

Surface Blasting Safety Procedures

I PURPOSE

Control risks related to storage, transportation, handling and use of explosives, blasting accessories and agents.

2 SCOPE

This procedure applies to all Surface operating areas and all employees and contractors.

3 DEFINITIONS

Attended The presence of an individual to prevent unauthorized entry or access.

Authorized Personnel Those employees that carry out blasting tasks, handle explosives, transport explosives and who are duly authorized by the BATFE and by the COMPANY.

Berm Material that has been piled to restrict access.

Blaster 2400 Remote Remote electronic box capable of programming up to 2400 IKON detonators when used in conjunction with the SURBB.

Blaster 400 Blasting box capable of programming 400 IKON detonators for blasting

Blasting Agent ANFO, emulsion and similar products as classified by the Department of Transportation in 49CFR173.114(a).

Blasting Area/Zone

- The area that may be affected by fly rock, dust, or fumes from an explosion that may cause personal injuries, damages to property, or losses in the process.
- The minimum distance for personnel is 500 feet.
- Safe distances will be determined based on conditions for each blast by the Blasting Foreman or designee.

Blasting Blocker or Guard Persons assigned to block the entry of vehicles and persons to the blasting area during detonation and subsequent inspection until the reentry to the area is allowed.

Blast Foreman The Supervisor who is responsible for ensuring that the blasting procedure is executed.

Blast Key non-programmable key used in conjunction with the Blaster 400

Blaster/Lead Blaster The person in charge of the blast.

Blasting Materials Surface delays, detonators or blasting caps, boosters, safety fuse, down-line and other explosives used for blasting.

Blast Site The area explosive materials are handled during loading that includes a 30 foot perimeter around the loaded blast holes. This perimeter must be demarcated with signs stating “Danger”, Explosives”, or “Keep Out” and green cones..

Blocker Any person designated by the Blast Foreman or his designee to perform a blocking operation.

BATFE Bureau of Alcohol, Tobacco, Firearms and Explosives.

Detonator Any device containing a detonating charge used to initiate an explosive. These devices include electric and non-electric instantaneous or delay blasting caps, and delay connectors. The term detonator does not include detonating cord.

Detonating Cord A flexible cord containing a center core of high explosives which may be used to initiate other explosives.

Dongle Programmable blast key for use in remote initiation

Explosives Chemical compounds or physical mixes, susceptible to sudden decomposition, that momentarily produce a large volume of gases at high temperatures and pressures with destructive effects. These are classified by the Department of transportation in 49CFR173.53, 173.88 and 173.100.

IKON Programmable electronic detonator.

IME Institute of Makers of Explosives.

Logger Recorder used to “log” detonators by programming individual timing

Mixing Truck A truck equipped with a mechanized mixer to load blasting agents, used to charge blast holes.

Pattern Drilled holes that will be loaded with explosive material, then blasted.

POI Point of Initiation. The location at which the IKON detonator is connected to the blast pattern.

Powder Magazine Area where explosives are kept.

Powder man/blast crew Personnel who assist Blaster/Lead Blaster in day to day activities.

Powder Truck Vehicle used to transport explosives to and from the blast site.

Primed holes Holes that have a detonating device lowered into the blast hole.

Radio Silence Prohibited use of radio during designated blast times except for blasting personnel, and emergency use.

Surface Remote Blasting Box (SURBB) Remote electronic box utilized for remote initiation.

Tied-in Connected with other initiation devices in a manner that provides for uninterrupted propagation between two or more holes.

4 RESPONSIBILITIES

Blaster/Lead Blaster

Responsible for withdrawal, distribution and return of explosives and documentation of blasting accessories.

Properly handle explosives according to current procedures.

Prevent unauthorized persons from entering the blast site.

Maintain the magazine inventory (including documentation) and cleanliness.

Prohibit the entry of unauthorized personnel to the magazine.

Have a current 5000-23 for blasting procedures.

Attend or present a pre-shift safety meeting and line out.

Inspect and test the blast initiation equipment.

- Ensure all are fully charged before use.
 - Surface Remote Blasting Box (SURBB)
 - Blaster 2400 Remote
 - Blaster 400
 - Loggers
- Retrieve DONGLES from Key Safe and keep in possession at all times.
- Return DONGLE to Key Safe at the end of shift.
- Ensure Logger memory is clear.

Secure a safe location for the positioning of the SURBB prior to blast time.

Perform proper pre-op inspections on any equipment operated.

Update site blast notification boards.

Conduct a daily visual inspection of the powder magazine area to ensure good housekeeping practices are being followed including removal of weeds or other combustibles and flammables within 50ft.

Oversee the day to day duties of the Blast Crew.

Perform and document daily visual inspection of all work areas.

Ensure proper placement of barricades and appropriate signage around the blast site.

