MANUAL CLEARANCE AND TECHNICAL SURVEY

Standard Operating Procedures (SOPs)

Section	Amendment	Date	Amended By
2.2	Change '1m (from the ground surface) red/white posts placed every on the turning points' with 'red and white sandbags at every turning point'.	29/10/2018	AG
2.2	Changed The Control Point is marked with four '1m blue and white sticks' to 'four blue and white sandbags'.	29/10/2018	AG
3.6.1	Change 'overlap of a full detector head or 20cm, whichever is greater, on either side' to 'a full detector head'. Change "overlap of 20 cm to the sides" to "Overlap of one detector head".	29/10/2018	AG
3.6.1	The deminer will then return to the baseline of the second 1 x 1 metre box and repeat the same steps listed above.	29/10/2018	AG
3.6.3	Stressed brushing 'towards' & removed '(but not on top of it)'.	29/10/2018	AG
3.6.3	Removed 'the marker will be placed below the centre of the detector head as the edge of the signal is heard.'	29/10/2018	AG
3.7.1	Added, 'once the excavation trench is created the Deminer should carefully remove the earth at the front using the elongated scraper tool. The chisel can be used in some cases horizontally in a rotary motion (always from the bottom to the top of the excavation face) in some cases if the ground is particularly compacted.'	29/10/2018	AG
3.7.2	<u>Once they reach the front isolation marker</u>, they excavate the full width of the excavation trench to a depth of 7.5 cm. Earth should be removed by brush, finger tips or the bespoke elongated scraper.	29/10/2018	AG
Annex B	Changed stones to stakes for marking areas that need to be cleared by full excavation.	29/10/2018	AG
4.7	Added '(an assistant TL or TL must provide guidance on where the original ground level is)' and 'the deminer must not excavate more than 15 cm of spoil before checking again with the detector.'	29/10/2018	AG
4.7	Added 'If the soil is very hard, or the original ground level cannot be ascertained in a confident manner, full excavation should be used.'	29/10/2018	AG
Annex D	Changed marking drawings (sandbags, etc)	29/10/2018	AG
1.4.6	Addition of OMOL.	02/11/2018	RS
2.2	The clearance perimeter will be marked during clearance with red and white sandbags at every turning point), and with red stones every metre as mentioned above. As clearance advances into the minefield, red/white sandbags	02/11/2018	RS

	will remain along the original baseline on the TPs and every 10 metres. Red “danger mines” signs are to be displayed at regular intervals.		
2.2	UXOs and IEDs will be marked with yellow stones/sandbags.	02/11/2018	RS
3.1.3	Specified use of gloves.	02/11/2018	RS
3.3	More detailed description of sweep prior to placing ELM.	02/11/2018	RS
3.7.1	Addition of ‘the back (side closest to the deminer) of the initial trench shall be sloped at 45 degrees in order to allow clear access to use the scraper to remove material from the front of the excavation.’	02/11/2018	RS
3.7.1	Addition of ‘this must be done from side to side, and not in a vertical motion.’	02/11/2018	RS
6.3	More detailed description of full excavation QC.	02/11/2018	RS
4.2	Additional information when components of IEDs are encountered in lanes, avoiding ‘bypassing’.	03/11/2018	NT
Annex E	Greater detail given for manual support to mechanical clearance.	03/11/2018	NT
1.3	Use of red and white flags.	09/11/2018	AG
6.	Additional information on QC and supervision on teams.	12/11/2018	AB
Annex A	Addition of use of tripwire feeler in urban environments, not leaning into un-searched area during tripwire search and removing visor during close visual search.	12/11/2018	AB
2.2	The marking method used on task may vary but it should be consist, where possible.	12/11/2018	AB
3.1	Added specifications for the wooden triangle	18/11/18	JV
3.6.2	Clarification on chip placement “Actions on Signal.”	18/11/18	JV
Annex E	Restructured with greater detail added throughout	25/11/18	PS
1.4.2	Change in minimum safety distance for CP to 200m	10/01/19	JV
1.4.12	Inclusion of Detector Test Area	10/01/19	JV
6.3	Building Clearance - Quality Control (QC)	10/01/19	JV
Annex D	Inclusion of additional marking and change stones colour, from red to red and white (red/white)	21/01/19	JV
Annex G	Addition of CEIA CMD-3 Detector Use guidelines	06/02/19	JV
v.31	Update following review (as above) in Iraq	April 2019	NT

Contents

SECTION ONE – Introduction

1.1 Introduction

It is impossible to prescribe the drills to best fit every task in an environment with extensive improvised explosive devices (IEDs) meaning that hazardous areas may need bespoke clearance procedures on a near task by task basis. Therefore, the information contained within this document is to be used as guidance for basic mitigation measures and clearance procedures. Prior to any deployment operations management must ensure that the procedures are fit for the task and anticipated device type (size, layout, sensitivity, switch mechanism etc.). It is imperative that only qualified personnel who have been trained in the specific procedures required are utilised in any form of IED clearance

IEDs are often laid in rural areas to mimic and achieve the same results as conventional minefields where conventional demining procedures can be easily adapted, or they may be in urban areas which present unique technical challenges. Part 3 of the HALO Global SOP details considerations for both environments.

1.2 Team Structure

The general structure of a clearance team may be as follows:

TEAM MEMBER	QTY	QUALIFICATIONS
Team Leader (TL)	1	IED Clearance Team Leader Course, HALO Paramedic Medic (preferable) EOD Level IMAS 3
Assistant Team Leader/ Senior searcher	1	IED Clearance Team Leader Course, HALO Paramedic Medic (preferable) EOD Level IMAS 2
Deminer/searcher	4	IED Clearance deminer/searcher
Medic	2	IED awareness training / HALO Paramedic Medic
Driver	2	Driving Assessment, IED awareness training

Depending on specific operations, the personnel in the team may be expanded to cover the operational requirements by the agreement of the PM and Operations Manager. At all times the TL is to consider operational casualty evacuation requirements and that they have the requites resources to evacuate a casualty if required.

1.3 Initial Set Up

The set-up and marking of all HALO hazardous areas must be done from proven safe areas. Therefore, during assessments of future tasks details should be recorded both of the suspect ground itself and the surrounding area. When opening the hazardous area, the following guidelines must be followed:

- A supervisor must be present during the initial marking of the hazardous area, especially in areas where HALO have not worked before

- If there is any uncertainty, the entirety of the area is to be marked as suspect until instructed otherwise by senior HALO staff (Supervisor, DPM and PM). The way HALO marks tasks may not only affect the safety of our staff but also that of local inhabitants.
- If safe access permits, the Supervisor, TL and survey team leader should start by first walking the boundary of the task to ensure the TL has a clear understanding of the risks associated with the area and to familiarise them with their task boundaries. Do not stray from proven safe ground.
- Following this, the Operations Manager and Supervisor should lead the hazardous area marking by first marking-out the hazardous area perimeter or base-line in accordance with national standards. In general, this should be red and white sandbags or 1.5m poles on the edge of clearly safe area-i.e. edge of a paved route, if this cannot easily be identified markings should be no closer to the proven safe/uncleared boundary than 5m. This is to be done before supervising the cutting of vegetation and the placing of the red danger area marking. The 5m rule will always apply unless instructed otherwise by senior operations management.
- Red flags can be used to show active working lanes, with white flags used to indicate car parking and administration areas.
- During the placement of the boundary marking, all staff involved within 100m of the marking must wear full PPE
- Only on completion of the hazardous area boundary marking may the Supervisor leave the remainder of marking to the TL and deminers, in order to continue the placement of the starting point, control point, etc.

Whilst drawing their hazardous area map/annotating imagery, the TL should mark all relevant information and landmarks found within the hazardous area or the neighbouring area. To ensure NTS information is up to date the TL should make regular efforts to try to gain additional information about the history of the area and the explosive hazards, the history of any surrounding cultivation, and try to make contact with any accident victims to ensure the fullest and most accurate picture of their task is available. This should happen during the initial marking and continue throughout the clearance of the hazardous area. The TL should also aim to update all visiting senior HALO staff on issues concerning their hazardous area whenever such visits take place.

1.4 Task Layout

1.4.1 General. The layout of a clearance operation will be dictated by the ground. In all cases the conduct shall be governed by the fundamental principles of clearance operations, and each hazardous area will feature the following:

- Control point (admin & parking area);
- Benchmark;
- Start point;
- Base line;

- Working lanes;
- Perimeter turning points;
- First aid points;
- Fragmentation pits;
- Latrine;
- Temporary Explosives Hazards (EH) and Non-Explosive Hazards (NEH)store;
- Rest area
- Detector Test Area - DETA

1.4.2 Control point (admin & parking area). The control point contains the casualty evacuation vehicle(s), with the communications system(s), parked in the direction of travel to the nearest competent medical facility. This will act as the assembly point in the event of an emergency. The admin area will also be used for storage of equipment, briefings and parking. The control point should be in accordance with safety distances outlined in part 1 of these HALO Global SOPs (at least 200m from the nearest working lane). It is to be protected from sun and rain. In the admin area, the Team Leader is to have the following:

- Hazardous area sketch map/imagery, plus printed area map showing nearby survey and clearance data
- Task book and visitor record
- Copy of SOPs
- Clearance Plan

1.4.3 Start Point (SP). This is the point at which all measurements of the hazardous area perimeter originate. It is usually positioned on the base line.

1.4.4 Base line(s). The line along the hazardous area boundary from which clearance begins[1].

1.4.5 Perimeter turning point (TP). A TP defines a change in direction of a hazardous area perimeter.

1.4.6 Working lane. One or two-metre-wide lane in which a deminer works.

1.4.7 First Aid point. Each section should have its own First Aid point within the hazardous area. It shall be clearly visible with a green-cross sign. The First Aid point should contain a Major Trauma bag, and a stretcher opened and ready for use. All demining staff must be aware of the nearest first aid point.

1.4.8 Metal fragmentation pits. All metal fragments shall be discarded in these pits. They shall be marked with black 50cm sticks. There should be at least one pit per team, and when a new pit is required it shall be sited at least 4m away from any other pit. A fragmentation pit should not be located in an area cleared that day. When the task is completed all fragmentation pits are to be filled in.

Explosive-free explosive hazard fragments shall be collected in a pit at the Control Point for suitable disposal on completion of the task.

[1] HALO may conduct IEDD clearance operations in countries / regions where the majority of the contamination is in congested urban environments. These operations may necessitate more complex CPs incorporating multiple base lines.

1.4.9 Latrine. To avoid people wandering into un-cleared areas and for hygiene purposes, a latrine shall be prepared and a screen erected. It should be under hard cover or at least 200m from the nearest working lane so that deminers can safely remove PPE. Latrines should be suitable for number of staff and duration of the task.

