

STANDARD OPERATING PROCEDURE

MEC OPERATIONS - DEMOLITION/DISPOSAL OPERATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the conduct of demolition/disposal operations on sites contaminated with munitions and explosives of concern (MEC) or unexploded ordnance (UXO).

2.0 SCOPE

This SOP applies to all site personnel, including contractor and subcontractor personnel, involved in the conduct of MEC demolition/disposal operations on a UXO contaminated site. This SOP is not intended to contain all of the requirements needed to ensure complete compliance, and should be used in conjunction with project plans and applicable federal, state and local regulations.

3.0 REGULATORY REFERENCES

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of UXO demolition/disposal operations:

- OSHA General Industry Standards, 29 CFR 1910
- OSHA Construction Standards, 29 CFR 1926
- USACE Safety Concepts and Basic Considerations for Unexploded Ordnance
- USACE EM 385-1-1, Safety and Health Requirements Manual
- DoD 4145.26-M, Contractor's Safety Manual for Ammunition and Explosives
- DoD 4160.21-M, Defense Reutilization and Marketing Manual
- DoD 6055.9-STD, DoD Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosive Safety

- AR 385-10, Army Safety Program
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- TM 9-1300-206, Ammunition and Explosive Standards
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60A-1-1-31, EOD Disposal Procedures
- AR 190-11, Physical Security of Arms, Ammunition and Explosives
- ATF 5400.7, Alcohol Tobacco and Firearms Explosives Laws and Regulations
- Applicable sections of DOT, 49 CFR Parts 100 to 199

4.0 RESPONSIBILITIES

4.1 PROJECT MANAGER

The Project Manager (PM) shall be responsible for ensuring the availability of the resources needed to implement this SOP, and shall also ensure that this SOP is incorporated in plans, procedures and training for sites where this SOP is to be implemented.

4.2 SENIOR UXO SUPERVISOR

The Senior UXO Supervisor (SUXOS) will be responsible for assuring that adequate safety measures and housekeeping are taken during all phases of site operation, to include demolition activities, and shall visit site demolition locations as deemed necessary to ensure that demolition operations are carried out in a safe, clean, efficient and economical manner.

4.3 DEMOLITION SUPERVISOR

Prior to initiation of demolition operations, the SUXOS shall designate an experienced and trained UXO Supervisor to act as the Demolition Supervisor (DS). The demolition activities shall then be conducted under the direct control of the DS, who will have the responsibility of supervising all demolition operations within the area. The DS shall be responsible for training all on-site UXO personnel regarding the nature of the materials handled, the

hazards involved and the precautions necessary. The DS will also ensure that the Daily Operational Log, Ordnance Accountability Log, Demolition Records and inventory records are properly filled and accurately depict the demolition events and demolition material consumption for each day's operations. The DS shall be present during all demolition operations or designate a competent, qualified person to be in charge during any absences.

4.4 UXO SAFETY OFFICER

The UXO Safety Officer (UXOSO) for the site is responsible for ensuring that all demolition operations are being conducted in a safe and healthful manner, and is required to be present during all MEC demolition operations. The only exception to this rule is when the project site has multiple sites conducting various types of UXO investigation and remediation operations being conducted concurrently with periods where there may be continuous demolition operations throughout the day. In that event a demolition team UXOSO will be designated. This individual will report to the UXOSO and assume the UXOSO's responsibilities at the demolition range. In this situation, the UXOSO will conduct periodic safety audits of the demolition team and assist the demolition team UXOSO in the performance of his duties.

4.5 UXO QUALITY CONTROL SPECIALIST

The UXO Quality Control Specialist (UXOQC) is responsible for ensuring the completeness of demolition operations and for weekly inspecting the Ordnance Accountability Log, the Daily Operational Log, the Earth Tech Demolition Shot Record and the inventory of MEC and demolition material. The UXOQC, assisted by demolition team personnel, will inspect each demolition pit and an area of up to 250 feet in radius after each demolition shot to ensure there are no kick-outs, hazardous MEC components or other hazardous items. In addition, the pit will be checked with a magnetometer and large metal fragments four inches or greater, and any hazardous debris will be removed on a per use basis. Any MEC discovered during the QC check will be properly stored for destruction at a later date. Extreme caution must be exercised when handling MEC which has been exposed to the forces of detonation.

