting operation.

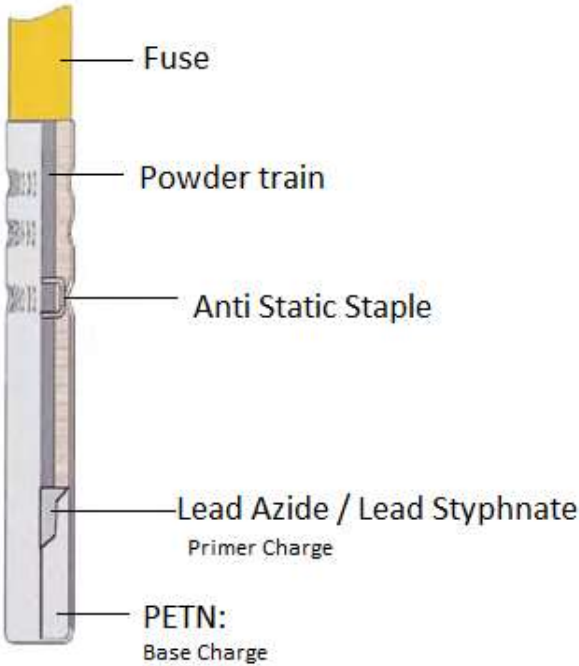
Explosives should always be handled carefully and protected from shock, friction, fire or sparks. All Authorities Having Jurisdiction (AHJ) are to be complied with while using any explosive products. The avalanche blaster's priorities should include the safety of themselves and others around them, prevention of damage to surrounding property, and completion of blasting in an efficient manner. The avalanche mitigation crew should be as small as possible, but the blasting team should consist of at least two people with one of these being a qualified avalanche blaster. The control team members are to be in a safe position and have proper equipment. All teams should be in radio contact, sharing and documenting information about results, particularly in the indicator slopes. Magazine keys should be kept in a secure place and only one employee should be responsible for the distribution of explosives. Explosives should be transported away from the public, preferably before the resort opens. The team should clear the blast area, run out zone and select a route to a safe location prior to setting charges. Consult the AHJ for minimum recommended distances and or acceptable terrain barriers to blasting charges. Complete and accurate records of inventory must be maintained on a daily basis. Each of the explosive materials you may handle has different hazardous ingredients, specifications, and safety concerns. For any questions, please refer to the Material Safety Data Sheet (MSDS), Technical data sheets (TDS) or user protocols. If you have any questions contact the manufacturer or appropriate AHJ in your individual district.

Products:

CIL Avadet: Blasting Caps

The modern blasting cap is typically a number 8 or higher blasting cap that is made up of two explosives materials
1) primer charge of 60% LeadAzide/ 40% Lead Styphnate
2) secondary charge or base charge of PETN. The primer charge is the point where the burning energy of the fuse train is transferred to detonation energy of the fuse cap. A static staple is required by some jurisdictions; see AHJ regulations in your area for rules pertaining to this.

Caution: Blasting caps should never be tampered with or abused in any way; such treatment can lead to premature detonation resulting in serious injury.



CIL MILDET: 90s, 1m,2m,3m,Custom Safety fuse Assembly

Safety fuse is the medium through which the burning reaction is conveyed at a relatively uniform rate to the ignition area of the blasting cap. It burns at its core, not at its surface, thus the exterior signs of burning follow behind the interior burning. The burn rate is 40 seconds a foot at sea level, 46 seconds a foot at elevation of

6000 feet and 48 seconds per foot at 8000 ft. Air pressure determines the burn rate. The greater the confinement or pressure is on the fuse, the faster the fuse's burn rate. The core of the safety fuse is a black powder train, tightly wrapped by coverings of tape, textiles, and waterproofing materials such as asphalt and plastics. The core can be affected by water absorbed through cracks or at the end of the fuse.

The core of the safety fuse is a black powder train, tightly wrapped by coverings of tape, textiles, and waterproofing materials such as asphalt and plastics. The core can be affected by water absorbed through cracks or at the end of the fuse.

The functions of these coverings are to:

1. Protect the powder train from water, oil or other substances which might affect its burning rate or desensitize it altogether.
2. Protects the core from abrasion or other abuse while maintaining flexibility so as to minimize the chance of exothermic damaging to the explosive charge before initiating the fuse cap.
3. Prevent intercommunication of firing between adjacent lengths of fuse.

Fuse assemblies are a pre-made fuse and cap with a specific length. The fuse cap is typically a number 8 strength or higher blasting cap, with a 60%Lead Azide, 40% Lead Styphnate priming charge and PETN base charge inside an aluminum shell. The cap is attached to a length of safety fuse that has a burn rate of approximately 40 sec / ft +/- 10% at sea level. It is typically manufactured with a fuse shunt which is intended to ground the black powder to the cap and relieve static buildup (required by law in Canada, also in all MILDETS in USA). They also have a rubber nipple on the end of the fuse to reduce the risk of static energy transfer and to keep moisture from entering the fuse train.

Note: If you cannot determine the difference between Safety Fuse and Detonating Cord by the exterior, check the inside. The Safety Fuse will be black powder and the core load of Detonating Cord will usually be White/ Yellow material if PETN, while pink is common for RDX. Additionally, textile wrapped detonating cords typically have a black thread pattern weaved throughout the textile covering.

- [MILDET SDS link](#)



- [MILDET video make up and comments by workers](#)

CIL M&S Pull Wire Lighters



Pull wire lighters are low explosive devices used to initiate safety fuse. It consists of a paper tube, white plastic safety cap, and safety clip. Inside the tube is a pull wire coated with red phosphorus, which is pulled through an ignition cup containing potassium chlorate and charcoal. A fuse grip ferule is located at the mouth of the tube and a fuses top ferule is located at the back end of the tube to stop the fuse from pushing up into the ignition cup and PULLWIRE. When the cap is pulled, the wire is pulled through the ignition cup and emits a directional spark toward the fuse, thus lighting the black powder fuse train of a fuse cap assembly.

- [M&S PULLWIRE SDS link](#)
- [Proper use video](#)

CIL Shock Star: Shock tube detonation product

Description: They are designed to be used for the initiation of cast boosters, high explosives. In-Hole Delays come equipped with a T-Connector for compatibility with detonating cord initiation or can be initiated by an electric or nonelectric detonator or approved shock tube starter device.