1.4.10 Temporary EH and NEH Storage Area. The Explosives Hazards Storage area shall be kept at a safe distance (no less than 25m) from the admin area. It is to be clearly identifiable, and separated from possible sources of flame/sparks. Smoking is not to be permitted in the vicinity of the EH store. The store should be visible to at least one member of staff at all times, and should be sited away from public access. Explosives and detonator boxes are to be separated by sandbags; when in use, the store is to be sheltered from sun and rain by a tarpaulin. Explosives and detonator boxes shall be locked at all times and the keys held by the Team Leader.

1.4.11 Rest Area. The first aid point for a team will usually also be used a rest area but a Team Leader may specify another suitable rest area if required.

1.4.12 Detector test area

An area at least 3x1m clear of metal that will allow detectors to be tested prior to usage. The area must incorporate the likely IED components present in the task (i.e. battery, and switch) buried at a certain depth according to National Standards – 13cm, and 1 square meter empty for ground compensation purposes.

SECTION TWO – Clearance Overview

2.1 Manual Clearance Methods

Below are common methods of clearance that may be adapted for an IED environment in an open area.

Linear/lane Breaching: A deminer working with a detector clears forward in a two-metre-wide line. It is likely this will be the most common method of clearance for the majority of tasks.

Linear: A deminer working with a detector searches using a linear method in a bound 5 to 50m long and 70cm deep. This may be used for clearance of boxes or working from a baseline. For example, this can be done with a standard handheld detector or one fitted with a large (UXO) head. Detailed at Annex B.

Full Excavation: Used in cases where detectors cannot be used (e.g. excessive metal contamination, deeply buried mines). Consideration must be given to whether or not this method is appropriate for the expected devices type/sensitivity etc. Detailed at Annex C.

The aforementioned methods are complemented according to the type of task with:

Trip-wire Clearance: Where there is a tripwire or surface laid crush wire threat this drill may be incorporated with other drills or, if specified in the clearance plan, conducted in isolation. Detailed at Annex A

Fingertip search: Used when detector and/or full Excavation is not possible or appropriate, particularly in building/urban environments. Detailed at Annex F.

2.2 Marking During Clearance Operations

During clearance operations, the team is to mark the hazardous area as follows:

- The boundary between cleared and uncleared ground is to be marked clearly with red and white (red/white) painted stones, at 1m intervals. Red/white sandbags are to be placed every 10m and on turning points. When it is necessary to close a lane the forward edge of the lane shall be marked with a red stone in the middle of the lane. When an uncleared linear bound protrudes into cleared area, each end shall be closed with a red stone. No one shall cross a line of red/white stones.
- In general, stones or wooden marking discs/pucks are to be the preferred means of marking hazardous areas, as they are less invasive than stakes. Although stakes may be more appropriate in some circumstances. Guidance should be sought from the Operations Manager. In any case, task marking should be consistent, where possible.
- The clearance perimeter will be marked during clearance with red and white sandbags at every turning point), and with red stones every metre as mentioned above. As clearance advances into the minefield, red/white sandbags will remain along the original baseline on the TPs and every 10 metres. Red “danger mines” signs are to be displayed at regular intervals.
- The Control Point is marked with blue and white sandbags in the corners.
- Yellow stones/sticks are to mark the location of individual IEDs/UXOs found and removed, with the type and depth of the item (in cm) clearly marked on the stone.

- On occasions it may be necessary to leave an uncleared area within the marked hazardous area perimeter. These areas shall be marked by red and white stones at 1m intervals, and at the turning points. When clearance is completed, they are to be re-marked as defined in post clearance documentation.
- A sketch map/image of the site with areas and boundaries marked and explained on it are to be available in the CP.

2.3 Marking of Clearance Lanes

Clearance lanes are marked as follows:

- The End of Lane Marker (ELM) defines the separation between cleared and uncleared ground at the front of the lane. For IED search a 2m ELM is preferable as a wider search sweep is more likely to detect dispersed components, and will allow greater opportunity to identify and isolate components other than the switch. Example below:
- As the working lane extends the deminer is to place a red/white stone every metre to indicate clearly the difference between cleared and uncleared ground.
- A one metre wide lane will extend no further than 5m before being doubled in width.

Two-metre ELM (End of Lane Marker), 2m of red rope marked in the centre, with thin bamboo sticks (70cm long) marked at 50cm

SECTION THREE – Linear/Lane Breaching

3.1 Deminers Tools and Personal Protective Equipment (PPE)

3.1.1 Deminers Tools

Deminers may only use tools, which have been issued by HALO. Each Deminer is issued the following tools for clearance[2]:

- A purposely designed mine detector[3], the type of which is determined by the Operations Manager;
- Loppers for cutting bushes; shears for cutting grass; secateurs for cutting roots during excavation;
- Two-metre ELM (End of Lane Marker) for marking cleared and uncleared area, 2m of red rope or a light wood stick, marked in the centre with thin bamboo sticks painted white and marked at 50cm
- Unpainted 1m stick for measuring distance between markers;
- Mallet for hammering sticks into the ground
- Trowel, scraper and paintbrush for excavation
- 3 unpainted wooden 20cm isolation marking sticks for marking isolation of detector signals;
- 2 equilateral wooden triangles (edge length 20cm) for marking discovered IEDs/mines/ERW with the tip painted on red colour, to be marked at 7.5cm and 15cm in order to guide any excavation.
- Sharpening stone;
- A bucket for metal signals;
- 1 detector stand
- 1 bag for tools;
- Tripwire feeler
- Brush

3.1.2 Team leader's Tools

These tools are to be available to the Team Leader

- Communications ○ Whistle ○ Radio ○ Cell phone
- PPE
- Camera
- Notebook and Pen
- Map/Imagery of site
- GPS, camera, map drawing kit

3.1.3. Deminers PPE

[2] It is important that individual assessments are made about precisely which tools are suitable for the operating environments. It may be that metal tools are inappropriate and should be replaced with smaller plastic or wooden tools.

[3] For IED clearance it is preferred that a minimum metal mine detector, that will detect non-ferrous metals such as aluminum used to manufacture detonators, is used and not a magnetometer type detector.

All personnel actively approaching or conducting operations within the safety distance of clearance is to wear:

- Protective Body Armour Vest (demining apron).
- Visor
- Work gloves (only for use during manual clearance by deminers)
- Work boots
- Durable full-length shirt and trousers

3.2 Lane Safety Distances

The minimum distance between working deminers is for the most likely device type:

- 25m for IED main charges with less than 10 kg NEQ of HME and no primary fragmentation
- 50m for main charges more than 10kg NEQ and/or primary fragmentation hazards.

Considering the type of task and threat the Operations Manager might instruct greater distances.

3.3 Preparation of Lane for Start of Work

Before entering the clearance area the deminer shall carry out a complete visual search of their lane, ensuring that the lane is marked correctly and that there has been no disturbance to the ground since the previous day's work. If there are any markers missing, then these shall be replaced.

Before placing new marking, the deminer is to check the area with the detector. If it is suspected that there has been any removal or re-laying of devices, then the Team Leader is to be informed immediately and all work suspended while an investigation is carried out. After carrying out a visual search of their lane, the deminer should position their tools within easy reach. The tools required for the deminer to work should be kept in the cleared lane to the rear of the deminer.

At the start of each working period the detector should be ground-balanced – if applicable- according to manufacturer and the standard test-piece check conducted. Once the detector has been calibrated, then the deminer is to start work. The following is to occur:

- If there is a tripwire threat, then tripwire drills are to be carried out before checking with the detector or placing the ELM.
- Before placing the ELM, the deminer shall conduct two sweeps of the detector along the line where the ELM is to be placed. The sweep shall start one detector head to the left or right of the edge of the lane. The sweep shall be conducted with the centre of the detector head along the line where the ELM is to be placed, so that it covers a distance of half a detector head length into the area where clearance is about to take place. The sweep finishes one detector head width outside the clearance lane on the opposite side to where it started, and is then repeated in reverse. Whilst conducting this sweep the deminer is to take care that full ground coverages occurs around marking stones.

- If, when beginning a new lane, a signal is detected then this shall be investigated prior to placing the ELM.
- The deminer shall place their start of day marker immediately behind the front right red/white marker, and the two QC check sticks next to it.
- The deminer shall then place their ELM immediately in front of the two red markers ensuring that the bamboo canes are parallel and facing their direction of clearance. Where there is thick vegetation a vegetation removal drill may be need to be done first.

3.4 Visual Search

The importance of the visual search of the demining lane/area should never be underestimated and should form the initial part of all manual clearance drills.

- The deminer is to systematically visually search the area in front of their ELM for trip wires, IED components, ground sign, UXO or suspicious objects.
- On a regular basis deminers are to visually search the area beyond and adjacent their ELM for trip wires, IED components, ground sign, UXO or suspicious objects. This is ground dependent but generally should be conducted every 2 – 4 bounds.

3.5 Cutting and Removal of Vegetation

If there is grass/vegetation at the front of the lane which will prevent the detector sweeps this must be removed using the following procedure:

- A careful visual inspection.
- Detector sweep over vegetation (this is only necessary when the vegetation is so dense that the Deminer would not be able to see a surface-laid device).
- The vegetation should be cut from the top down at intervals of approximately 20cm without putting pressure on the ground or allowing heavy vegetation to fall to the ground.
- Shears or pruners must be kept parallel to the ground.

Cut vegetation must be placed in the cleared ground. Piles of cut vegetation must not be allowed to build up to the point where they will obstruct safe lane(s), or safe access in the hazardous area. When necessary, they should be burnt in a controlled, supervised manner at the end of the working day. If this is not possible, or if they cannot safely be left until the end of the working day, then they should be removed to a safe area.

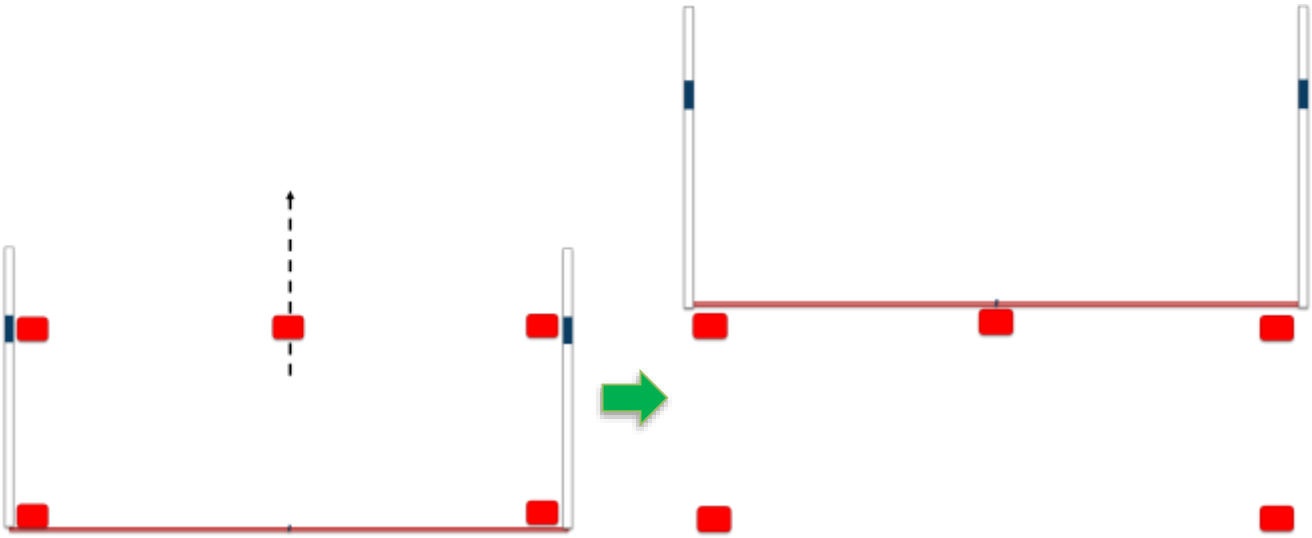
3.6 Detector Search Sweeps

3.6.1 General. The Deminer may work in the kneeling, squatting or standing position and adjust the length of the detector as required. The lower shaft may be collapsed to a minimum of 20cm. The shaft must not be collapsed when it is wet or dirty. The Deminer clears a lane two-metre wide, with an overlap of a full

detector head on each side. The ground is searched using a pattern of overlapping sweeps, with the detector head as close as possible to the ground without scraping it.

