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AM1403
16 SEPT 2005

STUDENT OUTLINE

DETONATING CORD FIRING SYSTEM

TERMINAL LEARNING OBJECTIVE

(1) Given demolition materials, while wearing a fighting load, construct a detonating cord firing system in accordance with FM-250. (51TR.02.05)

(2) Given an unexploded detonating cord firing system and demolition materials, while wearing a fighting load, clear a detonating cord misfire in accordance with FM-250. (51TR.02.06)

ENABLING LEARNING OBJECTIVES

(1) Given a list of choices, identify the characteristics of a line main in accordance with FM 5-250. (51TR.02.05c)

(2) Given a list of choices, identify the characteristics of a branch line in accordance with FM 5-250. (51TR.02.05d)

(3) Given two lengths of M456 detonating cord, while wearing a fighting load, demonstrate methods of attaching M456 detonating cord to a M6 or M7 blasting cap in accordance with FM 5-250. (51TR.02.05e)

(4) Given a list of choices, identify methods of attaching M456 detonating cord to a M6 or M7 blasting blast cap in accordance with FM 5-250. (51TR.02.05f)

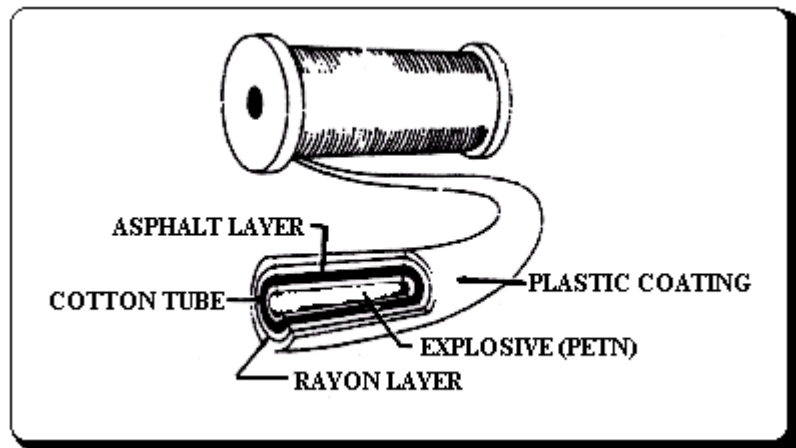
(5) Given a length of M456 detonating cord, while wearing a fighting load, demonstrate how to tie priming knots in accordance with FM 5-250. (51TR.02.05g)

(6) Given a list of choices, identify the detonating cord firing system misfire procedures in accordance with FM 5-250. (51TR.02.06a)

1. CHARACTERISTICS OF DETONATING CORD. The primary application for detonating cord is for priming charges and as an explosive charge. Detonating cord should never be placed or carried around the neck.

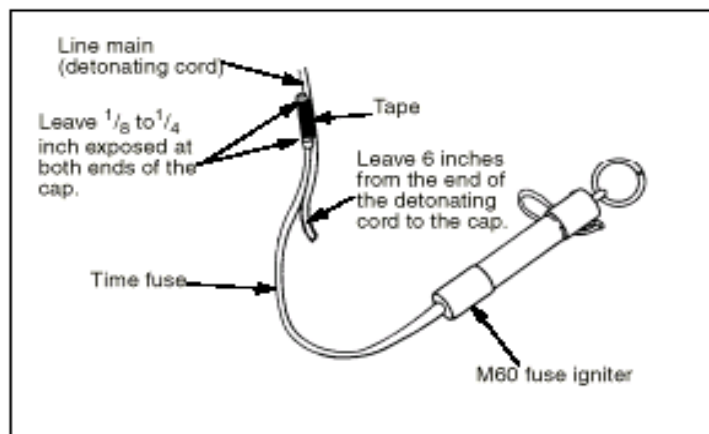
a. Detonating cord. Detonating cord consists of a core of HE (6.4 pounds of PETN per 1,000 feet) wrapped in a reinforced and waterproof olive-drab plastic coating. Detonating cord has a detonation velocity of