5.0 GENERAL OPERATIONAL AND SAFETY PROCEDURE

All personnel, including contractor and subcontractor personnel, involved in operations on MEC contaminated sites shall be familiar with the potential safety and health hazards associated with the conduct of demolition/disposal operations, and with the work practices and control techniques used to reduce or eliminate these hazards. During demolition

operations, general safety provisions listed below shall be followed by all demolition personnel, at all times. Non-compliance with the general safety provisions listed may result in positive discipline, to include termination of employment:

- All safety regulations applicable to demolition range activities and demolition and MEC materials involved shall be complied with.
- Demolition of any kind is prohibited without the express permission from the client
- The use of sandbags for mitigation of fragmentation and blast effects due to intentional detonation of munitions will be required for all demolition shots conducted in accordance with (IAW) HNC-ED-CS-98-7. The quantity of MEC to be destroyed will be kept to a minimum to reduce noise travel into residential areas.
- In the event of an electrical storm, or heavy snow or dust storms, immediate action will be taken to cease all demolition range operations and evacuate the area.
- In the event of a fire or unplanned explosion, if possible, put out the fire, if unable to do so, notify the fire department and evacuate the area. If injuries are involved, remove victims from danger, administer first aid and seek medical attention.
- The DS is responsible for reporting all injuries and accidents which occur to the UXOSO.
- Employees will not tamper with any safety devices or protective equipment
- Any defect or unusual condition noted that is not covered by this attachment will be reported immediately to the DS or UXOSO.
- Methods of demolition shall be conducted IAW this procedure and approved changes thereto.
- Fire prevention procedures for disposal operations contained in para. 5.1 will be enforced during all demolition operations.
- Adequate first aid equipment shall be provided at all times
- All personnel engaged in the destruction of MEC shall wear under and outer garments made of natural fiber, close-weave clothes, such as cotton. Synthetic material such as nylon is not authorized unless treated with anti-static material.
- Care will be taken to minimize exposure to the smallest number of personnel, for the shortest time, to the least amount of hazard, consistent with safe and efficient operations.
- Work locations will be maintained in a neat and orderly condition
- All hand tools shall be maintained in a good state of repair
- Each heavy equipment and/or vehicle operator will have in his possession a valid operator's permit, i.e., state driver's license.
- Equipment and other lifting devices designed and used for lifting will have the load rating and date of next inspection marked on them. The load rating will not be exceeded and the equipment will not be used without a current inspection date.

- Leather or leather-palmed gloves will be worn when handling wooden boxes, or MEC
- Lifting and carrying require care. Improper methods cause unnecessary strains observe the following preliminaries before attempting to lift or carry:
 - When lifting, keep your arms and back as straight as possible, bend your knees and lift with your leg muscles; and
 - Be sure you have good footing and hold, and lift with a smooth, even motion
- The demolition range shall be provided with telephone and/or radio communication
- Motor vehicles and material handling equipment (MHE) used for transporting MEC or demolition materials must meet the following requirements:
 - Exhaust systems shall be kept in good mechanical repair at all times
 - Lighting systems shall be an integral part of the vehicle
 - One Class ABC rated, portable fire extinguisher shall, if possible, be mounted on the vehicle outside of the cab, on the driver's side, and one Class ABC fire extinguisher shall be mounted inside the cab.
 - Wheels of carriers must be chocked and brakes set during loading and unloading.
 - No demolition material or MEC shall be loaded into or unloaded from, motor vehicles while their motors are running.
- Motor vehicles and MHE used to transport demolition material and MEC shall be inspected prior to use to determine that:
 - Fire extinguishers are filled and in good working order
 - Electrical wiring is in good condition and properly attached
 - Fuel tank and piping are secure and not leaking
 - Brakes, steering and safety equipment are in good condition
 - The exhaust system is not exposed to accumulations of grease, oil, gasoline, or other fuels, and has ample clearance from fuel lines and other combustible materials.
- Employees are required to wear leather or rubber gloves when handling demolition materials. The type of glove worn is dependent on the type of demolition material.
- An observer will be stationed at a location where there is a good view of the air and surface approaches to the demolition range before material is detonated. It shall be the responsibility of the observer to order the DS to suspend firing if any aircraft, vehicles or personnel are sighted approaching the general demolition area.
- Two-way radios shall not be operated at the disposal site while the pit is primed or during the priming process. The charts shown in Tables 1 and 2, shall be used for determining the safe distances from transmitter antennas.

- No Demolition operation will be left unattended during the active portion of the operation (i.e., during the burn or once any explosives or MEC are brought to the range).
- No demolition activities will be conducted if there is less than a 2,000 foot ceiling or if wind velocity is in excess of 10 mph.
- Demolition shots must be fired during daylight hours (i.e., between 30 minutes after sunrise and 30 minutes before sunset).
- No more than two persons shall ride in a truck transporting demolition material or MEC, and no person shall be allowed to ride in the trailer/bed.
- Vehicles shall not be refueled when carrying demolition material or MEC, and must be 100 feet from magazines or trailers containing such items before refueling.
- All explosive vehicles will be cleaned of visible explosive and other contamination before releasing the vehicles for other tasks.
- Prior to conducting any other task, personnel shall wash their face and hands after handling demolition material or MEC.
- Disposal sites shall be spaced at least 50 feet apart, with no more than 10 pits prepared for a series of shots at any one time.