Benefits: 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
- To be used in conjunction with 209 primer and shock tube initiator system

- [Austin SHOCKSTAR SDS link](#)
- [Video talking about howitzer duds and cornice control](#)



CIL-Liteline, A-cord, 50g

Detonating cord

Detonating cord is a high explosive with a core of PETN wrapped in a textile and plastics sheath. The core load is usually expressed in grains of explosive per linear foot of cord. It is spooled on non-sparking reels, which are shipped in fiberboard boxes. It is color-coded to assist in the easy identification of the product grade. Since detonating cord contains a core of high explosives, it must be handled and stored in compliance with all applicable AHJ regulations. DETCORD should be cut using a sharp knife, not a shearing tool, as the crushing pressure from a shearing tool might detonate the cord. Detonating cord requires intimate contact with a detonator of at least number 8 strength or higher. All detonating cords lose sensitivity when wet. Wet detonating cord will still detonate but, may be difficult to initiate. Cut off wet ends. Dispose of scraps by gathering in a bunch and tying into the shot where they will not have an adverse effect.

Caution: when using detonating cord as an initiator, refer to the recipient product's technical data sheet for compatibility.

Key benefits

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



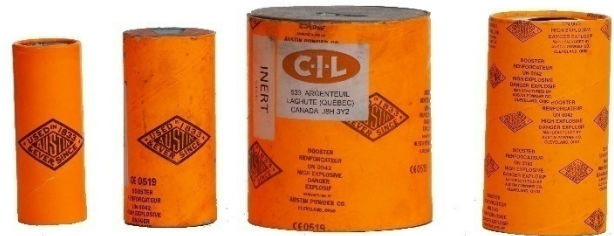
- [Austin DETCORD SDS link](#)



CIL Cast Boosters- Grey cap

5lb 3h, White cap 2lb 2h or 3h, Orange cap 1lb 3h, Brown cap 0.5lb 2h, Avalanche Guard 4kg 2h

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



Key benefits

- CIL cast boosters detonate in excess of 24,000 ft/sec (7380m/sec)
- Over 200kb of detonation pressure ensures optimum state velocity for blasting agents
- Excellent shelf life highly resistant to snow and water

- [Austin Cast boosters SDS link](#)
- [Cast booster priming video](#)

CIL 1kg (2.2lbs)EmulexSnowpro- 2.5” by 12”

Detonator sensitive emulsion Hand Charge cartridge

Description

Packaged emulsion explosive is a robust, detonator sensitive explosive.

Application

Emulex Snowpro is a paper wrapped packaged explosive that could be used in an assortment of robust applications, but is ideally suited as an avalanche control hand charge. The high detonation velocity and the robust nature of the heavy spiral wrapped tube making it a great hand charge choice.



Key benefits

- Emulex Snowpro is a high-energy High VOD emulsion Formula. 17,000 ft/sec (5200m/sec)
- The rigid paper cartridge reduces tobogganing and decreases the potential of breaking.
- Reduced post-blast fumes. **Minimal snow marking residue.**
- Highly water resistant, which minimizes leaching and reduces environmental impact.
- Any OH&S issues around the handling and storage of nitroglycerin are eliminated
- Pre-fabricated capwell for easy disassembly if desired

- [Austin Emulex 917 SDS link](#)
- [Emulex suggested priming video](#)
-

CIL Austinite 12.5kg (25lb), 25kg (50lb) ANFO Blasting Agent

Description

Austinite is a packaged blend of Ammonium Nitrate and Fuel Oil.

Application

Austinite™ packaged blasting agent can be used in combination with a primer assembly to make ANFO charges.

Key benefits

- Austinite packaged blasting agent has reduced post blast fumes.
- Austinite is factory blended to provide consistent results.
- Austinite is free flowing; and can be poured into secondary containers for use as a ANFO hand charge.

Packaging

Austinite is packaged in plastic bags with a valve port.

- [Austin Austinite SDS link](#)
- [Austinite suggested priming video](#)
- [Surefootanti-skid sac video](#)



CIL 1kg(2.2lbs) Classic Snowlauncher

Classic Tail fin

- Four-blade polycarbonate design.
- See-through material for initiation inspection.
- Industry proven reliability.



Classic 1kg Forebody

- Filled forebody net explosive weight 2.20 lbs.
- VOD 24,000 ft/sec (7380m/sec)
- 100% of round is cap sensitive (50% TNT & 50% PETN +/- formulation).
- Unlimited shelf life under proper storage conditions.
- RECCO Chip technology.

• [Austin Cast booster SDS link](#)

- Classic



[suggestedinspect/assemblyvideo](#)

CIL 2kg(4.4lbs) Slugger Snowlauncher

Slugger Tail fin

- Four-blade polycarbonate design with threadlock system
- See-through material for initiation inspection.
- Industry proven reliability.

Slugger 2kg Forebody

- Filled forebody net explosive weight 2.20 lbs.
- VOD 24,000 ft/sec (7380m/sec)
- Threadlock interface
- 100% of round is cap sensitive (50% TNT & 50% PETN +/- formulation).
- Unlimited shelf life under proper storage conditions.
- RECCO Chip technology.

• [Austin Cast booster SDS link](#)

- [Slugger suggested inspect/assembly video](#)

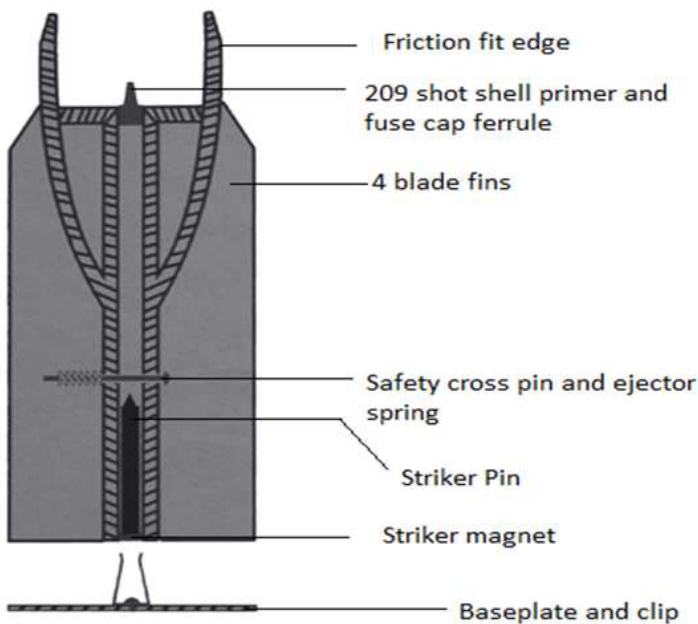
Procedures and Protocols

CIL Classic/ Slugger Tailfin and Forebody protocol

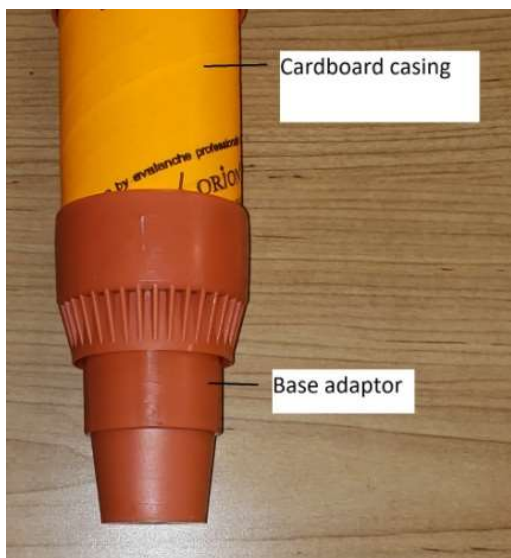
Tailfin assembly

The Classic/ Slugger tailfin assembly serves the following functions:

1. Contains the firing mechanism.
2. Houses the safety devices that prevent unplanned detonations.
3. Incorporates a pressure plate which is used to push the projectile as well as arm it at a point of safety.
4. Uses the fins to guide the projectile's flight.



The pre-assembled tail fins come in case quantities of 16 tail fin assemblies each. The assemblies contain a 209 shot shell primer and should be stored accordingly



Classic 1kg forebody

The payload is a 1kg (2.2 lb) poured cast booster with an integral cap well in the aft end.

The payload is poured into an assembled casing at the plant with explosives material

The cap well, cast into the payload, is surrounded by the explosive material and is detonator sensitive to a Avadet fuse cap.

Date coding the forebody is suggested to aid in DUD recovery and Dud log

Depth of Cap well is 2" for the use of a 1.75" Avadet and 1 foam Pillow



Slugger 2kg forebody

The payload is a 2kg (4.4 lb) poured cast booster with an integral cap well in the aft end.

The payload is poured into an assembled casing at the plant with explosives material.

The cap well, cast into the payload, is surrounded by the explosive material and is detonator sensitive to a Avadet fuse cap.

Date coding the forebody is suggested to aid in DUD recovery and Dud log.



Depth of Cap well is 2" for the use of a 1.75" Avadet and 1 foam Pillow



Tail fin inspection

Inspect the tail fin assembly to ensure that:

1. Pressure plate is clipped to the tail between two of the fins.
2. "Loop" end of the arming wire is pulled as near as possible to the pressure plate. This gives the arming wire clip a "running start" before it starts to pull on the arming wire.
3. Arming wires and transport safety pin are correctly in place, threaded through the flight safety cross pin (bore rider pin).
4. Flight safety cross pin is straight and active (push the pin into the spring and release).
5. Striker is resting on the magnet (no air space between, striker and the magnet).
6. Striker is approximately 1 / 8" clear of the flight safety cross pin.
7. Striker rattles in its position (freed up).
8. Visual space between the flight safety cross pin and the shot shell primer.
9. Ferrule is clear of obstructions.
10. Shot shell primer is in the ferrule (If you can see light through the top of ferrule the shot shell primer is missing). If any of these tests fail you have a potential dud round. If you have any concerns with a fin assembly, do not use it and return to supplier.

Date coding the tailfin is suggested to aid in DUD recovery and Dud log

Forebody (payload) inspection

- Check the Forebody to be sure that all components are firmly attached.
- Inspect inside of receiver lip of the Base Adapter assuring that it is clear of explosives residue.
- Check the cap well cavity visually or with a wooden dowel or pencil to ensure that the well is clear and deep enough to accommodate the detonator. The dowel or pencil should match or be slightly larger in diameter than the caps you are using. This method can be used to verify the cap well diameter.

Caution: If the cap well is not clear of obstruction or deformed, return the forebody to your supplier.

Blasting cap placement Classic

Seat the open end of the Avadet fuse cap on top of the ferrule.

Assembly of the forebody to the tailfin assembly

With the Avadet fuse cap in place, push on the forebody base adapter into the tail fin. The detonator will slide into the cap well until the base adapter seats inside tail fin.

It is important that the forebody base adapter is seated ALL THE WAY DOWN onto the ferrule platform.

Caution: Avoid "forcing" the forebody assembly over the cap; it should be snug but slide on freely.

Caution: The maximum firing pressure for the Classic round is 300 PSI.

The minimum firing pressure for Classic rounds is 80 PSI to reliably disengage the pressure disk.



Recco reflectors:

RECCO reflectors are installed internally in all Classic and Slugger forebodies as the boosters are poured.



Assembly of the Forebody to the tailfin assembly

With the cap in place, thread on the forebody base adapter into the tail fin.

The detonator will slide into the cap well until the base adapter o-ring seats on edge of the tail fin. It is important that the forebody base adapter is seated ALL THE WAY DOWN onto the ferrule platform.

Caution: Avoid “forcing” the forebody assembly over the cap

Caution: The maximum firing pressure for the Slugger round is 300 PSI.

The minimum firing pressure for Slugger rounds is 80 PSI to reliably disengage the pressure disk.

Recommended CIL Classic/ Slugger misfire procedures

Avalauncher round misfire definition:

The complete or partial failure of an Avalauncher round to detonate as planned.

When a deployed Avalauncher round misfire is suspected, it is recommended to first notify the proper company policy chain of command of the misfire location and any other pertinent information. Then temporarily close the suspected misfire area, while the patrol team jointly develops a safe action plan to secure the potential blast area, and any other subsequent avalanche danger if the misfire was to detonate. After waiting the appropriate time depending on your state or provincial laws (typically 60 minutes), proceed with your company's specific misfire action plan. Every effort should be made to locate the misfired Avalauncher round. All CIL Classic/ Slugger products come with a pre-installed RECCO chip. This technology should greatly enhance the ability to safely locate the misfired Avalauncher round. Once found, the misfire should be destroyed in place. From a safe distance, using an appropriate size and speed hand charge.

Caution: Some government and / or company policies prohibit ever touching or moving a misfire. In these cases they are typically instructed that only personnel with misfire experience identify and remove the hazard by placing an explosive of equal or greater energy beside the misfire to destroy it thus removing the hazard.

If the round was not found, it should be logged into the misfire / dud log book and recovered at a later date.

Unused charges

It is CIL's recommendation that once the Classic/ Slugger is assembled manufactures recommendations are that you **cannot disassemble**.

