GENERIC SOPs

CHAPTER 2: SAFETY

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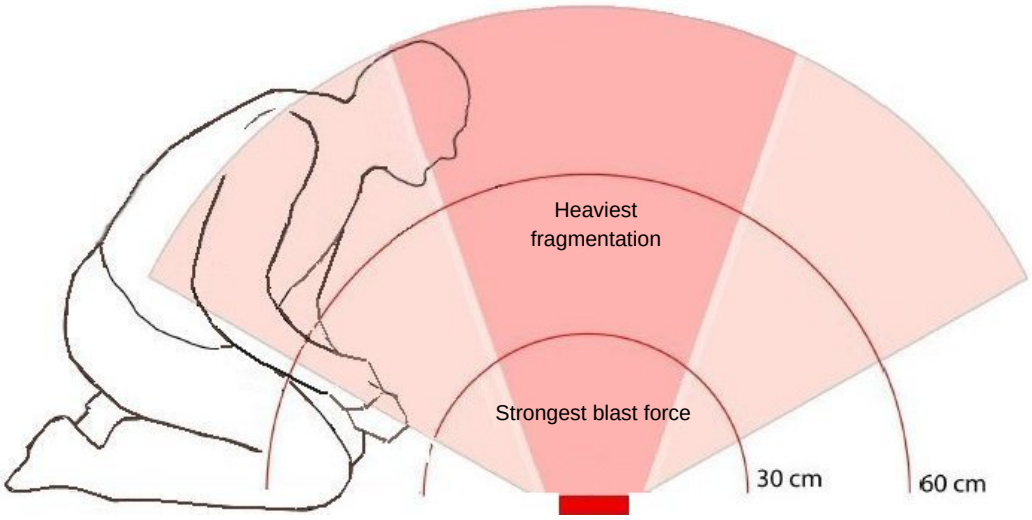


As well as general Health and Safety issues, safety covers the threat of explosive injury. Most demining accidents happen when exposing a small AP blast mine. The blast force expands as a dome and its velocity decreases very rapidly. The “environmental fragmentation” is concentrated in a cone above the mine (as illustrated in the diagram above).

To keep the risk of severe injury as low as possible, procedures and tools must be used that keep the deminers hands and head as far as possible from the point of detonation. It is also important that the deminer is not directly above the detonation.

Excavation tools should be designed to keep the deminer’s hands at least 30cm from the mines.

Demining procedures should be developed so that the deminer’s head is at least 60cm from any detonation. The use of PPE should then reduce the risk of severe injury still further.

CHAPTER 2: SAFETY

AP blast mine detonation

Contents

1. Principles

A “safe” Task site is not one where there is no risk at all. No human activities are risk-free, so risk can never be totally eliminated. A “safe” Task site is one at which the risk has been reduced to a “tolerable” level. There is a need to provide a *tolerably safe* working environment at all times.

All Tasks must be “safe”, whether they are Technical Survey or Clearance tasks. No procedure that does not result in complete confidence that the land is safe can be followed by staff who walk on the land. Safety must not be compromised during Technical Survey

1.1. Risk control

Risk is controlled at Task sites by management procedures and processes that identify and reduce risk, ensuring that it is always as low as possible.

Demining Task safety is achieved by:

1. Ensuring that all staff are sufficiently trained and competent;
2. Making a Task Risk Assessment (TRA) for each Task and revising it frequently;
3. Making a Task Release Plan for each Task and revising it when necessary;
4. Ensuring that the tools and procedures that are used reduce the risk of an injurious detonation to the minimum;
5. Maintaining appropriate work and rest periods;
6. Maintaining obvious and unambiguous site marking;
7. Controlling the movement of deminers, machines, MDDs, visitors and the public;
8. Providing effective supervision for all Task site activity;
9. Providing appropriate PPE to all those at the Task;
10. Enforcing working-distances appropriate to the remaining risk of secondary injury; and
11. Providing effective medical cover and insurance.

Staff must be encouraged to take responsibility for their own safety. No person in authority shall order staff to breach these SOPs or to work in an unsafe manner. If such an order is given, it should be refused and reported to a higher level of management. The report should reproduce the order and explain why it was not obeyed.

2. Working periods

The working hours at demining Tasks may vary according to the weather and local conditions. A normal deminer’s working day should comprise six working hours at a Task, excluding travel time, preparation time, maintenance periods, and meal breaks. All staff, including every level of Supervisor, are expected to work up to nine hours each day when necessary to complete all of their work inside and outside the SHA.

No deminer’s working day in the SHA should be longer than seven working hours, excluding travel time, preparation time, maintenance periods, and meal breaks.

The following minimum requirements should be applied during work at all demining Tasks:

1. Demining operations must be undertaken in daylight;
2. Demining operations should not be conducted when it is raining;
3. Deminers should not normally work for longer than 30 minutes in the SHA before they take a ten minute Rest break. Even in exceptional circumstances, no deminer shall work longer than 50 minutes in the SHA before they take a ten minute Rest break;

4. Supervisors must vary the length of the work periods if deminers are not concentrating fully; and
5. Deminers should not be required to work during the evening.