20,000 to 24,000 feet per second. A firing system uses detonating cord to transmit a shock wave from the initiation set to the explosive charge. Detonating cord is versatile and easy to install. It is useful for underwater, underground, and aboveground blasting because the blasting cap of the initiation set may remain above water or above ground and does not have to be inserted directly into the charge. Moisture can penetrate the explosive filling to a maximum distance of 6 inches from any cur or break in the coating. Water-soaked detonating cord will detonate if there is a dry end to allow initiation. Detonating cord can be used to prime and detonate single or multiple explosive charges simultaneously. Detonating cord firing systems combined with detonating cord priming are the safest and most efficient ways to conduct military demolition missions.

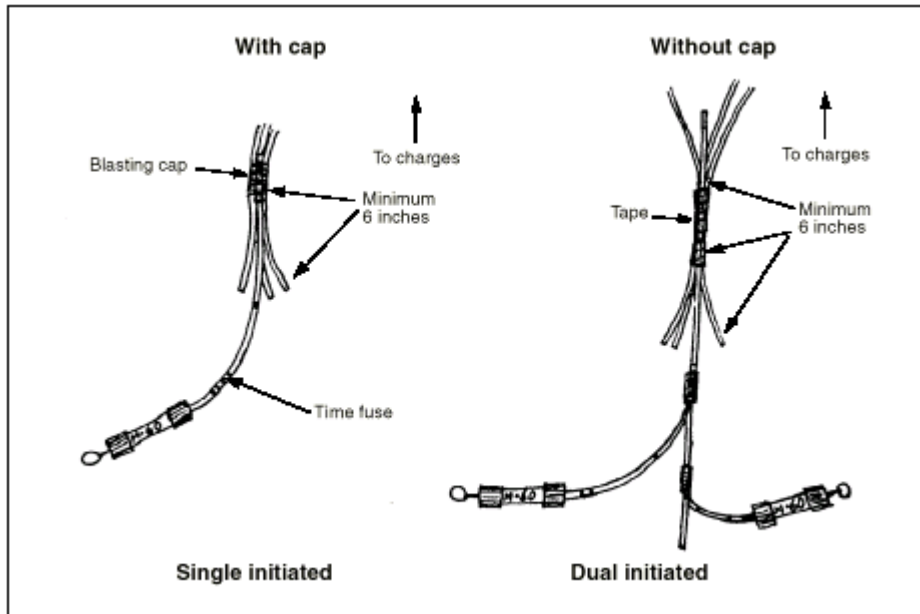


2. ATTACHING DETONATING CORD TO A BLASTING CAP

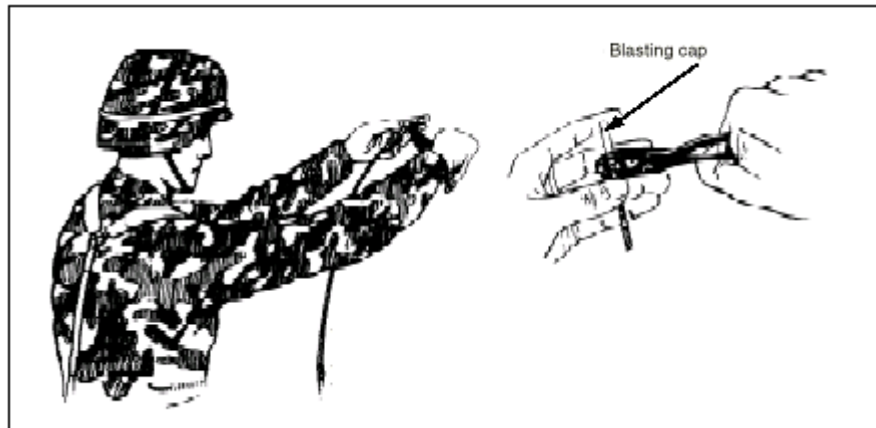
a. Attach The Blasting Cap. Attach the blasting cap, electric or nonelectric, to the detonating cord with tape. You can use string, cloth, or fine wire if tape is not available. Tape the cap securely to a point 6 inches from the end of the detonating cord to overcome moisture contamination. The tape must not conceal either end of the cap. Taping in this way allows you to inspect the cap in case it misfires. There should be no more than 1/8 inch on the cap needs to be left exposed for inspection.



b. Splicing Using a British Junction. A British junction is a connection made by utilizing tape. A British junction is simply a connection made by attaching an initiation set to multiple branch lines.