5.1 FIRE PREVENTION FOR DISPOSAL OPERATIONS

Due to the high fire potential season anticipated at the site, the following procedures will be adhered to on each disposal shot conducted at the site:

- MEC that is moved for disposal will be taken to a location that will provide the most protection from fires and provide the easiest access by fire fighting vehicles if required.
- For UXO that cannot be moved, measures will be taken to carefully plan fire suppression accesses and procedures prior to detonating shots. All disposal and safety personnel will be fully briefed on fire suppression procedures.
- Immediately after the detonation, all safety personnel will report status of the disposal site and presence/absence of fires.
- If fire or smoke in the vegetation surrounding the site is present, the demolition team will proceed immediately to the site with field fire suppression equipment and attempt to suppress any fires present.
- If a fire becomes uncontrollable, emergency notifications to local fire agencies will be made and all field workers will stand by to assist as necessary.

The fire prevention goals are to plan effectively for all potential fire suppression obstacles, effectively mitigate the disposal shot and surrounding vegetation with water, ensure prevailing winds are not going to take potential smoke towards populated areas, ensure that adequate fire suppression equipment is on site, and keep vigilant communications with the local Fire Department during all disposal operations.

6.0 SPECIAL REQUIREMENTS FOR DEMOLITION ACTIVITIES

The following safety and operational requirements shall be followed during demolition range operations. Any deviations from this procedure shall be allowed only after receipt of written approval from the MARRS' Site Manager and the client. Failure to adhere to the requirements and procedures listed in the paragraphs below could result in serious injury or death, therefore complete compliance with these requirements procedure will be strictly enforced.

6.1 GENERAL REQUIREMENTS

The general disposal operations requirements listed below shall be followed at all times:

- Attachment 1 of this SOP, Explosive Hazards Tables, will be adhered to in all demolition operations.
- Material awaiting destruction shall be stored at not less than intra-line distance, based on the largest quantity involved, from adjacent explosive materials and from explosives being destroyed. The material shall be protected against accidental ignition or explosion from fragments, grass fires, burning embers or detonating impulses originating in materials being destroyed.
- MEC or bulk explosives to be destroyed by detonation should be detonated in a pit not less than three feet deep and covered with earth which protrudes not less than two feet above existing ground level. The components should be placed on their sides or in a position to expose the largest area to the influence of the demolition material. The demolition material should be placed in intimate contact with the item to be detonated and held in place by tape or earth packed over the demolition materials. The total quantity to be destroyed below ground at one time shall be kept at a minimum.
- Detonations will be counted to ensure detonation of all pits. After each series of detonations, a search shall be made of the surrounding area for unexploded UXO and MEC. Items such as lumps of explosives or unfuzed ammunition, may be picked up and prepared for the next shot. Fuzed ammunition or items which may have internally damaged components will be detonated in place, if possible.

- Prevailing weather condition information will be obtained from the U.S. Weather Service and the data logged in the Demolition Shot Log before each shot or round of shots.
- All shots shall be dual primed
- A minimum of 30 seconds will be maintained between each detonation
- After each detonation and at the end of each day's operations, surface exposed scrap metal, casings, fragments, and related items shall be recovered from the demolition range and disposed of in accordance with munition debris procedures, as well as all applicable environmental regulations. All collected scrap metal will be 100% inspected for absence of explosive materials by UXO personnel and certified by the SUXOS.
- When operated in accordance with the conditions of this procedure the demolition range should not present a noise problem to the surrounding community. However, if a noise complaint is received, the name, address and phone number of the complainant should be recorded and reported to the SUXOS, who in turn, will report it to the Earth Tech site manager.
- Prior to and after each shot, the Demolition Shot Record is to be filled out by the DS with all applicable information. This record will be kept with the MEC Accountability Log and reflect each shot.

6.2 PREPARATION SEQUENCE (for a NONEL Firing System)

6.2.1 Assembling the NONEL Firing System

- Test and maintain control of the NONEL firing device
- Lay out the NONEL shock tube
- Protect the NONEL detonator
- Prime the charge(s)
- Connect the firing device to the shock tube

6.2.2 Testing and Maintaining Control of the NONEL Firing Device

The NONEL firing device will be tested each day prior to use as specified in the manufacturer's instruction. The supervisor in charge of the demolition operation is responsible for maintaining control of the NONEL firing device at all times.

