GENERIC SOPs

CHAPTER 10: DESTROYING MINES AND ERW

Date:

The procedures for neutralising and rendering safe mines described in this Chapter should not be adopted without thoroughly checking them to confirm their accuracy. The mines described should be extended to cover all those mines present in the country of operation.

CHAPTER 10: DESTROYING MINES AND ERW

Contents

1. Destroying mines and ERW

Destroying mines and ERW where they are found often reduces operational efficiency so mines and ERW may be moved for later demolition when it is safe to do so. Mines and ERW can only be moved by qualified EOD Operators. The EOD Operator must have been trained to assess the mines and ERW so that they can decide which are safe to handle.

When there is any uncertainty, mines and ERW should be pulled before being handled. This will ensure that they are not booby trapped. When there is total confidence that pulling is not necessary, it need not be conducted.

EOD Operators should not touch mines or ERW that they cannot identify as being among those they have been trained to move or render safe. When any mine or ERW is damaged or unstable, it should be destroyed without moving it.

When mines and ERW are safe to move or can be safely neutralized or disarmed before being moved, EOD Operators should move them to designated Collection Areas inside the Task site. If there is no designated Collection Area for mines and ERW that have been discovered and moved, all mines and ERW should be destroyed where they are found on the day when they were found.

When mines and ERW are not safe to be moved and cannot be rendered safe to move, EOD Operators must destroy them without moving them. Mines and ERW that cannot be moved will normally be destroyed at the end of each day or at a time directed by the Task Supervisor.

All mines and ERW moved from the Task site to Collection Areas should be destroyed on the same day unless specific safety concerns or lack of demolition explosives/materials prevent this.

Mines may be destroyed by:

1. Explosive demolition using explosive charges;
2. In controlled fires;
3. With chemical burning powder and igniters; or
4. With flares and directed chemical burns or with proven gas burning methods.

When the procedures for using these are not described in this SOP, approved procedures must be added before the method is used.

When mines or ERW are not destroyed on the day they are found, the Task Supervisor must ensure that the mines and ERW are stored in a safe way. When necessary, a guard must be posted.

Before any mines are destroyed, the Task Supervisor must be told the place and time it will take place. The Task Supervisor should also be told the quantity and types of mine and ERW that will be destroyed. The Task Supervisor should liaise with the local authorities and the Programme Manager about destroying mines by demolition or by burning.

2. Safety-distances

Safety-distances for demolition using explosive charges are much greater than the working-distances used during manual demining operations. Demolition safety-distances are given in Chapter 2, Part 7 of these SOPs.

When a device has been separated from its fuze and detonator(s), the risk of a high-order detonation has been removed and safety-distances can be much shorter than when the device may detonate as designed.

The procedures in this SOP allow for mines and ERW to be destroyed by burning in fires, or using a chemical burning powder. Some will have been rendered safe before destruction, others may have

been moved for destruction while still intact. The safety distances required when burning mines and ERW are given below.

2.1 Safety-distances when burning unfuzed mines and ERW

When burning unfuzed mines and ERW, the demolition staff must be EOD Operators trained in the identification of the devices being destroyed.

The safety constraints in the detailed procedures described in this Chapter must be followed.

Safety-distances imposed during burning in a fire or with chemicals are given below. These distances should be applied when the mines or ERW are not fuzed and do not contain detonators.

NOTE: *When a device may be fuzed or contain a detonator, the fuzed safety-distances in Part 2.2 must be used.*

Burning in a controlled fire		
Unfuzed mines	Minimum burning safety-distance (distance in metres)	
	Burning Team	**Other staff**
Separated mine bodies	10	50
Separated ERW bodies	25	100
Separated mine fuzes	15	50
Separated ERW fuzes	25	100
Burning with Chemical Deflagration System (CDS)		
Unfuzed ordnance/ERW	Minimum chemical burning safety-distance (distance in metres)	
	Burning Team	**Other staff**
Separated ERW bodies	25	75
Separated ERW fuzes	40	120
Notes to table: 1. Recommended minimum distances are for burning staff wearing IMAS 10.30 compliant PPE and other staff not wearing PPE. 2. The distances shown are between the site of the chemical burn and the position of staff at the time of destruction, not distances between demining staff. 4. Multiple unfuzed devices without detonators may be destroyed in a single fire.		

2.2 Safety-distances when burning fuzed mines and ERW

When burning fuzed mines and ERW, the demolition staff must be EOD Operators trained in the identification of the devices being destroyed. Generally the Burning Team Controller (BTC) must be the only person to start the fires or initiators used when burning fuzed mines and ERW.

The safety constraints in the detailed procedures described in this SOP must be followed.

Safety-distances imposed during burning in a fire or with chemicals are given below. These distances should be applied when the mines or ERW are fuzed and/or contain detonators.

Burning in a controlled fire		
Fuzed mines	Minimum burning safety-distance (distance in metres)	
	Burning Team	**Other staff**
AP blast mines in burning cones	30	60
Single AT blast mines in pits	75	150
Burning with Chemical Deflagration System (CDS)		
Fuzed Ordnance/ERW (burned one at a time)	Minimum CDS safety-distance (distance in metres)	

	BTC	Other staff
Fragmentation mines	50	100
Shell up to 160mm	200	500
Shell above 160mm	300	600
Mortar up to 120mm	200	500
AT Rocket up to 88mm	150	250
Hand/rifle Grenade	40	100
Buried charges of up to 10kg	75	150
ERW	40	120

Notes to table:
1. Recommended minimum distances are for burning staff wearing IMAS 10.30 compliant PPE and other staff not wearing PPE.
2. The distances shown are between the site of the chemical burn and the position of staff at the time of destruction, not distances between demining staff.
4. Multiple unfuzed devices without detonators may be destroyed in a single fire.

2.3 Control of entry into demolition areas

When demolitions are being conducted, they must be complete confidence that people and livestock will not enter the danger area.

During demolition by explosion, a perimeter guard that is further away than the safety-distances listed in Chapter 2, Part 7 must be established.

During demolition by fire or chemical burning, a perimeter guard that is further away than the safety-distances listed in Parts 2.1 and 2.2 in this Chapter must be established.

During all demolitions, sentries must be posted to ensure that no animals or people can enter the area. Sentries should have communication with the EOD Operator controlling the demolition. When electric detonators are not used, this may be by whistles, radios or reliable telephones. Electrical communications equipment should not be used close to any electrically initiated detonators.

Warning signs must be placed on all routes around the Demolition area unless a sentry is placed at that point. A sentry must be placed on frequently used routes.

The Platoon MRE and Community Liaison officer should ensure that all local people know that the demolition(s) will take place and that they understand the need to keep away from the area.

3. Explosive demolition of mines and ERW in-situ

When necessary, mines and ERW will be explosively demolished in-situ by EOD Operatives under the direction of the Platoon Commander, Platoon Supervisor or Task Supervisor (all of whom should be EOD Level 3 qualified.

Demolition in-situ can be conducted using explosive charges or using the Chemical Deflagration System described in Part 7 of this Chapter.

3.1 General safety precautions

The minimum number of people should be involved during the preparation and use of explosive charges. All other staff should remain at or beyond the safety-distance until the EOD Operator instructs otherwise.

During explosive demolitions, sentries must be posted to ensure than no people or livestock enter the safety-distance before the all-clear is announced.

The following additional rules always apply:

1. Smoking within 30 metres of High Explosive is forbidden;

2. Detonators must be handled carefully and kept separate from explosives (including detonating cord) until such time as they are used in the planned firing circuit;
3. Detonators must not be left unattended in the field at any time;
4. Detonating cord must be treated as an explosive;
5. Safety-fuse must be protected from rain and dampness at all times;
6. Electrical firing cable should be a minimum of 100 metres long, two-strand cable and must always be tested for continuity and discontinuity before use;
7. The minimum safety-distance applicable to the mines/ERW being destroyed must be maintained at all times;.
8. Sandbags may be used to reduce the effects of any shrapnel or fragmentation; and
9. After demolitions, the EOD Operator must check that all charges have fired correctly before announcing the all clear.

3.2 Making controlled demolitions

A senior EOD Operator (EOD Level 3 or 4) must be responsible for the safe and correct conduct of explosive demolitions. This Operator must control and brief any deminers involved in preparation for the demolitions. Staff involved in the preparation and conduct of the demolition must have the appropriate experience to carry out the work safely.

The senior EOD Operator shall be responsible for ensuring that the following actions are carried out:

1. All staff are instructed that no radios are to be used within 50 meters of exposed electric detonators;
2. Sentries must be briefed about their duties;
3. All equipment not required for the conduct of the demolition must be moved away from the demolition;
4. Clearance and access lanes must be free from obstructions;
5. A communication system must be issued to sentries and tested;
6. All staff not involved in the conduct of the demolition must withdraw to the appropriate safety-distance;
7. All equipment required for the demolition must be tested and working properly;
8. Sandbags must be available when required;
9. Cables must be correctly laid out when used;
10. Transportation of explosives and demolition accessories from the temporary Explosive Storage area to the place where they will be used must be conducted safely; and
11. Charges must be correctly positioned and connected to the firing circuit (electric or non-electric).

The senior EOD Operator should inspect the prepared demolition to verify that it has been prepared correctly. The senior EOD Operative should then confirm that the area is secure before giving the EOD Operator permission to continue.

The EOD Operator should conduct the demolition in this sequence:

If the demolition is electric:

1. Connect the detonator to the firing cable, then to the detonating cord;
2. Confirm with sentries that the area is secure;
3. Give a loud verbal warning; and
4. Initiate the demolition.

If the demolition is conducted using safety-fuse:

1. Push the detonator into the charge or attach it to a detonating cord trunk-line;
2. Prepare the lighter or matches that will be used to light the fuse;
3. Confirm with sentries that the area is secure;
4. Give a loud verbal warning; and
5. Light the fuse and walk to a safe position.

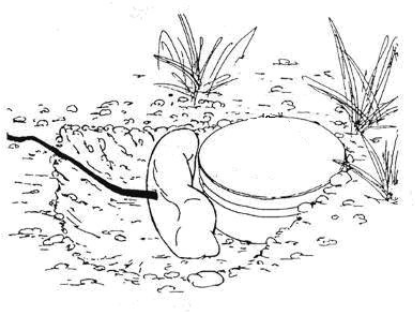
Until the “All Clear” command is given, everyone except the EOD Operator must remain at the safety-distance.

The EOD Operator should wait at least ten minutes after the last signs of smoke or burning have stopped, or from the time of the demolition, whichever is the longest. The EOD Operator should then approach the demolition site to ensure that the item(s) have been destroyed and no hazards remain. When this is confirmed, the EOD Operator should give the “All Clear” command and ensure that the senior EOD Officer is informed. The Senior EOD Officer should inform the Task Supervisor.

3.3 Conducting explosive demolitions of mines in-situ

Generally, charges must be placed as close as possible to a device without moving it. They should also be positioned to direct the blast into the ground or into an unclear area so that metal contamination of Cleared areas in avoided. The use of sandbags to contain blast and fragmentation should be considered.

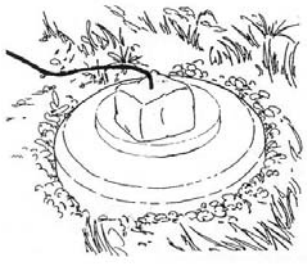
Explosive charges for anti-personnel blast mines and bounding mines should be placed next to the mine as shown below. Partly filled sandbags may be used to hold the demolition charge in position when this is considered safe.

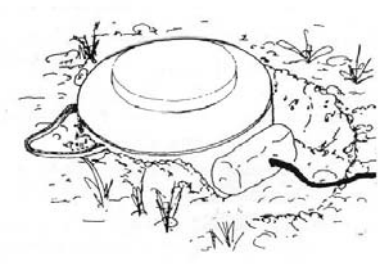


When tripwires are present, they should be cut after the fuze has been pinned (when possible) and before placing any barrier of sandbags. After tripwires have been cut, adhesive tape may be wound around the fuze to hold the pin in place.

When sandbags are used, they should be placed at least 20cm from the mine. The minimum number of staff should be used to place sandbags.

The charge for anti-tank mines should be placed next to the mine or on top of the mine as shown below, unless previous damage to the mine would make this unsafe. Part-filled sandbags may be used to hold the demolition charge in position when necessary.





3.4 Conducting explosive demolition of ERW in-situ

ERW that is not damaged may be moved unless it cannot be identified or falls into a no-touch category. The EOD Operator must ensure that no unrecognised device is touched until it has been identified and the EOD Operator is confident that it is safe to do so. Unidentified ERW may be destroyed in-situ even if it appears to be in good condition.

The destruction in-situ of the following items may be considered by the EOD Operator in consultation with the Senior EOD staff.

1. Shells or bombs over 82mm in diameter;
2. All rockets;
3. Any projectiles fired from disposable anti-tank weapon systems;
4. Sophisticated or unidentified UXO; and
5. UXO suspected of containing a Piëzo-electric or a graze fuze.

Safety-distances for ERW demolitions are given in Chapter 2 of these SOPs.