- The detector should be ground balanced if required and an audio reset done before starting the sweeps.
- Any markers that will obstruct the detector sweeps (except the ELM) should be removed temporarily.
- The **first sweep** shall start from the right edge of the ELM and with the side of the detector head just in front of the ELM at its tip on the right-hand side. The detector then moves forward in a straight line and then along the front of the ELM to the centre point, and then overlaps by one detector head.
- The **second sweep** is conducted half a detector head further forward along the same line but in the opposite direction, overlapping on the right hand side by one detector head.
- The **subsequent sweeps** in the same manner, and each sweep progressing forward half a detector head.
- The **last sweep** should follow along an imaginary line at 70cm from the ELM, with one detector head overlap at each end, along the one metre box.
- The deminer will then return to the baseline of the second 1 x 1 metre box and repeat the same steps listed above.

3.6.2 Actions When No Signal. If no signals are detected once the bound is completed the deminer should place two red/white stones inside the bamboo markers at the 50cm point. Then the centre marking stone is moved forward. The two bamboo canes are then lifted and then repositioned in front of the new stones (note this may again require a vegetation drill to be completed first).



3.6.3 Actions on Signal – Isolation of the Signal[4].

[4] In conventional demining a magnet was often recommended for this phase. However, improvised devices are likely to be more sensitive with limited safety distances. As such the use of a magnet may be inappropriate.

Any signals noted during the detector sweeps shall be marked with a chip placed in front of the signal. Using the front edge of the detector search head, as soon as the signal is heard, a chip is placed, and not on top of the signal), and the signal is isolated once all sweeps have been completed, dealing with the signal nearest to the Deminer first, or an accessible signal considered to present the least threat (e.g. anticipated battery pack). Deminers should never "lean over" a signal in order to excavate another.

Before starting full isolation, it may be appropriate for the Deminer to gently use their hand or a soft brush, to sweep the immediate surface soil, brushing towards the signal, and visually check to see if scrap metal is lying loose in the topsoil. If a crush wire threat is present, then a visual search (aided by a tripwire feeler) should be conducted across the bound.

Under no circumstances are tools to be used to check the soil surface for explosive hazard component parts. Where sensitive switches are expected this drill is not to be used (see more detail below).

If some scrap metal is identified on the surface, the Deminer shall place it into their contamination bucket, confirm with the detector that the signal has gone, and continue with the detector method by repeating the complete detector sweeps before moving the ELM forward.

If the signal is not on the surface, then the Deminer must do the following:

- The Deminer shall isolate signals with the three unpainted isolation markers. If there are two or more signals, the Deminer shall investigate the signal closest to the ELM before isolating the next.
- The Deminer will perform an audio reset before starting the isolation.
- The Deminer shall first determine the front edge of the audible signal, and mark it by placing an isolation marker flat on the ground.
- The marker will be placed on the front edge of the detector search head as soon as the signal is heard.
- The two other isolation markers will be placed on the left and right sides of the signal on the edge of the detector head nearest to the signal.
- The isolation markers will then be centred on the signal without moving the front isolation marker forwards or backwards.
- After completing the isolation, the Deminer must lift the detector head off the ground, perform an audio reset, and then double check the isolation.
- The excavation should never be extended outside of the bound searched (70 cm forward) or over a detector head to the side. In case that the signal is no found withing the limits, the deminer should refer to his team leader for instructions.

3.7 Signal Excavation

Below are two options for signal excavation. The first for environments considered conducive to the use of hard tool excavation, where improvised threats are of a consistent build akin to conventional mines and/or where the threat is considered relatively deep (15cm). The second is a less aggressive procedure which seeks to identify components closer to the surface; this may be more appropriate but

it may only be used where the switch component of the device is anticipated to be within the first 7.5 cm. If switches or conventional mines are suspected, then this depth must be increased or the standard drill used.

3.7.1 **Standard.**

- The Deminer measures back 15cm using the triangle from the edge of the front isolation marker and marks a line on the ground.
- From this line, they open a trench using the chisel. The excavation pit is to be 15cm deep and 20cm wide (the wooden triangle will be used to ensure measurements) with a vertical front face, 15 cm back from the front isolation marker. It may be required to remove the end of lane marker (ELM) to facilitate the excavation, but marking stones/stakes should remain in place.
- The back (side closest to the deminer) of the initial trench shall be sloped (approx. at 45 degrees) in order to allow clear access to use the scraper to remove material from the front of the excavation.
- The Supervisor may increase the depth of excavation in certain cases.
- For wide isolations, the excavation trench should still be 20cm wide at the centre of the isolation.
- Once the excavation trench is created the Deminer should carefully remove the earth at the front using the elongated scraper tool, this must be done from side to side, and not in a vertical motion. The chisel can be used horizontally in a rotary motion (always from the bottom to the top of the excavation face) in some cases if the ground is particularly compacted.
- Once the trench has reached within 5cm of the front isolation marker the Deminer may use the detector to check the signal is there, and again after every 5cm of forward progress.
- Once the Deminer has exposed a portion of what they recognise to be a suspicious object, they shall stop all excavation and carry out the procedures as described in "Action on Suspicious Item" (see below).
- The Deminer shall expose the absolute minimum of the object to assist in recognition.
- If the object is not dangerous then it shall be completely exposed by excavating under and around it and then removed to the fragmentation pit/ contamination bucket.
- Once the detector signal has been removed then the ELM is to be replaced and the full detector sweeps repeated before moving forward.

3.7.2 S**hallow excavation.**

- The Deminer measures back 15cm using the triangle from the edge of the front isolation marker and marks a line on the ground[5].
- If there is a pattern of IED construction and the layout of an IED can be predicted, the demining Team Leader may direct the Deminer to site their excavation to the right and left of the isolation markers. This may allow the Deminer to identify less sensitive component parts other than the

[5] This distance may need to be increased where it is anticipated that the metal component may be relatively small compared to the switch surface (e.g. a small metal connection in the centre of a much larger wooden pressure plate)

switch (e.g. wire links etc.). However, if nothing is found the original signal must be excavated in line with the below.

- From this line, they open a trench using the chisel. The excavation pit is to be 15cm deep and at least 20cm wide.
- Once they reach the front isolation marker, they excavate the full width of the excavation trench to a depth of 7.5 cm. Earth should be removed by brush, finger tips or the bespoke elongated scraper.
- Once the trench has extended 10cm forward the deminer is to check if the signal is still present.
- If no objects are detected in the first 7.5 cm deep excavation, then they are to deepen the excavation trench to 15cm and then excavate the remaining area as per the standard method[6].
- Once the Deminer has exposed a portion of what they recognise to be a suspicious object, they shall stop all excavation and carry out the procedures as described in "Action on Suspicious Item" (see below). The Deminer shall expose the absolute minimum of the object to assist in recognition.
- If the object is not dangerous then it shall be completely exposed by excavating under and around it and then removed to the fragmentation pit/ contamination bucket.

3.8 Administration

3.8.1 Back Filling. Excavation trenches created during this process should be back-filled before the Deminer moves forward. When back-filling excavation trenches, the soil should be compacted.

3.8.2 Breaks. During breaks in the working day the ELM is to be left in place but the direction of the bamboo sticks inverted, or, if the Deminer is conducting an excavation, temporarily replaced in front of the two red/white stones.

3.8.3 End of Day Marking. At the end of the day the Deminer must close the bound by placing three red/white stones on either side, and immediately behind the ELM.

[6] Or to the required clearance depth laid down in national standards. For example, it may be that in some areas only the first phase 7.5cm is required.

SECTION FOUR – Actions On

4.1 Introduction

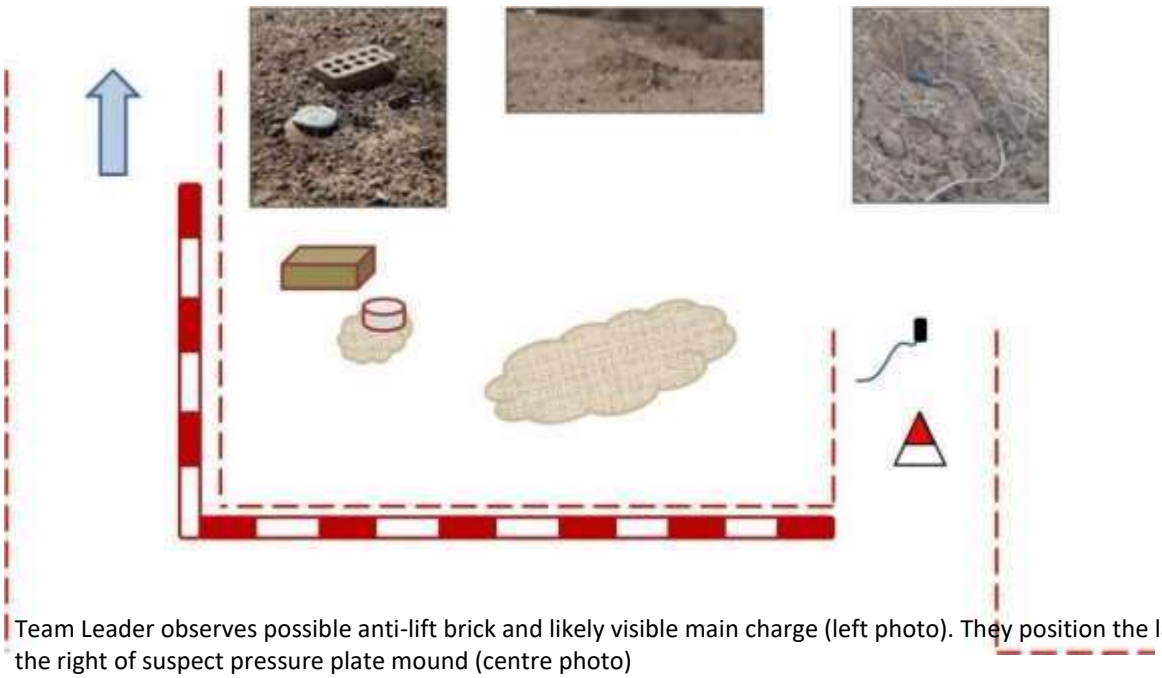
This section covers those actions which are the same regardless of the detector/drill being used.