Suggested Avalauncher shooting sequence

1. Gun team will ensure clearance of blast area from snow cats, maintenance and all personnel
2. Team will fire 2 blank test shots with 50 lbs of pressure to ensure proper working of the gun components. The gun is left in the seated position.
3. Gunner confirms the target name, angle of elevation, bearing and pressure setting are correct in accordance with the target inventory sheet.
4. Barrel person locks the turntable
5. Gunner turns radio off and barrel person turns radio to low to avoid distractions
6. Gunner checks payload for integrity of charge, shape and depth of cap-well with provided pencil. Then test slide the payload for fit thru the test tube sleeve.
7. Gunner checks the tail fin assembly for structural integrity as well as the bore-rider pin friction, magnet and striker function, base plate assembly with arming wire in the slack position, both arming wire and safety pin in their respective holes and that the shot gun shell primer and cap ferrule look intact.
8. Gunner inspects the high strength cap for flaws and for the yellow PETN at the bottom of the cap hole.
9. Gunner inserts the cap onto the ferrule of the tail fin and says, "Cap inserted". Barrel person repeats, "Cap inserted".
10. Gunner screws the payload onto the tailfin but does not over tighten and says, "Shottogether".
11. Barrel person opens barrel and looks up barrel to make sure it is clear.
12. Gunner loads shot into tray, pulls out safety pin and says, "Pin out" and throws pin off of gun deck.
13. Gunner loads shot down into tray and says, "shot seated"
14. Barrel person slides barrel into position over shot "barrel seated" then locks barrel "barrel locked"
15. Gunner and barrel person get behind shield.
16. Gunner states "going up to (working pressure)", once there "holding at (working pressure)"
17. Gunner opens safety valve "safety off, clear to fire"
18. Barrel person confirms clearance and attentiveness to flight characteristics by stating "clear to fire"
19. Gunner opens fire valve while stating "fire"
20. Barrel person watches for shot to leave barrel and for base plate to come off
21. Gunner closes fire valve then safety valve and re-seats gun to 50 lbs and states "safety on, gun seated"
22. Barrel person repeats "gun seated"
23. Team confirms detonation and records results in book.

Procedures and Protocols

Avalanche Guard RACS System



CIL/Orion (CIL) Recommendations Safe Procedures for Loading and Unloading the Avalanche Guard Remotely fired Avalanche Control System (RACS).

All Federal, Provincial, Regional and Municipal laws must be followed at all times.

CIL recommends that users follow all of the procedures listed in this document in order to safely load and unload explosives in the Avalanche Guard remotely fired avalanche control device. CIL further recommends that these procedures require the participation of a minimum of two trained persons at all times during loading and unloading.

Avalanche Guard Loading Procedures

Preparing the Avalanche Guard for Loading

On arrival at the launching device, proceed as follows:

- Place the lower service platform, handrails and ladder into position.
- The blaster in charge unlocks the control cabinet.
- Turn the switch in the control cabinet to the SERVICE position using the *secure control box key*. The complete firing control system is NOW LOCKED OUT while the switch is in the SERVICE mode.

Remove the key from the SERVICE switch.

- Place the upper service platform, hand rail and ladder into working position.
- Unlock and open the terminal access panel.
- Remove the launching squib leg wires from the contact panel; shunt each pair of leg wires, by twisting the bared ends together, as they are removed.
- Use the *secure control box key* to turn the key switch on the bottom of the launching box to the DOOROPEN position. The door of the launching box will swing open. Remove the key from the switch. The Blaster of Record must now retain this key in his possession to ensure LOCK-OUT for the duration of the procedure.
- Check the launching device housing including the door for icing and soiling. Clean as required.
- Remove all used launching cups and leg wires. Check to insure the wing nut on the bottom outside of the barrel is backed out so as not to disrupt loading of the charge.
- Check the barrels for icing and soiling. Clean as required.
- Inspect the lanyards and twin connector hooks, replace if worn or damaged. Tuck the lanyards into operational position.
- Ensure the barrel retention wing nut is tight on all barrels.

Procedure for Loading - Charging the Barrels

- Remove a propellant cup from the packaging and test for continuity using an approved galvanometer. Shunt the leg wires by twisting the bared ends together.
- Remove the adhesive cover from the propellant cup. Attach the propellant cup to the bottom of the explosive charge with the leg wires in the 9:00 o'clock position and the fuse tie down strap in the 12:00o'clock position.
- Run the leg wires up the side of the charge in the 9:00 o'clock position.
- Insert the charge into the barrel propellant end first. Leg wires remain in the 9:00 o'clock position and the fuse tie down strap in the 12:00 o'clock position. Lower the propellant cup and charge into the barrel until the top end is flush with or below the upper rim of the barrel.
- Hand tighten the wing nut at the bottom of the barrel to secure the propellant cup.
- Pass the leg wires down the conduit and through the numbered hole in the top of the connection panel that corresponds to the number of the barrel being loaded.
- Repeat this procedure for each barrel that is being loaded.

Procedure for Loading - Fusing the Explosive

- Remove a one meter fuse assembly from the packaging and insert the detonator into the cap well of the first charge. Ensure the detonator is at the bottom of the 10 cm deep cap well. Secure the fuse by hand tightening the screw-down fuse holder at the top of the cap well. Repeat this step with a second one meter fuse in the second cap well of the same charge.
- Cut both fuses to the correct length using an approved fuse cutter. **11.5” -292mm**

- Crimp a pull-wire lighter onto each fuse using an approved crimping tool. DO NOT remove the protective cap from the pull-wire lighter.
- Pass both fuses through the fuse tie down strap attached to the explosive charge and loosely tighten the tie down strap. Do not tighten the fuse tie down strap all the way at this time.
- Repeat these steps for each barrel that is being loaded.

Procedure for Loading - Attach Lanyards

- Remove the protective caps from both pull-wire lighters of one charge.
 - Attach the twin hooks on the end of the lanyard to the eye-hooks on the pull-wire lighters.
 - Tighten the fuse tie down strap onto the pull-wire lighters until the fuses are held securely.
 - Replace the lanyard cover.
 - Cover the end of the barrel with a plastic bag and use a rubber band to secure.
 - Repeat this procedure for each barrel being loaded.
 - The assistant inspects each charge to ensure all lanyards are connected and all barrels are covered.
 - The blaster of record turns the secure control box key to the DOOR CLOSED position and removes the key after the door is fully closed.
 - Connect the leg wires to the terminals starting with the leg wire for barrel number one. Repeat this for each barrel that is loaded, connecting the wires to the terminal of the same number as the barrel number.
 - Close and lock the terminal access panel.
 - Fold away the upper service platform, ladder and handrails.
 - Insert the secure control box key into the key switch in the control cabinet and switch from the SERVICE (locked out) position to the AUTOMATIC position. The firing system is NO LONGER LOCKED OUT.
- The key cannot be removed in this position.
- Lock the control cabinet and remove the key.
 - Fold away the lower service platform, ladder and handrails.
 - Use the fire control computer to confirm system readiness.