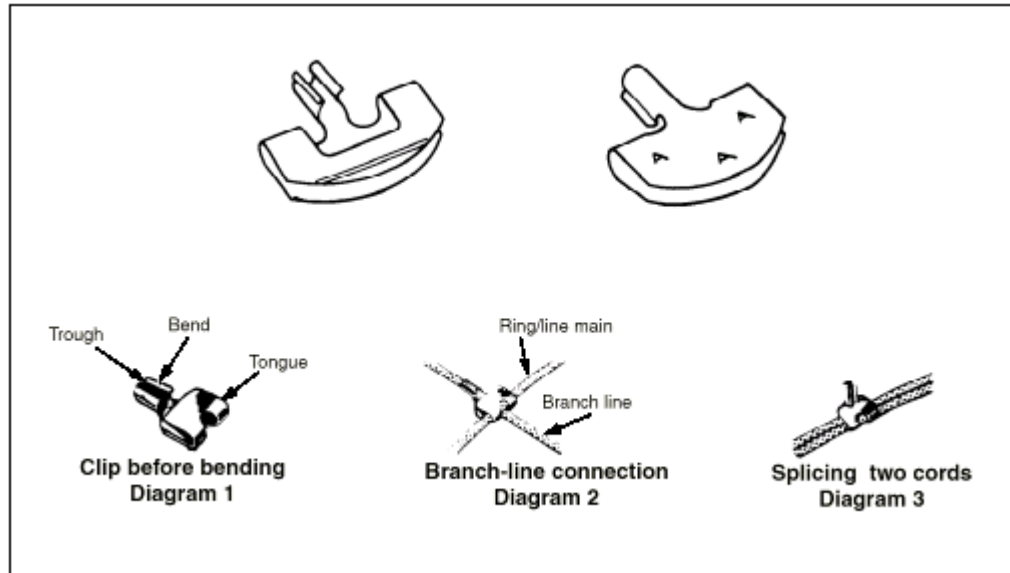
c. Crimping Detonating Cord to a Blasting Cap. When crimping detonating cord to a blasting cap, follow standard crimping procedures. Detonating cord crimped to a blasting cap is known as sensitizing detonating cord.



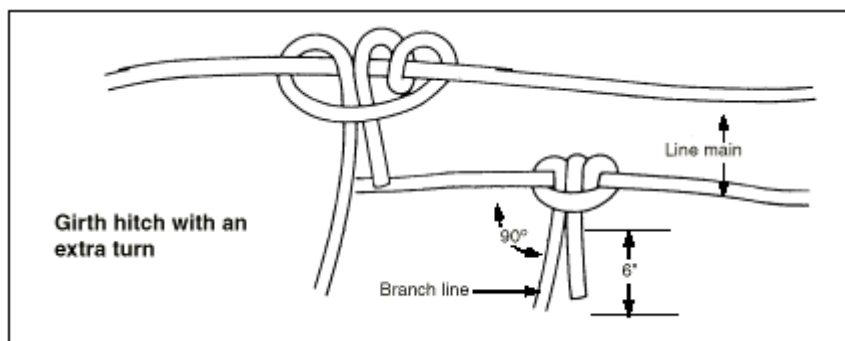
3. CONNECTING THE DETONATING CORD TO DETONATING CORD. Use square knots or detonating cord clips to splice the ends of detonating cord. Always reinforce the splice with tape. Do not splice detonating cord of branch lines. Allow 6-inch tails on square knots to prevent misfires from moisture contamination.