3.5 Demolition of misfires

Care must be taken to ensure that all explosive demolitions are detonated successfully. When a demolition is unsuccessful, it is called a “misfire”.

There are two types of misfire, each with a minimum wait-time which must always be observed. The wait-times are:

- Non-electric detonators — 30 minutes;
- Electric detonators — 10 minutes.

3.5.1 Non-electric misfire procedure

The following actions must be carried out when there is a non-electric misfire:

- Wait 30 minutes under cover or at the safety-distance;
- When approaching the misfire, approach it from the up-wind side if possible; and
- Look for any smoke coming from the safety-fuse. If there is smoke, return to cover and wait an additional 30 minutes.

Evaluate the situation and handle the misfire in accordance with the instructions below.

The following are common reasons for demolition failures when using non-electric methods of initiation. The destruction methods for these misfires are also explained.

Failure of the detonator(s)

1. The detonator may be unstable. Do not move the detonator or explosive charge.
2. Prepare a new charge in a safe area.
3. Connect a new detonator to an appropriate length of safety-fuse (minimum length of one metre).
4. Position the new charge close to the misfired charge.
5. Connect the new detonator to the new charge using detonating cord where appropriate.
6. Light the safety-fuse.
7. Walk back to a safe area.

Failure of the detonating cord or safety-fuse

If the failure is because the detonating cord was cut or the safety-fuse did not burn, the misfire is normally dealt with by attaching a new initiating set to the same explosive charge.

Follow this sequence:

1. Retrieve the explosive charge.
2. Connect new detonating cord to the misfired charge.
3. Connect a new detonator to a minimum length of one metre of safety-fuse.
4. Tape a new detonator to the new detonating cord.
5. Reposition the charge.
6. Light the safety-fuse.
7. Walk back to a safe area.

Failure of the High Explosive charge

In there has been a partial explosion, gather all scattered fragments of explosive and detonate them by placing a fresh charge alongside them. If necessary, place them underneath a filled sandbag or in a hole to prevent the pieces of explosive being scattered again by the blast from the new charge.

Follow this sequence:

1. Dig a hole large enough to take the failed explosives.
2. Gather the failed or broken-up explosives and place them in the hole.
3. Prepare a new charge and initiation set in a safe area.
4. Place the new charge on top of the failed explosives.
5. Light the safety-fuse.
6. Walk back to a safe area.

3.5.2 Electrical misfires

In the event of an electrical misfire, follow this sequence:

1. Check the firing cable for continuity.
2. Make another attempt to fire the charge.
3. If the charge still does not fire, wait 10 minutes.
4. Reel out a second cable.
5. Prepare a new charge.
6. Place the second charge as close to the misfired charge as possible without touching it.
7. Walk back to a safe area.
8. Fire the demolition.

4. Demolition explosives and accessories

Only explosives and demolition accessories in good condition can be used for the explosive demolition of mines and ERW.

All safety-fuse must be tested by burning a measured length before it is used.

Wire used in electrical initiation systems must be tested as described in Part 4.4.2 below.

4.1 Detonators

The following safety precautions must always be observed when using detonators.

1. Detonators must be handled with care at all times and never left unattended when out of their containers.
2. Detonators must be removed individually from their container.
3. When the required numbers of detonators have been removed from their container, the cover of the container must be replaced immediately.
4. When a detonator is not issued in a special container, a suitable container must be provided.
5. Detonators must never be carried in the pockets of clothing.
6. Detonators must remain in their containers until they are used.
7. Detonators must be stored separately from all other explosives.
8. The wires on an electric detonator should only be pulled apart enough to allow connection to the firing cable.
9. Electric detonators must be connected to the firing cable before being pushed into the explosive or connected to detonating cord.
10. Detonators must not be buried at any time.
11. Electric detonators should not be used if there is a risk of lightning.
12. When a detonator is inserted directly into a charge, the direction of the detonation shock-wave should be considered. The detonator should normally be inserted into the charge at an angle of 90º to the target.

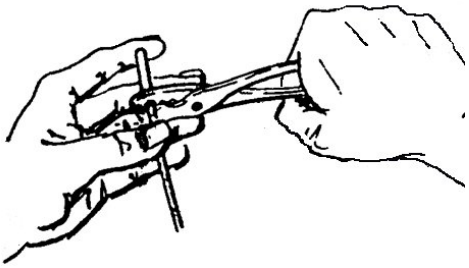
4.1.1 Detonator crimping procedure

Eye protection must always be worn when crimping detonators to safety-fuse.

NOTE: *Never force safety-fuse or detonating cord into a detonator.*

To crimp a detonator to safety-fuse, follow this procedure:

1. Calculate and cut the length of the safety-fuse and ensure that the end to be inserted into the detonator is cut square.
2. Before taking detonators from containers, the EOD Operator must “ground” himself by placing all fingers of one hand on the ground for several seconds to remove any static electricity.
3. Select a detonator from the container and hold it by the open end.
4. Inspect the open end of the detonator to confirm that it is free from dirt and obstructions. Detonators which are blocked should be destroyed.
5. Slide the open end of the detonator down over the safety-fuse until the safety-fuse is in contact with the detonator filling. Hold the safety-fuse with the thumb and middle fingers and apply a light pressure downwards to hold the detonator in position with the tip of one finger.



6. Place the crimpers around the detonator opening approximately 5 – 10mm from the open end (where the safety-fuse is inserted into the detonator).
7. Close the crimper jaws with just enough pressure to hold the detonator and safety-fuse together.
8. To prepare the final detonator crimp to the safety-fuse, hold the detonator and the crimpers in front of the body. With the sealed end away from the body, raise the hands above eye level and lightly squeeze the crimpers. Look at the crimpers and make sure that they are in the right position. While doing this, shout “crimping” in a loud voice.

Wear eye protection and do not look away during the crimping procedure.

After crimping is completed, remove the crimping tool from the safety-fuse and inspect the detonator to ensure it is firmly attached to the safety-fuse.

4.2 Safety-fuse

A safety-fuse is used to ignite a detonator that will detonate a high explosive charge. There is a delay between the time of lighting the safety-fuse and the initiation of the detonator. The delay enables the EOD Operator who lights the fuse to move to a safe position before the detonator detonates.

The following procedure must be used to test the safety-fuse before it is used:

1. Cut off the first 300mm and destroy it by burning.
2. Cut off another 300mm of the safety-fuse and time how fast it burns by lighting one end and timing how long it takes to burn through to the other end. If this time is within the manufacturer’s specifications, the coil of safety-fuse can be used.
3. If the burning time is outside the manufacturer’s limits, the coil of safety-fuse is unreliable so it should be destroyed as soon as possible.

The last 300mm of any safety-fuse coil must be destroyed by burning.

When the burn rate for 30cm of safety-fuse is known, it should be divided by three to give the burn rate of 10cm of fuse. The answer should be multiplied by 10 to give the burn rate for 100cm of fuse.

Having established the time it takes for a metre of fuse to burn, the EOD Operative should walk the distance between the charge and the safe place he/she will use during the demolition. He/she should time how long it takes to walk this distance.

The EOD Operative can then calculate the length of fuse that is needed to allow time to walk to the safe place. This can be done using this formula.

WS / BT + 0.3 = Length of safety-fuse in metres.

WS stands for the number of seconds it takes him/her to walk from the firing pit to the safe place.

BT stands for the actual Burn Time of 100cm of the safety-fuse (in seconds).

The 0.3 represents an additional 30cm of fuse which will be a safety factor.

For example: WS = 130 seconds. BT= 110 seconds per metre. So the formula becomes:

130 / 110 + 0.3 = 1.48 metres.

A length of 1.48 metres of safety-fuse should be used.

The minimum length of safety-fuse to be used for a demolition is one metre.

The end of the fuse inserted into the detonator must be cut off squarely at an angle of 90° using a sharp knife.

Before a detonator is inserted into the safety-fuse, the EOD Operative must ensure that all other staff are at a safe distance. The detonator should be crimped as described in Part 4.1.1 of this Chapter.

Care shall be taken to protect the safety-fuse against rain and dampness. Safety-fuse should only to be cut from the coil when it is needed.

If a new coil of safety-fuse is damaged, the content must be examined carefully and any damaged lengths should not be used.

Care must be taken to ensure that the fuse length does not curl back when it is laid out ready for use. If the safety-fuse curls back there is a risk that a flash transmission may cause a premature explosion. Curling can be avoided by gently placing sticks or small stones on top of the safety-fuse. Do not place items heavy enough to crush the fuse on top of it.

4.3 Explosive charges

Where several separate explosive charges are required to destroy several different targets, the charges can be connected to a single initiation point. This is normally done by connecting the charges with detonating cord. A main-line system is normally used. A main-line system has one main-line of detonating cord with branch-lines of detonating cord used to link the main-line to each explosive charge.

When preparing charges, only staff necessary for the preparation should be present. All other staff must stay at a safe distance.

Charges must always be placed as close to the target as possible. Partly filled sandbags may be used to hold the charge in place and to deflect the blast when required.

Charges may also be initiated using detonating cord. The end of the detonating cord should be tied with a double knot. Plastic explosive is then moulded around the knot to bury it inside the explosive.

4.4 Electric initiation of an explosive demolition

The following safety precautions must be used during demolitions that are initiated electrically.

1. Before connecting detonators to a firing cable, all VHF radios and mobile telephones must be switched off.
2. Before handling electric detonators, the EOD operator must “ground” himself to remove any static electricity.
3. Only approved electrical accessories can be used.
4. Never connect detonators to a firing cable when the wires at the other end of the cable are not twisted together (shunted).
5. Never leave detonators un-shunted unless actually testing or connecting to firing cable.
6. The EOD Operator in charge of the demolition should keep the blasting machine or exploder with him/her at all times.
7. The exploder or blasting machine should not be connected to the firing cable until the EOD Operator is told that the safety cordon is in place.
8. Precautions against electromagnetic radiation hazards must be taken during the preparation for the demolition.

4.4.1 Electromagnetic Radiation (EMR) Hazards

An electric current induced by electromagnetic waves can fire electric detonators accidentally. Radio transmitters, radar sets and electrical machinery including vehicles, may cause induced currents. The current may be induced in the firing circuit as a whole, in part of the circuit, or in the leads of a detonator. It is not necessary to have continuity in a circuit for it to be affected by electromagnetic hazards.

The danger of accidental firing occurs when a circuit, or part of a circuit, acts as an aerial and picks up energy from radio or other electromagnetic waves. The danger is greatest when part of the circuit of the correct length and configuration becomes resonant to the frequency of the transmitter by coincidence. Because the critical lengths and configurations vary with the frequency, power and direction of the transmitter, a circuit that is safe at one frequency may fire when a radio changes frequency or is moved to another location.

Avoid circuit configurations which tend to act as aerials. This will reduce the danger of accidental firing.

Examples to avoid are:

1. Knots and loops in firing cables.
2. Untwisted double cable.
3. Separated ends of firing cable at the firing point (wide separation of the leads during a discontinuity test).
4. Detonators taken from the same strand of double cable. A contributing factor is the number of detonators in a circuit - the fewer the better so do not connect more than one detonator to a firing cable.
5. A detonator with one lead connected to a circuit that is held by a person who acts as an aerial.

When there are possible electromagnetic radiation hazards, the safest possible demolition circuit is one where a single electric detonator with completely twisted leads (two twists to each 25mm) is connected to the end of one continuous double twisted firing cable. The firing cable should have at least 60 complete twists per metre. The leads at the firing point should not be parted more than necessary to achieve connection.

If detonators are issued with untwisted leads, they should be twisted over their entire length at two twists in each 25mm.

Test the firing circuit for continuity and discontinuity after it is laid out. Before the circuit is connected, the following components should be checked and tested individually and separately.

Test the:

1. exploder or blasting machine for power;
2. electric cables for continuity and discontinuity; and
3. detonators for continuity.

4.4.2 Tests of Electrical Cable

Electrical cable should be inspected for damage before use. This should be carried out before continuity and discontinuity tests. Cables must always be tested for continuity and discontinuity prior to use. To do this:

1. Connect the ends of the cable to the terminals of the ohmmeter or test-set.
2. Separate the leads at the far end of the cable. Signal to the assistant that this has been done by showing hands separated above the head. The assistant at the far end should repeat the hand-signal to confirm that he/she has seen it. If the ohmmeter gauge reads a fault, there is discontinuity in the cable.

3. Join together the leads at the far end of cable. Signal that this has been done by showing hands brought together above the head. The assistant at the far end should repeat the hand-signal to show that he/she has seen it. If the ohmmeter gauge reads between 0 and 300 Ohms, continuity is present in the cable.
4. If continuity is present, signal the assistant by moving a hand in a circular motion and then touching the ground. This signals the assistant at the far end to check that the leads are twisted together and place them into the earth in order to ground the circuit.