Avalanche Guard Unloading Procedures

Preparing the Avalanche Guard for Unloading

On arrival at the launching device, proceed as follows:

- Place the lower service platform, handrails and ladder into position.
- The blaster in charge unlocks the control cabinet.
- Turn the switch in the control cabinet to the SERVICE position using the *secure control box key*. The complete firing control system is NOW LOCKED OUT while the switch is in the SERVICE mode.

Remove the key from the SERVICE switch.

- Place the upper service platform, hand rail and ladder into working position.
- Unlock and open the terminal access panel.
- Remove the launching squib leg wires from the contact panel; shunt each pair of leg wires as they are removed.
- Use the *secure control box key* to turn the key switch on the bottom of the launching box to the DOOR OPEN position. The door of the launching box will swing open. Remove the key from

the switch. The Blaster of Record must now retain this key in his possession to ensure LOCK-OUT for the duration of the procedure.

Procedure for Unloading - Detonator Removal

- Using an approved fuse cutting device, cut a section approximately 15cm in length out of each fuse between the fuse tie down strap and the detonator.
- Loosen the screw-down fuse holder at the top of the cap well and gently pull the fuse and detonator out of the charge and place this in the detonator container. Repeat this for all fuses in each charge that is being unloaded.
- Cut the fuse tie down strap. Detach the twin lanyard hooks from the eye-hooks on the pull-wire lighters and put them in the used pull-wires container.
- Repeat this procedure for each barrel being unloaded.
- Remove the detonator container and the pull-wire lighter container to a safe location off of the service platforms.

Procedure for Unloading - Remove Explosive and Propellant

- Loosen the propellant cup clamping screws; extract the explosive charge, propellant cup and leg wires.
- Pull the explosive off of the propellant cup.
- Place the explosive in the explosive container.
- Place the propellant cup in the propellant cup container.
- Repeat this procedure for each barrel being unloaded.
- Remove the explosives container and the propellant cup container to a safe location off of the service platforms.

Securing Avalanche Guard after Unloading

- Close and lock the terminal access panel.
- The blaster in charge turns the secure control box key to the DOOR CLOSED position and removes the key after the door is fully closed.
- Fold away the upper service platform, ladder and handrails.
- Insert the secure control box key into the key switch in the control cabinet and switch from the SERVICE (locked out) position to the AUTOMATIC or the OFF position. The firing system is NO LONGER LOCKED OUT. The key cannot be removed in this position.
- Lock the control cabinet and remove the key.
- Fold away the lower service platform, ladder and handrails.

- [Loading Video](#)

Procedures and Protocols

General control team (recommendations)

The avalanche control blasting team typically consists of a minimum of two persons: the blaster and the blaster's assistant.

The blaster is the team leader as well as the blaster-in-charge and is responsible for the following:

1. Familiarity with manufacturers' recommendations, current standards and practices.
2. Team safety.
3. Communications with AVALAUNCHER control team, other hand control teams groomers, and supervisors.
4. Documenting results.
5. Reporting of any theft or loss of explosives.

In addition, they must be a holder of a current AHJ blasting certificate.

Team members should be in good physical and mental condition. They should be qualified and capable of ensuring snowpack stability and conducting avalanche hazard analysis.

It is recommended that the blaster's assistant should be adequately trained and considered competent in all blasting procedures.

Training Documentation: The qualifications and the training of all personnel should be documented. Also, due to the seasonal nature of avalanche work, annual refresher training in avalanche explosive techniques is recommended or required in some AHJ.

Initiation system type recommendations

It is CIL's recommendation, based on the potential for unplanned static charge releases and the frequent use of radios, that the only initiation system types acceptable for avalanche control work are safety fuse cap systems, shock tube type systems. It is our recommendation that all electric blasting cap systems are not permitted in these types of applications.

Pull wire lighters

The pull-wire-lighter is cardboard constructed friction-based phosphorus lighting device, meant to light the end of a fuse cap assembly. This product consists of a holding mechanism inside the lighter, which secures the fuse in place until the user pulls the string cord which initiates the friction-based lighting device. It is required to not attach the pull-wire-igniter until the blaster is ready to place/deploy the charge. Keep all pull-wire-igniters dry to increase the product's reliability.

Caution: Do not place pull-wire-lighters onto the fuse assembly until the last practical moment before placing the charge.

It is recommended that pull wire lighters are to be transported separately from explosives and safety fuse assemblies (see AHJ regulations).

Hand charges



Hand charges typically consist of a high explosive and detonator combination of sufficient size as to perform its intended work. Charge size should be adjusted for the situation at hand and more than one explosive may be needed to trigger instability. The blaster is responsible for determining the number of charges required for each avalanche hazard reduction mission. The blaster is also responsible for determining the most appropriate safe primer assembly location closest to the blasting site and ensuring that explosives and detonators are only brought together at the last most practicable moment as determined by weather, snowpack, visibility and terrain conditions. It is an ongoing acceptable industry standard to transport during the course of a mission, hand charges with inserted fuse cap primer assemblies (without pull wire lighters). This has been accepted based on the fact that it cuts down on mission exposure time and it protects the detonator from impact or damage during falls or other types of potential impacts. Check with AHJ in your area for specific rules referencing these practices.

Caution: Unused hand charges should be disposed of according to AHJ.

The blaster should be familiar with the route, application of explosive material issued in avalanche control, and trained in the proper use of these explosives.

The use of double primed or dual initiated hand charge explosive systems should be considered as an extra safety precaution, especially during times when personnel are placed in extremely hazardous positions.

ANFO charges

ANFO is defined as a blasting agent containing no essential ingredients other than prilled industrial grade ammonium nitrate (94% by weight) and fuel oil (6% by weight).

All blasting agents such as ANFO require a high strength detonator in combination with a detonator sensitive booster charge of at least 100 k-bars of detonation pressure, to reliably detonate these products. ANFO blasting techniques can be utilized in its original packaging or can be repackaged to better fit the task at hand.

- Most commonly used in helicopter control

Caution: Some jurisdictions may require relabeling before transporting any repackaged explosive materials. Check with AHJ in your area to determine what is required before transporting any repackage products.



Unused charges

It is CIL's recommendation that unless otherwise prohibited by AHJ, unused charges in good condition can be disassembled and returned back into their approved storage facilities. All returned product must be re-logged back into their respective inventory log books. In addition, all returned product should be noted on the blasting logs sheets. Any products with excess residue (i.e. detonators with emulsion residue), defective products or unusable products should be destroyed in conjunction with a normal hand charge deployment. If this occurs, take additional safety precautions, because that charge might be larger than normal.