6.2.3 Laying Out the NONEL Shock Tube

Care will be taken to prevent kinks or sharp bends in the shock tube. Control of the firing position will be maintained from this point on. This control will ensure that no one tampers with the shock tube or fires the charge prematurely. Personnel will not walk on or step over the shock tube.

6.2.4 Protecting the NONEL Detonator

The NONEL detonator will be protected at all times prior to priming the charge(s).

6.2.5 Priming the Charges/Returning to the Firing Point

Earth Tech will use commercially available explosives to detonate UXO. The NONEL detonator will be connected to the detonating cord trunk line or ring main system. Detonating cord trunk and branch lines will be used to link multiple shots.

6.2.6 Initiating the NONEL Firing System

The NONEL firing device will not be connected until all personnel are accounted for and the perimeter security is verified. The supervisor in charge of the demolition operation will give the order to fire the charge(s) only after all personnel are accounted for and the perimeter security is verified.

6.3 ELECTRIC DETONATOR USE

The following requirements are necessary when using electric detonators and blasting circuits:

- Electric detonators and electric blasting circuits may be energized to dangerous levels from outside sources such as static electricity, induced electric currents and radio communication equipment. Safety precautions will be taken to reduce the possibility of a premature detonation of the electric detonator and explosive charges of which they form a part. Radios will not be operated while the pit is primed or during the priming process.
- The shunt shall not be removed from the leg wires of the detonator until the continuity check of the detonator.
- When uncoiling or straightening the detonator leg wires, keep the explosive end of the detonator pointing away from the body and away from other personnel. When straightening the leg wires, do not hold the detonator itself, rather hold the detonator leg wires approximately one inch from the detonator body. Straighten the leg wires by hand, do not throw or wave the wires through the air to loosen them.
- Prior to use, the detonators shall be tested for continuity. To conduct the test, place the detonators in a pre-bored hole in the ground or place them in a sand bag, and walk facing away from the detonators and stretch the wires to their full length, or to 50 feet, whichever is less, being sure to not pull the detonators from the hole or sand bag. With the leg wires stretched to their full length, test the continuity of the detonators one at a time by un-shunting the leg wires and attaching them to the galvanometer and checking for continuity. After the test, re-shunt the wires by twisting the two ends together. Repeat this process for each detonator until all detonators have been tested. This process shall be accomplished at least 50 feet

from any MEC or demolition materials and out of the demolition range personnel and vehicle traffic flow pattern. In addition, all personnel on the demolition range shall be alerted prior to the test being conducted.

NOTE: When testing the detonator, prior to connecting the detonator to the firing circuit, the leg wires of the detonator must be shunted by twisting the bare ends of the wires together immediately after testing. The wires shall remain short circuited until time to connect them to the firing line.

- At the power source end of the blasting circuit, the ends of the wires shall be shorted or twisted together (shunted) at all times, except when actually testing the circuit or firing the charge. The connection between the detonator and the circuit firing wires must not be made unless the power end of the firing wires are shorted and grounded or the firing panel is off and locked.
- The firing line will be checked using pre-arranged hand signals or through the use of two-way radios if the demolition pit is not visible from the firing point. If radios are used, communication shall be accomplished a minimum of 25 feet from the demolition pit and detonators. The firing line will be checked for electrical continuity in both the open and closed positions, and will be closed/shunted prior to connecting the detonator leg wires.
- MEC to be detonated/vented shall be placed in the demolition pit and the demolition material placed/attached in such a manner as to ensure the total detonation/venting of the MEC. Once the MEC and demolition material are in place and the shot has been tamped, the detonators will be connected to the demolition material. Prior to handling any detonators that are connected to the firing line, personnel shall ensure that they are grounded. The detonators will then be carried to the demolition pit with the end of the detonators pointed away from the individual. The detonators are then connected to the detonation cord, Non-EI, etc., ensuring that the detonator is not covered with tamping material to allow for ease of recovery/investigation in the event of a miss-fire.
- Prior to making connections to the blasting machine, the entire firing circuit shall be tested with a galvanometer for electrical continuity and ohmic resistance to ensure the blasting machine has the capacity to initiate the shot.
- The individual assigned to make the connections at the blasting machine or panel will not complete the circuit at the blasting machine or panel and will not give the signal for detonation until satisfied that all personnel in the vicinity have been evacuated to a safe distance. When in use, the blasting machine or its actuating device shall be in the blaster's possession at all times. When using the panel, the switch must be locked in the open position until ready to fire, and the single key must be in the blaster's possession.
- Prior to initiating a demolition shot(s), a warning will be given, the type and duration of such will be determined by the prevailing conditions at the demolition range. At a minimum, this should be an audible signal using a siren, air horn or megaphone

which is sounded for a duration of one minute, five minutes prior to the shot and again one minute prior to the shot.