4.4.3 Connecting Electric Detonators

The following procedure must be used when connecting an electric detonator to a firing circuit:

1. Place the detonator on the ground beneath a sandbag or shock-absorbing object.
2. Untwist the demolition cable leads enough to allow them to be joined to the detonator leads.
3. Wind one lead wire of the detonator on to each of the demolition cable leads. Then bend each cable lead back onto itself.
4. Cover each connection with adhesive insulating tape.
5. Tape the electric detonator onto the detonating cord or push it into the explosive charge.

Electric detonators must be connected to the firing cable before they are inserted into the explosive or connected to detonating cord.

Connections must be taped together so that twists of the detonator leads continue smoothly into the twist of the firing cable.

4.5 Detonating-cord firing systems

When firing more than one explosive charge during demolition operations, electrically initiated firing systems should be used whenever possible.

A main-line and branch-line firing system should be used. This comprises a main-line of detonating cord onto which a number of branch-lines are connected. The main-line is initiated with an electric detonator.

4.6 Storing High Explosive material

Explosives and ancillary equipment stored at the Task site must be kept in lockable containers with detonators separated from high Explosive by a wall of sandbags or similar material. A “No Smoking” sign must be placed at the entrance to the temporary storage area.

During daily use, boxes which contain high explosive material must not also contain detonators or detonation cord. All detonation equipment must be stored and carried in separate containers.

The EOD Operator must control the use of explosive and all related equipment. After demolitions, the EOD Operator must report the quantity used and the purpose for which it was used to the Senior EOD Operator or the Platoon Commander. The Platoon Commander will inform the Task Supervisor who will liaise with the Programme Manager’s office to ensure that no explosives or ancillary equipment are unaccounted for, and to arrange for resupply as required.

4.7 Transporting explosive materials

The Programme Manager is responsible for ensuring that all procedures and standards for the movement of High Explosives and ancillaries are obeyed. The Senior EOD Operator appointed by the Task Supervisor must ensure that:

1. An appropriate vehicle is designated to transport the explosives.

2. The explosives are secure from theft and tampering in the transport vehicle.
3. The explosives are transported according to the manufacturers' instructions and specifications.
4. When it is necessary to transport passengers in the same vehicle as the explosives, the EOD Operator must be in the same vehicle and in charge of the explosives.
5. That detonators and explosives are not transported on the same vehicle, unless the detonator storage container meets the minimum design requirement as stipulated in IMAS 10.50.
6. That no material is loaded on top of the portable detonator container.
7. That the detonator container is secured to the vehicle to prevent movement during transport.
8. That the vehicle has 2 x 9 litre (or bigger) water fire extinguishers on board.
9. That the vehicle has a container for storing radios, cellular phones, smoking materials, matches, lighters cigarettes etc.
10. That the vehicle has hazard warning signs and a red flags displayed at all four corners of the vehicle when required by the NMAA.

4.7.1 Rules for driving with HE and ancillaries

The Driver, EOD Operator and a Security Guard (when security is an issue) are generally the only staff allowed in the vehicle.

All staff involved in transporting High Explosives and ancillaries must have had adequate training in both hazardous load handling and emergency procedures.

Vehicles should travel with a minimum safety-distance of 100 metres between them when in convoy and at a speed not exceeding 60 km per hour.

Where possible, routes should be selected to avoid areas that are heavily populated.

The EOD Operator and driver must have written instructions covering the procedures to be followed in the event of an accident.

It is the Drivers responsibility under supervision of the EOD Operator to ensure that:

1. boxed explosive is evenly distributed over the vehicle tray;
2. the load is secure against movement, loss and damage during transit;
3. explosives boxes are stored away from the vehicle exhaust pipes;
4. no smoking is allowed within 20 metres of the vehicle;
5. vehicle radios, hand held radios and cellular phones are switched off in any vehicle carrying electric detonators;
6. rapid acceleration and deceleration is avoided;
7. vehicles carrying explosives are not parked near buildings or in populated areas;
8. vehicles carrying explosives are not left unattended;
9. during loading, unloading and refuelling the hand-brake is applied, the engine switched off, and, if on a gradient, the wheels are blocked with stones or wedges; and
10. fuel is not to be carried anywhere on the vehicle except in the fuel tank.

5. Collection of mines and ERW

Mine and ERW Collection Points must be established at any Task where mines or ERW are moved for demolition. The senior EOD Operator should advise on the positioning of appropriate Collection Points for mines and ERW discovered at a Task site. The Senior EOD Operative or Task Supervisor must ensure that the Collection Points are prepared appropriately. Because the destruction of mines and

ERW is not conducted while work is being conducted inside the SHA/CHA, the Collection Points and the Demolition area can be close to the start-line or base-line. See Chapter 4, Part 3.1.20.

The Collection points are often adjacent to the Demolition Area at a Task, but may be separated when that is most convenient, and must be separated when the Demolition Area is not big enough to ensure that items in the Collection Points are secure during the demolition of other items.

Shallow pits should be prepared for the collected mines and ERW to be placed inside. The pits should be 15cm deep and large enough to allow all mines and ERW to be placed without touching each other.

Separate pits should be prepared for:

1. fuzed mines;
2. fused ERW;
3. Unfuzed mines and ERW;
4. Mine and ERW fuzes.

When the ground is wet and pits would be flooded, a rack above ground should be constructed and the mines and ERW stored on top of it. The rack must be constructed so that devices cannot fall through it or roll off the sides.

A temporary shade should be erected over the area where the mines and ERW are placed.

6. Destroying mines and ERW by burning in fires

There are several methods of destroying mines by burning in a controlled fire. Defuzed blast mines and their separated fuzes can be destroyed by burning in simple fires. Fuzed blast mines can be destroyed by burning in Burning Cones or special pits. Fuzed fragmentation (AG) mines and ERW can be destroyed by chemical burning using the Chemical Deflagration System (CDS) described in Part 7 of this Chapter or by using approved gas or flare systems.

6.1 Mine Burning Team

A Platoon's Mine Burning Team will be led by an EOD Operator assisted by two seconded deminers. All members of a Mine Burning Team must receive comprehensive training before mine burning is conducted.

When burning is to take place, the Task Supervisor must appoint an EOD Operator to act as a Burning Team Commander (BTC).

Burning is conducted in pits in a Demolition Area while no work in being undertaken in the SHA/CHA, and so is generally conducted after normal demining work has finished for the day. The Burning Team must be supported by a Paramedic, and the Task Supervisor must be on duty.

6.2 The burning procedure for unfuzed AP mine bodies

This procedure is used for the controlled destruction of Anti-Personnel mines ***without*** fuzes. AP mines that have not had the fuze removed ***must not*** be included in this procedure. Despite the absence of fuzes, the procedure includes many of the safety requirements necessary when burning mines with fuzes. Variations are kept to a minimum in order to make supervision of the various activities in the demolition area easier.

Mine bodies without detonators or booster charges will burn but will not detonate. Most plastic cased mines burn very well. Bakelite cased mines burn less well.

Up to 50 mine bodies are placed in a 20cm pit on top of sand and inflammable material (often wood shavings) spread with flammable liquid. The Burning Team Commander (BTC) starts the fire (using a torch) then withdraws. When convenient, an oil drum may be used instead of a pit.

The Burning Team should have a fire extinguisher available at the burning pit at all times.

All staff carrying unfuzed mines to the burning pit should wear frontal PPE and eye protection.

The following procedure must be followed:

1. The Burning Team Commander (BTC) orders the collection of mines bodies without fuzes from the Mine/Fuze Collection Area(s) to the Demolition area where a pit has been prepared.
2. The BTC must make an accurate record of the number of the number of mines delivered to the Demolition area.
3. Before the mine bodies are burned, the BTC should inform the Paramedic and the Platoon Commander/Supervisor that he/she will start. The Platoon Commander should inform the Task Supervisor. The Task Supervisor should ensure that a cordon is established to ensure that persons and livestock do not enter the area.
4. The Paramedic should make sure that nobody enters the Demolition area. When necessary demining staff should ensure that persons and livestock do not enter the area.
5. The Burning Team places up to 50 mine bodies on top of the prepared fire in the burning pit. A chemical fire-lighter may be used to start the fire burning.
6. The Burning Team should withdraw a minimum 30 metres.
7. The BTC should starts the fire using a long torch.
8. The BTC should withdraw to 30 metres to observe the burn.
9. After completion The BTC should goes back to the burning pit and check that the mines have completely burned out. This may be done using a light rake.
10. If all the mine bodies have not burned out, the fire should be rebuilt and burned again.
11. The BTC should then inform the Paramedic and the Platoon Commander/Supervisor that the process is complete.
12. The Burning Team should then prepare the burning pit for its next use.

The BTC is responsible for completing the burning record, which must be signed by the Task Supervisor.

6.3 The burning procedure for separated AP mine fuzes

AP mine fuzes include a detonator so can be expected to “pop-off” during the burning process. To ensure that the detonators are all destroyed, it is necessary to burn them separately.

A fire should be started in either an oil-drum, or in a pit that is at least a 1.2 metres square and 60cm deep. When the fire is burning well, a single fuze should be dropped into it by a person who immediately withdraws to ten metres. When multiple pits or oil-drums are prepared they must be at least five metres apart.

The Burning Team should have a fire extinguisher available at the burning site at all times.

All staff moving fuzes must wear frontal PPE and eye protection at all times.

The following procedure must be followed:

1. The Burning Team Commander (BTC) should order the movement of AP mine fuzes from the Fuze Collection Area(s) to the Demolition area where a pit or oil-drum has been prepared. Several pits or drums can be prepared when necessary.
2. The BTC must make an accurate record of the fuzes moved to the Demolition area.
3. Before the fuzes are burned, the BTC must inform the Paramedic and the Platoon Commander/Supervisor that he/she will start. The Platoon Commander/Supervisor must inform the Task Supervisor. The Task Supervisor must ensure that a cordon is established to ensure that persons and livestock do not enter the area.

4. The Paramedic should make sure nobody enters the Demolition area. When necessary, demining staff must ensure that persons and livestock do not enter the area.
5. The Burning Team should prepares the oil-drum(s) or pit(s). Fire-lighters may be used to start the fires burning.
6. When the fire is burning well, a single fuze must be dropped into it by a Burning team member who must immediately withdraw to a minimum of ten metres.
7. After the fuze pops-off, another fuze can be dropped into the fire.
8. If a fuze does not pop-off, the fire should be allowed to burn out and the bed inspected to ensure that the fuze has completely burned out.
9. After completion, the BTC must go back to the fuze burning pits or oil-drums and check that all fuzes have completely burned out. This can be done in pits using a light rake.
10. If any of the fuzes do not burn out, a soak-time of 30 minutes should be allowed before the fire is rebuilt and burned again. No partially burned fuzes should be handled.
13. The BTC must then inform the Paramedic and the Task Supervisor that the process has been completed.
14. The Burning Team should then prepare the burning pits or oil-drums for their next use.

The BTC is responsible for completing the burning record, which must be signed by the Task Supervisor.

6.4 The burning procedure for separated AT mine bodies

This procedure is used for the controlled destruction of Anti-Tank Mines *without* fuzes. It must never be used for fuzed AT mines. AT mine fuzes, included boosters, can be burned as fuzed AP mines. AT mine fuzes with small detonators and no boosters can be burned as AP mine fuzes. Fuze mechanisms without detonators or boosters should also be burned and buried to prevent them being re-used or causing alarm in future.

A group of up to 10 mine bodies should be collected together and placed upside down in a circle in a shallow pit. The pit need only be 20cm deep. The filling caps of the mines must be removed and put aside. TNT must be placed in the centre with the mines' filling cap facing inwards. One or more fire-lighters must then be placed on top of the TNT. The Burning Team Commander (BTC) should light the fire-lighter(s) using a torch, then withdraw to a minimum of 20 metres.

☠ **NOTE:** *Any AT mine that may have a detonator still inside must be destroyed as a fuzed mine.*

The Burning Team should have a fire extinguisher available at the burning pit at all times.

All staff carrying AT mine bodies should wear frontal PPE and eye protection at all times.

The following procedure must be followed:

1. The Burning Team Commander (BTC) should order the collection of AT mine bodies from the Mine/Fuse Collection Area(s), and their movement to the Demolition area.
2. The BTC must make an accurate record of the AT mine bodies moved to the burning area.
3. Before the mines are burned, the BTC should inform the Paramedic and the Platoon Commander/Supervisor that he/she will start. The Platoon Commander/Supervisor should inform the Task Supervisor.
4. The Paramedic should make sure nobody enters the mine burning area. When necessary, the Task Supervisor should ensure that a cordon is established to ensure that persons and livestock do not enter the area.
5. The Burning Team should remove the filling caps and places 4-10 mines in a circle with the holes left by their filling caps facing inward. TNT should be placed in the centre of the mines with one or more fire-lighters on top.

6. The Burning Team should withdraw a minimum of 30 metres.
7. The BTC should set fire to the fire-lighter(s) using a long torch.
8. The BTC should withdraws to 30 metres to observe the burn.
9. After completion, the BTC must goes back to the mine burning site and check that the mines have completely burned out. If all mines fail to burn out, a fire should be rebuilt and the mines burned again.
10. The BTC should then informs the Paramedic and Task Supervisor that the process has been completed.
11. The Burning Team should prepare the burning pit for its next use.