Provide a blast report with a shot map attached for each blast.

Determine, along with the Blast Foreman, the type of bulk product to be used in the loading process.

Determine, along with the Blast Foreman, the delays to be used in the pattern.

Conduct, along with the Blast Foreman, a month end physical inventory of explosives to verify record count.

Powder Man/Blast Crew

Properly handle explosives according to current procedures.

Prevent unauthorized persons from entering the blast site.

Prohibit the entry of unauthorized personnel to the magazine.

Have a current 5000-23 for blasting procedures.

Attend or present a pre-shift safety meeting and line out.

Inspect and test the blast initiation equipment.

Perform proper pre-op inspections on any equipment operated.

Update site blast notification boards.

Conduct a daily visual inspection of the powder magazine area to ensure good housekeeping practices are being followed including removal of weeds or other combustibles within 50ft.

Perform daily visual inspection of all work areas.

Ensure proper placement of barricades and appropriate signage around the blast site.

Other duties assigned by Blaster, Lead Blaster, or Foreman.

Blocker

Follow COMPANY Surface Blasting Procedures.

Arrive at their assigned location prior to the start of the blast sequence.

Choose a position within the assigned location that allows for clear visibility in all directions.

Position equipment perpendicular to the normal flow of traffic going into the blast area.

Remain alert and immediately inform the Blast Foreman of any breach of the block.

Remain in position until the Blast Foreman, or his designee, has announced that the shot is all clear and blockers can release their blocks.

Not engage in any idle conversation that would detract from assigned duties.

Blast Foreman

Ensure the blasting notification board is updated and post the blast notification on designated locations no later than 9 a.m. on the same day of the blast.

Verify that the established standards and procedures as well as the existing legal regulations are fulfilled.

Responsible for any change in the blasting schedule subject to coordination with and approval by the General foreman or designee.

Will not allow any unauthorized persons to enter an area charged with explosives; much less allow them to handle explosives.

Periodically reassess the skills of blast personnel to handle explosives.

Determine location of the blasting blockers.

Handle and use explosives according to the safety standards and regulations.

Document and inspect the magazines monthly to verify the inventory, condition of the magazines and surrounding area.

Issue a 3 minute pre-blast notification.

Ensure that each employee handling explosives completes BATFE Form 5400.28 (User / Possessor Form) prior to handling explosives and that employee is aware this is on a temporary basis until approval is received.

Communicate changes to procedures & legal requirements to crew members.

Conduct monthly safety meetings with all crew members.

Ensure that the blast crew has adequate handheld radios to conduct pre and post blast examinations.

Shall obtain approval from the Mine General Foreman of any schedule changes for the blast crew (i.e. summer hours).

Conduct or prepare the blast crew line-out meeting.

Designate, in his/her absence, a lead person to conduct inspections, inventories and daily line out meetings.

Determine, along with the blaster, the type of bulk product to be used in the loading process and communicate to the loading contractor.

Ensure proper clearing procedures are followed, identify the blast area and assign blocks.

Determine, along with the blaster, the delays to be used in the pattern.

Review upcoming blast with site specific personnel i.e. engineering, geology.

Conduct, along with the blaster, a month end physical inventory of explosives to verify record count.

Conduct a monthly planned inspection of magazines, night boxes, explosive truck cargo areas/spaces, and surrounding area.

Attend the daily Mine Production meeting to review daily activities.

Ensure all personnel on the blast crew shall be trained on the safe use of Explosives.

Ensure trainees must be in the presence of a trained person at all times during the training period while handling explosives or working on a pattern.

Ensure Training will include familiarity with the COMPANY Surface Blasting Safety Procedures, BATFE Regulations, MSHA Explosives subpart E, and Site Procedures.

Evaluate competency of the individual prior to allowing the individual unsupervised use of explosives, documented on a MSHA 5000-23 form.

Use Task Training Guidelines as needed for training.

Contractor Supervisor

Adhere to all federal regulations and COMPANY SOPs and STPs.

Will ensure the proper operation and maintenance of all equipment and facilities.

Attend COMPANY Blast safety meetings as applicable to site requirements.

Employees and Visitors entering the mine site

Must obey the orders of the Blast Foreman or designee when within the blast area/zone.

Responsible for checking posted blast times when entering mining areas.

Immediately report to their supervisor any condition that is unsafe.

In the event that un-detonated explosives are found the employee will:

- Move a safe distance at a minimum of 30 feet.
- Contact their supervisor immediately.
- Restrict access until supervisor assumes control.

Anyone discovering a suspected burning hole (smoke coming out of material previously blasted) shall immediately inform his/her supervisor.

- All personnel must be evacuated and cleared from the designated blast zone/area.
- Blockers shall be put in place until determined safe to re-enter.

The supervisor will assign blocks and notify the Blast Foreman for further instructions and follow step 5.23 for un-detonated explosives.