4.2 Improvised device or component part

- As soon as a suspected device is uncovered the Deminer ceases excavation and stops work and informs their team leader.
- The item should be marked with the wooden triangle at a minimum distance of 10cm with the red tip pointing towards the device.
- The team leader or the assistant team leader will confirm that the item found is likely to be part of an IED. They will ensure the lane is correctly close, marked and they will collect relevant information to brief the IED operator.
- Once the IED operator has planned his actions and the RSP has been approved; the Team Leader will then stop clearance and the item will be disposed of in accordance with Part 5 of this SOP. Alternative the lane may be closed and item marked for future disposal and clearance can continue elsewhere.

Unlike landmines improvised devices are highly likely to be distributed in an irregular fashion across a less predictable area. For example, once a deminer has identified the edge of a TM-62 the total size of the hazard can be easily avoided[7]. Following identification of a component part plus other evidence, Team Leaders and supervisors should consider the likely areas where an IED may be situated and mark off an area accordingly. This may make clearance more efficient and avoid placing deminers at undue risk by repeatedly sending them towards a device. An example of how this might work is below:

[7] Although dispersal does occasionally occur with landmines, with det-cord linking multiple mines together for example, but is far more common with improvised devices.



1. Team Leader observes possible anti-lift brick and likely visible main charge (left photo). They position the lane to the right of suspect pressure plate mound (centre photo)
2. Deminer marks wire and battery identified during excavation (right photo).
3. Team Leader marks off entire area suspected to contain IED and sites new lane bypassing it. EOD teams will dispose of item later

This method may be used to mark devices in a linear strip prior to mechanical lifting (see SOP 4). However, clearance teams should avoid "bypassing" devices that may hinder CASEVAC or command/control. There must be a minimum lane of 2m between devices and a maximum of 2m beyond a device should be cleared, before they are removed be either mechanical assets or an HIEDD team.

4.3 UXO/ERW

For UXO the procedure is the same, except that the Team Leader must decide, in accordance with HALO EOD SOPs, on one of the following actions:

- Destroy in situ.
- Pull and remove to store for later destruction at a HALO Central Disposal Site (CDS)

Once the device/ERW has been dealt with the area must be checked again with the detector before proceeding.

4.4 Logs, Rocks and Other Obstacles

In an IED threat environment there is likely to be a far higher risk of pressure-release switches hidden beneath otherwise innocuous objects. As a general guiding principle objects larger than a fist that have a detector signal beneath them should not be moved by hand and the use of hook and line considered. In some cases, its normally appropriate to excavate completely around the object but never underneath it.

- Carry out usual visual and detector sweeps (and tripwire search if required) of the item.
- If a signal is detected, the Deminer is to notify the Team Leader immediately.

- The Team Leader may discuss with demining supervisor/Technical Advisor if required, and determine whether any excavation or further mitigating action is required.
- If no suspicious objects are identified the Team Leader will then pull the item using Hook & Line.
- Once the item has been pulled through all its planes, the item is to be checked and then can be removed.
- Repeat the usual detector sweeps and proceed.

4.5 People or Animals that are Close or Enter the Clearance Area

It is necessary to take all precautions to prevent the entry of people or animals into a clearance area. If nevertheless animals or people enter the uncleared area, then the Team Leader should blow their whistle once and order the Deminers to a safe area. The Team Leader should attempt to move the animal or person into a safe area, without putting any HALO staff at risk.

4.6 Clearance on Slopes

With steep slopes that affect the balance of Deminers, it is necessary to conduct excavation at the top of the slope. Deminers must dig deep enough (the depth depends on the angle of inclination) to ensure a comfortable position. Excavation continues as long as the inclination angle (gradient) does not decrease.

4.6.1 Clearing up a Steep Slope. This is the preferred option but it can still cause some difficulties, particularly in wet weather. In this case, steps should be cut in the slope.

4.6.2 Clearing down a Steep Slope. Deminers should only be asked to clear down a slope when there is no other alternative. Deminers should create steps down the slope to ensure that they do not fall forward into uncleared areas.

4.7 Mounds, Trenches, Furrows and Soil Piles

If mounds, piles, trenches or furrows are found in the clearance area it is necessary to find out if they were made before or after potential devices were laid, ideally during the Non-Technical Survey phase.

- Mounds and piles created before devices could have been laid, may be cleared by working over the top using the standard detector method.
- Mounds and piles created after devices could have been laid, should be cleared by excavation down to the original ground level (an assistant TL or TL must provide guidance on where the original ground level is), after which the ground is to be cleared using a detector.
- Before excavating, and each time the Deminer has excavated a half detector head forward, the Deminer is to check with their detector over the top of the soil to be excavated and along the excavation face. The deminer must not excavate more than 15 cm of spoil before checking again with the detector.
- Trenches (especially back-filled) shall be assumed to contain devices or ERW unless there is reliable first-hand information to the contrary. If in any doubt, they are to be excavated down to the

original trench-floor as detailed above, and the trench floor checked with a detector. Due to high levels of metal contamination full excavation will usually be the safest manner of clearance.

- For surface soil build-up, which is not very hard the usual detector sweeps should be performed. If a signal is encountered, then it should be excavated while maintaining a depth of 15cm below the original soil level.
- If there are no signals, then the soil may be scraped away using lateral motions and without exerting downward pressure on the soil. The detector sweeps are then to be repeated before moving forward. Only soil that has been checked first with the detector is to be removed in this manner.
- If the soil is very hard, or the original ground level cannot be ascertained in a confident manner, full excavation should be used.

4.8 Metal Debris

Where appropriate, Deminers must remove all metal debris from their lane and place it in their bucket. The bucket should be emptied into the metal contamination pit during breaks.

4.9 Deep Detector Signals

If, during signal excavation, a detector signal is found to be deeper than 15cm, the Deminer should return to the start point the trench and after referral with supervisor; deepen it an additional 15cm before scraping forward again.

If the signal is deeper than 30cm then the Team Leader is to be informed, and unless there is a specific reason to search deeper than 30cm (e.g. the threat of deeply-buried items) then the signal should be marked and left.

4.10 Command Wire

When a deminer identifies a wire it may not be clear whether it is part of a smaller victim operated device or a larger command device. Regardless the item should be marked and an EOD operator tasked accordingly. The operator and Team Leader (if not the same person) must then make an assessment as to whether the device is likely to be a command device and if so where the likely firing point and main charge(s) are. Clearance lanes should then be sited to clear a route to those locations. If the locations of the firing point/main charge are unclear, then lanes should be sited 50m to the left and right of the wire to trace its route. Further detail on command wire EOD procedures are in Part 5 Annex C of these HALO Global SOPs.

SECTION FIVE – Pulling Drills

5.1 Reasons for Using the Pulling Drill

- Preventing damage to property during a demolition.
- Removing objects, including trees, spare parts or building materials that are preventing clearance progress.
- To move ammunition that is unsafe to move into a suitable demolition point in the cleared area.
- To remove an item of ammunition or metal mine that would contaminate the hazardous area when destroyed.

Only an IMAS EOD 3 qualified Supervisor may authorise the pulling of a conventional mine or piece of ammunition. A complete IED is never to be pulled.

5.2 Performing the Pulling Drill

- Ensure that the entire area around the item to be pulled has been cleared as much as possible.
- Decide on the method of pull. For most heavy items, this will be the team vehicle.
- Stop work and all non-essential staff within the danger area are to withdraw to a safe area.
- Establish a safe area from where to pull (providing a safe distance with protection from fragmentation) as per distances for normal demolitions. For innocuous objects that have not been confirmed to be an explosive hazard this is 100m.
- Lay pulling rope through a cleared area to the item that is to be pulled, carrying out a visual search to ensure that rope is not snagged. The line should be free from all obstacles.
- If pulling out a buried item a pivot or high pulley point may be required.
- The Team Leader should deploy sentries (as for a controlled demolition) and signal when an effective cordon (see Part 1 Task Management) has been established.
- If there are not sufficient personnel within the team to establish a cordon, then members of the local police or security forces must be requested to assist with the task.
- The Team Leader shall ask for “quiet” and carry out the pull. The rope should be pulled slowly, taking up the slack, continuing until the object is in the desired position ensuring it has moved through all planes. The item should be pulled through cleared areas only, the shortest possible distance into fully cleared ground.
- Following the pull a minimum 10 minute soak period shall be observed. If there is a risk of time delay booby traps or re-starting a mechanical timer then an extended soak is to be set by the Operations Manager
- The Team Leader will approach the area and check to see if anything suspicious has been uncovered. The Team Leader shall then give the all clear. Only now shall the cordon be opened.
- All remaining ground around the item should be cleared, as well as any previously cleared ground which has been unsettled by the process.

SECTION SIX – Quality Control

Quality control (QC) checking of clearance activities is the responsibility of *all* members of the operations management team, up to and including the Operations Manager. Details of QC check requirements for different individuals and scenarios are outlined below. Supervisory staff are required to brief searchers under their command with clear instructions, ensuring that each searcher is aware of their daily clearance plan and 'actions on' in case of emergency. If the searcher is in any doubt of the above, they should close their lane and move back to a safe access lane to await instructions from their immediate superior.

6.1 One Person One Lane – OPOL - Quality Control

All ground cleared using detectors is to be rechecked fully by the Assistant Team Leader or Team Leader and partially by the Area Supervisor. In addition to these formal checks, where possible, other senior operations staff will carry out random checks to ensure that the other checks have been carried out correctly. A QC log must be completed in each clearance dossier by a supervisor or senior operations staff member at least once per cycle. Before any lane is checked, the Deminer shall move all equipment behind the green QC stick.

6.1.1 First QC Check. The TL shall perform the first QC check. They are to do this at the following times:

- At least twice per day per Deminer.
- Once the Deminer has cleared 6 square metres.
- On moving a Deminer to another lane.
- At the end of the working day.

The check shall be carried out using a detector set up as for the original clearance. The detector is swept across the cleared lane, and one detector's head width both sides of the lane, keeping the head as close to the ground as possible without touching it.

The detector head is then moved forward, ensuring that the next sweep overlaps the previous one. On completion of the QC check the green check stick is to be moved forward to the point to which the TL has checked.

If any signal is found, the TL is to take disciplinary action against the Deminer.

6.1.2 Second QC Check. The Area Supervisor carries out the second QC check. The procedure is the same as for the Team Leader or Assistant Team Leader except they use the green stick with the blue top. The Supervisor should normally only check ground that has already been checked by the TL. The Supervisor may not be present at the site every day so the green stick with the blue top must be left in place between visits. During visits the Supervisor must check:

- Part of every demining lane;
- At least 100% of one lane per team;

- At least 50% of the total area cleared since their last visit.
- If time allows then the Supervisor should check 100% of the area cleared since their last visit.