a. Splicing

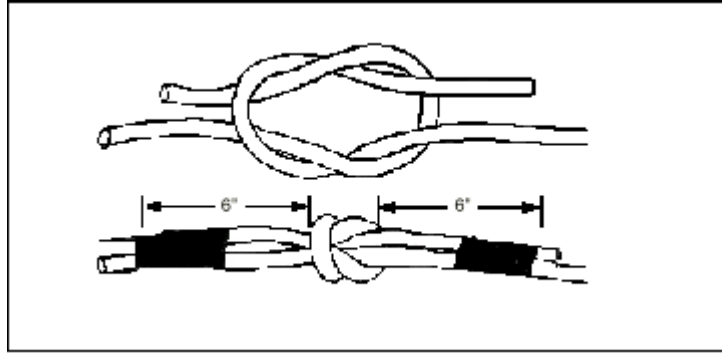
(1) Splicing with the M1 Detonating Cord Clip. Splice the ends of detonating cords by first overlapping them approximately 12 inches. Then secure each loose end to the other cord by using a clip. Bend the tongues of the clips firmly over both strands. Make the connection stronger by bending the through end of the flip back over the tongue.



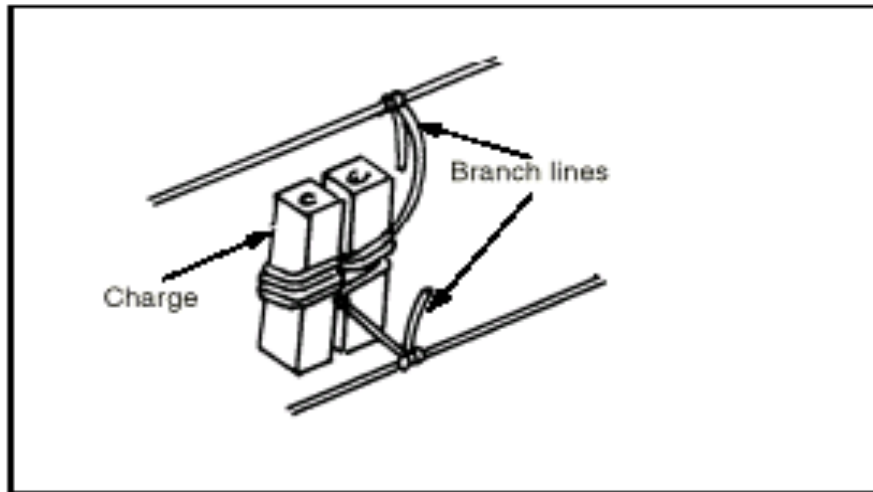
(2) Splicing with a Girth Hitch with an Extra Turn. To construct a girth hitch with an extra turn, you will use the branch line as the running end of the knot. Make a single wrap over the main line so that the running end is on the outside of the branch line. Wrap the running end over the branch line, and then fold it under the main line. Make two loops over the main line. Then feed the running end through the loop made by the running end over the branch line, so that the running end and the branch line are next to one another. Ensure that there is at least 6 inches of the running end extending past the knot. Pull the knot as tight as possible. Reinforce the knot with tape.



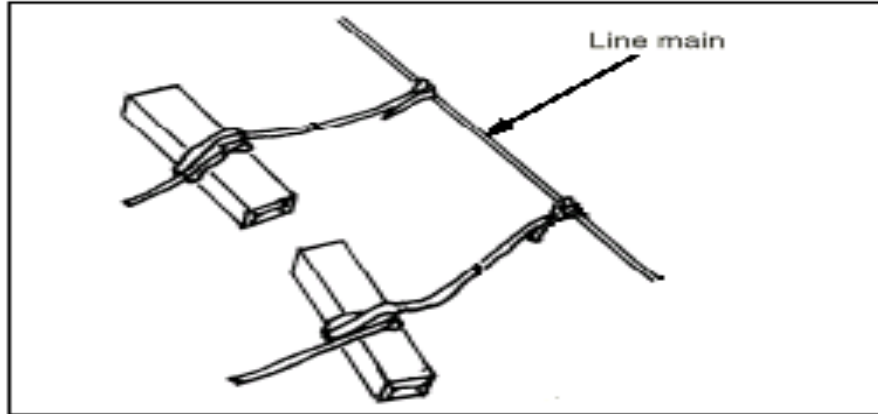
(3) Splicing With a Square Knot. The use of a square knot is an excellent way to join pieces of detonating cord together and as a splice for branch lines. A square knot can be used under water or under ground as long as the initiation comes from a dry end or above ground. Ensure that you leave 6 inches of tail beyond the knot.