6.4 DETONATING CORD USE

The following procedures are required when using detonating cord (det cord):

- Det cord should be cut using approved crimpers and only the amount required should be removed from inventory.
- When cutting det cord, the task should be performed outside the magazine
- For ease of inventory control, only remove det cord in one foot increments
- Det cord should not be placed in clothing pockets or around the neck, arm or waist, and should be transported to the demolition location in either an approved "day box" or a cloth satchel, depending upon the magazine location and proximity to the demolition area.
- Det cord should be placed at least 25 feet away from detonators and demolition materials until ready for use. To ensure consistent safe handling, each classification of demolition material shall be separated by at least 25 feet until ready for use.
- When ready to "tie in" either the det cord to demolition materials, or det cord to detonator, the det cord will be connected to the demolition material and secured to the MEC. The cord is then strung out of the hole and secured in place with soil, being sure to leave a one foot tail exposed outside the hole.
- Once the hole is filled, make a loop in the det cord that is large enough to accommodate the det cord detonator, place the detonator in the loop and secured it with tape. The explosive end of the detonator will face down the det cord toward the demolition material or parallel to the main line.
- In all cases, ensure there is sufficient det cord extending out of the hole to allow for ease of detonator attachment and detonator inspection/replacement should a misfire occur.
- If the det cord detonators are electric, they will be checked, tied in to the firing line and shunted prior to being taped to the loop. If the det cord detonators are non-electric, the time/safety fuse will be prepared with the igniter in place prior to taping the detonators to the det cord loop. If the det cord detonators are Non-EI, simply tape the detonators into the loop as described above.
- In the event that a time/safety fuse is used, and an igniter is not available and a field expedient initiation system is used (i.e., matches), do not split the safety fuse until the detonator is taped into the det cord loop.

6.5 TIME/SAFETY FUSE USE

The following procedures are required when using a time/safety fuse:

- Prior to each daily use, the burn rate for the time/safety fuse must be tested to ensure the accurate determination of the length of time/safety fuse needed to achieve the minimum burn time of five minutes needed to conduct demolition operations.
- To ensure both ends of the time/safety fuse are moisture free, use approved crimpers to cut 6 inches off the end of the time/safety fuse roll and place the 6-inch piece in the time/safety fuse container.
- If quantity allows, accurately measure and cut off a three foot long piece of the time/safety fuse from the roll.
- Take the three foot section out of the magazine and attach a fuse igniter
- In a safe location, removed from demolition materials and MEC, ignite the time/safety fuse, measure the burn time from the point of initiation to the "spit" at the end, and record the burn time in the DS's Log
- To measure the burn time, use a watch with a second hand or chronograph
- To calculate the burn rate in seconds per foot, divide the total burn time (in seconds) by the length (in feet) of the test fuse.
- Whenever using time/safety fuse for demolition operations, the minimum amount of fuse to be used for each shot will be the amount needed to permit a minimum burn time of five minutes.

6.6 PERFORATOR USE

The following procedures are required when using perforators:

- Only remove from inventory the number of perforators required to perform the task
- Transport perforators in an approved "day box", cloth satchel or plastic container, depending upon magazine location and proximity to the demolition operations.
- Keep perforators stored at the demolition site at least 25 feet away from detonators and demolition materials until ready for use.
- When ready to use, place the det cord through the slot on the perforator and knot the det cord, ensuring the cord fits securely and has good continuity with the perforator.
- Once the det cord is secure, place the perforator in the desired location and secure it in place.
- Proceed from this point as described in para 6.3

6.7 USE OF TWO-COMPONENT EXPLOSIVES

The following procedures are required when using two-component explosives as demolition

material:

- Only remove from inventory the amount of two-component required to perform the task
- When transporting the solid and liquid, they need only be placed apart in the bed of a truck.
- Do not mix the solid and liquid components until certain that it will be used, since the resulting mixture is classified as a Class 1.1 explosive by Department of Transportation.
- When mixing the solid and liquids components, follow the manufacturer's instructions, while being sure to wear rubber gloves and goggles. Mix components in an area away from other demolition materials, the MEC, and if possible, sheltered from the wind.
- Once the components have been mixed, it is essential that the lid to the solid bottle is put on securely as soon as possible after mixing to prevent evaporation of the liquid.
- Attach the det cord as recommended by the manufacturer, place the assembled unit in the desired location in the hole and secure the unit.
- Proceed from this point as described in para 6.3