6.2 Full Excavation - Quality Control

The Team Leader or Assistant Team Leader, and the Area Supervisor must make regular visual checks to ensure that the correct depth of excavation is being maintained. As a minimum, the trench must be checked every time the Deminer has moved forward a maximum of 1 metre. If Deminers have been instructed to check the floor of the excavation trench with detectors, the (Assistant) Team Leader and Supervisor must carry out full detector QC as described above.

QC of full excavation lanes is to be conducted as follows:

- A hole is to be dug by hand to the point where the ground becomes hard, indicating that this is the full depth the excavation has reached.
- A stick of known length or ruler is to be placed in the hole.
- The ELM is used to confirm that this depth is correct relative to ground level at the edge of the excavation lane. This is necessary as soil expansion can make this difficult to judge by eye.
- The check should be conducted on both sides and in the centre of the lane in order to ensure that the depth achieved is consistent across the full width of the lane.

In either case, they are to use their green and green and blue sticks as above to indicate the point to which they have checked.

6.3 Building Clearance - Quality Control (QC)

Given the intrinsic features of buildings where search will be conducted, the team leader or assistant team leader will implement a bespoken clearance plan that might incorporate different techniques, (mechanical, manual with detectors, full excavation, fingertip search etc.) hence the QC will correspond to the method used. In case of fingertip search and where tripwire feeler is required, the QC will consist in a confirmation that marking is in place and actions instructed have been implemented (i.e. review of cracks in the ground, removal of vegetation and small debris has occurred). The QC might need to be conducted in a greater frequency than other techniques given the constraints of close-distance or real-time observation. In any case, the QA will be conducted revising the clearance plan, map sketch and a visual check around the 100% area searched ensuring all marking is correct and any obstacle have been removed.

Annex A - Tripwire Clearance

Where the survey has identified that tripwires, or other surface or above surface switches, may be present then a tripwire drill is to be conducted before any other clearance technique is used. This technique has been used very successfully to safely locate victim operated switches constructed from thin wires and small pressure contact switches that are surface laid and it is recommended that it is utilised in areas where there is threat of crush wire IEDs.

Tripwire clearance cannot be conducted during falling snow or when there is snow on the ground.

Under no circumstances is a tripwire to be cut or pulled until such time as the penalty device/devices have been located and neutralized or destroyed.

The tripwire search drill has three stages:

- General visual check
- Close visual check
- Tripwire feeler check.

General Visual Check

The Deminer should conduct a visual check from a standing position of the general area to look for IEDs, mines or booby traps that may be visible on stakes, attached to trees or buried with a switch laying on the surface of the ground. The deminer should divide the ground up into near, middle and far distance; search each systematically. They should check areas to either side of their demining lane as the most easily identifiable components may not be in their lane.

Close Visual Check

The Deminer shall do a detailed visual check of the area immediately in front of the ELM that will be checked by the tripwire feeler. A high-powered torch may be used to assist with this check. The aim is to identify tripwires, crush wires, protruding fuzes or other suspect items. When conducting urban search, inside buildings, the deminer is authorised to remove his or her visor in order to improve vision. While the visor is off, the deminer should not change stance or make any movement other than that necessary for the visual search.

Tripwire Feeler Check

The aim of using a tripwire feeler is to see a tripwire by helping the eye focus, not to actually '*feel*' it. The tripwire feeler will be marked at its tip. If any vegetation is light enough to pass a tripwire feeler through then the drill will be conducted as below:

- The Deminer will start in the kneeling position to check to waist height.
- The feeler shall be fed from the baseline along the ground and pushed through the vegetation ensuring that the tip of the tripwire feeler remains in contact with the ground to contact any slack tripwires.

- The tripwire feeler will be placed into the vegetation from the centre axis of the access lane at 90 degrees to the right of the lane.
- The Deminer shall insert the feeler its full length into the vegetation, no more than 60cm from the end of lane marker.
- When conducting tripwire drill inside or in a building the tripwire feeler must be extended to the end of the search area (approx 60 cm). Here, it will be necessary for the deminer's hand to pass over the ELM rope up to the wrist.
- During this process, the deminer must ensure that he/she does not lean into, or encroach on the un-searched area.
- The feeler shall then be raised slowly through the vegetation being visually inspected along the length of the tripwire feeler to waist height (1.2m).
- If any pressure is felt on the feeler the Deminer shall stop and visually inspect the length of the feeler before continuing. The tripwire feeler drill is a visual inspection and no force should be placed any tripwire.
- If a trip wire is identified the Deminer should follow drills laid down in Actions on Locating a Trip Wire. If any other suspect object is identified they are to immediately inform their TL.
- If no pressure is felt and the feeler has been raised through the vegetation unimpeded, then it shall be re-inserted at intervals of 50 cm along the 2m ELM and again at 90 degrees to the left of the axis meaning that the lane is inspected 5 times in from ground to waist height (1.2m from the ground).
- This height may vary depending on the height of the vegetation and the perceived threat in the area. If there is high vegetation or there are believed to be high tripwires (i.e. when searching inside buildings) the area between waist and head height will also require inspecting.
- Once all inspections are complete between ground and waist height (0m to 1.2m) then the process should be conducted again between waist height to head height (1m to 2m above ground level) while in the standing position.
- When a trip wire drill is required to clear through a building access point or window, an horizontal check should be conducted – using the doorway method- consisting in using the TWF to travel from the right axis on the ELM at ground level to the left axis, helping the deminer to identify tripwires set in a vertical direction and repeating the same trajectory from left to right at head level.
- Whenever possible the feeler should be held in the same hand as the side it is being used (e.g. when doing the check at the right end of the ELM the feeler should be held in the right hand).

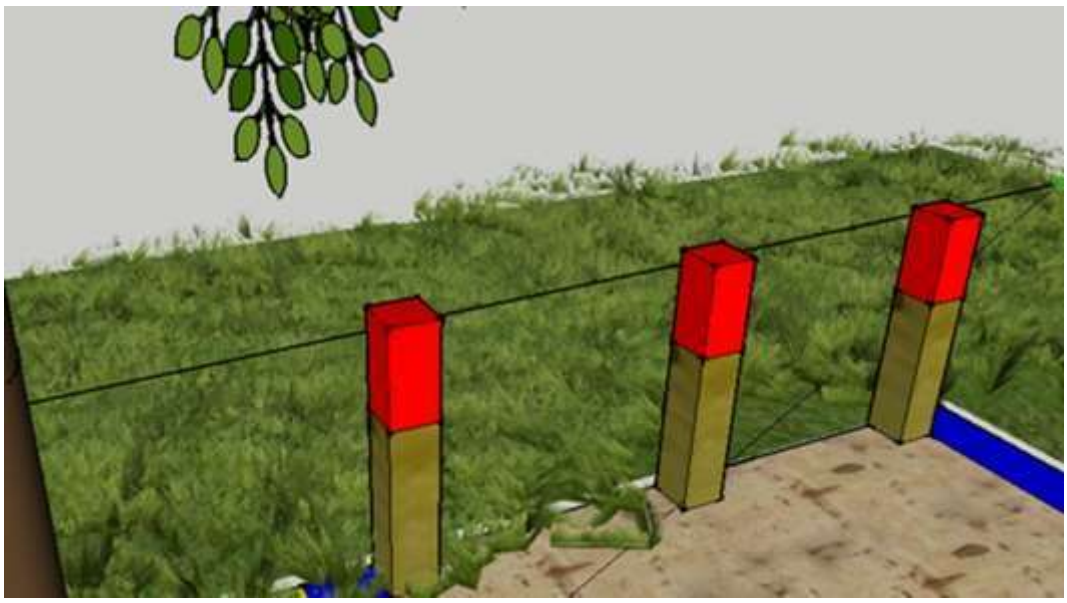
If no trip wire is found the vegetation can then be cut in front and 20cm to the side of the ELM as for standard OPOL clearance.

Any low hanging branches should also be removed that may interfere with the Deminer's visor or hinder the Deminer's vision. All vegetation must be cut cautiously to ensure that nothing falls forward or sideways. Long branches may not be pulled out of area that have not been checked for trip-wires. It may be necessary to clear along a branch until its end before it can be cut. The Deminer can then proceed with the detector sweeps as appropriate to the threat.

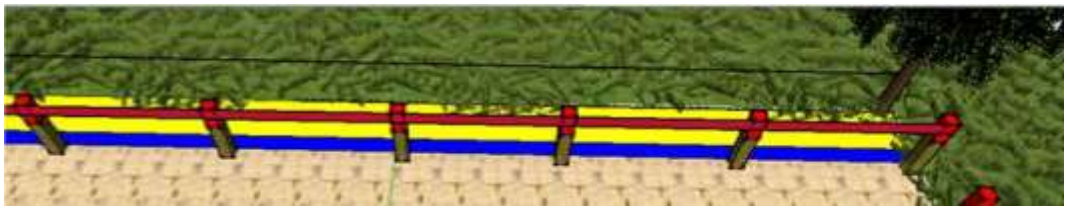
Actions on Location of a Tripwire

Wire, cord and twine (natural and manufactured in many forms) can be present at clearance sites. All must be assumed to have been placed deliberately as a link in the chain of an explosive device and treated as such until correct drills have established otherwise. Consideration should be given to the possibility of wire debris left on the battle field from surface to surface guided weapons that will possibly leave up to 1km of wire.

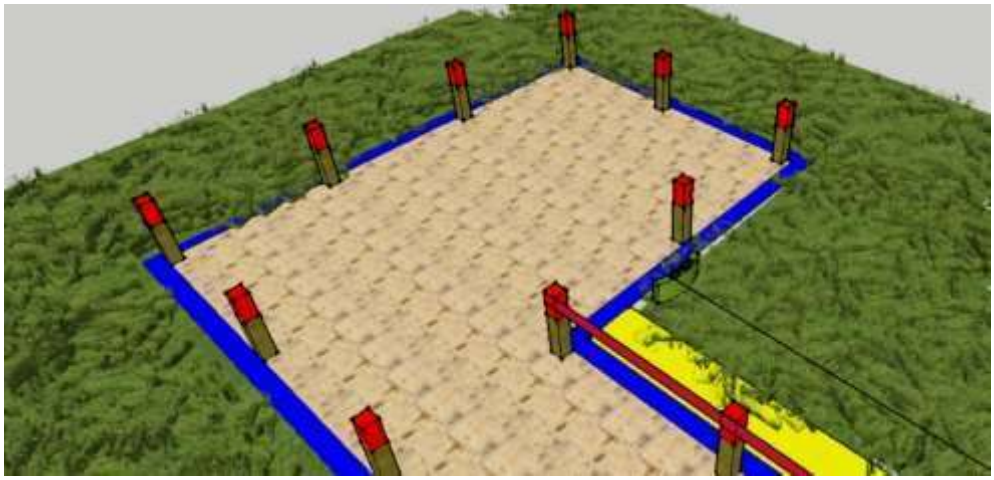
- The deminer should now work under the direction of the HIEDD operator and their role should be limited to clearing ground for access for the HIEDD Operator to conduct disposal procedures.
- The deminer should close the front of lane with three red/white stones, stop work and inform the Team Leader.