3. Clothing and Personal Protective Equipment (PPE)

All items of clothing and tools used at a Task site either provide some level or protection, or some level of risk.

3.1. Clothing and footwear

All field staff must be issued with suitable clothing to provide protection from strong sunlight and vegetation scratches. All staff must also be issued with strong footwear that is comfortable and has slip-resistant soles.

Deminers should be issued with gardening gloves. These do not provide significant protection if a mine detonates but they do stop the deminer getting cuts and scratches in his/her normal work. When excavating a possible mine or ERW, the deminer should take the gloves off if they effect dexterity. When feeling for tripwires, the deminer should take the gloves off.

3.2. Personal Protective Equipment (PPE)

PPE is provided as the final protective measure after all training and procedural efforts have been made to reduce risk. Wearing PPE does not make the wearer safe. It reduces the risk of the person suffering a severe injury but it does not remove all risk of that happening. If it is not worn correctly, it may provide no protection at all, so PPE must be correctly worn and properly maintained.

All PPE restricts the wearer by limiting movement, vision and comfort. It is also heavy and can be tiring to wear, especially in hot conditions. The desire for protection has to be balanced against the fact that wearing too much PPE can restrict movement or concentration and so make an accident more likely to occur.

All staff moving inside a Task site while demining is being conducted must wear the approved PPE unless they are at the Task safety-distance or in the Administration or Rest areas. When no demining is being conducted, staff *should* wear PPE when they approach the SHA.

Task Supervisors and Platoon Supervisors *must* always ensure that:

1. all staff using PPE are trained in its use, maintenance and storage;
2. appropriate facilities are provided for PPE storage, transport, cleaning and maintenance; and
3. that all PPE is regularly inspected and replaced when in an unsatisfactory condition. It is especially important to ensure that eye protection is easy to see though.

The minimum PPE requirement for staff engaged in any activity inside the SHA is 5mm polycarbonate eye protection and frontal body protection. When the mine may be within two metres of the deminer, a 5mm polycarbonate blast visor should be preferred.

The minimum requirement may be exceeded when the equipment is available. Other PPE that may be worn include lower-leg protection.

Generally, no practical PPE provides protection against the detonation of AT mines or large items of ERW. Despite this, EOD Operators must wear, as a minimum, the PPE used by deminers. This provides some protection against a partial detonation, or the detonation of the fuze.

Specialist protective clothing should be available when working with munitions that include toxic or volatile chemicals. Enhanced PPE, such as a bomb-suit, may also be issued for other activities.

3.2.1 Body protection

The minimum protection for the body is frontal protection that extends over the groin and the top of the thighs. Many designs are in use in demining and the designs used may vary.

The protection offered should be equal to a NATO STANAG 2920 V50 of 450 m/s or greater. This is a fragmentation measure and does not assess the resistance to blast. Body protection made using ballistic aramids of any kind may be used (Kevlar is just one brand name). All body protection used must be capable of withstanding the blast effects of 240g TNT (a PMN mine) detonated at 30cm from the nearest part of the armour when the armour is in position as if worn by a kneeling deminer.

Because the qualities of body armour can be affected by poor design and production methods, it must be sourced from reputable suppliers. When there is any doubt about the quality of a product, blast tests should be conducted on any body protection before it is approved for use. A field trial should also be conducted to assess comfort and any restrictions on movement that the protection may impose.

NOTE: *Body protection that restricts movement or is easy to wear incorrectly must be avoided.*

3.2.2 Eye/face protection

All eye or face protection used at a Task site must be made using 5mm untreated polycarbonate. This material has been proven effective in many blast mine accidents.

The long visor, vented mask visor, and short visor shown above may all be used.

When eye protection that is not a visor or mask is used, the 5mm lens must be held in a frame that prevents blast entering from beneath. Goggles similar to those shown on the right should be used.

The flexible qualities of polycarbonate are an essential part of the protection it offers. Because the qualities can be affected by poor production methods, eye protection must be sourced from reputable suppliers. When there is any doubt about the quality of a product, the item should be subjected to blast testing before it is approved for use. A field trial should also be conducted to assess comfort and any restriction to vision that the protection may impose.

NOTE: *Eye protection that restricts vision, or is easy to wear in a raised position, must be avoided.*

Polycarbonate is degraded by exposure to sunlight and can become brittle. All polycarbonate eye protection should be replaced after 300 days of use, or sooner.

Polycarbonate is easily scratched and can become difficult to see through. Polycarbonate eye protection that restricts vision is dangerous and must not be used.

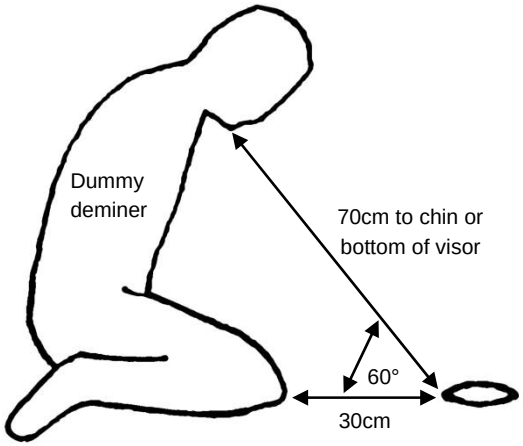
3.2.3 Blast testing PPE

To allow comparison with other blast tests, care should be taken to set up the test in the same way every time. A real mine should be used whenever possible.