NO ATTEMPT WILL BE MADE TO PUT OUT THE BURNING HOLE(S)

Blasting Agent Mixing (Prill) Truck Operator

Ensure the optimum operating conditions and good repair of his/her unit (Mixing Truck) by inspecting the unit daily before operation and document pre-op inspection.

Make sure that explosives are mixed in the trucks according to the established proportions.

Only authorized personnel are allowed to travel in the vehicle.

Fall arrest (anchoring line) shall be used for access to the top of the Mixing Truck Bins.

All the shafts of the hydraulic engines must have guards or shelters so that no part of the human body or any other objects that form part of the clothing may get caught in them.

Grounding shall be installed so that the static current that may accumulate in the metal mass of the unit can be discharged.

All the blasting agent mixing trucks will be equipped with two (2) multipurpose Dry Chemical fire extinguishers in operable condition or one such extinguisher and an automatic fire suppression system.

Mixing trucks are not allowed to come in contact with explosive products.

HSLP

Will provide support as required.

Must ensure the license for explosives handling as issued by the BATFE is current.

Request Licenses, Authorizations, Inspections and others from the relevant authorities for the transportation and storage of explosive material. Furthermore, furnish such authorities with any documentation they may require according to the provisions set forth in the Law.

Inform the BATFE about the loss of any explosives, blasting agents or accessories.

Mine/Drill and Blast General Foreman

Ensure compliance of the blasting safety procedures.

Operator of Explosive Transport Units

Ensure the optimum operating conditions and good repair of his unit (Explosives Truck) by inspecting the unit daily before operation (pre-op inspection).

Only designated personnel are allowed to travel in the vehicle.

Supply Chain

- Keep records of purchases, the shipment and receipt of the explosives, blasting agents and accessories acquired by the mine for event plus six (6) years.

5 PROCEDURE/GUIDELINES

All COMPANY blasting activities will be done in accordance with MSHA, BATFE, state, and local regulatory requirements. COMPANY procedures and STPs will reflect these regulatory requirements.

All Site Blasting STPs shall be aligned with the procedures referenced in this document and follow all product and equipment manufacture's recommendations.

Each site will develop site specific STPs which address situations and conditions not covered in this Procedure.

Smoking, welding or open flame shall be prohibited for a distance of 50 feet from any explosive material including nitrate silos.

Authorized personnel and vehicles are allowed to enter a blast site only after proper notification and escort have been provided.

Handling explosives without proper authorization by the COMPANY and BATFE is considered a felony. COMPANY security shall be notified of any infractions.

Drilling activities shall not occur within 30 feet of any charged holes, except in cases of re-drilling of holes.

- Refer to section 5.18 Re-drilling of Holes.

Geology will walk blast site prior to loading and inform the blast crew of the following:

- Sulfide content related to reactivity potential
- Hardness of material being blasted

Under no circumstances shall personnel enter explosive magazine areas or blast sites during electrical storms. (In the event of a lightning storm that could affect the blast site, the area will be cleared and blocked as if it were a scheduled blast. Blocks will be held until the shot can be safely detonated or the storm passes. If a storm occurs during night shift, the production foreman in charge of the area will follow the blocking procedures until the storm has passed.)

Blast Notification Procedures

- Blasting Notification display boards located at the main entrances to the Mine site, as well as other locations, will be updated by the start of shift daily with the blasting schedule for that day.
- Blast Hotline shall be updated prior to start of shift daily.
- If the shot is delayed for any reason the Blast Foreman will notify all departments concerned by radio or phone.

Storage of Explosive Materials

- Magazine sites must be labeled with appropriate warning signs that indicate the contents and are visible from each approach. The signs shall be placed so that a bullet passing through them will not strike the magazine. The magazines areas shall be fenced and locked with a single lock.
- Magazines shall be secured in accordance with BATFE and MSHA regulations.
- Only explosive material and essential non-sparking equipment (pens and inventory records) used for the operation of the magazine may be stored in the magazines.
- A current BATFE Storage permit will be posted in each magazine.
- Metal magazines will be grounded and equipped with electrical bonding connections between all conductive portions so the entire structure is at the same electrical potential.
- Ground checks shall be conducted on the blast magazines and prill silos at least annually. Records shall be kept with the electrical department.
- All explosive material must be stored in approved magazines according to the IME safety publication 22.
- Magazine keys shall be kept in the key card box and accessed only by authorized personnel approved by the Blast Foreman.
- Metal magazines will be grounded and equipped with electrical bonding connections between all conductive portions so the entire structure is at the same electrical potential.