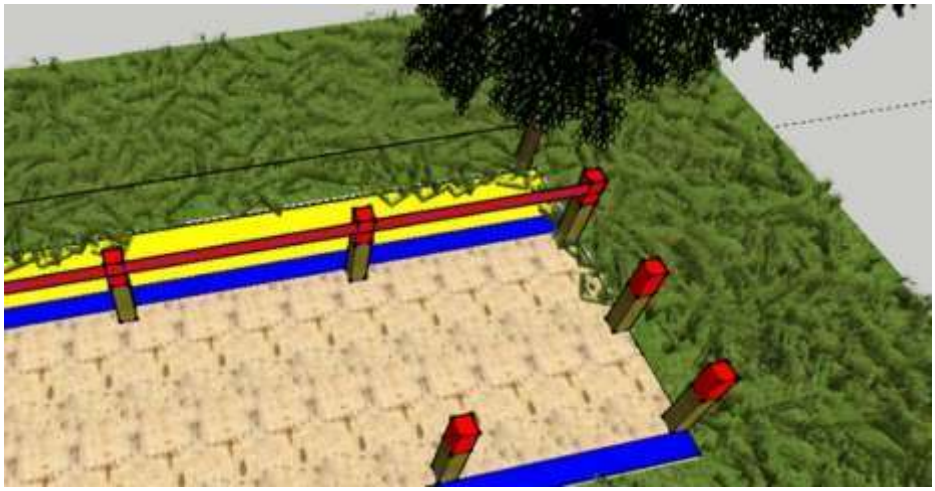
- The HIEDD Operator may redirect the clearance lane to locate both ends of the trip wire.



- The Deminer should clear 30cm from, but parallel to the trip wire until both ends of the trip wire have been exposed
- The lane marking will as per that used for OMOL
- Once each side of the tripwire is located and a hazard identified a safe working area may be established around the item before any positive action taken to investigate the item. The safe area should be 2m wide and 3m long allowing enough room for the EOD qualified person to lay in the prone position while investigating the item.



- The item should be investigated for secondary explosive devices, daisy chains and recording purpose in accordance with the Section 5 of these SOPs.
- If the end of the tripwire has been located and no explosive content has been identified i.e. the tripwire is secured to a tree then the lane should be blocked and no further action taken at this time.

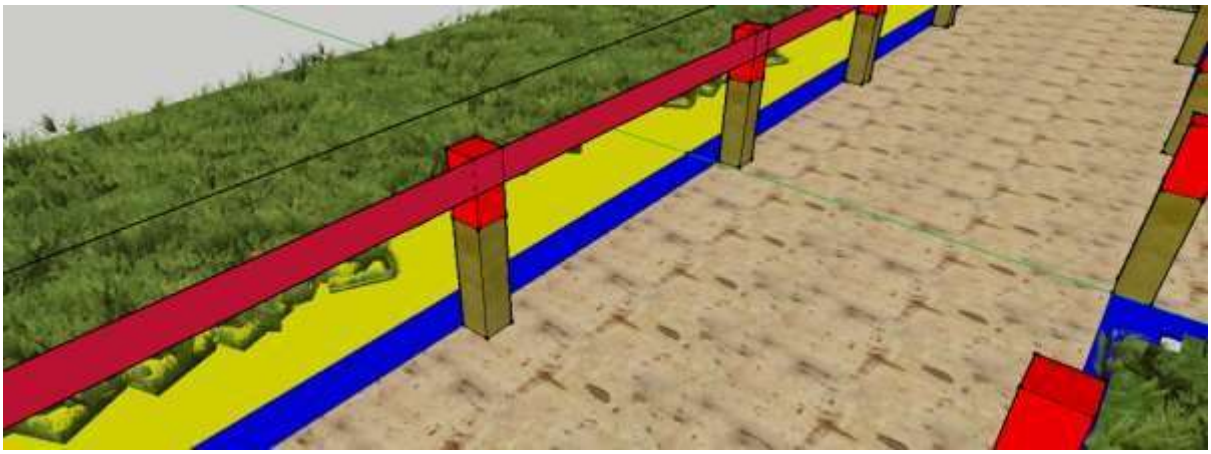


- Once both ends of the tripwire have been located, investigated and the items removed or destroyed the tripwire should be carefully removed without going into the uncleared area. If there is any doubt that the tripwire could still be attached to something, then the tripwire should be pulled remotely using Hook & Line.
- If any part of the tripwire is buried it may be excavated as per the investigation of a signal following advice from senior operations management.

WARNING: No stakes are to be removed from the ground before being investigated first by hand held detector and then by excavation and not just pulled from the ground as it is common practice to boobytrap the stake. Stakes are only to be removed by Hook & Line Techniques.

Marking of Tripwires

Trip wires are marked by using red tape along the red stakes marking the boundary of cleared ground.



Whenever possible when a tripwire is found, the penalty device should be destroyed by the end of the working day.

Annex B - Linear Method

Linear clearance may only be conducted where there is no trip-wire threat, or where vegetation has been removed using an armoured machine. Linear can be done with a handheld detector (usually a Minelab F3 series) with a standard head or the large head. Use of the linear drill and the choice of head and sensitivity end-cap for each hazardous area will prescribed in the Clearance Plan.

The demining team for linear is the same as for OMOL except that two of the team will be nominated as handheld detector large head operators, each with one detector with large head (if in use). All other deminers will have standard handheld detector. If necessary, the number of operators can be increased or decreased.

The linear method is very effective in open areas. Therefore, after the completion of breaching by OMOL, in hazardous areas where there is no threat of tripwires, the linear method is preferred.

If tripwires are discovered/suspected during clearance then all work must stop and advice sought from the Operations Manager.

Linear clearance is most efficient when there is plenty of space to work. The Team Leader must make sure that plenty of bounds are prepared so that no deminer has to wait for someone else.

Set-up and Lane Preparation

Prior to mapping, the handheld detector bound is to be cut down to ground level and at least 1.2 m out from the line of red/white stones.

The bound is then marked out with a guide stick at each end, and a red rope placed in the uncleared area 70cm in from the red/white stones (see Figure 5.2 below).

Deminer's Tools

In addition to standard demining tools (see above):

Two red ropes/string 35 m each.

Approximately 300 red chips per mapping deminer.

Deployment

Linear clearance can be deployed on one long baseline, or a hazardous area which has been cut into boxes. Wherever possible, the bounds should be placed on opposite sides of boxes, but not around all sides, as this will reduce the length of the bounds and, consequently, reduce productivity.

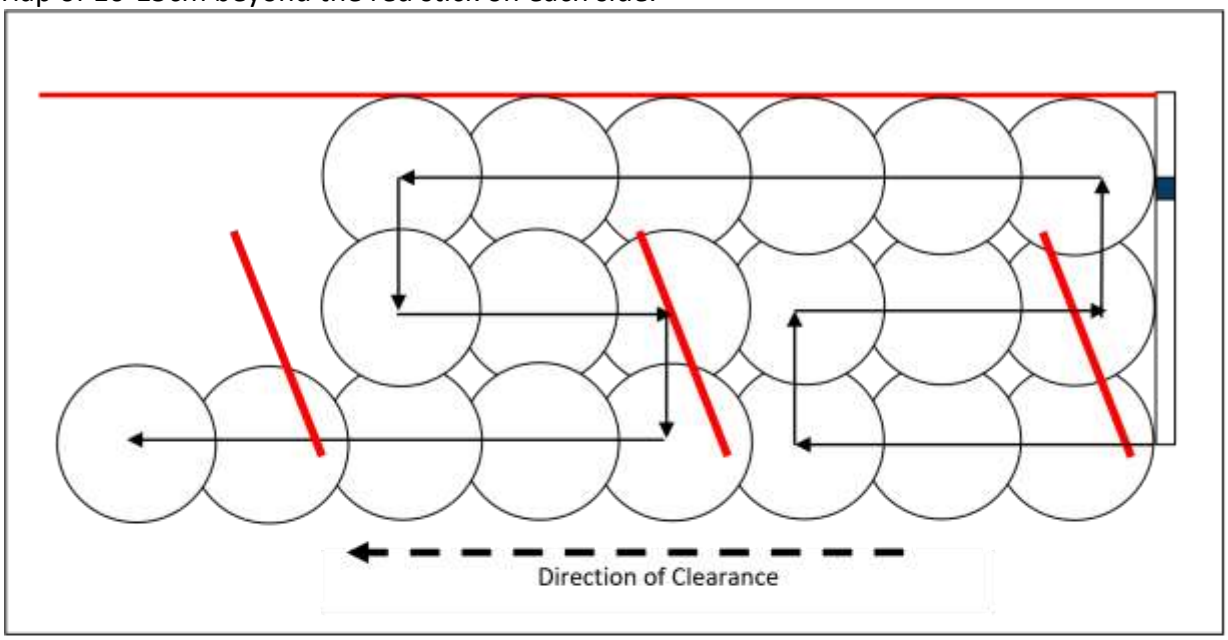
On the right end or the left end near the red marking sticks is placed an unpainted stick which represents the starting point. Next to it is placed a 50cm stick with blue top for the mapping operator, and the usual two QC sticks

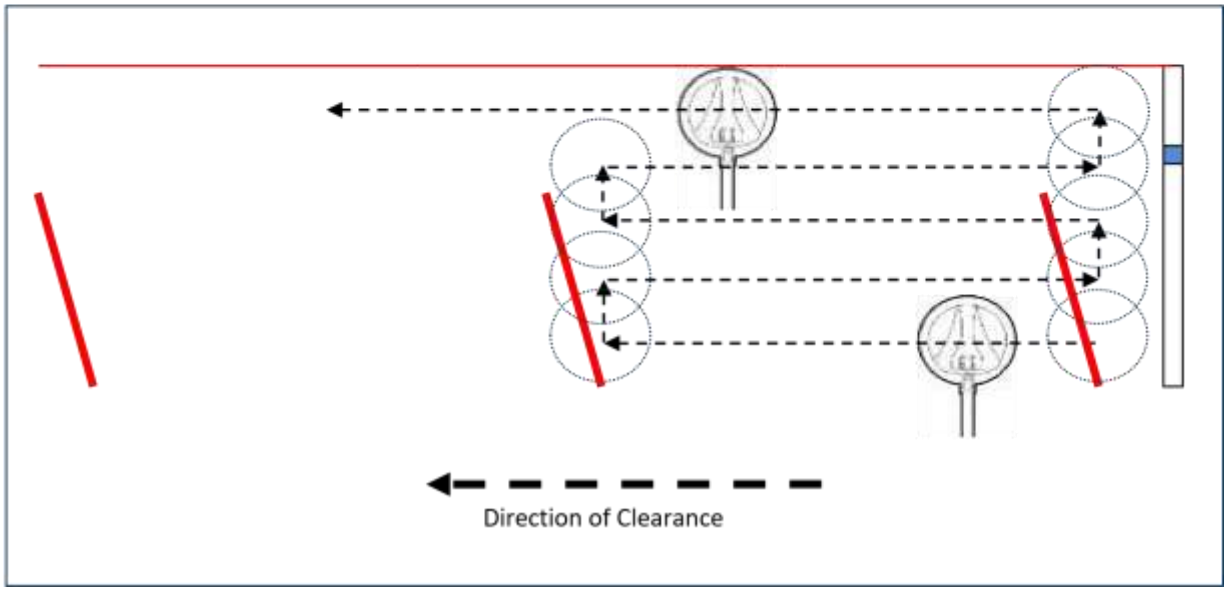
Mapping

A mapping operator will 'map' all detector signals within a bound and mark them for subsequent investigation by placing red chips. The detector operators may work from left to right or from right to left.