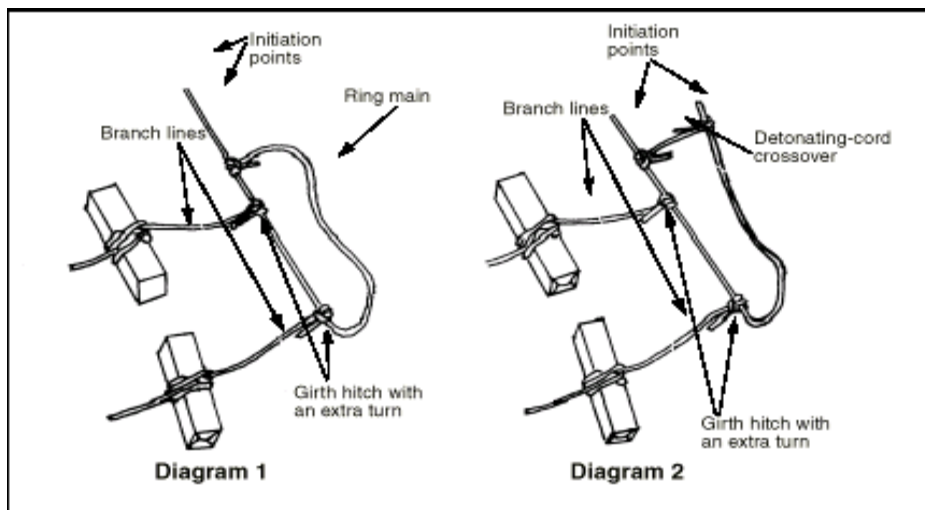
b. Branch Line. A branch line is a length of detonating cord between the charge and the firing system. Attach branch lines to a detonating cord ring or line main to fire multiple charges. Combining the branch line with an initiation set allows you to fire a single branch line. Fasten a branch line to a main line with a detonating cord clip or a girth hitch with an extra turn. The connections of branch lines and ring or line mains should intersect at right angles. If these connections are not at right angles, the branch line may be blown off the line main without complete detonation, leave at least 6 inches of the running end of the branch line beyond the tie. It does not matter which side of the knot the 6-inch tail is on at the connection of the ring or line main.



c. Line Main. A line main can fire a single charge or multiple charges, but if a break in the line occurs, the detonating wave will stop at the break. When the risk of having a line main cut is unacceptable, use a ring main. Use line mains only when speed is essential. You can connect any number of branch lines to a line main. However, you connect only one branch line at any one point unless you use a British junction.



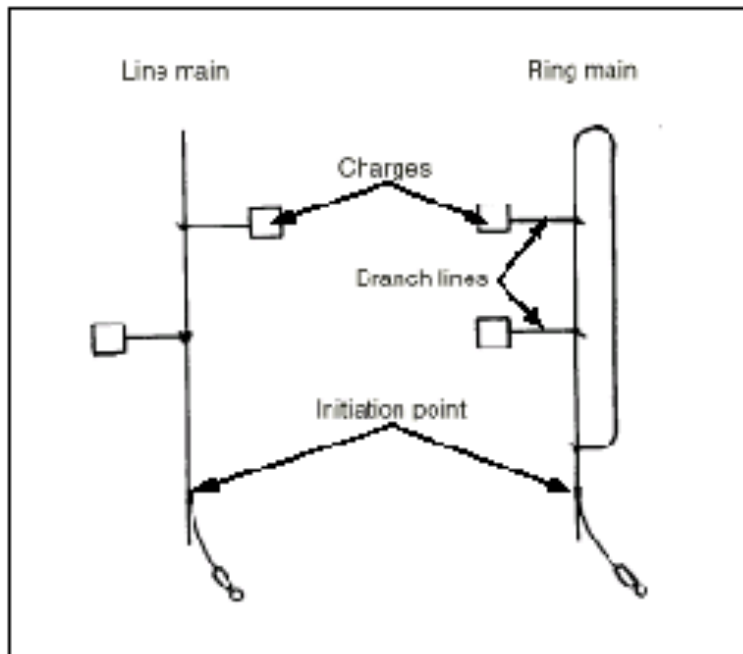
d. Ring Main. Ring mains are preferred over line mains because the detonating wave approaches the branch lines from two directions. The charges will detonate even when there is a break in the ring main. A ring main will detonate an unlimited number of charges. Branch line connections to the ring main should be at right angles. Kinks in the lines should not be present. You can connect any number of branch lines to the ring main; however, never connect a branch line where the ring main is spliced. When making branch line connections, avoid crossing lines. If a line crossing is necessary, provide at least 1 foot of clearance between the detonating cords. Otherwise, the cords may cut each other and may destroy the firing system.