7.0 METEOROLOGICAL CONDITIONS

In order to control the effects of demolition operations and to ensure the safety of site personnel, the following meteorological limitations and requirements shall apply to demolition operations:

- Demolition operations will not be conducted during electrical storms or thunderstorms
- No demolition operations shall be conducted if the surface wind speed is greater than 10 miles per hour.
- Demolition operations will not be conducted during periods of visibility of less than one mile caused by, but not limited to, dense fog, blowing snow, rain, sand or dust storms.
- Demolition shall not be carried out on extremely cloudy days which are defined as: overcast (more than 80% cloud cover) with a ceiling of less than 2,000 feet.
- Demolition operations will not be conducted during any atmospheric inversion condition (low or high altitude).
- Demolition operations will not be conducted during periods of local air quality advisories

- Demolition operations will not be initiated until 30 minutes after sunrise, and will be secured at least 30 minutes prior to sunset.

8.0 PRE-DEMOLITION/DISPOSAL PROCEDURES

8.1 PRE-DEMO/DISPOSAL OPERATIONAL BRIEFING

The DS will brief all personnel involved in range operations in the following areas:

- Type of MEC being destroyed
- Type, placement and quantity of demolition material being used
- Use of sandbags for mitigation of fragmentation and blast effects
- Method of initiation (electric, non-electric or Non-EI)
- Means of transporting and packaging MEC
- Route to the disposal site
- Equipment being used (e.g., galvanometer, blasting machine, firing wire)
- Misfire procedures
- Fire prevention procedures
- Post shot clean up of range

8.2 PRE-DEMO/DISPOSAL SAFETY BRIEFING

The SSO will conduct a safety brief for all personnel involved in range operations in the following areas:

- Care and handling of explosive materials
- Personal hygiene
- Two man rule and approved exceptions
- Potential trip/fall hazards
- Horse play on the range
- Stay alert for any explosive hazards on the range
- Location of emergency shelter (if available)
- Parking area for vehicles (vehicles must be positioned for immediate departure, with the keys in the ignition).
- Location of range emergency vehicle (keep engine running)
- Wind direction (to assess potential toxic fumes)

- Location of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal

8.3 TASK ASSIGNMENTS

Individuals with assigned tasks will report the completion of the task to the DS. The types of tasks which may be required are:

- Contact local Police, Fire personnel, and FAA as required
- Contact hospital/emergency response personnel if applicable
- Secure all access roads to the range area
- Visually check range for any unauthorized personnel
- Check firing wire for continuity and shunt
- Prepare designated pits as required
- Check continuity of detonators
- Check time/safety fuse and its burn rate
- Designate a technician to maintain custody of blasting machine, fuse igniters or Non-EI initiator.
- Secure detonators in a safe location
- Place MEC in pit and place charge in desired location

8.4 PREPARING EXPLOSIVE CHARGE FOR INITIATION

To prepare the explosive charge for initiation, the procedures listed below will be followed:

- Insure firing wire is shunted
- Connect detonator to the firing wire
- Isolate or insulate all connections
- Place demolition charge on MEC
- Prime the demolition charge
- Depart to firing point (if using non electric firing system, obtain head count, pull igniters and depart to designated safe area).
- Obtain a head count
- Give one minute warning signal, using a bullhorn or siren, five minutes prior to

detonation, and again at one minute prior to detonation.

- Yell "**fire in the hole**" three times (or an equivalent warning) and take cover
- If using electric firing system connect firing wires to blasting machine and initiate charge
- Remove firing wires from blasting machine and shunt
- Remain in designated safe area until DS announces "**All Clear**". This will occur after a post-shot waiting period of 5-minutes and the DS has and inspected the pit(s).

9.0 POST DEMOLITION/DISPOSAL PROCEDURES

Do not approach a smoking hole or allow personnel out of the designated safe area until cleared to do so, and follow the below listed procedures:

- After the "**All Clear**" signal, check pit for low orders, kick outs, and fires
- Mag pit and remove any large fragmentation
- Back fill hole as necessary
- Police up all equipment
- Notify police, fire, etc. that the operation is complete

10.0 MISFIRE PROCEDURES

A thorough check of all equipment, firing wire and detonators will prevent most misfires. However, if a misfire does occur, the procedures outlined below shall be followed.