A dummy deminer can be made using stiff wire and held upright using a 20kg sandbag.

The test requirements are:

1. The mine should be a PMN AP blast mine containing 240g TNT (or equivalent). The booster and detonator should be removed and replaced by a small quantity of plastic explosive and a detonator allowing remote initiation.
2. The mine should be positioned with the top level with the ground. The ground around the mine should not be disturbed more than necessary.
3. When the detonator is not centrally positioned in the mine, it must be on the side nearest to the dummy deminer. Any offset metal content inside the mine should be on the side closest to the dummy deminer. These provisions make it more likely that metal will strike the PPE, and so provide a “worst-case” test.
4. The PPE must be positioned as it would be when worn by a kneeling deminer.
5. It must be held on a dummy deminer that can move backwards without constraint. The dummy must not be held it place with rigid supports or suspended from a frame.
6. The distance from the knees of the dummy deminer to the mine must be 30cm.
7. The distance from the centre of the mine to the bottom of the visor or the chin of the dummy deminer must be 70cm.
8. The angle between the ground and a line to the centre of the deminer’s face or visor must be 60°.



The dummy deminer will be driven backward and upward by the expanding blast wave and may fall over. The visor may be thrown up into the air and may land in front of the dummy. The blast wave frequently removes the visor as it passes. The fragments hit the visor just before the blast wave, so it does not matter if the visor is removed.

After the test, the result should be photographed before being moved. The equipment should then be examined for damage. The inspector(s) should be looking for damage that means the equipment did not perform in the required way.

The PPE will be damaged, but should not be damaged in a way that could result in critical injury. The lens of eye protection must stay in one piece. Full penetrations of 5mm polycarbonate may occur if it is struck by a metal fragment from the mine or by burning stone. Clean holes are unusual occurrences and should be ignored. Generally, polycarbonate only fails to perform as expected if the equipment breaks in the area facing the blast.

Body armour *must* not have any complete penetrations and should always stay in one piece (collars, groin flaps, thigh protection of shoulder panels must not be separated). Check the back of the equipment for signs of exit holes.

Partial penetrations of body protection are acceptable, but the depth of penetration can provide a means of comparing different equipment that is otherwise similar. Cut the stitching on body armour to examine the inside when necessary. Small variations in penetration depth should be ignored. PPE made using Kevlar with a V50 of 450m/s usually has 13 or more layers (the number depends on the weave and fibre). A difference in penetration of 1-4 layers should be ignored because the deeper penetration may have been caused by chance.

In any test, if the mine fails to detonate or partly detonates and deflagrates, the result should be discounted. With a failed detonation, no real test has occurred. With a deflagration, an unusually severe test may have occurred. For example, if the PPE has been struck by a shower of burning material that has become welded to it, this material has probably continued to burn after it stopped, and so the level of damage caused by the impact can no longer be reliably assessed by comparing the end result with another test in which this did not occur.

3.3. Hand-tools as PPE

The use of tools made of material that easily breaks has caused severe deminer injury in demining programmes around the world. Tools that are used in the investigation of a metal-detector signal or in area-excavation of land that is inside a SHA must be designed to minimise risk to the deminer.

Demining tools used during mine excavation should have the following features:

1. The user's hand should be as far away as possible from any accidental initiation, usually at least 30cm from the point of initiation.
2. The material used to make the tool must distort rather than break in an AP blast mine detonation. This prevents the use of very hard and brittle steels.
3. The tool must be constructed so that it does not readily separate into parts in any AP blast mine detonation. This usually means that the shaft must be taken right through the handle and that the handle must also be able to bend easily.
4. The tool should be designed so that it is easiest to use at a low angle (30° or less) to the ground by a kneeling deminer. This encourages the user to keep his/her hand beneath most of the fragments of earth and stone from any detonation.
5. When practical, the tool may include a flexible blast-guard for the hand using it.
6. When a tool has two handles, the handle for the second hand should be as far as possible from any accidental initiation.
7. The design must be comfortable and easy to use for long periods.

Some materials that are proven to work well are E304[1] Stainless Steel for blades and Medium or High Density Polyethylene (MDPE/HDPE) for handles. Materials to avoid are brittle plastics, hardened metals and soft alloys. Natural materials such as wood and leather should be avoided because their properties vary so widely that consistent quality cannot be assured.

[1] E304 is the number of an American AISI type of steel. The composition is: 18-20% Chromium; 8-12% Ni-Nickel; a maximum 0.08% carbon; a maximum 2% Manganese; and a maximum 1% Silicon. The UNS designation for 304 is S30400 Annealed, Tensile Strength MPa 518; hardness Brinell 201; ASTM Specification A240. It is generally the cheapest grade of Stainless Steel available.