The BTC is responsible for completing the burning record, which must be signed by the Task Supervisor.

6.5 The burning procedure for fuzed AP blast mines

This procedure can only be used when steel Burning Cones made for the purpose are available.

Burning Fuzed AP mines usually makes the detonators explode. Sometimes most of the high explosive has burned before the detonator explodes. At other times the mine may explode with its full force. The Burning cone is heavy enough to survive an AP mine blast and direct it upwards. But it is essential that the Burning Team members keep at least 20 metres from the detonation and wear their PPE correctly. The procedure has a very low risk of injury if it is conducted properly.

The size of each burning cone should be approximately 30 x 30 x 17cm. The cone is made using 12mm (or thicker) mild steel plate welded together on all sides. A photograph is shown alongside.

Wood-shavings or sawdust should be put into the cone and soaked with diesel fuel or other flammable liquid. When sawdust is used, a thin metal grid is placed on top of the sawdust to hold the mine a little away from the sawdust. The mine is placed on the grid and the fire is lit using a torch by the BTC. When a metal grid is used, the metal grid may “jump” from the Burning Cone when the mine explodes and generally lands within a metre of the cone.

The following procedure must be followed:

1. The Burning Team Commander (BTC) should order the collection of fuzed AP mines from the Mine/Fuse Collection Area(s), and their movement to the Demolition area.
2. The BTC must make an accurate record of the fuzed AP mines moved to the Demolition area.
3. Before the mines are burned, the BTC must inform the Paramedic and the Platoon Commander/Supervisor that burning is about to start. The Platoon Commander/Supervisor must inform the Task Supervisor. The Task Supervisor must ensure that a cordon is established to ensure that persons and livestock do not enter the area.
4. The Burning Team must prepare the Burning Cone(s) and place a mine in the middle of each.

5. The Burning Team must withdraw a minimum of 20 metres.

6. The BTC must set fire to the Burning Cone(s) using a long torch.
7. The BTC must withdraw to 20 metres to observe the burn.

   The mines will generally low-order when the detonator explodes after burning for between four and eight minutes. When they high-order, the blast and debris is deflected harmlessly upward and the Burning Cone is undamaged.
8. After completion, the BTC must return to the Burning Cone(s) and check that the mines have completely burned out. If any mine has failed to burn out, it should be left for 30 minutes to cool down before the fire in the cone is rebuilt and the mine burned again.
9. The BTC must inform the Paramedic and Task Supervisor when the burning process has been completed.
10. The Burning Team should prepare the Burning Cone(s) for their next use.

The BTC is responsible for completing the burning record, which must be signed by the Task Supervisor.

6.6 The burning procedure for separated AT mine fuzes

This procedure can only be used when steel Burning Cones made for burning mines are available.

Burning AT mine fuzes complete with their detonators usually makes the detonators explode. The detonators are generally not powerful, so the procedure has a very low risk of injury if it is conducted properly.

The procedure used for burning fuzed AP mines described in Part 6.5 of this Chapter must be followed.

7. Destroying mines and ERW with the CDS

The Chemical Deflagration System uses a dense and heavy magnesium powder that burns at a very high temperature and is able to melt the casings of metal-cased mines and ERW.

All storage and transportation of deflagration powder and igniters should be conducted as if the material were High Explosive. Deflagration powder is not High Explosive, and the initiators are not detonators, but the danger of fire is very real so the precautions for transporting High Explosive should be applied.

All AP and AT mines can be destroyed using CDS. The following ERW other than mines can also be destroyed using CDS:

1. Heat munitions without rocket motors;
2. HESH munitions without rocket motors;
3. Other pyrotechnics like smoke and white phosphorus (WP). When WP is burned, all safety regulations regarding WP must be obeyed; and
4. Any propellant that is not connected to an HE charges (the rocket motors of RPG-7s, for example).

CDS may burn out some devices without any detonation or with only a low-order detonation (when the detonator explodes after most of the High Explosive has already burned). In other cases the device may high-order, so the precautions necessary for a high-order detonation must always be applied.

The following general rules apply to CDS whether destroying mines and ERW in-situ or in a designated Demolition area:

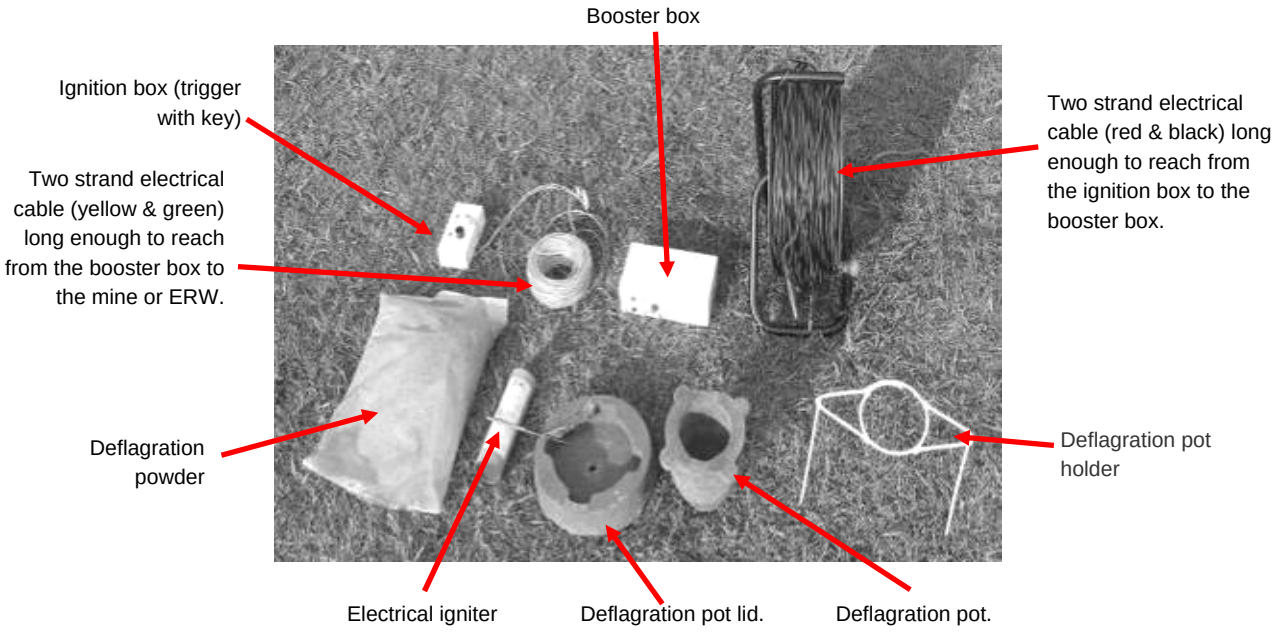
1. Only one fuzed device should be burned at a time.

2. Only EOD Level 2 and above Operatives who have been trained and certified to use the MDS may conduct the demolition.
3. When using CDS on fragmentation mines, sandbags should be used to control fragmentation. With bounding fragmentation mines, the mine may bound before the burning process is completed, and an in-air detonation may occur. When safe to do so, the mine may be placed on its side and the burn conducted through the side to prevent in-air detonation.
4. Smoking is prohibited within fifty meters of the Deflagration powder.
5. The booster box should always be fully charged before starting a demolition. The box can be used for up to 50 ignitions before it need to be recharged.
6. The Burning Team must include a spotter with binoculars to confirm that the powder has ignited during the "firing" process. The Spotter should be at the safety-distance or take cover after confirming that smoke is visible, and the burn has begun. The spotter must remain under cover until the BTC gives the all clear.

7.1 CDS powder and accessories

The Chemical Deflagration System is designed to be completely safe as long as it is conducted in the correct way and the correct accessories are used.

The necessary accessories are shown below.



Electrical igniters are the most sensitive accessory in the burning process and must be treated with the greatest of care at all times. Handling of the igniters should be kept to a minimum.

Electrical igniters must be:

1. handled with care;
2. removed form their container one at a time immediately before use; and
3. After removing an igniter from the container, the container must be closed.

Deflagration powder is not shock sensitive but it must be kept away from all sources of fire or extreme heat.

A fire extinguisher must be present whenever deflagration powder is used.

7.2 Before conducting a CDS demolition

The senior EOD Operator must ensure that:

1. no radios are used within 50 metres of the CDS initiating system;
2. sentries are briefed about their duties and a means of communication with them is in place;
3. equipment not required for the CDS must be moved away from the Demolition area;
4. access lanes must be free from obstructions;
5. all staff not involved in the demolition must be at the appropriate safety-distance;
6. sandbags must be available when required;
7. there must be a fire-extinguisher at the Demolition site (brush-beaters should also be available if there is any risk of a grass fire);
8. the CDS cable must be correctly laid out;
9. transportation of Deflagration powder and initiators from the temporary Explosive Storage area to the Demolition area must be conducted safely and
10. the exploder key must be kept by the Senior EOD Operator until the burning process is ready to be conducted.

The senior EOD Operator should inspect the prepared CDS demolition to ensure that it has been prepared correctly. The senior EOD Operative should also confirm that the area is secure before giving the EOD Operator permission to continue.

7.3 Conducting a CDS burn

CDS should be conducted by a Burning Team headed by an EOD Operator serving as Burning team Commander (BTC). A Senior EOD Operative must be appointed by the Task Supervisor to oversee the activities.

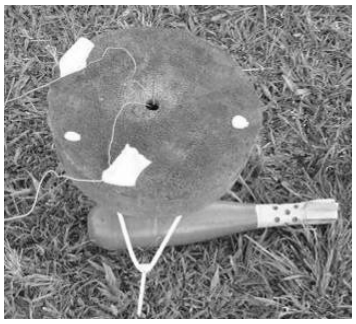
When necessary, the BTC should order the collection of a mine or ERW device from the Mine/Fuse Collection Area(s), and its movement to the Demolition area. The BTC must make an accurate record of all devices that are destroyed.

Whether destroying mines and ERW with CDS in-situ or in a Demolition area, the following procedure must be followed:

1. Before the mine or ERW is burned, the BTC must inform the Paramedic and the Platoon Commander/Supervisor that he/she will start. The Platoon Commander/Supervisor must inform the Task Supervisor. The Task Supervisor must ensure that a cordon is established to ensure that persons and livestock do not enter the area.
2. The Burning Team should approach the device and leaves the CDS equipment which the BTC will use to prepare the CDS. The rest of the Team should withdraw to the safety-distance and the Observer should take position to watch the CDS ignition start.
3. The BTC must anchor the yellow & green wire to a picket and arrange the wire so that it leads to the device to be destroyed. He/she must leave enough wire to connect the electric igniter to the cable and to reach from there to the deflagration pot.
4. The BTC must unwind the remaining yellow and green wire in the direction of the firing point, then closes the wire ends and place the booster box next to the closed ends.
5. The BTC then closes the black and red ends of the wire that lead from the booster box to the firing point. He/she must then unroll the wire up to the firing point and connect the red and black wires to their corresponding terminals.

6. The BTC must remove the key from the Ignition box, then carry the electric igniter, deflagration powder, deflagration pot with lid, and the pot holder to the device to be destroyed.

7. The BTC must insert the pot in the pot-holder and fill it 80% full with deflagration powder, taking care not to overfill it. He/she must then place the lid on the pot and turns the lid clockwise until it locks securely.
8. The BTC must position the pot over the main charge of the device to be destroyed. The bottom of the pot should be approximately 6cm from the item to be destroyed, so the legs of the pot holder should be bent when necessary.



9. Sandbags should be positioned to contain fragmentation when necessary.
10. The BTC must then connect the electric igniter to the cable and isolate the connections.
11. The BTC must insert the igniter in the hole in the lid of the deflagration pot, ensuring that the black rubber end of the igniter is just above the powder.
12. The BTC must walk back to the booster box and insert the four cable ends into the colour coded sockets in the rear of the booster box.
13. The BTC must then walk from the booster box to the firing point. The green “Ready” light on the Ignition box should light to confirm that the ignition trigger is ready to use.

14. The BTC must confirm with sentries that the area is secure and confirm that the spotter is ready with binoculars trained on the deflagration pot over the device to be destroyed.
15. The BTC must give a loud verbal warning that burning is about to begin.
16. The BTC must then insert the key in the Ignition box and turn the key clockwise. The system is ready to fire when the red light above the word “Fire” appears.
17. To start the fire, the BTC must press and hold down the button on the ignition trigger until the Spotter indicates that smoke has been seen. If the red light stays on after the button is released, the BTC must press down the push button again to make the red light go out.

18. When smoke has been confirmed, the BTC must turn the key anti-clockwise and remove the key from the Ignition box.
19. The BTC must wait until the burn has finished or the device has detonated, then ask the Spotter to confirm that there is no more smoke. When there has been no smoke for five minutes, the BTC can approach the demolition site to inspect the outcome.
20. The BTC must inspect the site to confirm that a full demolition has taken place before giving the “All Clear” signal. If there is any doubt about the completeness of the burning, the procedure must be repeated and a second burn conducted.