- Magazines must be a sufficient distance from power lines so that the power lines, if damaged, would not contact the magazine.
- Explosive material storage areas and magazines including nitrate storage areas shall be kept clean and clear of rubbish, brush, dry grass, and trees for 25 feet in all directions. Other combustibles will not be allowed to accumulate within 50 feet of these magazines.
- Only authorized personnel shall be allowed access to blasting material storage areas.
- Explosive material, blasting agents, and detonator (blasting caps) shall be stored in separate magazines.
- Magazines shall only be used for the storage of explosives materials. Only explosive material and essential non-sparking equipment used for the operation of the magazine may be stored in the magazines.
- The explosives shall be stored in their own containers (boxes).
- Explosive material will be stored to facilitate use of oldest stock first and stacked in a stable manner, but not more than eight (8) feet high.
- Explosives and Detonator Magazines shall be secured with two locks at all times when unattended and protected with covers to deter access.

The locks shall be case hardened with a minimum of 3/8 inch shank and no less than five (5) tumblers.

- Drop trailers containing blasting agents must be kept locked with a single lock when unattended and king pins must be secured against transport.
- Nitrate Silos
- Must be well ventilated, located in a secure place.
- The diesel oil storage and fuel depot must always be separated from the ammonium nitrate area to avoid the danger of explosion in the event of a fire.
- The ammonium nitrate must be kept dry.
- If present, the electrical wiring located in the nitrate silo must be equipped with the relevant safety devices to prevent hazards and losses.
- Water should be used to facilitate nitrate spillage clean-up when necessary.

Explosive Transport

- Explosive material will be transported without undue delay to the storage area or blasting site.
- Closed non-conductive containers (cargo areas/spaces) will be used to carry explosives and detonators to and from blast sites. Separate containers will be used for explosives and detonators
- Explosive material and detonators will not be transported on the same vehicle unless they are separated in compartments by 4 inches of hardwood or the equivalent per IME Safety Publication 22 and the detonators are kept in closed non-conductive container. The hardwood partition must be fastened to the vehicle or conveyance.

- The vehicles used to transport explosives will be:
 - Equipped with a minimum of two multipurpose dry chemical fire extinguishers or one such extinguisher and an automatic fire suppression system.
 - Posted with warning signs that indicate the contents and are visible from all four sides. The signs must be removed when explosive material is not being transported.
 - Equipped with side and end enclosures higher than the explosive being transported.
 - Equipped with a cargo space that has no sparking material exposed in the compartment. Explosive material must never be transported in the operator's compartment.
 - Occupied only by qualified persons necessary for handling the explosive material.
 - Attended at all times while explosives are present:
 - Attended means qualified persons are present or the cargo areas/spaces are locked.
 - In no instance will explosives be left in the cargo areas/spaces of the blasting truck overnight.
 - Must be secured with parking brake applied and bermed or chocked when not being operated.
- The explosive (prill) mixing truck shall be calibrated so that the mixture is appropriate for the product being used and the required powder factor needed.
- Only qualified personnel shall attempt removal of rocks lodged between the dual tires of vehicles.

Inventory

- An Accurate Inventory shall be kept at all surface area blast magazines and verified monthly.
- The blaster/lead blaster assigned to a blast pattern will:
 - Check out the needed amount of supplies from the magazines by recording the amount, specific type, and date it was taken.
 - Initial the inventory sheet where the entry was made.
 - Properly record the amount and specific type of product on the date code card for the date code being checked out.
 - Some sites may use the total inventory book
 - Initialize next to each entry.
 - The same blaster checking out supplies will be responsible for checking them back in.
 - Complete the daily inventory for all contents of magazines being used.
- In the case of an unexpected departure by the blaster, he/she must designate a qualified replacement to check supplies back into the magazine.
- **ALL ENTRIES WILL BE MADE IN INK.**

- NO ENTRIES WILL BE ERASED.
- IF THERE IS AN ADDITION OR SUBTRACTION ERROR:
 - DRAW A SINGLE LINE THROUGH THE ERROR
 - REWRITE THE ENTRY ON THE NEXT LINE.
 - NO ATTEMPTS SHOULD BE MADE TO DISGUISE THE ERROR.
- After the pattern has been primed or tied in, the blaster and/or designees will walk the pattern and check for any supplies or unused explosives left on the pattern and record any holes that were not loaded.
- A physical count of the remaining supplies that were checked out will be made at this time.
All supplies must be accounted for prior to blast!
- Any unresolved discrepancies must be reported immediately to the Blast Foreman and a thorough investigation completed.
 - In his absence it will be reported to the General Foreman.
- Any loss or theft must be reported to COMPANY Management and the Health, Safety and Loss Prevention Department immediately.
- All invoices will be kept on file by the Supply Chain.
- The Blasting Foreman or his designee will keep a copy of the receiving invoices on file for event plus six (6) yrs.
- When receiving a shipment of blasting supplies, the old stock will be rotated to the front so that it will be used first (FIFO).
- After the shipment has been unloaded, the supplies will be counted, entered into the date code card and at some sites the total inventory log.
- Each container will be inspected to assure the seal has not been broken.
- Any container which has the seal broken will be inspected for the correct quantity and the decision to accept the item as part of the delivery will be left to the Blast Foreman, General Foreman, or his designee.
- All counts and date codes on items delivered must match the invoice.
- Anytime there is a discrepancy in the paper work it must be corrected before accepting • delivery.