Misfires and no-light recommendations

Common causes of misfires are:

- Explosive is moist or contaminated
- Explosive is cold or frozen
- Detonator is moist or contaminated
- Detonator is crushed or damaged
- Detonator has become detached from charge
- Incorrect use of initiation system
- Explosives have become desensitized
- Damage to initiation system.

These recommendations were derived from industry organizations and industry professionals that strive to create the safest and most practical solutions to fit most situations. These recommendations were never intended to cover every situation or unique conditions, but rather to provide guidance and insight to common avalanche mitigation protocol. In the event of a misfire or when dealing with a discovered misfired charge/primer, only an experienced, qualified blaster should handle the counter charging and destruction. The immediate area should be treated as highly hazardous and restricted to the absolute minimum personnel that are required to accomplish the task.

In the case of a hand charge misfire where the fuse assembly was ignited but doesn't detonate:

1. The blaster should ensure that the danger area remains closed and that no one approaches the misfire until **at least 60 minutes** have elapsed since the time at which the detonation should have occurred (check AHJ for misfire entry regulation).
2. Proper belaying techniques must be used when accessing misfires to be detonated or retrieved in dangerous areas.
3. Non-sparking shovels must be used when digging for misfires within the snow pack.
4. Some AHJ allow the retrieval of misfires, so they can attempt to determine the cause of the failed charge. If not, to destroy a misfired charge/primer, place a second primed charge beside it of equal or greater energy, without disturbing the misfired charge, and then detonate that charge. This should destroy the suspected misfire.
5. If the charge cannot be found, was moved by an avalanche from a subsequent shot, or a search is too hazardous due to unstable snow conditions the location should be noted and the charge should be looked for as the snow melts.
6. All suspected misfires are to be recorded in the route sheet or blast report as soon as possible.

Military EXO Dud disposal (Howitzer/Recoilless)

With the disposal of EXO Unexploded round Military Ordnance, this is a specialty application. For further information please call CIL for information and training requests.

What to do in a NO-LIGHT situation?

There are two primary reasons for no-lights; the first is using a fuse that is wet or damaged. The second reason is either completely or partially pulling the fuse out of the pull wire lighter fuse housing while attempting to light the fuse.

If a no-light occurs there are multiple acceptable protocols referencing no-light hand charge procedures, as always check with the appropriate AHJ to determine your specific legal requirements when dealing with no-lights.

Here are two common no-light protocols that are acceptable in many regions.

Suggestion

If the fuse fails to light; verbally call out "no-light" and either place the charge on the ground where easily dealt with later or deploy it into a safe direction, and ski away to a safe location. Wait the appropriate amount of time (check AHJ), **60 minutes**. Come back to that location and dispose of in place with secondary shot of equal or greater energy

Avalauncher



The Avalauncher has been an integral tool for avalanche mitigation work for over 60 years. Avalauncher rounds have been perfected to accurately and safely place high explosives up to two thousand meters away. Throughout the decades, many modifications have been made to both the launcher and its projectiles. Current technology has allowed the Avalauncher to attain greater accuracy and operational range.

Generic launcher maintenance guidelines

1. Keep steel parts lightly oiled and free from rust.
2. Keep foreign objects (snow, rain, dust) out of the pressure vessel.
3. Keep fittings snug.
4. Correct gas leaks at once.
5. Check the pressure gauge for accuracy.
6. Oil "O" rings often.

Generic Avalauncher operational procedures:

a) Clean the mount

1. Clear the mount and launcher of snow and ice.
2. Take the cover off the launcher and clear any ice buildup on the equipment.
3. Make sure the elevation and traverse work freely and raise the elevation to a level position.
4. Close the safety and firing valves as well as the pressure control valve.

b) Hook up the nitrogen

1. Make sure the regulator valve is fully backed off and open the tank valve.
2. Check for appropriate tank pressure needed for the firing mission.
3. Open the regulator valve until there is over 200 lbs on the flow gauge (depending on firing pressures).

c) Prepare the launcher and test fire

1. Fill the pressure vessel to 50 psi and test that the seal (valve seat) is working.
2. Remove the barrel from the protective sleeve, inspect it for dents, out-of-roundness, ice and other foreign material, and slide it into place testing it to be firmly seated and secured with the clamp.
3. Check the vessel for gas leaks. If found do not fire the Avalauncher until the leak is fixed.
4. Test fire the unloaded Avalauncher and immediately re-prime the vessel to 50 psi this ensures that the valve (flapper) is seated.

Caution: Dents and / or out-of-roundness can restrict the path of the projectile in the barrel and could lead to a potential in-bore unplanned detonation.

d) Loading procedures

1. All team members should check each setting for each shot, to assure consistent and reliable results.
2. Confirm that the safety is in the "safe" position and the vessel is primed to 50 psi.
3. Adjust the elevation to a level position and set traverse to proper shot.
4. Inspect the shot area and run out zone for persons, snow cats, etc.
5. Tray Loader: One person slides the barrel out of the loading tray and holds it in position for loading.

Breech Loader: Open the breech and visually inspect barrel for foreign material.

6. The loader visually inspects that the projectile is properly assembled.
7. The loader then places the projectile in the barrel, pulls the transport safety cotter pin, and slides the projectile into the barrel until the pressure plate is flush with the end of the barrel. Keep all cotter pins to reference the number of shots fired (and confirm that they were all pulled).

Tray Loader: only pull the safety pin after the projectile is in the tray.

The barrel cross pin needs to be then inserted into the rear of the barrel behind the shell to prevent it from sliding backwards.

Breech Loader: place the front half of the projectile into the breech as far as practical, while holding the back of the assembly, before the safety pin is pulled.

Caution: Never force a projectile into the breech, barrel or tray, if the projectile or any of its components do not have adequate free play discard the projectile and notify the manufacturer of this irregularity.

e) Closing the breech or tray

Tray Loader: Slide the barrel into the closed position and clamp the barrel into the locked position. Breech Loader: Close and lock the breech.

f) Firing pressures

Caution: It is mandatory that you never exceed the manufacturer's maximum and minimum firing pressures.

g) Hearing Protection

Caution: Make sure everyone has proper hearing protection

h) Recommended firing procedures

(Follow all applicable AHJ regulations in regards to required use of barriers)

1. Raise the launcher to the proper elevation and turn the barrel to the proper bearing for that particular shot.
2. Fill the pressure vessel to the desired pressure.
3. Double-check all the coordinates with the shot card.
4. Recheck shot area and run out zone for people etc.
5. The gunner calls "all clear" and waits for an "all clear" response from the loader.
6. Get behind approved barrier when firing if required by AHJ.
(Recommended procedure even if not required)
7. The gunner calls "Clear to fire" and waits for "Clear to fire" response from the loader.
8. Release the safety valve.
9. The gunner calls "fire" and waits for a "fire" response from the loader.
10. Release fire valve.

i) Observers should mark the projectile in flight and watch for any discrepancies in order to pin point the landing spot in case of a dud

1. Close the safety valves.
2. Prime the pressure vessel to 50 psi (seat the valve).

j) Securing the Avalauncher after firing

1. Prime the pressure vessel to 50 psi to seal (seat the valve) the vessel and prevent moisture from entering. If available follow Manufactures recommendations
2. Close the valve on the tank and open the other valves to bleed pressure out of the hoses. Back off the regulator valve and leave other valves open to prevent freezing.
3. Remove the barrel and clean it of ice and moisture before returning it to its sleeve.
4. Re-cover the launcher and lock the tool and nitrogen box.

k) Pick up any tail fin pressure plates that are visible

Recommended Avalauncher team

1. Avalauncher blasting teams should consist of an Avalauncher gunner (gunner is blaster-in-charge) and at least one assistant (loader).