7.3.1 Misfire of the CDS system

In the event of a BTC misfire, this sequence should be followed:

1. Make another attempt to fire the initiator.
2. If the deflagration powder still does not burn, wait 5 minutes.
3. The BTC should go forward and check the connections on the booster box. If they were loose, he/she must tighten them and then withdraw to make another attempt to fire the initiator.
4. If the initiator still does not fire and there is no smoke from the CDS, the BTC must approach the device, separate the wires leading to the initiator and lift the pot holder and pot clear of the device.
5. The BTC should check all connections and if satisfied that the CDS is in working order, set up the demolition again using a new initiator.

8. Approved render-safe procedures

The following are fundamental Render safe rules:

1. No staff can undertake render-safe procedures until appropriately trained. The training must be strict and certificates of competence only given to those with proven professional competence.
2. No render-safe or neutralisation procedure can be conducted without a Paramedic and ambulance available for CASEVAC.
3. Only one appropriately trained EOD Operative should be present when conducting render-safe or neutralisation procedures.
4. PPE must always be worn, and eye protection must be clear and easy to see through.
5. Gloves may be worn when cutting fuzes and may provide some small protection against the small blast involved in a detonator exploding. They should only be worn when they do not make the wearer clumsy and more likely to have an accident.

Some mines that may be rendered safe when found in good condition are shown in the table below.

NAME	TYPE	HAZARDOUS CONTENT
R2M2	AP Blast	58 gm RDX/WAX:88/12
M14	AP Blast	29 gm Tetryl
PMN	AP Blast	240 gm TNT, 9 gm Tetryl
PRB M35	AP Blast	100 gm TNT
MAI-75	AP Blast	120 gm TNT
Type 72 A/B	AP Blast	50 gm TNT (TNT/RDX: 50/50)
GYATA-64	AP Blast	300 gm TNT
PRB M3 & PRB M3A1	AT Blast	6 kg TNT/RDX/Al (70/15/15)
TM-46 (TMN-46)	AT Blast	5.7 kg TNT
TM-57	AT Blast	6.34 kg RDX/TNT
M15	AT Blast	10.3 kg Comp.B – RDX/TNT
M19	AT Blast	9.5 kg Comp.B – RDX/TNT

Additional render-safe information must be added to these SOPs at a later date.

8.1 Rendering mines safe

Mines that are in good condition can often be made safe by either neutralising or disarming them.

To neutralise a mine, its arming system is turned off. This is normally done by using a pin or clip to block the firing train in the mine. In some cases, the mine has a “switch” to turn it from “armed” to “Safe”.

To disarm a mine, the mine body and the fuze mechanism including detonator(s) must be separated. When a detonator remains inside the mine, it has not been disarmed.

There are three main reasons why mines should be rendered safe to handle.

1. When metal-detectors are used, mines with their entire metal content but no High Explosive are needed as Target-mines.
2. When MDD are used, mines with the original High Explosive inside but no initiation mechanism are needed as MDD Test mines.
3. Rendering the mines safe for movement to a demolition area can be very convenient.

8.2 R2M1 and R2M2 AP blast mine (58 gm RDX)

The R2M1 and R2M2 are anti-personnel blast mines with a plastic case. They were made in the Republic of South Africa.

The picture on the right shows an R2M2 made in 1976.

The R2M1/2 is a small cylindrical AP blast mine with an injection moulded plastic body and initiation assembly. It has many parts. The pressure plate on the top of the mine has 12 radial ribs with a raised projection in the centre surrounding the plunger which is red and visible as a red nipple.

On the upper side of the mine body is a ribbed plastic sleeve with a short lip at the bottom and a flange at the top. On the R2M2, the short lip is trapped between the two screw-together halves of the High Explosive chamber at the bottom of the mine, acting as a seal. On the R2M1 the plastic sleeve extends to the bottom of the mine. The flange at the top forms the upper edge of the mine and is stiffened with a red plastic ring on the inside. There is a foam sponge in between the pressure plate and the body cap.

The other differences between the R2M2 and the R2M1 are the colour and the shape of the plastic moulding on the booster plug. R2M1s are usually dark green.

The mine on the left is as R2M2. The mine on the right is an R2M1. Both mines were recovered from a minefield and are in the kind of condition that should be expected.

If the red top of the plunger can be seen, the mine should be safe to disarm. When the mines are in a bad condition such as those shown below, they must be destroyed in-situ.

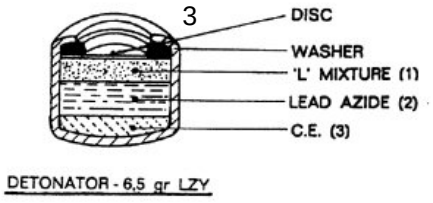
There is an R2M2 “TNT variant” that is a simpler model with a TNT fill. This mine cannot be separated and the case must be cut with a fine toothed saw in order to expose the main charge. The fuse mechanism and detonator are identical. The R2M2 “TNT variant” has a “flat” base with a raised central platform with three equally spaced circular recesses around the booster well. The TNT variant is reported to be common in some parts of Africa.

	R2M1	R2M2	R2M2 TNT Variant
Height	57 mm	57 mm	57 mm
Diameter	69 mm	69 mm	69 mm
Mine weight	130 gr.	128 gr.	145 gr.
Explosive weight	58 gr.	58 gr.	75 gr.
Explosive type (main charge)	RDX/WAX:88/12	RDX/WAX:88/12	TNT
Booster explosive weight	12 g	12 g	12 g
Detonator explosive weight	6.5 g	6.5 g	6.5 g
Casing material and colour	Plastic, brown, green	Plastic, brown, green	Plastic, green
Fuze type	Ball retained striker, spring pressure	Ball retained striker, spring pressure	Ball retained striker, spring pressure
Sensitivity	3-7 kg pressure	3-7 kg pressure	3-7 kg pressure
Detectability	Can be very hard to detect. Metal components are usually made of stainless steel: some variations occur.		

8.2.1 The R2M1/R2M2 initiation assembly

The picture below shows the following:

1. Below, on the left, the metal parts and a detonator in its plastic housing.
2. Below, in the middle, the entire initiation assembly. The pin is visible through the clear plastic body. The detonator is set into the plastic beneath this. The spring, pin and balls are inside the red upper part.
3. Below on the right is a cutaway view of the stab-sensitive detonator. When the layers inside are disturbed, it detonates. This is why the detonator cannot be safely emptied without specialist equipment.



The three retaining balls are held in a recess in the plastic head of the pin. When the red plunger is depressed the balls line up with the holes in the plunger and move to the side, allowing the spring to press down onto the plastic head of the pin and push it into the detonator.

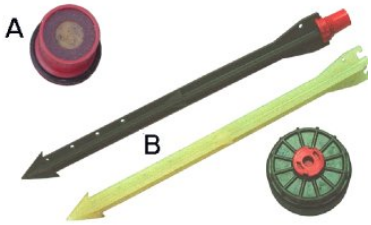
The detonators measure 7.5mm in diameter and are coated with a transparent lacquer that glues them into the clear plastic housing.

The same initiation mechanism is reported to be present in the South African No.8 AT mine.

8.2.2 Safety clip and booster

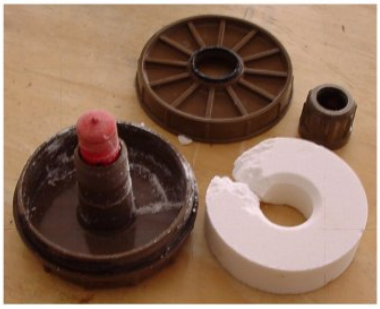
An unarmed mine has a safety clip inserted in a slide in the centre of the pressure plate and through the groove at the top of the red plunger. This holds the plunger up. A clip is shown alongside.

The booster well is positioned in the centre of the base of the mine, directly beneath the detonator. The booster is shown at "A" alongside. The booster charge has a fibre washer on top of it. The detonator initiates the booster charge and the shock wave of its detonation initiates the main charge.



The threaded booster plug is made of red plastic and screws into the booster-well. It has a rubber O-ring washer.

Some booster plugs are varied to allow the attachment of a plastic spike, shown at "B" alongside. The spike is designed to prevent mine movement in washout areas.



The mine is relatively watertight but mines that have been buried for a long time are often found with the striker pins and/or retaining balls rusted.

The RDX and wax (8:1 ratio) High Explosive filling is white.

8.2.3 Rendering an R2M2 safe to move

When a mine is in good condition, it may be rendered safe to move.

Follow these stages:

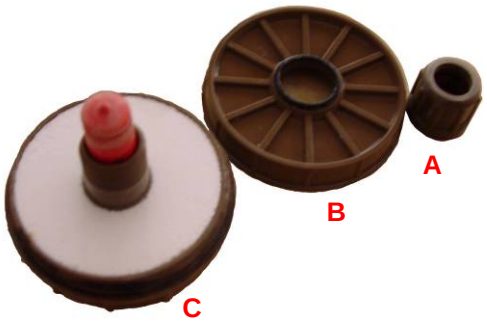
1. Wear PPE and a visor.
2. Expose the mine completely so that it can be picked and held by the sides. Never put any pressure on the top.
3. Turn the mine, still holding it by its sides, and unscrew the booster charge from the base of the mine.

The mine is now safe to move BUT the detonator may still be initiated if any pressure is applied to the top of the mine. The booster charge is missing so the detonator should not initiate the main explosive, but the detonator is powerful and could still cause injury. The detonator is powerful enough to shatter the mine casing and cause injuries to exposed areas (such as the holder's hand).

8.2.4 Making an R2M2 safe to use as a metal-detector target

Start with a mine that has been rendered safe to move, so does not have its booster charge inside.

1. Wear PPE and a visor.
2. Put the mine on a flat surface and hold it by the sides.
3. Cut and remove the outer Plastic sleeve, allowing the pressure plate and foam disc to be lifted away.
4. Unscrew the knurled plastic boss in the centre of the mine (A in the photograph).
5. The top and bottom of the body (B and C in the photograph) of the mine can then be separated by unscrewing them. It is usually necessary to cut the remains of the PVC sleeve from the join (where it forms a gasket) between the mine



halves so that they can unscrew easily.

6. The RDX/WAX fill is a tight fit but can be removed from the smooth inner casing of the bottom of the mine relatively easily.
7. The plunger and detonator assembly are moulded into the central pillar of the mine's base which must be cut so that they can be withdrawn.
8. Cut the brown plastic threaded tube rising from the bottom of the mine on both sides, cutting from top to bottom and using a fine toothed saw (a small hacksaw is appropriate). Then bend the brown plastic sideways. Considerable care is needed not to initiate the detonator at this time.
9. The complete fuze can then be lifted out.

10. Cut the clear plastic where the needle can be seen, shown by a red arrow on the photograph.
    The detonator is then separated from the firing pin and spring.
11. Mix some two-part epoxy glue. Fill the gap around the pin with glue, then coat the face of the detonator with glue and place a small disk of stiff plastic on top. Do not push them back together. Stand the detonator on a flat surface, then place the top part of the assembly back in position. Ensure that there is glue all around the join.
12. When the glue has dried hard, the assembly can be handled and the mine reassembled. Use plenty of glue so that it does not come apart in use.
13. Fill the cavity where the RDX/TNT went with clay or Plaster of Paris.

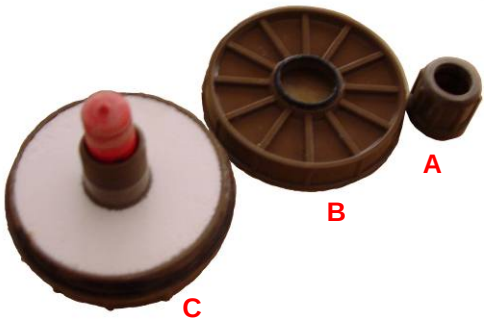
NOTE: *The cavity must be filled because some detectors will sometimes signal on a cavity.*

14. When the mine has been reassembled, paint it red.

8.2.5 Making an R2M2 safe to use as a MDD target

Start with a mine that has been rendered safe to move, so does not have its booster charge inside.

1. Wear PPE and a visor.
2. Put the mine on a flat surface and hold it by the sides.
3. Cut and remove the outer Plastic sleeve, allowing the pressure plate and foam disc to be lifted away.
4. Unscrew the knurled plastic boss in the centre of the mine (A in the photograph).
5. The top and bottom of the body (B and C in the photograph) of the mine can then be separated by unscrewing them. It is usually necessary to cut the remains of the PVC sleeve from the join (where it forms a gasket) between the mine halves so that they can unscrew easily.



6. The plunger and detonator assembly are moulded into the central pillar of the mine's base which must be cut so that they can be withdrawn.
7. Cut the brown plastic threaded tube rising from the bottom of the mine on both sides, cutting from top to bottom and using a fine toothed saw (a small hacksaw is appropriate). Then bend the brown plastic sideways. Considerable care is needed not to initiate the detonator at this time.
8. The complete fuze can then be lifted out.

