

HR LF	HR HF	<p style="text-align: center;">Massachusetts Fire District - 14 Technical Rescue Team Trench Rescue TRT 3100-18-013</p>	<p style="text-align: center;">10/17/2019</p>
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I) PURPOSE/SCOPE/APPLICATION

- A) To establish trench rescue methods and address operations that involve the location, disentanglement, and removal of victims from collapses involving trenches and excavations.
- B) This Standard Operating Procedure shall apply to all members of the District 14 Technical Rescue Group.
- C) Application

II) REFERENCE DOCUMENTS

- A) SOG 3100-18-008 PPE

III) DEFINITIONS

- A) **Angle of Repose**: The greatest angle above the horizontal plane at which loose material, such as soil, will lie without sliding.
- B) **Excavation**: For the purpose of emergency response, an excavation shall be defined by any depression, hole, trench or earth wall, man-made or natural, of four feet or greater.
- C) **Lip**: Grade level earth immediately surrounding the edge of the excavation.
- D) **Sides, Walls, or Faces**: The vertical or inclined earth surfaces formed as a result of excavation work.
- E) **Spoil Pile**: Mass of excavated dirt that is piled near and rises above the trench opening.
- F) **Trench**: Trench is defined as deeper than it is wide, not wider than 15 feet.

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G) **Types of Cave-Ins:**

- 1) Slough In: A portion of the sidewall slides into the trench usually in a "V" shape, tapering in width and thickness as it nears the bottom of the trench.
- 2) Shear Off: A portion of the side wall shears off and falls as a brick wall would fall, possibly covering the entire width of the trench.
- 3) Spoil Pile Slide: The dirt piled above the trench slides back into the trench.

H) **Types of Soil:** The following are the types and classes of soil that may be encountered. The average weight of soil is 100 pounds per cubic foot.

- 1) Type A: Cohesive type soils with an unconfined compressive strength of 1.5 tons per square foot or greater. Any soil with clay content is Type A. If the soil is fissured, subject to vibration, or previously disturbed, it does not fall in this category.
- 2) Type B: Cohesive materials with an unconfined compressive strength of between 0.5 and 1.5 tons per square foot. Gravel, silt, and loam are examples of Type B soil.
- 3) Type C: Cohesive materials with unconfined compression strength of less than 0.5 tons per square foot. This category includes granular soils, sand and submerged soils.
- 4) In a rescue situation, all soil types are considered to be type C and shoring should be constructed accordingly

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- I) **Team Liaison**: The Team Liaison will act as a liaison between the District 14 and Command.
- J) **Rescue Operations (Ops)**: Responsible for formulating rescue/recovery and back-up plan and communicating plans to all involved. Position can be passed once. Rescue Leader Communicates directly with liaison.
- K) **Staging Manager**: Will be responsible for accountability and sending personnel to assigned positions per Rescue Leader.
- L) **TRT Safety Officer(s)**: Responsible for all aspects of the operations that deal with safety and health of all rescue team personnel.
- M) **Shoring Team Manager**: Responsible for building or fabricating shoring, and setting them in place, working with the rescuers.
- N) **Panel Team Manager**: Responsible for directing team members in the correct placement on panels.
- O) **Extrication Team Manager**: Responsible for selecting and operation of the appropriate extrication system. (Horizontal, Vertical etc.)
- P) **Air Supply Team Manager**: Responsible for the operation of air cart, low/high pressure air bags and pneumatic shoring.
- Q) **Ventilation Team Manager**: Responsible for the selection and operation of ventilation systems. Will work in conjunction with atmospheric monitoring.
- R) **Atmospheric Air Monitoring Team Manager**: Responsible for the operations of atmospheric monitoring equipment. This position should be assigned to the most qualified person.
- S) **Cutting Station Team Manager**: Responsible for the set-up and operation of a cutting station to fabricate shoring or other components used in trench system.