Loading Blast Holes

- Blast site shall be evaluated for the existence of sulfide areas, wet holes, and the potential short holes, and follow the appropriate procedures addressed below.
- Before laying out any blasting supplies, the blast site shall be barricaded with berms and/or green cones and posted with explosive signs to prevent unauthorized entry at a minimum of 30' around the loaded blast holes.
- Vehicles and equipment shall not be operated in an unsafe manner that will cause a hazard by coming in contact with explosive products.
- Before loading, blast holes will be checked and whenever possible, cleared of obstructions.

- High walls shall be examined for loose material that may present a hazard to personnel and/or equipment. If an unstable slope is found, the Blast Foreman or Designee will assign a Spotter throughout the charging procedure.
- Until loading begins:
 - Explosives and ANFO or Emulsion will be kept separated from detonators.
 - Explosive material will be protected and kept in closed non-conductive containers. (cargo areas/spaces)
 - Primers should not be pre-made up.
- Before the blasting agent mixing truck enters the blast site:
 - The operator shall consult the blast crew about any potential adverse ground hazards in the area including soft areas where the truck could get stuck.
 - The Blast Foreman shall be notified immediately to coordinate the removal of the truck if it should become stuck within the blast site.
- Once blast site has been delineated only work associated with the loading of the blast pattern may be done in the blast site area unless authorized by the Blast Foreman or blaster in charge.
- Boosters will be placed in a manner, which prevents them from falling into the holes.
- The booster will be tied to down-line according to the manufacturers recommended procedure.
- Once the booster has reached the bottom of the hole it should be lifted up approximately 18 inches and secured.
- Blast crew members shall be responsible for guiding and spotting any equipment entering the blast site.
- Loading will be continuous, except where adverse conditions cause disruption or if pattern will be slept overnight.
 - Only oxide areas can be slept overnight.
 - Loaded holes will not be slept more than seventy-two hours (72) after the pattern loading is completed.
- If the blast cannot be fired before the end of the shift:
 - The shift foreman must be notified of the blast location and given direction of what to do in the event of a lightning storm.
 - Signs and barricades must be placed to prevent access to the blast site.
 - All explosive material not loaded in the holes must be returned to the proper magazine before the end of the shift.
 - Under no circumstances shall the initiation system be connected.
- In the event of a lightning storm that would affect the blast site:
 - The area will be cleared and blocked as if it were a scheduled blast.
 - Blocks will be held until the shot can be safely detonated or the storm passes.

If a storm occurs during night shift, the Production Foreman in charge of the area will follow the site specific procedures for electrical storms.

- Powder poles shall be wooden or other nonconductive non-sparking materials.
- All explosive containers (cardboard boxes) will be thoroughly inspected to insure no product remains. Empty boxes shall be completely dismantled prior to being disposed of at the dumpsite. This will allow individuals to check for unused explosives hidden within the containers.
- Entrance to a blast site requires permission from the Blast Foreman or designee and an escort for all personnel not conducting normal business (i.e. Survey/Ore Control) or trained in the use of explosives.
- In areas where short holes have been a problem the holes will be pre-measured to allow time for re-drilling.

If short-holes are not re-drilled, they will be loaded accordingly.

If a hole is too short, it will be left unloaded.

Loading in Critical Areas

- It is imperative that pattern size and shape conform to critical areas.

This should be taken into account when the pattern is being marked for drilling.

- Before loading bulk products into blast holes, the lead blaster and the blaster designated to tape the holes during loading must make a visual check of the blast site for any critical areas.
- A critical area may include but is not limited to immobile equipment, dewatering wells, power cables and known or identified reactive areas (see reactive area procedures).
- When loading critical areas, the lead Blaster/ Blast Foreman must determine the amount and type of product to be used in holes.

The designated taper must understand the importance of the amount of product being used.

- When loading reactive areas a limited amount of holes should be loaded and blasted as soon as possible.

Charging of Explosives in Reactive Areas

- Geologists should have a critical role in identifying reactive areas prior to loading and blasting.
- Reactive areas can be caused by the presence of pyrrhotite, marcasite, fine-grained sooty pyrite, sulfur, etc.
- The blast crew and others should be constantly aware of possible reactive areas based on color and past experience.
- Hole temperatures will be measured in reactive areas by the blast crew prior to loading. For any given area a "lowest" hole temperature should be established to determine no reactivity. Any increase in temperature of 5-10 degrees a buffered or protected product will be used.