10.1 ELECTRIC MISFIRES

To prevent electric misfires, one technician will be responsible for all electrical wiring in the circuit. If a misfire does occur, it must be cleared with extreme caution, and the responsible technician will investigate and correct the situation, using the steps outlined below:

- Check firing line connections to the blasting machine and make a second attempt to initiate charge.
- If unsuccessful, disconnect and connect to another blasting machine (if available) and attempt to initiate charge.
- If unsuccessful, commence a 30 minute wait period
- After the maximum delay predicted for any part of the shot has passes, the designated technician will proceed down range to inspect the firing system, and a safety observer must watch from a protected area.

- Disconnect and shunt the detonator wires, connect a new detonator to the firing circuit and prime the charge without disturbing the original detonator (replacement detonator must have been checked for continuity as outlined in para 6.2, after disconnecting the defective detonator).
- Follow normal procedures for effecting initiation of the charge

10.2 NON-ELECTRIC MISFIRES

Working on a non electric misfire is the most hazardous of all operations. Occasionally, despite all painstaking efforts, a misfire will occur. Investigation and corrective action should be undertaken only by the technician that placed the charge, using the following procedure:

- If charge fails to detonate at the determined time, initiate a 60 minute wait period plus the time of the safety fuse, i.e., 5 minute safety fuse plus 60 minutes for a total of 65 minute wait period.
- After the wait period has expired, a designated technician will proceed down range to inspect the firing system. A safety observer must watch from a protected area.
- Prime the shot with a new non electric firing system and install a new fuse igniter
- Follow normal procedures for initiation of the charge

10.3 NON-EL MISFIRE

The use of a shock tube for blast initiation can present misfires which require the following actions:

- If charge fails to detonate, it could be the result of the shock tube not firing. Visually inspect the shock tube, if it is not discolored (i.e., slightly black), it has not fired.
- If it has not fired, cut a one foot piece off the end of the tube, re-insert the tube in the firing device and attempt to fire again.
- If the device still does not fire, wait 30 minutes and proceed down range to replace the shock tube per instructions outlined below.
- If the tube is slightly black, then a "Black Tube" misfire has occurred, and the shock tube will have to be replaced. When replacing the shock tube, be sure to remove the tube with the detonator in place. Without removing the detonator from the end of the tube, repackage the defective tube and return it to the supplier for credit.

10.4 DETONATING CORD MISFIRE

Det cord will be used to tie in multiple demolition shots and to ensure that electric detonators are not buried. Since det cord initiation will be either electrical or non-electrical, the procedures presented in paragraphs 10.1, 10.2, or 10.3, as appropriate to the type of detonator used, will be used to clear a det cord misfire. In addition, the following will be conducted:

- If there is no problem with the initiating system, wait the prescribed amount of time and inspect the initiator to the cord connection to ensure it is properly connected. If it was a bad connection simply attach a new initiator and follow the appropriate procedures in para 6.0.
- If the initiator detonated and the cord did not, inspect the cord to ensure it is det cord and not time fuze. Also, check to ensure there is PETN in the cord at the connection to the initiator.
- At this point, it may be necessary to uncover the det cord and replace it. If this is required, it must be accomplished carefully to ensure that the demolition charge and the MEC item are not disturbed.

10.5 PERFORATOR MISFIRE

The use of perforators is both cost effective and considerably safer than the use of C-4 and many other demolition materials. If the perforator is not initiated properly, it could malfunction. Since the perforator is covered with tamping material, det cord is used as the initiator. Therefore, in the event of a misfire, the procedures presented in para 10.4 will be followed, along with the items presented below.

- If everything went but the perforator, one of four things has occurred:
 1. Det cord grain size was insufficient to initiate the perforator
 2. The det cord was dislodged from the perforator when placing tamping materials
 3. The perforator was defective
 4. The perforator was moved during the placement of tamping materials
- Check to ensure the grain size of the det cord is sufficient, with 80 grain size or greater being the recommended size.
- If the det cord connection to the perforator was the problem, ensure that the next connection is secure (use duct tape if necessary).
- If it is evident that the perforator was moved, then ensure it is properly secured for the next shot.
- If cord size and connection are sufficient, replace the perforator, leaving the defective one on the shot

11.0 RECORD KEEPING REQUIREMENT

To document the demolition operations procedures and the completeness of the demolition of MEC, the following record keeping requirements shall be met:

- The MARRS subcontractor Earth Tech will obtain and maintain all required permits
- The DS will ensure the accurate completion of the logs, and the SUXOS will monitor the entries in the log for completeness, accuracy and compliance with meteorological conditions.
- The DS shall enter the appropriate data on the Ordnance Accountability Log and the Demolition Shot Record, to reflect the MEC destroyed, and shall complete the appropriate information on the Explosives Accountability Log (a.k.a. the Magazine Data Card) which indicates the demolition materials used to destroy the MEC.
- The quantities of MEC recovered must also be the quantities of MEC destroyed or disposed of as scrap.
- MARRS and Earth Tech will retain a permanent file of all Demolition Records, including permits, Magazine Data Cards, training records, inspector reports, waste manifests if applicable, and operating logs.
- Copies of ATF License and any state or local permits must be on hand.