4. TYPES OF DETONATING CORD FIRING SYSTEMS. Firing systems do not include the initiation set(s) or the charges in which they are to detonate. When dealing with detonating cord firing systems, always avoid kinks, sharp bends, and unintended crossovers in the detonating cord.

a. Single Firing System. Each charge is single primed with a branch line. The branch line is tied to the line main or ring main. Tying to the ring main is preferred, but construction of a ring main may not be possible because of the amount of detonating cord. The ring main decreases the chances of a misfire, if a break or cut occurs anywhere

within the ring main. The electric, nonelectric, or combination initiation sets are then taped onto the firing system is always the primary means of initiation. When using dual, nonelectric initiation sets, the shorter time fuse is the primary initiation set. To prepare a single firing system you would wrap and secure detonating cord around each charge. Lay out a length of detonating cord that is sufficient enough in length to connect all of the charges. Connect each primed charge to the length of detonating cord using square knots or detonating cord clips and reinforcing each splice with tape. Then attach an initiation set to the firing system. Finally, seek cover and detonate the charge(s).

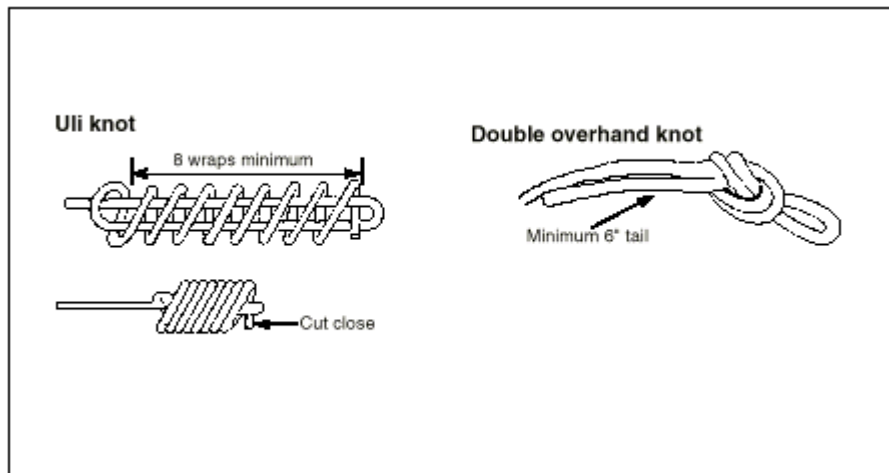


5. PRIMING A CHARGE WITH DETONATING CORD. Detonating cord can be used as an effective primer in situations when a blasting cap may not be available. Detonating cord priming is the preferred method for priming all charges, excluding shaped charges that require direct insertion into the charge, since it involves fewer blasting caps. It also makes priming and misfire investigation safer, and allows charges to be primed at state of readiness (when placed on a reserve demolition target or mission). There are two methods used when priming a charge with detonating cord; a wrap and a knot.

a. Detonating Cord Priming Knots

(1) Uli Knot. To make an Uli knot, form a loop at the end of the detonating cord. With the running end, begin wrapping the detonating cord around the loop. Ensure that you make a minimum of 8 wraps around the loop. Once you have an adequate number of wraps, feed the running end through the end of the loop and tighten the knot down.