- Reactive holes with an increase in temperature will be marked loaded and stemmed at the very end of the loading cycle. It may be necessary to sleeve the holes and use a buffered product based on the amount of temperature increase, past experience and safety concerns.
- If electronic detonators are chosen to be used for in-hole priming in reactive areas all measures should be adhered to for protection of the cap being exposed to high temperatures.
- When stemming holes, drill cuttings will not be used in holes which have elevated temperatures. These holes will be stemmed with inert oxide, non-reactive material.
- Sulfide and/or reactive holes will be loaded and shot within 12 hours. Sulfide and/or reactive holes will not be loaded and slept overnight.
- If a burning hole occurs during loading procedures the responsible blaster will:
 - Immediately evacuate the affected blast area of all personnel.
 - Set up roadblocks to keep personnel out of the area.
 - Notify the Production Foreman on duty.

NO ATTEMPT WILL BE MADE TO PUT OUT THE BURNING HOLE(S).
- The Blast or Pit Foreman will:
 - Contact the Drill & Blast General Foreman to inform him of the situation.
 - Ensure the affected area will remain blocked off until the burning has stopped and the Blasting Department and/or Health, Safety and Loss Prevention Department have determined that the area is safe to re-enter.

Charging of Blast Holes Containing Water

- Holes should be dipped or taped to determine water level.
- Holes containing water should not be loaded with ANFO.
- It is understood that in order to charge a flooded blast hole, the explosive shall be pumped from the bottom of the blast hole.
- When using slurry product to load wet holes, the manufacturer's recommendation shall be followed.

Re-drilling of Blast Holes

- Under no circumstances shall blast holes located within an area charged with explosives be re-drilled without the authorization and at the direction of the Blast Foreman or designee.
- The blast crew shall demarcate the area to be entered and use a spotter to ensure that the equipment does not come into contact with the explosive products.

Stemming Blast Holes

- Pull the down-line up to assure that the booster is anchored into the explosives before stemming occurs.
- Choose method, material, and equipment needed based on the location of the blast.

- All down-lines will be positioned to prevent the stem truck from running over them and secured to prevent them from being pulled down the hole.
- When using the skid steer, a helper will:
 - Be required to hold down-lines.
 - Make sure down-lines do not come in contact with skid steer during stemming process.
 - Ensure down-lines are not lost down hole during the stemming process.
 - Ensure that holes don't get bridged over and all holes are stemmed to the top.
- Blast holes shall not be filled with stemming material that may cut the down-line.
- After filling the blast hole with stemming:
 - The down-line will be connected using the manufacturer's recommended tie in procedure.
 - The down-line shall be pulled again to verify that it is in good condition and secured.
 - Excess down-line will be positioned at a ninety-degree angle from the connections.
- Once the trunk line surface delays are laid out and tie-in begins, the tied-in portion of blast site must be cleared, demarcated, and attended.
- The entire pattern will be walked and thoroughly inspected under a blaster/lead blaster's supervision, to check for proper tie-ins, unused explosives, and any other problems prior to initiation.

Clearing of Charged Blast Areas

- The blast area/zone will be determined by the Blast Foreman or his designee, based on type of material, number of holes, location and other safety considerations.
- Employees assigned to clear the pit will begin clearing their designated areas. This will be done in such a manner that once a zone is cleared within the blast area, no one can enter that zone while other parts of the blast area are being cleared. This may require two people in certain situations in order that one person blocks the entrance to an already cleared zone while the remainder of the blasting area is being checked. Individuals will clear their assigned zones as follows: clear from the blast site out, visually check all buildings and equipment notifying the blaster when area is cleared.
- The blast foreman or designee will call each individual blocker to confirm their location and status.
- When all blasting blockers have been contacted to verify their position and that the blast area/zone is clear, the Blast Foreman or designee will make radio contact with mine personnel initializing the blast process.
- Under no circumstances will the blocker allow anyone to pass a roadblock, without the permission of the Blasting Foreman or designee.
- Powder crew personnel will call the blocker and identify themselves before passing the blocker and entering the blast area.
- If anyone should try to run a roadblock, the blocker will notify the blast foreman immediately.