9. Mix some two-part epoxy glue and glue the mine back together, leaving the explosive in place.
10. Fill all gaps and the booster well with glue to try to reproduce the sealed condition of the original mine.
11. When the glue has dried, paint the mine red and clearly mark it “MDD”.

NOTE: *MDD targets cannot be used as detector targets because they do not contain all of the metal parts that the detector can find.*

8.2.6 Neutralising the R2M1/2

If the top of the red plunger is not visible, the spring may have been depressed and no attempt should be made to neutralise the mine by replacing the safety clip. If the red plunger is clearly visible in the middle of the pressure cap, the safety clip can be slid into the groove at the top of the red plunger and the slot in the pressure plate. When the clip is in place, replace the split-pin through the clip and the holes in the pressure plate to lock it in place. This is seldom a simple operation when a mine has been in place a long time and earth has filled the clip cavity.

Do not attempt to disarm a mine that has been exposed for any length of time. Discolouration of the plastic (fading) may be the best indication of exposure which means that the plastic case may be in an unpredictable state.

8.3 M14: AP Blast (29 gm Tetryl)

This mine may be rendered safe by suitably trained EOD Operators BUT if the mine is not in good condition, the mine should be destroyed where it is.

The picture on the left shows the “A” Armed and “S” Safe positions. The picture on the right shows an M14 in a minefield.

To render the mine safe and defuze it, the following sequence should be followed.

1) Rotate the pointer on the pressure plate away from the “A” (Armed) mark to point at the “S” (Safe) mark. If this cannot be achieved, but the mine is in good condition, go to step 2. If the mine is not in good condition or if the EOD Operator is in any way concerned, the mine should be destroyed where it is.

2) If a safety-clip is available, fit the safety-clip.

3) Turn the mine over and, without pressing on the pressure plate, unscrew the detonator assembly from the base of the mine. Use fingers or the correct key/spanner to achieve this.

If the detonator assembly cannot be removed but the pressure plate pointer is indicating “S”, the mine has been neutralised but not disarmed. The mine can be moved for bulk demolition if required.

4) If the detonator assembly has been separated, the mine has been disarmed.

NOTE: *The small copper-cased detonator and steel firing-pin are the only metal components in this mine. This can make it very difficult to detect with a metal-detector.*

8.3.1 Making an M14 safe to use as a metal-detector target

Start with a mine that has been rendered safe to move, so does not have its detonator inside.

1. Wear PPE and a visor.
2. Put the mine on a flat surface and hold it on one side.
3. Use a fine toothed saw (a small hacksaw is appropriate) to cut the mine in half.

4. The picture below shows the parts inside an M14.

5. The mine has a “Mine partition” inside. Lever out the partition and break out the Tetryl filling. Collect the Tetryl in a bag for later disposal.
6. Mix some two-part epoxy glue. Put a small disk of plastic over the hole in the middle of the mine partition and fill the mine partition with glue, then put it aside to dry.
7. Push epoxy glue into the top part of mine, filling all the cavities between the pressure plate, fuze assembly cover and the Belleville spring.
8. Glue a small disk of plastic on top of the detonator.
9. Before rebuilding the mine, fill the cavity where the Tetryl went with clay or Plaster of Paris.

NOTE: *The cavity must be filled because some detectors will sometimes signal on a cavity.*

10. When the glue has dried, reassemble the mine using plenty of glue to hold the sawn halves together.
11. Paint the finished mine red.

NOTE: *Remember to dispose of the discarded Tetryl safely.*

8.3.2 Making an M14 safe to use as a MDD target

Start with a mine that has been rendered safe to move, so does not have its detonator inside.

1. Wear PPE and a visor.
2. Mix some two-part epoxy glue and glue the top of the mine together so that the pressure plate is stuck in the Safe position.
3. Fill the cavity in the bottom of the mine where\the detonator was removed with epoxy glue.
4. When the glue has dried, paint the mine red and clearly mark it “MDD”.
5. Ensure that the detonator is safely destroyed.

NOTE: *MDD targets cannot be used as detector targets because they do not contain all of the metal parts that the detector can find.*

8.3.3 Neutralising the M14

The M14 is neutralised by turning the pressure plate to point to Safe and inserting a safely clip. This design allows the mine to be re-used.

If the grooves through which the clip slides are damaged or filled with dirt, neutralisation should not be attempted. When clips are available and you want to use them, the clips can be filed down to make it easier to insert them as shown in the lower picture alongside.

The clip is then used before disarming the mines, and removed for re-use after the detonator has been removed.

8.4 PMN: Anti-Personnel blast (240 gm TNT)

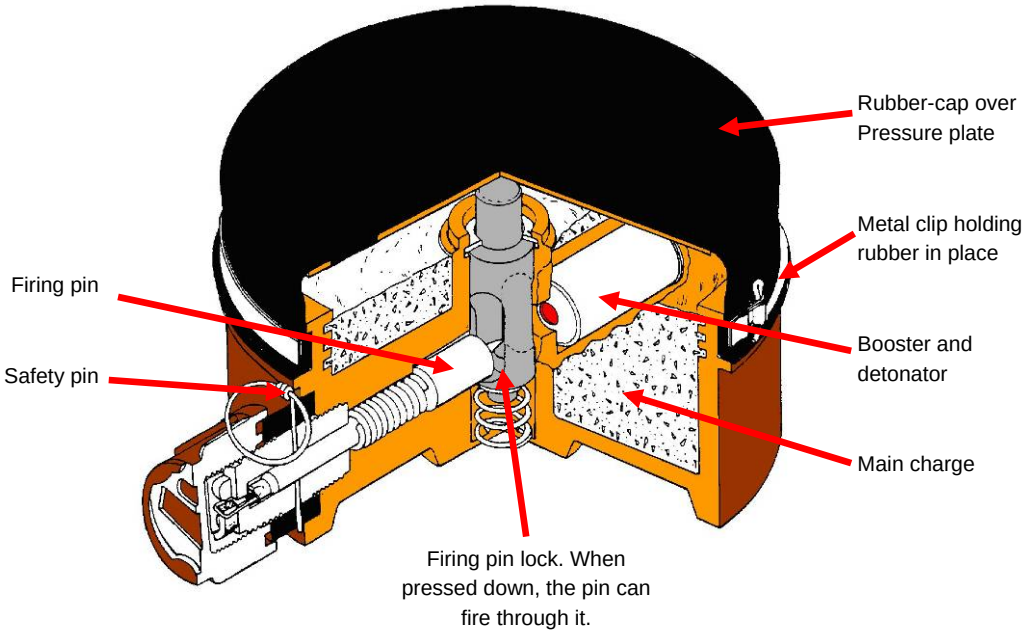
This mine may be rendered safe by suitably trained EOD Operators BUT if the mine is not in good condition, the mine should be destroyed where it is.

The mine cannot be neutralised by replacing its arming pin.

There are some reports of this mine being unsafe to disarm because of crystals forming in the threads of the booster cap.

The mine is more easily initiated by pressure on the extreme edge of the pressure plate than by pressure in the centre, so it must be handled with extreme caution.

The mine has a 240g TNT main charge and a 9gm Tetryl booster charge around a No 9 detonator. The cutaway drawing below shows the mine parts.



To render the mine safe and defuze it, the following sequence should be followed.

1. Unscrew and remove the booster-cap. The booster cap has a flat tab that is designed to be easy to grip.

NOTE: *Do not try to unscrew the knurled cap over the firing pin.*

2. Tilt the mine so that the booster and detonator slide out.
3. Pointing the booster-hole away from you, press on the top of the mine to fire the firing pin. The pin is large and heavy. Never fire it at anyone.
4. Collect the booster cap, the pin and its spring which may be needed for making a metal-detector target.

8.4.1 Making a PMN safe to use as a metal-detector target

Start with a mine that has been rendered safe to move, so does not have its firing-pin, detonator or booster detonator inside.

1. Wear PPE and a visor.
2. Put the mine on a flat surface and untwist the split pin that holds the metal ring tight on the rubber cover.
3. Lift the rubber cover away.
4. The TNT filling is often coated with black lacquer.
5. Break out the TNT filling. The filling is cast in place so often has to be chipped out in small bits. Collect the TNT in a bag for later disposal.
6. With no TNT inside, rebuild the mine leaving out the detonator and booster. This means there is slightly less metal than in the original, but still more than enough for any detector to find.
7. Before replacing the top, fill the cavity where the TNT went with clay or Plaster of Paris.

NOTE: *The cavity must be filled because some detectors will sometimes signal on a cavity.*

8. Glue the booster plug back in place and paint the finished mine red.

NOTE: *Remember to dispose of the discarded TNT and the Tetryl booster with detonator safely.*

8.4.2 Making a PMN safe to use as a MDD target

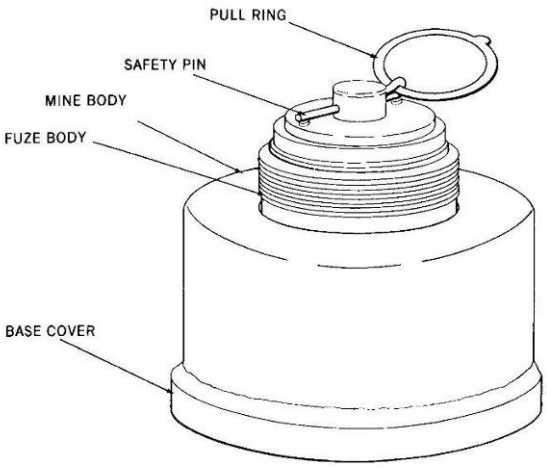
Start with a mine that has been rendered safe to move, so does not have its firing-pin, detonator or booster detonator inside.

1. Wear PPE and a visor.
2. Mix some two-part epoxy glue
3. Fill the hole where the booster plug screws with glue.
4. When the glue has dried, paint the mine red and clearly mark it “MDD”.
5. Ensure that the detonator and booster are safely destroyed.

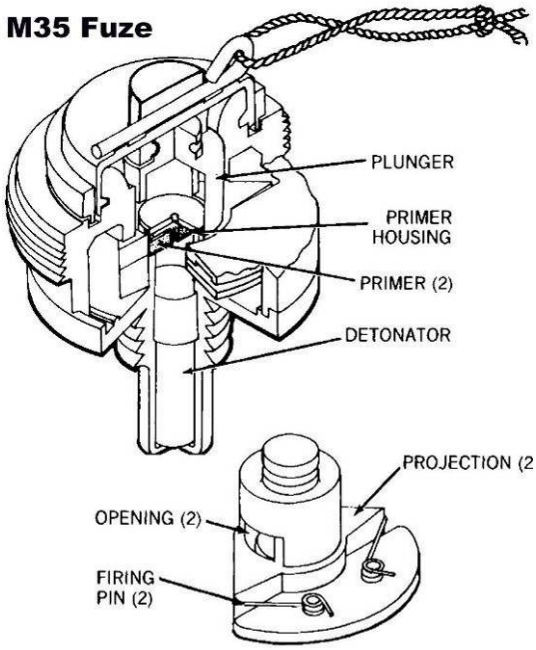
NOTE: *MDD targets cannot be used as detector targets because they do not contain all of the metal parts that the detector can find.*

8.5 PRB M35: Anti-personnel blast (100 gm TNT)

This mine may be rendered safe by suitably trained EOD Operators BUT if the mine is not in good condition, the mine should be destroyed where it is found.



PRB M35 Fuze



To render the mine safe and defuse it, the following sequence should be followed.

1. Wear PPE and a visor.
2. Standing up from the top of the fuze is a plastic pressure shaft indicated by the red arrow above. The plastic shaft has a hole through it. Insert a stiff wire pin (that has been previously prepared) through the hole. If the hole is blocked, move to Step 2.

NOTE: *If the plastic shaft has been pressed down so that the hole is not accessible, the mine should be destroyed where it is.*

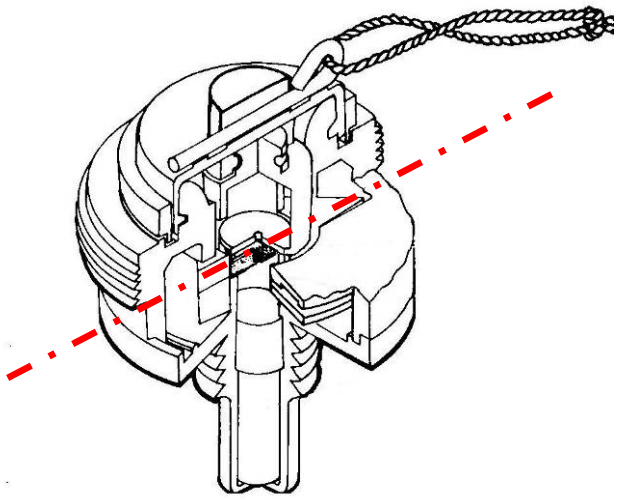
3. Unscrew the fuze assembly from the top of the mine using fingers or an appropriate tool. If the fuze assembly cannot be removed, but the pin is in place, the mine has been neutralised, but not disarmed. The mine can be moved for bulk demolition when that is required.
4. If the mine body and the fuze assembly have been separated, the mine has been defuzed.