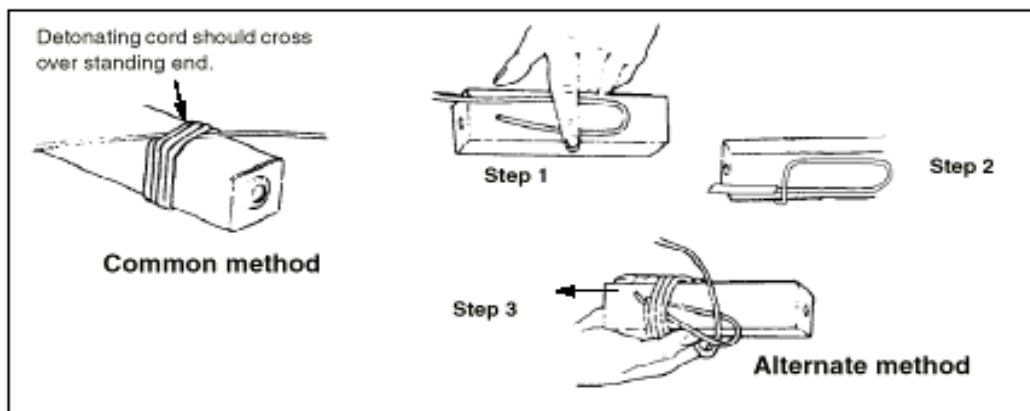
(2) Double Overhand Knot. To make a double overhand knot, make a loop at the end of the detonating cord. With the loop, make an overhand knot.



b. Priming With a Detonating Cord Wrap

(1) Common Method. Lay one end (1 foot length) of detonating cord at an angle across the explosive. Then, wrap the running end around the charge three times, laying the wraps over the standing end. On the fourth wrap, slip the running end under all wraps, parallel to the standing end and draw the wraps tight. This forms a clove hitch with two extra turns.

(2) Alternate Method. Place a loop of detonating cord on the explosive, leaving sufficient length on the end to make four turns around the charge and loop with the remaining end of the detonating cord. When starting the first wrap, ensure that you immediately cross over the standing end of the loop, working your way to the closed end of the loop. Pass the free end of the detonating cord through the loop, and pull it tight. This forms a knot around the outside of the charge.



6. DETONATING CORD MISFIRES. If a misfire occurs after attempting to fire the demolition, delay investigating any detonation problem for at least 30 minutes plus the time remaining on the secondary initiation set. Sometimes, tactical conditions may require an investigation before the 30-minute limit.

a. Misfired Charges Primed With Blasting Caps. If the misfired charge is above ground and primed with blasting caps, you should place a primed 1-pound charge next to the misfired charge and detonate the new charge. Each misfired charge or charge separated from the firing circuit that contains a blasting cap requires a 1-pound charge for detonation. Do not touch misfired charges that contain blasting caps; those charges must be destroyed in place.

b. Misfired Charges Due to Detonating Cord Failure. If a misfire has occurred where the blasting cap failed to initiate the detonating cord branch line, line main, or ring main, you should attach a new blasting cap to the remaining detonating cord. If the blasting cap fails to detonate, cut the misfired initiation set off between the blasting cap and the charge, and reattach a new initiation set. Ensuring that the new blasting cap is secured properly, move to a covered position, and detonate the charge.

c. Misfired Charges That Are Buried. In order to detonate a buried charge, you must remove the tamping to within 1 foot of the misfired charge. Constantly check the depth while digging to avoid striking the charge. When you are within 1 foot of the misfired charge, place a primed, 2 pound charge on top of the original charge and detonate the new charge. If digging over the original charge is impractical, dig a new borehole of the same depth beside the original hole, 1 foot away. Place the primed, 2 pound charge in the new hole and detonate the new charge.

REFERENCES. FM 5-250, Explosives and Demolitions, Pages 1-16 through 1-17, 2-25 through 2-33, 6-3 through 6-4, and 6-12.