- The blocker should attempt to get a vehicle number without leaving the roadblock.
- If the blocker notices anyone in the blast area, the blast foreman or designee must be notified immediately.
- The release of the blockers shall only be issued by the Blast Foreman or designee in charge.
- Clearing is required per blast area definition number 3.5.
- The Assessment for clearing distances will take into consideration any:
 - Bridged/over loaded holes
 - Mobility of equipment
 - Unconfined faces
 - Powder factor
 - Amount of holes
 - Pattern Spacing
 - Timing
 - Product
 - Concussion or Air blast
 - Wind direction, dust, and fumes

Blast Initiation

- For initiation procedures refer to the site specific SOP/STP and the manufactures recommendation based on the system being utilized.
- Once the shot has been fired, the lead blaster will contact the Blast Foreman and announce “shot fired” and the Blast Foreman will acknowledge.
- After any hazards (nitrous oxide, fly rock, etc.) from the shot have cleared, the powder crew will walk and visually inspect the blast site for any missed holes or cutoffs.
- If any un-shot holes are located, it will be determined by the blaster and the Blast Foreman to either shoot the hole or barricade it off and detonate it at a later time.
- All persons clearing the blast will have a handheld radio and access the pattern from the safest access.
- When it has been determined that the blast is clear, the Blast Foreman will announce that the shot is all clear and the blocks may release their traffic.
- The Blast Foreman will then clear the radio.
- Any remedial action that needs corrected such as cleanup or berms built should be relayed to the Blast Foreman.

Remote Blasting Using Electronic Initiation Devices for nonel pattern

- Connect IKON detonator to the Point of Initiation (POI) in Control Row of non-electric (nonel) loaded shot.

- Power up logger and enter “Log Det” mode.
- Connect one end of lead wire spool to the logger.
- Log the detonator by connecting “tail” end of lead wire to detonator clip, assigning a nominal time.
- Test detonator and leakage with the logger.
 - Detonator test should read “OK”.
 - Leakage test should read 0.0 mA.
- If detonator test result is “No Reply”:
 - Re-check the detonator connection to the lead wire at the POI to ensure a positive contact.
 - If a second detonator test fails, the detonator will have to be replaced.
- If leakage is greater than zero:
 - Ensure the IKON clip is not sitting in water and the integrity of the lead wire to the POI is not compromised.
 - If the wire has been damaged, a splice at the damage point can be made.
 - System can handle up to 15 mA of leakage.
- Remote Initiation
 - Sometime during the shift prior to shot time, one can put the SURB box in test mode at the blast sight then they can travel to the proposed shooting area with the BLASTER 2400. At that point turn the BLASTER 2400 on and enter RF-test mode. If RX/TX = 100 % communications are good. If not continue try safe areas until communications read 100%. If this is not possible follow manual initiation procedures
 - Shut down logger and walk lead wire spool out to the pre-determined SURBB location.
 - Cut the tail from the spool and re-connect logger to the lead wire, re-testing for detonator communication and system leakage.
 - If leakage is 0-15 mA proceed with shot. Anything greater than 15 mA the wire has been compromised. If the wire has been damaged, a splice at the damage point can be made. If there is suspicion of multiple damage to the wire, run a new lead wire from the POI to the SURBB location, re-testing for detonator communication and system leakage.
 - Turn the logger off once testing is completed.
 - Turn SURBB on, switching to “Test”. You should see the battery light flashing, indicating a positive test.
 - Insert Dongle into key port, turn “ON” and wait for an audible signal (two short beeps, followed by one long). The dongle has now been encrypted with a unique code for blasting. Remove dongle, close the SURBB case. The Blaster in charge must have possession of the DONGLE at all times.
 - At this point connect communication cable plug into the logger.

Once the blast zone/area is cleared by verification of the Blast Foreman or designee, then connect the logger communication cable clips to the SURBB.

Secure the logger and SURBB by protecting both with cover.

At a Safe location secure the Blaster 2400 and switch "ON". Once the "BLASTING" menu appears on-screen, insert the Dongle and confirm (press enter).

Scroll through the menu prompts, confirming as required. The blaster will power up the logger and initiate detonator programming.

If this programming fails the following errors may have occurred:

- Failure of line of site – radio comm error
- No reply from the cap
- Over voltage
- Low battery error
- Do not shoot with errors on single cap initiation.

Once programming is complete, the Blaster 2400 Remote will emit an audible signal and display the message "Ready to Fire". At this point, there exists a ten minute window in which the shot can be detonated.

Detonate the shot when ready by holding on the "FIRE" buttons a minimum of 2 seconds.

Once the shot has detonated, pull the Dongle key from its port.

If detonation is not successful it is considered a misfire and there is a mandatory 30 minute re-entry wait time. If detonation is successful follow standard clearing procedures.

Proceed to the SURBB location for retrieval of both the SURBB and loggers, disconnecting the loggers from the SURBB.

- **Manual Initiation**

Shut down logger and walk lead wire spool out a safe location outside the blast radius. This may involve splicing spools of lead wire together. One may use five 400 meter spools or a total of 2000 meters of harness wire from the detonator to the final LOGGER – BLASTER 400 location. If this distance is not sufficient, one must protect the LOGGER at that location and extend harness wire from that point a maximum of another 1000 meters to the final BLASTER 400 location.