12.0 SAFETY AND PPE REQUIREMENTS

The following safety measures and personal protective equipment shall be used in preventing or reducing exposure to the hazards associated with MEC demolition/disposal operations. These requirements will be implemented unless superseded by site specific requirements stated in the SSHP.

- Steel-toed safety boots will not be worn by personnel conducting demolition/disposal operations, unless a toe crush hazard exists, in which case personnel will wear boots with plastic or fiber toed safety toes.
- Unless a serious head, eye or face hazard exists, UXO personnel will not be required to wear hard hats, safety glasses or face shields when conducting operations involving the handling of demolition explosives or MEC.
- In the event that a serious head, eye or face hazard does exist, UXO personnel will wear the required PPE, but positive means shall be required to secure the PPE and prevent it from falling and causing an accidental detonation.

13.0 AUDIT CRITERIA

The following items related to demolition/disposal operations on a MEC contaminated site will be audited to ensure compliance with this SOP:

- The Demolition Shot Record
- The Site Daily Operational and Safety Logs
- The MEC Operations Daily/Weekly Report
- The Safety Training Attendance Forms, for the initial site hazard training
- The Safety Training Attendance Forms, for the Daily Tailgate Safety Briefings
- The Daily Safety Inspection and Audit Log

**TABLE 1
MINIMUM SAFE DISTANCE FROM TRANSMITTER ANTENNAS**

Average or Peak Transmitter Power in Watts	Minimum Distance to Transmitter in Meters / Feet
0 - 5	7.5 / 25
6 - 30	30 / 98.4
31 - 50	50 / 164.1
51 - 100	110 / 360
101 - 250	160 / 525
251 - 500	230 / 755
501 - 1,000	305 / 1,000
1,001 - 3,000	480 / 1,575
3,001 - 5,000	610 / 2,001
5,001 - 20,000	915 / 3,002
20,001 - 50,000	1,530 / 5,020
50,001 - 100,000	3,050 / 10,007
100,001 - 400,000	6,100 / 20,014
400,001 - 1,600,000	12,200 / 40,028
1,600,001 - 6,400,000	24,400 / 80,056
<p>Note: When the transmission is a pulsed or pulsed continuous wave type and its pulse width is less than 10 microseconds, the power column indicates average power. For all other transmissions, including those with pulse widths greater than 10 microseconds, the power column indicates peak power.</p>	

**TABLE 2
MINIMUM SAFE SEPARATION FORMULAS**

Unknown (Worst Case)	Without Metal Pack		With Metal Pack	
	Frequency	Formula	Frequency	Formula
Use Table 120D-1-1	2.3 KHz	$D = 0.093 \times (PG)^{0.5}$	73 KHz	$D = 0.093 \times (PG)^{0.5}$
	2.3 KHz - 0.45 MHz	$D = 39.7 \times F \times (PG)^{0.5}$	73 KHz - 0.45 MHz	$D = 126 \times F \times (PG)^{0.5}$
	0.45 MHz - 400 MHz	$D = 18 \times (PG)^{0.5}$	0.45 MHz - 400 MHz	$D = 0.6 \times (PG)^{0.5}$
	400 MHz - 75 GHz	$D = (7137 / F) \times (PG)^{0.5}$	400 MHz - 2.4 GHz	$D = (226 / F) \times (PG)^{0.5}$
	>75 GHz	$D = 0.093 \times (PG)^{0.5}$	>2.4 GHz	$D = 0.093 \times (PG)^{0.5}$

D = Safe distance to the transmitter in feet (multiply feet by 0.305 to obtain meters)
P = Output power of the transmitter in watts
G = Numerical gain of transmitter antenna
F = Frequency in MHz (divide KHz by 1,000 to obtain MHz, and multiply GHz by 1,000 to obtain MHz)

To properly use this table, the following assumptions are made:

1. The no-fire current of the EED is 10 mA.
2. At least 10 dB below the no-fire current in EED is considered to be safe.
3. The metal pack provides at least 30 dB of shielding.
4. Non-metal packs provide no shielding.
5. A 1 volt/meter field intensity is considered to be safe.
6. At no time should personnel or munitions be exposed to more than 200 volts/meter

THIS PAGE INTENTIONALLY LEFT BLANK