NOTE: *This mine has a small metal content and can be difficult to detect with a metal-detector.*

8.5.1 Making a PRB M35 safe to use as a metal-detector target

Start with a mine that has been rendered safe to move, so does not have its fuze attached.

1. Wear PPE and a visor.
2. Put the pinned fuze on a flat surface and use a small-toothed saw (a small hack-saw is appropriate) to saw across the fuze at the bottom of its thread as shown with the red-line below.



3. When the top of the fuze is separated from the detonator, take out the safety-pin and cut through the pressure shaft level with the top of the fuze so that no part of the pressure shaft stands up.
4. Mix epoxy glue and glue a small piece of plastic on top of the detonator, then fill the cavity on top of the detonator.
5. Press glue around the plunger to hold it in place.
6. Place the two halves of the fuze back together with plenty of glue holding them together and put them aside to dry.
7. Take the mine body and cut the base off with the hack-saw. Break out the TNT and collect it in a bag for later disposal.
8. Glue the base back onto the mine-body.
9. When the glue has dried, fill the cavity left by the TNT with clay or Plaster of Paris.

NOTE: *The cavity must be filled because some detectors will sometimes signal on a cavity.*

10. When all the glue has dried, reassemble the mine and paint it red.

NOTE: *Remember to dispose of the discarded TNT safely.*

8.5.2 Making a PRB M35 safe to use as a MDD target

Start with a mine that has been rendered safe to move, so does not have its fuze attached.

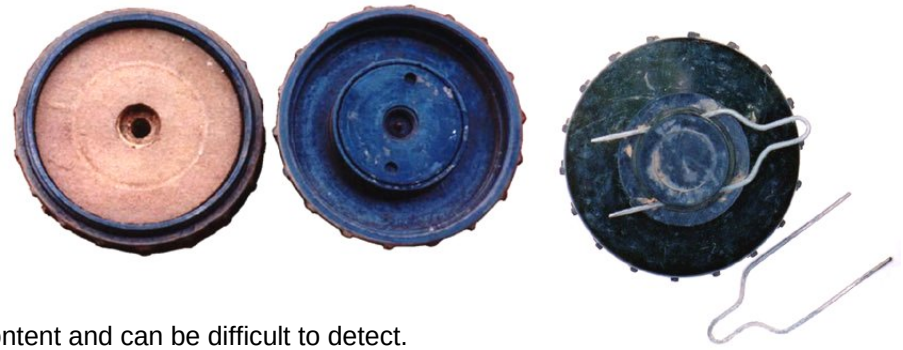
1. Wear PPE and a visor.
2. Mix some two-part epoxy glue
3. Fill the hole where the fuze is screwed with glue.
4. When the glue has dried, paint the mine red and clearly mark it “MDD”.
5. Ensure that the fuze and detonator are safely destroyed.

NOTE: *MDD targets cannot be used as detector targets because they do not contain all of the metal parts that the detector can find.*

8.6 MAI-75: Anti-personnel blast (120 gm TNT)

The MAI-75 is a bakelite cased AP blast mine.

Height: 61mm
Diameter: 95mm
Explosive charge: 120g TNT



The mine has a small metal content and can be difficult to detect.

The mine may be neutralised by replacing the forked pin through the holes on both sides of its circular pressure plate. This should not be attempted in the holes are blocked with soil or debris.

NOTE: *If the holes are not visible and the pressure plate has been partly depressed, the mine should be destroyed without moving it.*

To render the mine safe and defuse it, the following sequence should be followed.

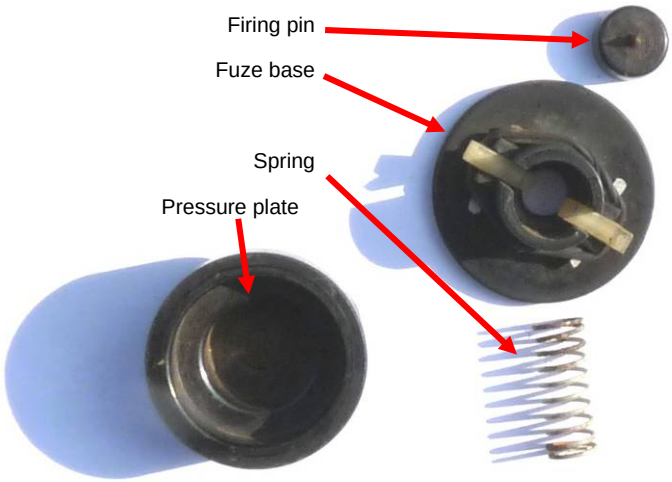
1. Wear PPE and a visor.
2. Either pin the mine, or hold it carefully avoiding putting any pressure on the pressure plate.
3. Unscrew the top and bottom halves of the mine.
4. If the mine will not unscrew, use a sharp knife to cut the gasket between the two halves and try again.
5. When the two halves are separated, remove the detonator from the lower half.
6. The mine has been defuzed.

8.6.1 Making a MAI-75 safe to use as a metal-detector target

Start with a mine that has been defused, so does not have its detonator inside.

1. Wear PPE and a visor.
2. Unscrew the fuze assembly from inside the top half of the mine.

   The parts of the fuze assembly are shown in the photograph on the right.



3. Cut a stiff plastic disc the same diameter as the black plastic cup on the firing pin.
4. Mix some epoxy glue and glue the disk inside the fuze base blocking the hole where the firing pin passes through. Add more glue covering the white “arms” on the fuze base, then reassemble the fuze in the top of the mine.
5. Glue a plastic disc over the top of the detonator.

6. Remove the TNT from the bottom half of the mine.
7. Fill the cavity left by the TNT with clay or Plaster of Paris.

NOTE: *The cavity must be filled because some detectors will sometimes signal on a cavity.*

8. Set the detonator into the Plaster of Paris in the centre of the mine.
9. When all the glue has dried, reassemble the mine and paint it red.

NOTE: *Remember to dispose of the discarded TNT safely.*

8.6.2 Making a MAI-75 safe to use as a MDD target

Start with a mine that has been defused, so does not have its detonator inside

1. Unscrew the mine and ensure that the detonator is missing.
2. Press on the pressure plate until the firing pin clicks through.
3. Screw the mine back together. Use glue on the threads to make a good seal.
4. Paint the mine red and clearly mark it “MDD”.
6. Ensure that the fuze and detonator are safely destroyed.

NOTE: *MDD targets cannot be used as detector targets because they do not contain all of the metal parts that the detector can find.*

8.7 Type 72 A/B: Anti-personnel blast (50 gm TNT or TNT/RDX)

The Type 72 anti-personnel blast mine is a small plastic mine made in China. The mine is green with a green rubber inset on the top. The Type 72a is a minimum metal mine and can be very difficult to detect with a metal-detector. The Type 72b has a battery and circuit board so has a lot of metal and is easy to detect.

Height: 38mm
Diameter: 78mm
Main charge: 50g TNT

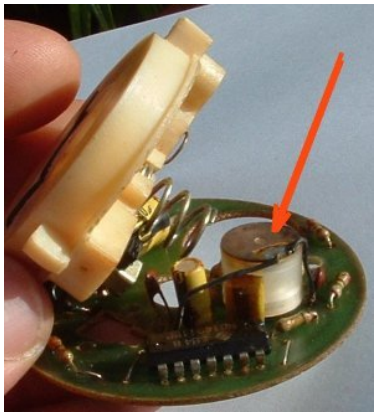
The picture alongside shows the separate parts of a Type 72a. The rubber top has holes in it, which often happens when the mine has been exposed for years.

The Type 72a is operated by applying pressure which causes a non-metallic belville spring to "click-through". A metal pin in the centre of the belville spring strikes a small aluminium cased pyrotechnic, which fires the detonator that is beneath it inside an RDX booster. The booster detonates and its shock-wave initiates the 50g TNT main charge in the mine.

The metal content of a Type 72a is shown in the picture on the right. The white plastic ring is inside the top of the mine and is the spring-loaded arming-ring. The spring is a long, thin coil-spring which is very hard to detect with a metal-detector. The metal content of the mine is so low that it may be impossible to detect with any modern metal-detector when the mine is in electromagnetic soil at a depth of 10-15cm.

The Type 72b looks exactly the same from the outside. The Type 72b incorporates an electronic anti-tilt device that makes it relatively easy to detect because of the presence of a circuit board and batteries. The two 1.5v batteries should last for up to ten years (although the entire circuit board is very vulnerable to moisture damage which would render the mine inactive far sooner).

The picture on the right shows the trembler anti-tilt device in the Type 72b. The trembler can be triggered by tilting the mine through less than 10°, so could be activated during excavation of a metal detector signal, and would almost certainly be activated if a mine were picked up.



The Type 72b can only be initiated electronically. If the batteries are dead or the circuit broken, there is no mechanical process to detonate the mine. (Poking at the pyrotechnic with a pin or a stick can still do it, of course.)

In tests, the Type 72b's anti-tilt trembler device was reliably triggered by passing a strip of neodymium magnets laterally above the mine at an 11mm distance. As a consequence using hand-held magnets in areas where active Type 72b mines are anticipated is not recommended UNLESS the magnets are attached to a blast resistant hand-tool that protects the user's hand by distance, ground angle and a hand-guard. The relatively small amount of HE in the Type 72b (50g) means that such a tool used at a low angle to the ground

should mean that blast injury to the hand is avoided (shock injury, sprains or broken bones may occur). Of course the magnet user should also have suitable frontal PPE.

The only easily visible difference between the Type 71a and the Type 72b is in the shape of the arming pin. The "a" has a round ring on the pin. The "b" has a triangular "ring" on the pin.

Copies of the Type 72a have been made in South Africa and these are reported to have been glued together, so may be impossible to separate safely.

The mine cannot be neutralised because the arming pin passes through the spring-loaded arming ring. When the pin is removed, the hole moves, so the pin cannot be replaced. Sometimes the top of the mine can be rotated to line up the holes but this is not recommended because the inner hole cannot be seen.

To render the mine safe, the following sequence should be followed.

1. Wear PPE and a visor.
2. Hold the mine by its sides and unscrew the booster assembly from the bottom of the mine.

   The booster cap has four notches around the edge, as shown in the photograph alongside. A specialist tool can be made to fit it, or a screwdriver can be used. Some long-nosed pliers with thin ends fit the notches well.

3. When the booster has been removed, the firing train has been broken. The detonator is inside the booster.
4. Above the detonator is a small detonator called a pyrotechnic. It is not powerful enough to initiate the mine, but can cause injury if it detonates while the mine is held in a hand.
5. There is a plastic pin on the underside of the mine, shown in the photograph on the right. Unscrew the plastic pin on the underside of the mine – continuing to take care not to press on the pressure plate.

6. Unscrew the top of the mine.
7. With the Type 72a, lift away the brown plastic Belleville spring with the firing pin in the middle of it. The Belleville spring has a hole on one side. Put a screwdriver through the hole and lever the spring away if it is not easily withdrawn.
8. With the Type 72b, lift away the circuit board with the white plastic pressure plate wired to it.
9. The bottom of the mine is now separated as shown in the photograph on the right. Cut a blunt wooden peg the same diameter as the pyrotechnic and push it out of the mine body.
10. Break out the TNT, which was cast in place and may only be removed in small pieces. Collect it in a bag for later disposal.
11. Reassemble the mine without the pyrotechnic and the booster. The mine has been disarmed.

8.7.1 Making a Type 72A/B safe to use as a metal-detector target

Start with a mine that has been rendered safe, so does not have its booster or pyrotechnic in place.

1. Wear PPE and a visor.
2. Use a knife to enlarge the hole in the bottom of the mine where the pyrotechnic fits.
3. Carefully use a pointed tool to scrape out the explosive around the detonator in the booster. Free the detonator from the explosive.
4. Mix some epoxy glue.
5. Glue the pyrotechnic upside down in the hole in the lower half of the mine.
6. Glue the detonator into the centre of the booster plug. Glue a small piece of plastic on top of the detonator.
7. When the glue has dried, fill the cavity left by the TNT with clay or Plaster of Paris.

NOTE: *The cavity must be filled because some detectors will sometimes signal on a cavity.*

8. When all the glue has dried, reassemble the mine putting the Belville spring in upside down (so that the pin points upwards).
9. Paint the mine red.

NOTE: *Remember to dispose of the discarded TNT (and RDX from the booster) safely.*

8.7.2 Making a Type 72A/B safe to use as a MDD target

Start with a mine that has been rendered safe, so does not have its booster or pyrotechnic in place.

1. Mix some two-part epoxy glue and fill the cavity in the bottom of the mine where the booster was removed with glue.
2. When the glue has dried, paint the mine red and clearly mark it “MDD”.
3. Ensure that the pyrotechnic, detonator and booster are safely destroyed.

NOTE: *MDD targets cannot be used as detector targets because they do not contain all of the metal parts that the detector can find.*

8.8 PRB M3 and PRB M3A1 – Anti-Tank blast mine: 6 kg TNT/RDX/Al

The PRB M3 is a large AT blast mine with a thin plastic case that is stitched together on the sides. The mine case has a thin webbing handle on one side.