4. Visitors to a Task site

Every person arriving at a Task site must be treated as a visitor unless they are Staff, authorised Technical Advisors, or authorised external QA staff. The Task Supervisor must ensure that the Country Manager has approved the visit. If the visit is a 'surprise visit', the Platoon Commander should take control and take advice from the Task Supervisor.

NOTE: *All press or media visits should be approved by senior management.*

All visitors must be made familiar with the marking system, what to do if there is an explosion and all general safety procedures inside the minefield.

NOTE: *All visitors, including Technical Advisors and members of the Internal QA Team, must report to the Administration Point for registration on arrival. PPE in accordance with Part 3 of this Chapter must be worn inside the Task site.*

The Task Supervisor (or his/her delegated representative) must take control of visitors from the time they arrive to the time they depart. If the Task Supervisor (or his/her delegated representative) feels that safety is being compromised, the visit must be stopped and the visitor(s) escorted to a safe-area immediately.

4.1. Conduct of visits

The following procedure must be followed when conducting a visit:

1. Confirm that senior management knows about the visit and that there is a translator present when necessary.
2. Count the visitors.
3. Fill in the visitors' log with each visitor's name and blood group, then ask each visitor to sign showing that they have understood the insurance disclaimer. If a visitor will not sign the insurance disclaimer, they must not be allowed within the safety-distance of the SHA.
4. Conduct a Task briefing for the visitors. Any visitors that do not understand or do not take an interest in it must not be allowed to leave the Administration area and enter the SHA.
5. Ensure that the visitors wear PPE correctly.
6. Ensure that the entire group of visitors is appropriately supervised to ensure safety.
7. All deminers must stop work in the immediate area until instructed to do otherwise by the person in control of the visit.
8. Conduct the visit with a Supervisor in front and another Supervisor behind the visitors.

4.1.1 Task Briefing

The following is the briefing format to be used as a guide by the Task Supervisor (or his/her delegated representative). The list below should be adjusted to suit the audience but should always include all safety elements. This briefing should also be given to QA staff and Technical Advisors when requested.

The Briefing should cover:

1. Introduction:
    a. Welcome the visitors to the Task;
    b. Give the Name of the Task and the Task ID number;
    c. State the date that work as the Task started;
    d. Explain how many manual demining Platoons, Sections, MDD and/or Mechanical Teams are working at the Task;
    e. Mention that questions will be answered at the end of the briefing.
2. Orientation:
    a. Show the visitors' current location on the Task sketch map;

b. Point out any obvious reference points that are on the map and easily seen.

3. Socio-Economic Information:
    a. Introduce the Task area, its Administrative centre and how the presence of the SHA affects the lives of the end-users;
    b. Explain the expected use of the SHA after it has been released.
4. Minefield History:
    a. If the SHA includes an expected minefield, explain why the minefield was placed;
    b. When it is relevant, explain the current security situation in the area.
5. Team deployment:
    a. Show on the map where the various Platoons, Sections, machines and MDD teams are working.
6. Statistics:
    a. List the Mines (AP and AT) that have been found and show where they were found on the sketch map;
    b. List any other ERW items that have been found;
    c. Using the sketch map, show the areas that have been Cleared.
    d. Give the total Clearance, Reduction, Verification and Cancellation figures for the Task.
7. Manual demining:
    a. Explain the procedures used;
    b. Introduce the tools used.
8. Marking in the SHA:
    a. Explain the use of marking pickets, stones and flags;
    b. Point out the explosive storage area, and ask people to avoid it;
    c. Point out the latrine area(s) and ask people not to leave the group to use the latroine without informing the supervisors.
9. CASEVAC plan:
    a. Explain that if an accidental detonation occurs the visitors must stand still and wait for instructions;
    b. Explain where the Paramedic is positioned;
    c. Explain the CASEVAC route to the nearest hospital and the anticipated travel time.
10. Procedure in the SHA:
    a. Tell the visitors that they must stay together between their escorts;
    b. Visitors must not leave the group, must be careful to stay in the marked safe areas and must obey instructions at all times;
    c. No interviews can be conducted within the SHA;
    d. PPE must be worn correctly at all times.
11. Ask if the visitor(s) have any questions?

After answering any questions, issue PPE and show the visitors how to wear it correctly. After leaving the Administration Area, if any visitor ignores the safety rules, he/she must be escorted from the SHA immediately.

5. Demining Task layout and marking

Each Task site *must* include marking that provides an easily visible and unambiguous separation of hazardous areas from safe-areas. Other designated areas on the Task site must be marked and the marking should be maintained daily.

The details of Task site layout and marking are given in Chapter 4 of these SOPs. They cover the marking of both safe-areas and Suspected Hazardous Areas (SHAs).

6. Working-distances between staff

All staff should understand that no human activity is risk free. During demining, the recorded accidents show that the greatest risk is faced by the deminer closest to the hazard. Those at a greater distance are at a smaller risk of secondary injury.

Working-distances do not make an accident less likely to occur. They make it less likely that there will be more than one victim of an accident. They should not be called “safety-distances” because the aim is not to reduce all risk of secondary injury to zero. They should be called “working-distances” because they reduce the risk of secondary injury to a *tolerable level*.