The mapping operator searches a series of 1m x 70cm cells along the bound. The search pattern is shown below. There is to be an overlap of 5cm from one search-head to the next; and half a detector head overlap beyond the red stick on each side.

For a large head handheld detector only three sweeps of the detector may be required per cell with an overlap of 10-15cm beyond the red stick on each side.



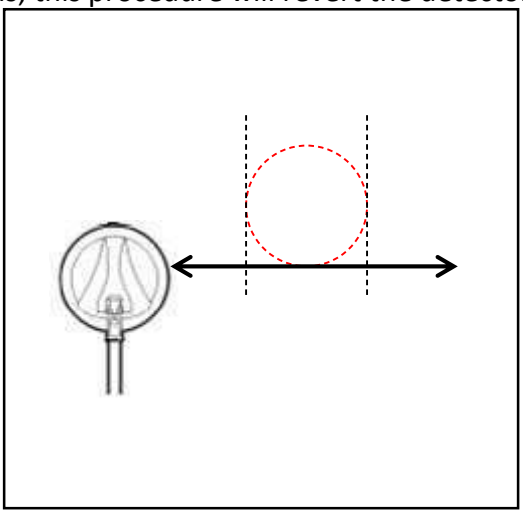


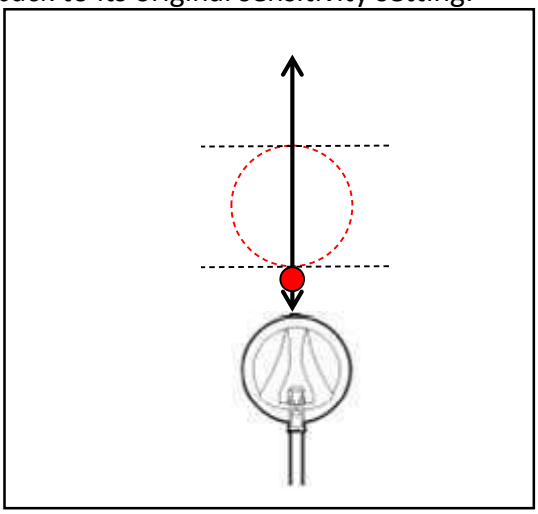
When the operator hears a signal, they are to swing the detector over it and mentally identify a box surrounding the signal, and also the centre of that box.

The operator should first utilise an exaggerated swing to establish the extent of the detector picture, then using the strongest point of the detector signal carefully move off the signal in four directions to establish a mental picture of the outside edge of the detector halo.

Using this mental picture, the operator is to place a red chip at the base of the detector signal. Where the centre of the signal is deemed by the operator to be beyond the rope, it is to be left until the next bound. After placing each chip, the operator is to lift the detector to waist height, and perform an audio reset by pressing and immediately releasing the Ground Balance button, pause for 2 secs, then lower the detector

and continue the search pattern. This is due to the ability of the detector to suppress small detector signals; this procedure will revert the detector back to its original sensitivity setting.





If there are too many signals in a small area for the mapping detector operator to isolate individually, they should mark the area for full excavation, using two 50cm red stakes and placing them in the middle of the detectors head and within the bound on either side of the contaminated area. They are to inform the TL once this has been done.

If the edge of a signal is detected which is beyond the red rope, then the operator should not try to reach forward too far to isolate it but should place a red disc just on the far side of the rope.

Any patches of waterlogged ground should be marked off with red/white stones and cleared at a later date, once the ground has dried.

Signal Investigation

Once the mapping operator is outside the required safety distance, support deminers should be deployed immediately behind them to start investigating the red chips in the bound.

Support deminers should be deployed in a logical sequence, spaced at the required safety distance, and following the route taken by the mapping operators without missing out any bounds.

The support deminer first uses a standard handheld detector to sweep the ground from the edge of the uncleared area to the chip. They will then isolate and excavate the signal as described in the OMOL procedures.

Annex C – Full Excavation Method

Deployment

This method is used whenever the detector method is not possible and should only be conducted in locations where there is no risk of initiating a sensitive switch through the use of hand tools It may be required when:

- There are too many detector signals and they cannot be isolated
- The soil is mineralised and compensating detectors are not available
- The devices are too deep for the type of detector
- There is a lot of noise or electrical interference, making it impossible to hear signals clearly
- The detector is broken or batteries are flat
- There is threat of low metal content or no metal content devices which the detector will not find

Method

The drill is as follows:

- The deminer shall create a 15 cm deep and 1 m wide excavation trench in the safe ground 15cm back from the front edge of the ELM (note a 1m ELM will be required for this method).
- The deminer will scrape from side to side with the right angled scraper, beginning from the base of the excavation trench, and must always be aware that they have no prior indicator that they will find a mine / IED.
- If full excavation is being done because of high metal contamination then after every 50 cm the deminer should use the detector to determine whether the area in front of the excavation trench is still contaminated. If it is not, the deminer should revert to the detector method.
- Soil removed during this process should be piled in such a way that it does not cause an obstacle to movement in the hazardous area.

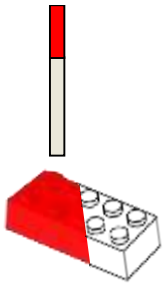
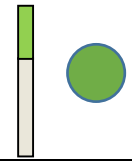
Detector-assisted Full Excavation

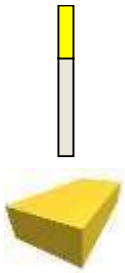
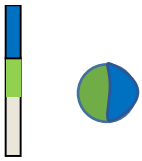
If it has been determined that there are deeply buried devices, then the detector assisted full excavation method may be used when authorised by the Operations Manager and prescribed in the CP. Deminers are to check the floor of the excavation trench with their detector every time they move forward 1 detector head (20cm). Any signals found are to be investigated using the method described for OMOL.

Full Excavation Marking

When excavating, Deminers mark every meter of the lane with 50 cm red sticks/stones inside the excavation trench. Every 50cm the Deminer shall use their ELM to check that the lane they are excavating is 1m wide. During breaks during the day the ELM is to be placed in the bottom of the trench. At the end of the day the lane should be closed with three red sticks as for OMOL.

Annex D – Task Marking

	Description	Meaning
	0.5m Stick with Red Top or Stone red and white	Boundary between Cleared and Uncleared Ground Every Meter
	1.5m Stick with Red/White/Red Bands Or Sandbag red and white	CHA Perimeter, Turning points and every 10 meters
	0.5m Stick Blue Top Or Sandbag blue and white	Admin Areas Parking, First aid points, rest areas, control point etc
	0.5m Stick green Top or Disk green	Team Leader QC

	Description	Meaning
	1.5m Stick White Top	Detector test areas.
	0.5m Stick Black Top	Metal fragmentation, and rubbish pits
	Red Flag	Active lane
	White flag	Additional marking for Admin areas
	1.5m Stick Yellow Top	Explosive and Non-Explosive Hazards Temporary storage area
	0.5 unpainted stick	Searcher start of the day
	0.5m Stick green and blue top or disk	Ops Officer/Supervisor QC

Annex E – Urban Clearance Considerations

1. Introduction

1.1 The clearance of Improvised Explosive Devices (IEDs) in urban environments can present potentially greater challenges than those experienced on rural tasks. In part, this is largely due to the likely combination of more complex devices (particularly in their methods of initiation) and the multitude of locations within a building where an IED can be emplaced. This can be further complicated by factors such as the extent of damage to the building (restricting access), the presence of conventional UXO following intense fighting, along with secondary hazards such as power, gas tanks, oil tanks, other hazardous substances and the risk of secondary fragmentation etc.

1.2 In all but the simplest structures, (barns, single room buildings etc,) HALO Operations Staff will generate bespoke plans for the clearance of individual buildings and urban areas. These will be based on a thorough understanding of the local threat, detailed planning, effective training, pre-task rehearsals and strict adherence to SOPs. It is expected that normal task management procedures will remain the same, although it is anticipated that greater supervision throughout the clearance of a building will be required.

1.3 The normal team composition for manual building clearance includes; a Searcher (deminer), supervised by a Team Leader (who in occasions might also act as the IEDD operator), a Medic and an Ambulance Driver. In large buildings where the opportunity to use additional searchers is assessed to be safe by the Technical Advisor, agreement in advance is to be obtained from the Operations Manager and recorded in the task dossier.

2. Planning Considerations

2.1 General. The clearance of urban areas is a technically challenging and extremely labour-intensive process. Consequently, and where achievable in early clearance planning, it is important to identify only those buildings that are genuinely at risk of being contaminated with IEDs. The temptation to respond to pressure from security forces and local residents to 'just check' buildings in the vicinity of our operations should be avoided in favour of a thorough risk assessment, survey and clearance plan.

2.2 Other Factors. In addition to routine IED clearance planning considerations, other important factors that should be considered during the planning phase for urban clearance operations include (but are not limited to);

- Is the planned area for clearance residential, commercial or industrial?
- What is the density of buildings in the area?
- What is the extent of occupancy in the area?
- What secondary hazards are present? To include an understanding and awareness of commercial hazardous materials.
- Are the buildings structurally safe to enter and/or operate around, either manually or mechanically?
- How many points of access are there to a building and can they be used?
- For how long and by whom were the buildings occupied during periods of conflict?

3. General Task Approach

As mentioned above, a bespoke plan will normally be prepared in advance of clearing particular individual buildings and urban areas. This plan will be created by the Team leader, agreed by the Technical Advisor and signed off by the Operations Manager). Given the variety of complexities associated with these operations, clearance plans may be reassessed during the clearance operation depending on the level of progress.

3.1 External Areas. In building clearance operations it is important to establish a safe working environment in close proximity to the building. This enables safe access to the building to better understand its layout and construction as well as the opportunity to identify multiple observations points through doors and windows prior to access. In addition, it provides for easier preparation for Hook and Line set up. In general, and wherever possible, a minimum of 5m should be cleared around the outside of the building.