The explosive charge incorporates a central well where two booster pellets are held in a Bakelite moulding below an M60 fuze and detonator. Above the fuze, a Bakelite pressure plate screws into place. The pressure plate is two mouldings held together with white plastic pins. When sufficient pressure is applied to the plate, the pins break and the pressure plate pushes down onto the fuze, initiating the detonator.

The M60 fuze has two steel strikers held apart by a plastic collar. Inside the collar are two stab-sensitive igniters inside a cavity leading to the detonator. The mine's only metal content is the igniter caps, detonator casing and steel strikers.

The PRB M3A1 is a design variation that has an extra fuze well in the side and another in the underside. The mine may be used with the PRB M30 anti-lift device. The mine body is normally olive green and the pressure plate is sand brown.

Size: 230mm square

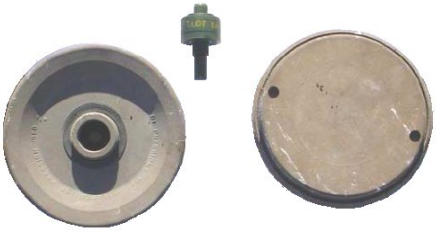
Main charge: 6 kg TNT/RDX/Aluminium powder (70/15/15)

Operating pressure: 250 kg

The mine cannot be neutralised without disarming it.

To render the mine safe, the following sequence should be followed.

1. Wear PPE and a visor.
2. Unscrew the pressure plate turning it anti-clockwise.
3. Lift the fuze from the cavity inside the mine. It the fuze does not lift out easily, do not use a tool to lever it.



NOTE: When the fuze remains in the mine it has not been disarmed and must be treated as a fuzed mine.

8.8.1 Making a PRB M3 safe to use as a metal-detector target

The fuze can be used as the metal detector target without using any other part of the mine.

It is not recommended that the fuze be cut open because it does not require much pressure to set it off. The entire fuze can be set into the centre of a block of epoxy resin so that it cannot be initiated accidentally. If you do this, set string into the resin so that it is easy to find a fuze that has been buried. The fuze should then be treated as a detonator and stored carefully.

When the fuze must be cut open:

1. Wear PPE and a visor. Wear a thick glove on the hand holding the fuze.
2. Use a junior hacksaw to cut around the body of the fuze just above the lettering. Take care not to cut deeper than the plastic.
3. When the top of the fuze can be lifted away, mix some epoxy glue.

4. Fill the cavity inside the fuze with epoxy glue and tape the top back into place while the glue is still wet.
5. When the glue has dried, paint the fuze red to show that it is live and dangerous. Although it should not fire with pressure on the top, it should not be stepped on or otherwise mistreated.

NOTE: *Remember to dispose of the rest of the mine safely.*

8.8.2 Making a PRB M3 safe to use as a MDD target

Start with a mine that has been rendered safe, so does not have the pressure plate or fuze in place.

1. Mix some two-part epoxy glue and fill the cavity in the top of the mine where the fuze was.
2. When the glue has dried, paint the mine red and clearly mark it “MDD”.
3. Ensure that the fuze is safely destroyed.

NOTE: *MDD targets cannot be used as detector targets because they do not contain the metal parts that the detector can find.*

The picture below shows a PRB M3 after a flail had been used in an area. The mine has been damaged, but not destroyed.

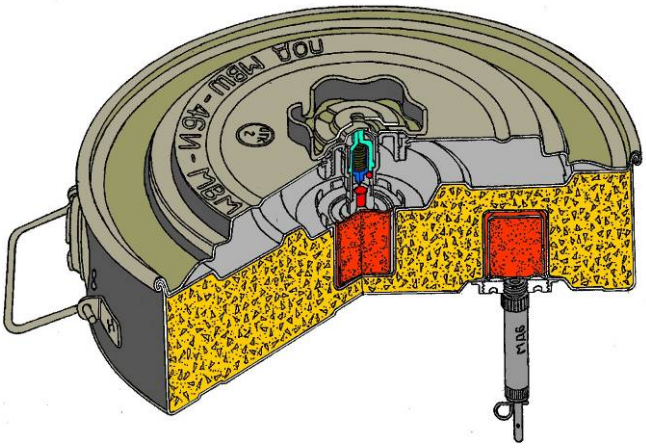
When mines are found without the pressure plate assembly attached, always presume that the fuze is inside and treat the mine as a live mine. Do not use a tool to try to clean out the fuze well. Deminers have died trying this.

8.9 TM-46: Anti-Tank blast mine (5.3 kg TNT)

The TM-46 is a metal cased AT blast mine containing 5.3 kg of TNT. The mine is usually laid with a pressure fuze, but may be used with a tilt-rod fuze.

This mine should always be pulled before any attempt is made to disarm it. This is because:

1. The mine have a pressure release device or anti-disturbance fuze which cannot be detected without removing the cap.
2. The mine may be paid with an anti-lift device fitted into an auxiliary fuze-well on the underside of the mine body. MUV fuzes may be used.



To disarm the mine, follow this sequence.

To render the mine safe, the following sequence should be followed.

1. Wear PPE and a visor.
2. Check the immediate area around the mine for anti-disturbance devices.
3. Excavate the rear side of the mine to place a pulling hook.
4. Pull the mine remotely.
5. Hold the mine firmly and unscrew and remove the fuze assembly.
6. Unscrew and separate the detonator from the fuze.

8.9.1 Making a TM-46 safe to use as a MDD target

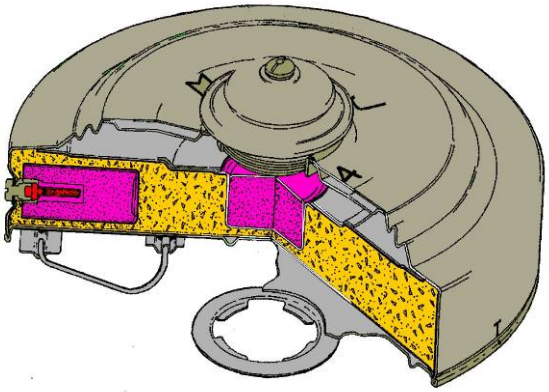
Start with a mine that has been rendered safe, so does not have its fuze in place.

1. Fill the fuze-well with resin, clay or Plaster of Paris.
2. When it has dried, paint the mine red and clearly mark it “MDD”.
3. Ensure that the fuze and detonator are safely destroyed.

8.10 TM-57: Anti-Tank blast mine (7 kg TNT Torpex)

The TM-57 is a metal cased AT blast mine containing 7 kg of TNT. The mine is usually laid with a pressure fuze, but may be used with a tilt-rod fuze.

Fuzes used may be the MVZ-57 or the MVSh-57 (tilt rod). AN MUV or other fuze may be used in the secondary fuze-well.



To render the mine safe, the following sequence should be followed.

1. Wear PPE and a visor.
2. Check the immediate area around the mine for anti-disturbance devices. There is secondary fuze well on the side of the mine, so carefully excavate all around it.
3. Excavate the rear side of the mine to place a pulling hook.
4. Pull the mine remotely.
5. Hold the mine firmly and unscrew and remove the fuze assembly.
6. Unscrew and separate the detonator from the fuze.

8.10.1 Making a TM-57 safe to use as a MDD target

Start with a mine that has been rendered safe, so does not have its fuze in place.

1. Fill the fuze-well with resin, clay or Plaster of Paris.
2. When it has dried, paint the mine red and clearly mark it “MDD”.
3. Ensure that the fuze and detonator are safely destroyed.

8.11 M15: Anti-Tank blast mine (10.3kg Comp.B – RDX/TNT)

This is a large AT mine with a metal case.



The pictures above show the filler cap on the side of the mine and the carrying handle.

To render the mine safe, the following sequence should be followed.

1) Turn the arming lever from ARMED, past DANGER to SAFE. Use an approved tool if necessary. If the arming lever cannot be moved to SAFE, destroy the mine where it is.

2) Unscrew the arming plug. If the arming plug cannot be unscrewed, but the arming lever points to Safe, the mine has been neutralised, but not disarmed. The mine can be safely moved for later demolition when required.

3) Remove the M603 fuze. If the fuze cannot be removed, the mine has been neutralised, but not disarmed. When the fuze cannot be removed, the mine can be moved for later bulk demolition when required.

4) If the mine body and pinned fuze assembly are separated, move the disarmed mine body and the fuze separately to the mine and fuze Collection Areas.

NOTE: *The size of this mine means that other mines within a six metre radius may be detonated sympathetically if it is destroyed in-situ.*

8.11.1 Making an M15 safe to use as a MDD target

Start with a mine that has been rendered safe, so does not have its fuze or detonator in place.

4. Ensure that the fuze is absent, then screw the arming plug back in place.
5. Paint the mine red and clearly mark it “MDD”.
6. Ensure that the fuze and detonator are safely destroyed.

8.12 M19: Anti-Tank blast mine (9.5kg Comp. B – RDX/TNT)

This is a large AT mine with a plastic case and a minimum metal content. A small copper-cased detonator and stainless steel firing-pin are the only metal components in this mine. This can make it very difficult to detect with a metal-detector.

The mine above was removed after 30 years in a minefield.

To render the mine safe to move for destruction, the following sequence should be followed.

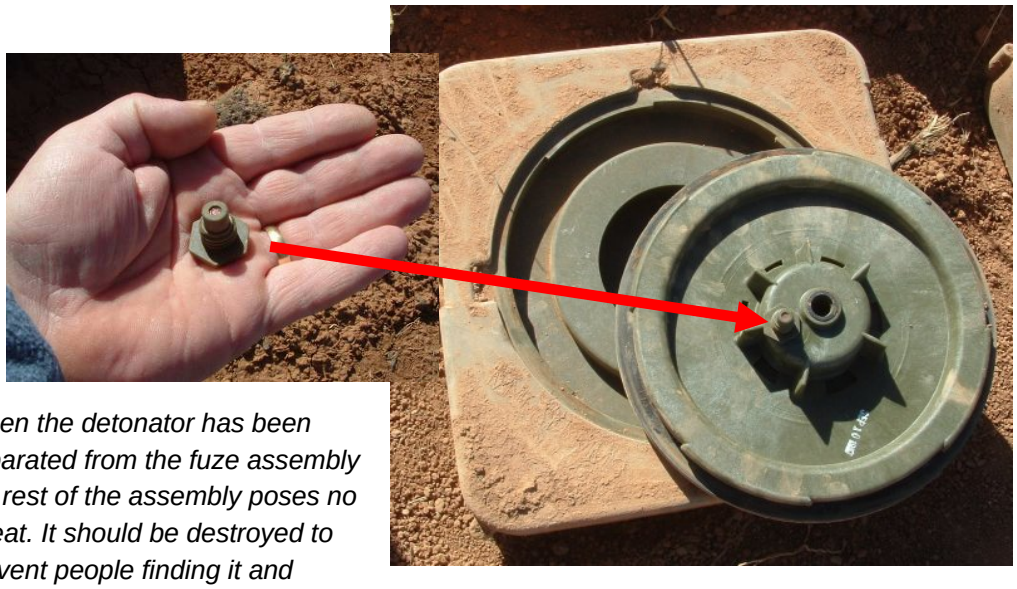
1) Turn the arming switch so that the switch moves from pointing at “A” (armed) to “S” (safe). If the switch cannot be moved, destroy in-situ.

The mine on the left is “A”rmed.

The mine on the right is “S”afe.

2) Turn the fuze assembly anti-clockwise by hand or with an approved tool. Lift the fuze. If the fuze cannot be removed, the mine has been neutralised, but not disarmed. The mine may be moved for later bulk demolition when required.

3) Unscrew the detonator from the bottom of the fuze. If the detonator cannot be removed, do not use excessive force. The picture below shows the detonator removed from the underside of the fuze.



NOTE: *When the detonator has been separated from the fuze assembly the rest of the assembly poses no threat. It should be destroyed to prevent people finding it and thinking it is dangerous.*

NOTE: *The size of this mine means that other mines within a six metre radius may be detonated sympathetically if it is destroyed in-situ.*

8.12.1 Making an M19 safe to use as a metal-detector target

Use only the fuze assembly.

1. Mix a very small quantity of epoxy glue.
2. Glue a small disc of stiff plastic to the top of the detonator. Let it dry.
3. Mix some more epoxy glue and fill the detonator hole with glue.
4. Screw the detonator back into the fuze before the glue in the hole has dried.
5. Paint the mine red.

NOTE: *Remember to dispose of the mine body safely. Large mines like this can be excellent sources of explosive from which to make your own demolition charges.*

8.12.2 Making an M19 safe to use as a MDD target

Start with a mine that has been rendered safe, so does not have its detonator in place.

1. Ensure that the detonator is absent, then screw the fuze assembly back in place.
2. Paint the mine red and clearly mark it “MDD”.
3. Ensure that the detonator is safely destroyed.

NOTE: *MDD targets cannot be used as detector targets because they do not contain all of the metal parts that the detector can find.*