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- T) **Rescuer(s)**: The Rescuer will be assigned the role of either victim rescue or recovery. They will be the member(s) that actually affect the rescue. For every Rescuer there will be one backup rescuer. The Rescuer answers directly to the Rescue Leader/Operations.
- U) **Protective Equipment**: Structural firefighting gear is not acceptable for trench operations. Duty and or Tech team approved uniform appropriate for the weather is best. As Referenced in SOG # 3100-18-008 PPE
- 1) The following items should be worn:
 - (a) Helmet
 - (b) Proper Footwear
 - 2) The following items should be worn as needed:
 - (a) Gloves (non firefighting type)
 - (b) Eye Protection
 - (c) Hearing Protection
 - (d) Harness Class II or Class III
- V) **Size-Up Considerations**: Different collapse scenarios will require different types of shoring techniques. Each scenario should be evaluated using the same evaluation mechanism and adaptations made for the current operation as required by the configuration of the trench or excavation.

IV) SPECIALIZED ROLES AND RESPONSIBILITIES

- A) All members are responsible for enforcing this SOG.

V) SAFETY

- A)

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VI) ENFORCEMENT

- A) Failure to understand this Standard Operating Guideline may result in disciplinary action.
- B) Any deviation from this Standard Operating Guideline may require a written report to the Chief overseeing the team and or the District 14 Chair.
- C) This policy is for internal use only and does not enlarge an employee’s civil liability in any way. The policy should not be construed as creating a higher duty of care, in an evidentiary sense, with respect to third party civil claims against employees. A violation of this policy, if proven, can only form the basis of a complaint by this department for non-judicial administrative action in accordance with the laws governing employee discipline.

VII) STANDARD OPERATING GUIDELINE

- A) No member should enter an unprotected trench to render patient care or perform disentanglement operations. Emergency personnel should protect all trenches using approved methods prior to entry. Do not allow any civilians, bystanders, or responders into an unprotected trench.
- B) Phase I: Size-Up
 - 1) First Arrival - The first arriving team member will assume role of Rescue Leader and will immediately report to Command for acknowledgement. This position can be passed once, only after the person assuming the position has been fully informed of the situations.
 - 2) Spotting Apparatus - Rescue Leader will spot all incoming apparatus at least 50 feet from the location of the trench failure. Advise Command to dictate Level 1 staging at least 150 feet from the scene.

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- 3) Initial Size-Up of the Scene - Survey a 100 foot radius around the hot zone. This should include:
 - (a) Conducting a primary assessment of the scene to determine what has happened and immediate needs.
 - (b) Assessing all potential hazards to all rescuers. All sources of vibration (construction equipment, traffic, bystanders, etc.) within 300 feet should be eliminated.
 - (c) Identifying the number of victims, their location, and the nature of their injuries. A critical decision to be made early on involves whether the incident is rescue or recovery.
 - (d) Locating a responsible party, co-workers, or bystanders in order to obtain information. Information should include length of time since the collapse.
 - (e) Establishing scene safety, including all bystanders in and around the emergency incident.
 - (f) Finding the dimensions of the trench: length, width, and depth. Any trench over 5 feet deep must be shored before personnel are allowed to enter.
 - (g) Ensuring all utilities are controlled, including water, gas, sewer, and electrical in the trench and the surrounding scene. All trench rescues must also follow the guidelines for a confined space rescue in regards to monitoring and ventilation.

- 4) Secondary Size-Up of the Scene - Once the initial size up is completed, the secondary assessment should begin. This secondary size-up should be conducted at least 50 feet away from the collapse scene. This area should be

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taped or fenced off, leaving only one way to enter and exit the collapse scene.

The following considerations for the secondary size-up should be met:

- (a) When approaching the trench to make the secondary size-up, always approach it from the ends.
- (b) Establish mode of operation based on time and degree buried, (Totally buried, buried to the neck, buried to the waist, or trapped by utilities), risk-benefit analysis, and rescue-probable or recovery. The mode should be announced to all personnel.
- (c) Establish visible command and control access to the collapse area.
- (d) Locate any shoring material, such as lumber, cross ties, shoring, etc that can be used on scene.
- (e) Assist victims out of trench who are not trapped by the collapse, but DO NOT ENTER the trench at any time until shoring has been put in place.

5) Patient Care

- (a) Make contact with the victim(s) and remain in contact with them throughout the operation. The following aid should immediately be rendered to the victim(s) if safe to do so:
 - (1) Determine their level of consciousness.
 - (2) Provide the patient with oxygen via non-rebreather mask lowered down to the patient.
 - (3) If the patient is buried above their chest, which inhibits their breathing, use a long pike pole or 2x4 to remove dirt from the chest area of the patient.