Cut the tail from any remaining spool and re-connect logger to the lead wire, re-testing for detonator communication and system leakage.

- If leakage is 0-15 mA proceed with shot. Anything greater than 15 mA the wire has been compromised. If the wire has been damaged, a splice at the damage point can be made. If there is suspicion of multiple damage to the wire, run a new lead wire from the POI to the SURBB location, re-testing for detonator communication and system leakage.

Once the blast zone/area is cleared by verification of the Blast Foreman or designee will connect logger to the Blaster 400 using enclosed cables.

Turn Blaster 400 on and insert (non-programmable) Blast Key into blaster port when the "BLASTING" menu appears on-screen.

Scroll through the menu prompts, confirming as required. The blaster will power up the logger and initiate detonator programming.

If this programming fails, the blaster will need to re-check wire and detonator connections, as described above.

Once programming is complete, the Blaster 400 will emit an audible signal and display the message "Ready to Fire". At this point, there exists a ten minute window in which the shot can be detonated.

Detonate the shot when ready by holding on the "FIRE" buttons a minimum of 2 seconds.

Once the shot has detonated, pull the Blast key from its port and shut off the Blaster 400, disconnecting the loggers from the Blaster.

If detonation is not successful it is considered a misfire and there is a mandatory 30 minute re-entry waiting time. If detonation is successful follow standard clearing procedures.

- For multiple electronic detonators, the logger shall be tied/spliced in the middle for the maximum amount of detonators on that logger.
- **If for any reason the shot needs to be aborted, removal of the blaster 1600/2400 dongle and blaster 400/1600 key will abort the shot.**

Un-detonated Explosives Procedures

- If any un-detonated explosive(s) are found in the mine or the process area during day shift, the blast foreman or his designee should be notified immediately. Explosives shall be demarcated until the blast foreman or someone from the blast crew removes the explosive(s) from the working area and transports them to the magazine.
- When explosive(s) are found during nights or weekend shifts, the mine foreman should be notified immediately. The mine foreman or designee is authorized to transport the explosive(s) from the discovery area to the short term (disposal) storage magazine using proper transporting procedures provided they have completed the BATFE possessor form and signed 5000-23 for safe handling of explosives on file.
- Under no circumstances should a mine foreman attempt to handle explosives if there is any uncertainty about safety. In such a case, secure the area and notify the blasting supervisor.
- If a loading unit unearths a blast hole column containing un-detonated ANFO, the operator will call the foreman immediately and inform him of its location. The operator should move the loading unit away from the hole and wait for further instructions.
- The mine foreman will determine if the powder crew or other qualified personnel can attend to the un-detonated blasting material immediately. If not, blasting signs and cones will be placed 30-feet from the hole to identify its location until the un-detonated blasting material can be attended.
- Only non-sparking and static electricity resistant tools may be used to extract the explosives.

- When flushing the hole out with water, only non-sparking implements and fittings may be used.

Unplanned Detonation Procedures:

- In the event of an unplanned detonation, evacuate and secure the area. Do not re-enter the area except to rescue an injured person and then only if safe to do so. Activate the emergency response plan as soon as possible.
- Notify the following personnel immediately: Mine Operations Manager, Production General Foreman and HSLP Manager.
- Only the Health, Safety and Loss Prevention Manager or designee will immediately notify MSHA and the State Mine Inspector.
- The area must be secured and guarded until released by management after completion of the investigation and the pertinent authorities have released the scene.
- Complete an accident investigation following the COMPANY Accident Investigation Procedure.

Disposal of Outdated or Discontinued Explosives:

- When explosive materials are discontinued every effort should be made to return to manufacturer or supplier.
- Outdated or discontinued explosives shall be disposed of in accordance to Federal, State, and Local Regulations on an active blast.
- Determination of amount and location of disposal shall be made by the Blast Foreman and Mine General Foreman.
- Entry shall be made on the Blast report indicating number and type of explosives disposed of and reason.
- The blast report will be signed by the Lead Blaster/Blaster and kept on file.

Demolition Shots

- Demolition shots will be conducted when other options to break oversize are not available or feasible.
- Demolition shots will follow all other applicable blasting policies and procedures.

Access to Observing Blasts

- No untrained/unauthorized persons shall be allowed in active loading or blasting areas without permission and escort from the Blast Foreman, Lead blaster or designee.
- All persons requesting to observe any blast must obtain permission and clearance from the Blast Foreman, lead blaster or designee.
- Blasts will only be observed from locations permitted / designated by the Blast Foreman.
- Observers must have a means of communication with the Blast Foreman.
- Photographing / filming blasts must be approved by Blast Foreman and General Mine Foreman.

- Observers will be required to understand blast procedures and comply with all procedures.
- No observer shall be allowed inside cleared / blocked areas without permission from the Blast Foreman, lead blaster or designee.