The principles used to decide working-distances appropriate for manual demining should also be used when determining appropriate working distances between MDD.

NOTE: *Working-distances do not reduce risk for the person who detonates a mine or ERW. The minimum distances provide a practical means of reducing risk of secondary injury without compromising the quality and efficiency of the work.*

People not wearing approved PPE must not be allowed to enter the Task site beyond the Administration Area. If people approach the SHA to within the safety-distances, work must be stopped until the people are appropriately protected by PPE or distance.

6.1. Calculating Working-distances

Appropriate working-distances for a Task are calculated as a part of the Task Risk Assessment described in Chapter 3 of these SOPs. The process of calculating them is described here.

As demining at a Task progresses, the information on which this calculation is based may alter, so the calculation must be reviewed regularly to ensure that is still appropriate. While no risk of severe injury should ever be tolerated, a small risk of minor injuries that do not result in disability is unavoidable and so is accepted as *tolerable*.

Calculation of appropriate working-distances for a Task involves assessing the following:

1. the mine and ERW hazards, their condition and the range of danger they present; and
2. the likelihood of severe or disabling secondary injury resulting from any unplanned detonation.

These are described in detail below.

6.1.1 Assessing the Mine and ERW hazards

The greatest threat that mines and ERW pose to demining staff is the blast-wave from the detonation of an anti-personnel mine that detonates while it is being uncovered. The working-distance will not protect the man uncovering the mine. It should protect others at the Task from severe injury.

The danger area presented by the *blast* of a detonation is directly related to the size of the high explosive in the device.

The blast hazard associated with AP blast mines reduces very rapidly so that deminers who are a metre away and wearing approved PPE often escape severe injury. The range of the danger area from the largest anti-personnel blast mines is less than 10 metres. Ear-drum injury to a person at ten metres from an AP blast mine detonation is rare, and then usually involves only temporary hearing loss.

The danger area presented by the *fragmentation* associated with a detonation is directly related to the material used for the casing of the device and to its deliberate fragmentation content. The danger area presented by the fragmentation from plastic cased AP blast mines is not greater than ten metres. The danger area presented by the fragmentation from metal-cased anti-personnel

fragmentation mines is greater. The fragmentation generally spreads in a 360° radius from the point of detonation and slows down over distance. The speed of two fragments from the same mine may vary considerably. The risk of being hit by a high-speed fragment is reduced both by distance and by the spread of the fragments. The danger range varies with different mines, and is generally related to the mine's design, the weight of its high explosive content and its position relative to the ground when it detonates. The spreading of fragmentation may present a varying degree of danger to staff at distances up to 50 metres. The greater the distance between the mine and the deminer, the less likely any injury is to be severe.

The danger area associated with large AT blast mines can be up to 50 metres, but approved manual demining procedures usually make the risk of detonation very unlikely. Severe ear-drum injury to a person at 50 metres from an AT blast mine detonation has not been recorded[2].

The range of ERW hazards other than mines is too great to summarise. However, hazards can be ignored unless the demining procedure that is being used could result in their detonation. For example, accident records indicate that manual demining has never detonated a mortar bomb, so the threat from mortar bombs can be ignored when deciding which working-distance to use for manual demining unless mortar bombs in a dangerous condition are anticipated.

When the hazards in an area do not include mines, BAC/S standards should be applied. During BAC there is usually no minimum working-distance as long as hazardous items are not touched.

With all mines and ERW, the condition of the device can make accidental detonation more or less likely. If it is known that a device or its fuze has decayed in such a way that it is no longer capable of detonating, the danger posed by that device should be ignored when calculating working-distances. If it is known that a device may have decayed in a manner that makes it more sensitive to accidental detonation, the danger posed by that device in that condition should be considered when calculating working distances.

6.1.2 Likelihood of severe secondary injury

An injury is called *minor* when it does not result in any loss of function or in disability. All injuries that result in loss of function or disability are called *severe*.

The likelihood of an unplanned detonation resulting in severe injury should be assessed with reference to the following:

1. the risk of initiation of the mines and ERW that are present;
2. the procedures and tools that will be used;
3. the demining staff's personal protective equipment (PPE); and
4. the working-distances that will be used.

An appropriate working-distance must reduce the risk of severe secondary injury to a tolerable level. The attempt to remove all risk of minor secondary injury must be avoided because it may impose impractical procedures, PPE and working-distances.

6.2. Calculating appropriate working-distances

The first assessment of working-distances at a Task is "preliminary" because it should be updated regularly as more information becomes available.

The assessment to decide the working-distance at a Task involves:

1. deciding the greatest hazard present;

[2] There are no records of this in the UNMAS supported Database of Demining Accidents – available at www.ddasonline.com

2. assessing the chance of an unplanned detonation occurring; and
3. deciding the appropriate working-distance.

Step 1: Deciding which mine or ERW presents the greatest hazard

The first step in deciding working-distances is the identification of the mine or ERW that poses the greatest risk of secondary injury at a Task. When the type or condition of the devices likely to be found is not known, a worst case scenario should be presumed and the assessment of working-distances reviewed when more information becomes available.