The blaster is the team leader as well as the blaster-in-charge and is responsible for the following:

1. Familiarity with manufacturers' recommendations, current standards and practices.
2. Team safety.
3. Communications with hand control teams, groomers, and supervisors.
4. Documenting results.
5. Reporting of any theft or loss of explosives.
6. In addition gunner must be a holder of a current AHJ blasting certificate and Avalauncher endorsement, if required.

It is recommended that the blaster's assistant (loader), should at minimum have been an active observer on at least three firing missions, and considered competent with all Avalauncher procedures.

Team should have in possession a shot card with name or number of each target, including elevation, azimuth and pressure required to hit the intended targets. Training Documentation: The qualifications and the training of all personnel should be documented. Also, due to the seasonal nature of avalanche work, annual refresher training in avalanche explosive techniques is recommended. It is highly recommended that no unnecessary personnel should be in close proximity to the Avalauncher when it is being operated.

Communications: Team members need to be in radio, voice or line of sight contact at all times. Furthermore, there should be an effective means of two-way communication between blasting crew and any personnel guarding the avalanche danger areas.

General

Inventory control & documentation

Explosives must be stored, logged in & out and separated in accordance to all applicable AHJ regulations.

Storage practices

It is up to the users to know and understand the different types of blasting product storage and transportation classifications. There are strict rules on the types of product that can be stored together and the compatibility of those products during public and on-site transportation.

In general all initiation devices must be stored in a detonator specific magazine and all high explosives and blasting agents are to be stored in a separated High-Ex magazine (all products designated as a 1.1 classification must be stored in a type I or II magazine).

Magazine records

It is a requirement of legal authorities to document, maintain and keep all records pertaining to the explosive consumption cycle for a specific period of time (see AHJ specific regulations pertaining to individual operations).

These records should consist of the following:

- Purchase invoices
- Shipping records
- Blasting or route records
- Magazine records.

Transportation

All transportation of explosives on public highways must be hauled in vehicles approved by AHJ and any drivers transporting those products must be licensed in accordance with AHJ regulations.

It is recommended that all distribution of all explosive type initiation systems and high explosives products be transported in approved containers or hazard reduction packs and the distribution of those products into those approved transportation containers be done outside the storage magazine.

If at all possible it is recommended that avalanche blasting operations should be done early in the morning when the area is more likely to be clear of the public.

Use routes that are away from the public and when possible, avoid congested areas. Make maximum use of area closures to minimize the public on those travel routes. In Canada an ERAP Emergency Response Assistance Plan is needed before approval to transport.

Disposal of explosive products

Any person who owns or possesses explosive materials has a legal responsibility to properly dispose of all un-used explosive materials. Surplus explosive materials in good condition, depending AHJ regulations, may be returned to a legal storage facility or their supplier. Damaged or deteriorated explosives must be destroyed safely. Consult your AHJ or the manufacturer for proper disposal procedures.

Prevention of blasting accidents

Storage of explosive materials

1. Keep all unnecessary sources of heat or fire away from magazines.
2. NO SMOKING in or near magazines.
3. Do not store or leave any combustible materials within 10 m (30 ft) of magazines. Keep grass close to magazines cut very short.
4. Store explosives only in authorized explosives magazines.
5. Keep explosive magazines free from grit or dirt. Sweep magazines clean with a whisk broom daily if magazines are used daily.

6. Store only authorized explosives in explosives magazines. (No metal tools or equipment, no oil, paint, gasoline, etc.).
7. Never store explosives near a heat source, such as radiators, stoves, steam pipes, etc.
8. Detonating cords are explosives and should be stored in explosives magazines.
9. Store detonators only in authorized detonator magazines.
10. Never store detonators in the same magazine as high explosives.
11. Keep detonator magazines clean and tidy on a daily basis if magazines are used daily.
12. Do not store anything other than detonators in detonator magazines.
13. On receiving new stock, relocate current stock to the front of the magazine so that oldest stock is always used first (FIFO = First-In-First-Out).
14. Do not overload magazines.
15. Stack cases so they cannot fall.
16. In loading, unloading or shifting cases, handle explosive materials as though they were breakable goods. Do not throw, drop, jolt, slide or kick cases.
17. Magazines must be locked at all times and access to keys controlled.

Preparation of charge

1. Remove only the number of explosive cartridges required to perform the task at hand.
2. Do not make up more charges than required to be loaded and fired in one shot.
3. Handle charges carefully. Do not drop or throw cartridges on the ground.
4. Use only an approved non sparking priming punch to make a cavity for the detonator. Do not use screwdrivers or any other steel implements for punching.
5. Never place charges near exhausts.
6. Do not use undue force in punching. Do not hammer punches. Do not swing axes or other steel implements at cartridges. Do not swing cartridges at sharp objects. Do not spear cartridges with stinger-points.
7. NOTE: If powder appears too hard to punch by applying a reasonable amount of steady pressure on the punch, report to your manager who will contact the distributor or manufacturer.
8. If required to cut powder, do this only with an approved brass knife or stainless steel knife. Cut only on a soft surface, such as the ground or on wood, (not on a metal surface).
9. Clean up any fragments of powder, and properly dispose of them.
10. Never cut cartridges in magazines or day-boxes.

Handling of detonators

1. Keep detonators away from open flame, sparks, or heat sources.
2. NO SMOKING.
3. Avoid impact on detonators. Do not attempt to pry detonators open to investigate the contents.
4. Do not attempt to pull out tube or safety fuse from a detonator.
5. Be aware that synthetics, such as nylon, can generate static energy.
6. Ground yourself whenever possible to bleed away static charges prior to handling detonators.