3.2 Clearance of External Areas. Where the clearance plan identifies the risk of IEDs being present in an area immediately surrounding a building, that area is to be cleared in accordance with SOPs. If no IEDS are anticipated but the threat from UXO exists then BAC procedures may be more appropriate in the area instead. In areas with significant metal contamination or rubble, mechanical means may be the most appropriate method. As in all aspects of clearance, the accurate marking of cleared and uncleared areas is crucial.

3.3 Visual Reconnaissance. If access permits before external clearance commences (or following completion of external clearance), a remote visual reconnaissance of the inside of the building should be conducted in accordance with the following guidance:

- A perimeter check of the building(s) may be conducted from different angles, paying attention to signs of military/armed group use or occupation. It should also establish whether the building had been targeted by direct / indirect fire, identify damaged or un-stable areas and to determine the safest access routes into the building.
- The inside of the property should be viewed through any open gaps such as windows and doors. These should be approached from an off-set position and “half mooned” i.e. each side searched prior to clearance of the entry / window. This increases the probability of avoiding firing switches and assists with potentially identifying other off-set components such as main charges.
- Holes may be drilled into walls of individual rooms to enable an appropriate camera to be passed through to observe into the room. Care must be taken to select an area to drill away from any doors or windows where potential firing switches may be located.
- Cameras or optical aids should be positioned to; view potential break-in points from the inside; identify potential IEDs/booby traps; discern a method of entry to the building and develop the threat picture. This should inform the decision to locate the best approach and method of the entering the building and subsequent clearance considerations.
- Drones (air or ground based) may be used to investigate individual rooms.

3.4 Break In. The selection of a break-in point should be an entrance that is assessed to be the least risky, with the lowest threat of a VOIED being present. This could be an entry point that an informant has previously used or one that is not obvious, such as entering from a second floor. This reduces the risk of encountering an IED on entry and provides other access options to other internal rooms. Importantly, it can enable the ability to approach a potential IED safely from a direction unanticipated by the insurgent/perpetrator. The following procedures should be followed:

- The method of break in is to be determined by the Team Leader/Technical Advisor.
- The cordon is to be briefed and all personnel moved beyond the safety limit.
- If a threat or hazard cannot be ruled out on the entrance (door) a trained and designated team of a minimum number of individuals will position a weight dropper, or hook and line, to open the entrance remotely. Every effort should be made to limit the number of people involved in this task. Alternatively, consideration should be given to employing a HALO excavator to force open an external door.
- The team will withdraw to a safe location in hardcover or beyond the safety limit and initiate the weight dropper or hook and line and observe a soak period prior to confirming their semi-remote action.
- The Team Leader is then to move forward and assess the situation, taking all opportunities to safely assess the threat from an external vantage point.

3.5 Building Clearance. When conducting the clearance phase of a building the following considerations should be applied:

- Once breached, as many additional doors and windows as possible are to be opened (using Hook and Line or weight dropper where applicable) to mitigate the effects of any potential unplanned blast.
- A route should be cleared through the house to another point of access.
- A 1m or 2m baseline should be selected depending on the nature of the building. The searcher should then conduct a search in the following order; visual search, trip wire feel, detector (if appropriate) followed by fingertip search.
- Search patterns should include all aspects of the searcher's lane (walls, ceilings, entrance-ways and window frames etc.).
- The cleared route is to be clearly marked.
- Where possible the floor in the first room is to be cleared entirely in order to establish a safe place from which to work within the building.
- Floors, walls, furniture and ceilings are to be cleared using hook and line and weight dropper where appropriate.
- One searcher only should search in a building at one time. (see para 4.4 below).
- The ground floor should be cleared first in order to allow for ease of access and assist in casualty evacuation.

3.6 Moving Items. During the building clearance phase it will be necessary to move all movable items remotely using Hook and Line. The following principles will be applied;

- All personnel must be outside of the building and in a safe location prior to ANY pull being completed.

- Team, cordon and local authorities should be informed before ANY pull can occur.
- Soak times must be applied after each pull.
- Attempt to safely move multiple items in a single pull.
- Each item that has been safely moved should be inspected and marked to indicate it has been moved.

3.7 Marking. Marking is to be conducted in accordance with this SOP. Pre-painted chips or stones should be used although, at times, depending on the clearance plan it may be easier and more effective to use spray paint and chalk. All marking is to remain *in situ* for the duration of the task and should be removed prior to closing the task.

- **RED/white** – Hazards.
- RED LINE AND ARROW – The forward edge and direction of the find.
- WHITE – If necessary to mark cleared area
- YELLOW - Destroyed explosive devices (non-UXO) with a yellow arrow indicating the direction of the target area and the location and direction of any method of initiation.

3.8 Action on a Find. The following actions will be adhered to on the discovery of an IED or suspect item;

- Searcher is to stop searching immediately, mark the area and inform the Team Leader. Searcher is then to move to the CP.
- Team Leader/Technical Advisor will move forward and visually assess the item – no further intrusive action is to occur to, or around, the item. Sketches and/or photographs should be taken.
- Team Leader/Technical Advisor will then plan the RSP.
- Team Leader/IED Operator will conduct and complete the RSP.
- When clear, the house clearance will continue.

3.9 Action on an Explosion. In the event of an unplanned explosion within a building the following is to occur;

- Team Leader/Technical Advisor is to complete a head count and identify any missing personnel.
- If a team member is missing the Team Leader/Technical Advisor is to enter the building to check for a safe access route to casualty.
- Team Leader/Technical Advisor is to coordinate casualty evacuation from the building.
- Normal HALO casualty evacuation procedures will apply after the safe removal of the casualty from the building.

4. Other Considerations

4.1 Secondary Fragmentation. Should an IED function within (or in close proximity to) a building there is the significant probability of secondary fragmentation occurring both within the building and within external to it. Consideration therefore must be given to the correct sighting of cordon positions and the use of hardcover by the clearance team and general public before any positive EOD action is to occur.

4.2 Secondary Hazards. All clearance plans within urban and industrial areas will contain a risk assessment of the secondary hazards likely to be encountered within the area. Urban and industrialised areas by their very nature include additional hazards such as industrial and toxic chemicals, asbestos in building materials, chlorine for use in water treatment plants, phosgene in plastics, medicines and fertilisers, hydrogen cyanide and ammonia used in the production of materials and medicines. Other potential hazards that need to be considered within the clearance plan include;

- Working in confined spaces
- Working at height
- Bio-hazards
- Extensive Civilian activity in the vicinity of the site
- Underground tunnels/cavities

4.3 Building Vulnerability and Risk of Collapse. A risk assessment of the structural condition of all buildings that need to be entered will be included in the clearance plan. Attention should be focused on the risk of building collapse and the potential for falling debris.

Immediately prior to entering a building, individuals are to conduct a dynamic risk assessment of the building and its condition. Where a building is determined to be too unstable to enter, it is to be marked and identified as such. The task will only proceed when suitable equipment is available to ensure the stability of the building and the safety of team members entering it.

4.4 Numbers of personnel inside buildings/safety distances. Careful consideration must be given to the numbers of personnel present within a building at one time and this must be clearly explained in the clearance plan. Generally, it is envisaged that only one searcher will search in a building at a time. Only by exception, where the building is particularly large or where the explosive charge size is assessed as small, will more than one searcher be considered as an appropriate and safe clearance method.

Annex F – Finger Tip Sweep

Employment

This method is used whenever the detector sweeps are not possible inside urban areas that are heavy contaminated with debris and when there is a risk of initiating a sensitive switch through the use of hand tools. This technique is useful inside buildings with compacted or fitted floors and layers of detritus excluding visual search.

It may be required when:

- There are too many detector signals and they cannot be isolated but full evacuation is impractical due to the ground surface.
- There is threat of low metal content or no metal content devices which the detector cannot find (in this case it should be used in conjunction with a detector search)

Method

The drill is as follows:

- Conduct visual (including trip wire feeling ,if required) search as per normal procedures
- The deminer, in the prone position, shall cautiously push their outstretched fingers, from their ELM into their search lane systematically, covering the whole of their area of responsibility.
- The depth of the push shall be determined by the state of the ground and the perceived threat on referral to the CP.
- The deminer is to feel for changes in ground consistency and detritus texture. If anything suspicious is identified, further investigation is recommended with a small paint brush.

Finger Tip Sweep Marking

The lane is to be marked as breach lanes above.

Annex G – CEIA CMD-3 Detector Use Guidelines

This annexe of the SOP relates to general guidelines for the use of the CEIA CMD-3 detectors for IED clearance.

All other procedures stated in this SOP for manual clearance and OMOL drills apply.

General Use

1. Holding the detector horizontal 1m from the ground, switch the detector on.
2. Ground balance the detector in an area confirmed to be clear of CMD-3 signals and near to the test pit (see **Ground Balance**).
3. Test the detector against the test pit as per the procedure below (see **1.4.12 Detector Test Area**).
4. Move to the working lane and conduct a ground balance again.
5. Use the detector according to the required search technique. When using the detector the following points should be followed:
    a. The detector head should be kept as close as possible to the search surface, without touching, and moved in smooth sweeps without tilting the detector head at the end of the swings.
    b. The detector head must be moving at a constant speed between 2-4 sec per one meter sweep.
    c. The 'heel' of the detector head does not contain any sensing components, and is not considered part of the search head. The detector use should accommodate this.
6. The detector should be ground balanced at the start of every working period, as clearance progress (minum every 2 meters or as indicated in the clearance plan) and if moved to a different area or type of ground.
7. At the end of the day, the detector should be switched off and cleaned with a soft brush, cloth, and water. The detector should not be collapsed or stored if it has not been cleaned.
8. The detector should be charged directly using the power cables supplied with the detectors. These power cables should be plugged into an extension cord with an appropriate surge protector / circuit breaker.

Detector Settings

The CMD-3 detector has a number of settings that can be changed. The default settings for HALO CMD-3 detectors are as follows:

- **Sound**: High (8 lights, 100%)
- **Vibrate**: High (8 lights,100%)
- **Lights**: Light , On
- **M/C (Metal/Carbon; Sensor 1 and Sensor 2)**: High (8 lights)
- **W (Wire; Sensor 3)**: High (8 lights)
- **Battery**: Not Applicable
- **F1 (Function 1)**: Locked using Supervisor's Key
- **CH (Channel)**: one detector on each channel when used by a 4-detector team

These settings may be altered according to the task requirements as detailed in the clearance plan and agreed by the operations manager and team leader.

Detector settings should be locked using the Supervisor's Key when in use by deminers/searchers on a task.

Ground Balancing

The detectors should be ground balanced at the start of every working period, if the deminer moves lanes, and if the ground conditions change. Team leaders, supervisors, and other people conducting QC checks should conduct a ground balance of the detector before conducting the QC check. The ground balance process for the CMD-3 is detailed below:

- Holding the detector horizontally 1m from the ground, press and hold the ground balance (**R**) button until the tone changes.
- When the tone changes, lower the detector head to a pre-selected area of ground free from any signals and swing the detector as per normal use until the tone changes again.
- Raise the detector to horizontal 1m from the ground until the tone ceases.