The largest or most potentially damaging mine will not always present the greatest risk of secondary injury. For example, when working in a mixed AP and AT minefield, there may be no reason to expect that an AT mine could be unintentionally detonated during any of the manual procedures used. In this case, the AP mines would present the greatest danger and an AP mine should be selected as the greatest hazard.

If there are functional AP fragmentation mines at a Task, they often present the greatest risk of secondary injury. However, if the AP fragmentation mines have no tripwires or their fuze system is reliably inoperative, there may be no reason to expect that an AP fragmentation mine could be unintentionally detonated during any of the procedures used. For example, in AP fragmentation mine areas that have been processed using a machine so that all the fragmentation mines have either detonated or their tripwires and fuzes are broken, the working-distance for the next greatest hazard (after AP fragmentation mines) should be used. This will usually be an AP blast mine.

After consideration of all the mines and ERW that may be at the Task, decide which presents the greatest hazard and move on to Step 2.

STEP 2: Assessing the chance of an unplanned detonation occurring

The second step in the assessment of working-distances is an assessment of the likelihood of an unplanned detonation occurring at the Task.

Consider the hazard and the procedures that will be used and decide the risk of an unplanned detonation occurring as being High, Increased or Normal, as defined below.

1. High risk. The condition of the hazard is such that it could be initiated during the correct application of approved manual demining procedures.
2. Increased risk. The Task conditions complicate the use of approved manual demining procedures in a way that could result in an unplanned detonation.
3. Normal risk. There is no reason to believe that the application of standard manual demining procedures will result in an unplanned detonation.

When the risk of the detonation of any mine or other ERW is high, the risk of severe injury to the deminer actually conducting manual demining procedures is unacceptable. If there is a high risk of a detonation, manual demining *must not* be conducted until the risk of detonation has been reduced. Equipment, procedures and tools must be selected that will reduce the risk of a detonation. Mechanical demining that detonates or disrupts the greatest hazards may be used before manual Clearance is conducted.

Manual demining may be conducted when there is an *increased risk* of an unplanned detonation but demining can only be conducted when, using the procedures, tools and PPE selected, there is a tolerably low risk of severe injury from any unplanned detonation.

A normal risk of an unplanned detonation is the normal situation at any Task. A normal risk of an unplanned detonation automatically means that there is a low risk of severe secondary injury because there is a low risk of any injury at all. When the risk of severe secondary injury is very

low, the working-distances required to make this risk *tolerable* can be short. Short distances improve communication, supervision and efficiency, which can increase general safety.

Choose whether there is an *Increased* or *Normal* risk of a detonation occurring and move on to Step 3.

STEP 3: Deciding appropriate working-distances

Working-distances should be determined for each Task. In some cases, working-distances may vary between different parts of the same Task. When this occurs, the variation must be marked with signs so that staff are always aware of which working-distances apply where they are.

Table 1 shows minimum working-distances between demining staff at a Task where mines present the greatest hazard. Greater working-distances should be considered when it is possible to use them without reducing safety or efficiency.

If any of the following apply, the distances shown under the heading “Increased risk” in Table 1 should be applied as the minimum:

1. Hazards are in an unknown or unpredictable condition;
2. Hazards may be booby trapped or have anti-lift devices fitted;
3. The procedures that will be used have not been proven at a similar Task; or
4. The risk of an unplanned detonation has been assessed as *Increased*.

When there is no reason to believe that the procedures and tools in use could cause an unplanned detonation of any of the mines present, the working-distances appropriate for the Normal risk associated with the smallest AP blast mine should be adopted.

While the accident evidence indicates that the working-distances shown in the table below should make secondary injury both unlikely and rare, they should be applied *as a minimum*. Greater distances should be used when the Task Supervisor decides that greater distances are desirable.

Mine Type	**Minimum distance between demining staff** **(distance in metres)**	
	Normal risk	Increased risk
AP blast, HE up to 200 gm	10	15
AP blast, HE more than 200 gm	15	20
AP fragmentation mines	20	25
AP Bounding fragmentation mines	25	30
AP directional fragmentation mines	25	30
AT mines	15	50

Notes to table:
1. Recommended *minimum* distances are for demining staff wearing PPE.
2. The assessment used to decide the minimum working-distance must be reviewed if any of the information used in the assessment changes.
3. If devices presenting a greater hazard than expected are discovered, the appropriate working-distance for the increased hazard must be adopted unless there is no reason to anticipate the presence of more of those devices in the area.
4. These distances must not be applied during demolitions or any other procedure during which mines are deliberately detonated (such as mechanical demining).

Table 1: Range of working-distances to be applied during manual demining

Working-distances at a Task will be one of those listed under “Increased risk” until an assessment of the hazard presented by the mines and ERW that are present has been made.

6.3. Working-distances during other procedures

Table 2 lists working-distances during various activities other than manual Clearance. Any variations must be approved by the Task Supervisor and reasons for the variation must be written in the Task Release Plan.