7. Minimize handling of detonators. Leave in containers until required. Do not carry detonators in your pockets.
8. Do not handle detonators during electric storms.
9. Avoid unnecessary contact with any conductor of electricity, (fences, etc.).

Priming of charge

1. Remove only the number of detonators required for the planned route or shots.
2. Prime the charge by inserting the detonator firmly into the detonator well or into the punched primer hole.
3. Never force the detonator into the charge. Enlarge the cavity if necessary on any emulsions products, but never attempt to enlarge the detonator well of cast booster charge.
4. Secure the detonator with tape if necessary.
5. Never prime charges in advance of your immediate requirements.
6. Never transport a primed charge on a vehicle, unless pre-approved.
7. Never drag primed charges by the detonator tube or fuse.

Blasting or launching

1. Double check any initiation connections.
2. Never prime charges before the last practical time.
3. Withdraw all personnel to a safe distance and / or take cover before shooting.
4. Plan and beware of potential flying debris and avalanches from the resultant blast.
5. If there is a misfire wait the proper time before investigation (see AHJ regulations); maintain guards and or other precautions until the misfire can be mitigated. Be sure to document all misfires and record coordinates of all misfires that were either not found or were located in areas that were too hazardous to retrieve at that time.

Use of detonating cords

1. Cut detonating cord only with approved non-sparking anvil type shears.
2. Tape or cap ends of cut cords to contain the explosive powder and to keep dry.
3. Never cut cords in magazines or day-boxes.
4. Never cut cords on a metal surface with a knife.
5. Never use any form of impact to cut cord.
6. Never use cords for any purpose other than an explosive related activities (i.e. rope, bootlaces, tying parcels, securing equipment, belt, etc).
7. Be aware that most emulsions are not compatible with detonating cord.

Electrical storms

When electrical storm activity is suspected or observed, immediately suspend all activities, and abandon (stash) all explosives in as safe a place as possible. Attempt to mark that area in preparation for later retrieval. Attempt to choose a location where they will be unlikely to be encountered by the general public. All personnel should then find a safe location, preferably

one where you can see still the general area where you abandoned the explosives. Wait until the threat of electrical storm activities has passed. When safe to do so, immediately recover and inventory all stashed explosives.

Terms & Definitions:

Air blast: The airborne shock wave generated by an explosive.

ANFO: A blasting agent (1.5D) containing no essential ingredients other than prilled ammonium nitrate and fuel oil.

Armed or primed charge: An explosive cartridge that contains a detonator.

Authority having jurisdiction (AHJ): Any federal, state, provincial or local regulatory agency governing the storage, use and documentation of avalanche control explosives.

Avalanche blaster: A person authorized by the state to use explosives for avalanche control purposes and meets the following requirements:

- Able to give and understand written and oral orders.
- In good physical condition and not addicted nor an abuser of narcotics, intoxicants, or similar types of drugs including prescription drugs.
- Qualified by reason of training, knowledge, and experience in the field of transporting, handling, and use of explosives and shall be familiar with and comply with all state and local laws and regulations pertaining to explosives.
- Can provide satisfactory evidence of competency in handling explosives and perform in a reasonably safe manner the type of blasting that will be required.
- Knowledgeable and competent in the use of each type of blasting method and procedure that the individual uses.
- Capable of working with explosives in adverse conditions (snow and blowing snow) and should have a basic understanding of avalanche characteristics.

Avalauncher: A pneumatic cannon, which is used for avalanche control blasting.

It has a rotating base calibrated for pointing and the barrel is mounted on an elevating mechanism. It uses compressed nitrogen gas to propel a projectile containing an explosive charge and detonating means.

Blast area: Is generally defined as the area within the influence of flying rock, gases, vibration, and concussion and at minimum extending at least 50 meters (165feet) in all directions from a place where explosives are being prepared or fired, or where unexploded charges are known or believed to be.

Blast site: Area where explosive material is handled during blasting operations, including the perimeter at a distance of 50 feet in all directions from explosive charges.

Blaster In Charge: The blaster in charge is held responsible for the consequences of the blasting process. He / she is a licensed blaster who is fully qualified in the blasting process to be used including all aspects of storage, handling and use as recommended by the manufacturer and as required by AHJ. He / She shall be adequately trained and experienced so as to be capable of recognizing hazardous conditions throughout the blast site and has the authority to take prompt corrective action.

Blasting agent: Any material or mixture, consisting of 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 (detonator) when unconfined.

Blasting cap (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, electronic detonators, blasting caps for use with safety fuse, detonating cord delay connectors, and nonelectric instantaneous and delay blasting caps which use detonating cord, shock tube, or any other replacement for electric leg wires.

Brisance: The shattering power of an explosive material as distinguished from its total work capacity.

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: An explosive material which will detonate with an IME No. 8 TEST DETONATOR when the material is unconfined.

Cast booster: A cast, extruded, or pressed solid high explosive which contain swells or tunnels. Number 8 strength detonator or detonating cord sensitive. May contain pentolite, TNT, composition B or similar type explosives.

CFR: Code of Federal Regulations.

Critical work Zone: Is defined as being 15 meters (50 ft) in all directions from handling explosives, handling detonators, preparing charges, priming charges, loading charges, and shooting charges. This zone applies 100% of the time to open flames and / or smoking.

Date Code: A code, required by federal regulation (ATF), 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 tracking.

Detonating cord (DET cord): A flexible cord containing a center core of high explosive which may be used to initiate other high explosives.

Dud: A blast or a specific charge that failed to detonate as planned.

Emulsion: An explosive material containing substantial amounts of oxidizer dissolved in water droplets, surrounded by an immiscible fuel, or droplets of immiscible fuel surrounded by water containing substantial amounts of oxidizer.

Fuse Cap: A detonator which is initiated by a safety fuse; also referred to as an ordinary blasting cap. Synonymous with BLASTING CAP.

Fuse Cap Number 8: An IME No. 8 test detonator has 0.40 to 0.45 grams of a PETN base charge pressed to a specific gravity of 1.4 g / cc and primed with standard weights of primer, depending on manufacturer.

Fuse shunt (static staple): A staple between the blasting cap and the fuse to prevent static electricity from initiating the cap.

Initiation: The start of deflagration or detonation in an explosive material.

Misfire: A blast or a specific charge that failed to detonate as planned.

No-Light: Failure of fuse igniter to ignite safety fuse.

Primer: The combination of a detonator and a detonator sensitive explosive product used to initiate other explosives or blasting agents.

Pull wire fuse igniter: Pyrotechnic devices for the rapid and certain lighting of safety fuse.

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 influence which can cause explosive decomposition.

Velocity of Detonation (VOD): The velocity at which a detonation progresses through an explosive.

Disclaimer

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