System in use	Minimum distance	Worst anticipated active threat
BAC visual procedures	Not appropriate	None
BACS (subsurface) procedures	Not appropriate	Dictated by detector interference
Mechanical flail	50m	Threat from flail heads and chains
Excavator with tool	40m	All AP blast mines
Excavator with tool	75m	All AP fragmentation (AG) mines
Excavator with tool	300m	AT mines: threat from flying machine parts.
Mechanical flail	50m	All AP blast mines (including throw-outs)
Mechanical flail	75m	All AP fragmentation (AG) mines
Mechanical flail	300m	AT mines: threat from flying machine parts.
Mechanical tiller	40m	All AP blast mines
Mechanical tiller	75m	All AP fragmentation (AG) mines
Mechanical tiller	300m	AT mines: threat from flying machine parts
MPV, Steel wheels and rollers	25m	All AP blast mines
MPV, Steel wheels and rollers	75m	All AP fragmentation (AG) mines
MPV, Steel wheels and rollers	150m	AT mines
MDD deployment	As manual	Same as manual demining

Notes to table:
1. Recommended *minimum* distances are between machines and staff wearing PPE or behind armour.
2. The assessment used to decide the minimum working-distance must be reviewed if any of the information used in the assessment changes.
3. If devices presenting a greater hazard than expected are discovered, the appropriate working-distance for the increased hazard shall be adopted unless there is no reason to anticipate the presence of more of those devices in the area.

Table 2: Range of working-distances to be applied during other procedures

Distances may be reduced if a physical barrier provides protection. The reason for the variation should be recorded in the Task Release Plan.

The distances between machines are the distance between the machine and staff, not the distance between two machines working in the same area. Because the machine is intended to detonate or disrupt mines, the distances between machines and staff are greater than are needed when the procedure does not involve making deliberate detonations.

When machines are remotely controlled, the distance between two machines working in the SHA should not be less than 50 metres. When the Operator is inside the machine and protected by the machine's armour, the distance between two machines working in the SHA should not be less than 100 metres.

6.4. Supervisor working-distances

During manual demining, MDD and BAC or BACS procedures, authorised supervisors and QA staff are allowed to approach as close as two metres to working deminers as part of their work. EOD Operatives inspecting discovered devices may approach the deminer showing the device as long as the deminer is standing and not working. Supervisors, QA staff and EOD Operatives should not stand closer than two metres to a working deminer and should not remain close to a deminer for longer than is necessary to conduct their work.

7. Safety-distances during demolitions

Demolition safety-distances are greater than the working-distances used during manual demining operations. This is because there are no deliberate detonations during manual demining and because the risk of a detonation is low, the risk of severe injury is very low. When detonations are deliberately made, the distance is not a *working-distance*, it is a *safety-distance*.

Explosive demolition distances do not necessarily apply to other means of destroying mines. The safety-distance required when burning mine bodies separately from their fuzes, for example, is greatly reduced when there is no danger of a high order detonation during the process. See Chapter 10 of these SOPs. When mines and ERW are below ground, safety distances may be reduced by 10% at the discretion of the senior EOD Operator.

While other staff may be involved in the preparation for demolitions, only an appropriately qualified EOD Operator can place charges and conduct the demolition.

7.1.1 Safety-distances during mine demolition

Table 3 below shows minimum safety-distances for the explosive demolition of one mine at a time. In general, when it is easy to use greater safety distances, greater safety distances should be imposed at the discretion of the EOD Operative in charge.

Mine Type **(for a single mine with a minimum charge)**	**Minimum safety-distance** **(distance in metres)**	
	Demolition staff	Other staff
AP blast, all types.	30	60
AP fragmentation mines (all types).	60	100
AT mines.	200	300
Notes to table: 1. Recommended minimum distances are for demolition staff wearing approved PPE (and protecting their ears) and other staff not wearing PPE. 2. The distances shown are between the site of the detonation and the position of staff at the time of demolition, not distances between demining staff. 3. When using protective works or natural cover while destroying mines by explosive demolition, the required safety-distance should be assessed by appropriately qualified staff and may be reduced to reflect the reduced risk. 4. When multiple mines are being destroyed in a single demolition, the all-up weight of the high explosive involved should be considered and an appropriate safety-distance should be determined and applied. The Danger Area Support Tool available on the IMAS website (under IMAS support tools see TNMA 10.20 - calculation of explosive danger areas), provides danger area radii based on the 'all up weight' of mines/ERW being disposed of.		

Table 3: Range of minimum safety-distances to be applied during explosive demolitions

Greater distances should be considered when there would be no reduction in operational efficiency by using them or when the Task Supervisor's personal assessment is that greater distances are desirable.

7.1.2 Safety distances during ERW demolition

Table 4 below shows *minimum* safety distances for ERW demolitions. In general, when it is easy to use greater safety distances, greater safety distances should be imposed at the discretion of the EOD Operative in charge.

ERW Type **(for a single device at a time)**	**Minimum demolition safety distance** **(distance in metres)**	
	Demolition staff	Other staff
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	50	100
Buried charges of up to 10kg	75	150

Notes to table:
1. Recommended minimum distances are for demolition staff wearing approved PPE (and protecting their ears) and other staff not wearing PPE.
2. The distances shown are between the site of the detonation and the position of staff at the time of demolition, not distances between demining staff.
3. When using protective works or natural cover while destroying mines by explosive demolition, the required safety distance should be assessed by appropriately qualified staff and may be reduced to reflect the reduced risk.
4. When multiple devices are being destroyed in a single demolition, the total weight of the high explosive involved should be considered and an appropriate safety distance should be determined and applied. The Danger Area Support Tool available on the IMAS website (under IMAS support tools see TNMA 10.20 - calculation of explosive danger areas), provides danger area radii based on the 'all up weight' of mines/ERW being disposed of.

Table 4: Safety distances for the destruction of mines and ERW

When the item to be destroyed is known to contain white phosphorus or irritant fillings, the wind direction should also be taken into account and the distance extended downwind.

8. Communications requirements

It is a requirement at all Task sites that:

1. The Task Supervisor must be in communication with the Country Office and with all supervisory staff at the Task site;
2. MDD and Mechanical Team Leaders must be in contact with the Task Supervisor and with all staff under their control;
3. The Platoon Supervisor must be in contact with the Task Supervisor and with all supervisory staff in his/her Platoon;
4. The Platoon Commander must be in contact with the Platoon Supervisor and with all Section Leaders in his/her Platoon;
5. The Section Leaders must be in contact with their Platoon Commanders and with all the deminers under their control; and
6. The ambulance driver must be in contact with the Task Supervisor, and should be in contact with the Country Office and the CASEVAC hospital.

8.1. Communication between the Task and Country Office

Before work can be conducted in the SHA, there must always be communication between the Task site and the Country Office. It may be achieved using:

- HF radio;
- Mobile or land-line telephones; and/or
- Satellite telephones.

Communication using two of the above should always be possible, so covering for any breakdown in one communication system.

The Task Supervisor should contact the Country Office before the start of work each day or at a designated contact time. This checks the communication link and keeps the Country Office informed about events in the field.

When there is no alternative, work may continue at a Task when there is no direct communication between the Task and the Country Office as long as there is communication between the Task and the nearest hospital. When communication with the hospital is not possible, work must be suspended until permission to continue has been received from the Programme Manager.

In exceptional circumstances, communication may be achieved by the Task Supervisor travelling to a place where an HF or telephone signal can be obtained.

8.2. Communication at the Task site

Within a Task site there is a need for reliable communication at every level. This is generally achieved using VHF radios and a combination of whistle blasts and verbal commands that may be amplified using a megaphone or augmented with flag signals. The Section Leaders, Platoon Commanders, Platoon Supervisors and Task Supervisor should always have a means of communication.

The communication system should be used to contact a direct superior, or all levels in the Command Chain that are lower than the speaker.

The Task communication system must never be used for private purposes.

When approved by the Task Supervisor, cellular telephones may be used for Task communication but must never be used for private purposes during working hours.

When mechanical assets are deployed, the mechanical team generally has its own radio communication systems. When radio communication is unavailable or unreliable, the noise created by one or more machines can make voice communication impossible. The use of a megaphone with amplified siren sounds can overcome this, as can the use of hand-signals and flag systems. No machine may be used without a working communication system in place that allows communication between:

1. The machine Operator and the Mechanical Team Leader;
2. Any Observers present and the Mechanical Team Leader; and
3. The Mechanical Team Leader and the Task Supervisor.

8.2.1 Task site communication with whistle blasts

Whistle blasts may be used to indicate:

1. Start of work (one long blast);

   Deminers put on their PPE, leave the Rest area and go to their working areas.
2. Rest period or end of work (two long blasts);

   Deminers close their lanes and move to the Rest area before removing PPE.
3. Emergency (many long blasts);

   All deminers stop work, move away from their base-line and stand still. The Platoon Commander moves to the Section Leader blowing the whistle.

The Task Supervisor may impose any other regime as long as all Task staff receive full instructions to ensure that they understand the signals and respond appropriately.

8.2.2 Task site communication with Siren megaphone

A siren megaphone may be used for the same communication system as a whistle, and the issuing of general verbal orders.

To avoid confusion when different sections hear the same commands, only the Platoon Commander of Platoon Supervisor should use a Siren megaphone at a manual demining Task.

The Siren megaphone may be used at mechanical demining Tasks by the Mechanical Team Leader when it is appropriate, and when its use would not confuse other staff working nearby.

Whenever the siren megaphone is used, all staff at the Task must receive full instructions to ensure that they understand the signals and respond appropriately.

8.2.3 Task site communication with a flag system

When appropriate, a simple flag system may be used by the Mechanical Team Leader.

Flags are used to indicate:

1. Green flag held up:
   The Operator can drive the machine into the SHA or continue inside the SHA.
2. Red flag held up:
   The Operator must stop the machine moving.
3. Red flag waved from side to side:
   The Operator must stop the machine and turn the engine off.
4. Red and Green flags shown together:
   The Operator must stop the machine's ground processing tool and return to the safe-area and the machine Inspection area.

The Mechanical Team Leader may impose any other regime as long as all of the Mechanical team receive full instructions to ensure that they understand the signals and respond appropriately.