6) Update Responding Members

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- (a) Confirm number of entrapped victims.
- (b) Inform responding units of victim(s) medical status.
- (c) Establish an area for supplies and equipment.

C) Phase II: Pre-entry Operations

- 1) Incident Command Resource Assignments - The Rescue Ops should be responsible for ensuring the following tasks are completed.
 - (a) Formulating an Incident Action Plan (IAP) and communicating it to all involved in the rescue operation.
 - (1) Assign Safety Officer or Group
 - (2) Assign Staging Manager
 - (3) Assign Rescue Group and Key Positions
 - (4) Identify shoring needs and equipment necessary to protect the trench.
 - (5) Develop a victim survivability profile and determine access options.
 - (6) Conduct air monitoring operations.
 - (7) Stabilize the surrounding area using ground pads and other necessary equipment.
 - (8) Insert shoring and apply pneumatics according to industry standards and rescue best practices.
- 2) The Rescue Group is responsible for air monitoring in the area of the trench. However, on large or complex incidents this may require the establishment of a separate Air Monitoring Group. Air monitoring should be performed for the following conditions:

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- (a) Oxygen-deficiency: less than 19.5% oxygen
 - (b) Oxygen-enrichment: greater than 23.5% oxygen
 - (c) Combustible Gases and Vapors (LEL) any atmosphere containing over 10% of lower explosive limit presents an explosion or fire hazard
 - (d) Toxicity: Carbon Monoxide over 35 ppm or Hydrogen Sulfide over 10 ppm
All Rescue Group members will be fully briefed on their assignments after Rescue Ops has consulted with the IC, an IAP has been formulated, and prior to the commencement of rescue operations. A backup plan should also be in place.
- 3) Site Safety - In order to ensure scene safety, the following precautions should be taken:
- (a) Create hot and cold zones.
 - (1) Hot zone extends 0-50 feet (Essential emergency personnel only.)
 - (2) Warm zone extends 50-300 feet (support and command functions)
 - (3) Cold zone extends >300 feet (The perimeter of the cold zone is the crowd/traffic control line.)
 - (a) Shut down roadway if necessary
 - (b) Re-route all non-essential traffic at least 300 feet around the scene.
 - (b) Rescue technicians should accompany all EMS personnel during patient access and removal.
- 4) Rescue Area Safety - Initial site safety is needed in order to control the safety in and around the trench collapse zone.

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- (a) Ground pads should be placed around the trench or collapse site lip. Approach the ends of trench when possible. Provide level area for ground pads and place within 6 inches of the trench lip.
- (b) Assess spoil pile and clearance to trench. Minimum of 2"x12" lumber placed between spoil pile and trench on level ground. 2 feet between trench and spoil pile is optimal.
- (c) Assess angle of repose and need for adjustment.
- (d) Place minimum of 2 ground ladders for emergency exit. Ladders must remain within 25 feet of personnel for emergency access.
- (e) Ventilate the trench until air quality returns to acceptable range in all categories. If the situation dictates entering the trench for any reason prior to acceptable air quality, SCBAs or supplied air with escape bottles must be worn at all times. Negative pressure ventilation may also be used as determined by personnel and intrinsically safe fans should be used whenever possible.
- (f) Assure that all utilities are shut off. Any product that is flowing, including water, must be secured and the use of drain pumps must be considered.
- (g) If conditions permit, provide victim with a helmet, goggles, and oxygen.
- (h) Do not touch any heavy equipment until it is determined that it is not in contact with electrical utilities

D) Phase III: Collapse Zone Operations

- 1) Collapse zone operations should be organized to include the following items:

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- (a) Limit personnel at the trench lip and collapse zone. The Shoring Team will be responsible for the placement of all shoring in accordance with the established plan. All shoring will be based upon the double funnel principle.
- (b) The maximum amount of surface contact must be maintained at all times. Backfill, airbags, and wood may be used behind panels in order to effectively transfer load.
- (c) Two hundred (200) psi will be used at all times when pressurizing air shores. The only exception is when pressurizing corners, then 50 psi will be used until all corners are secured and then re-pressurized to 200 psi in the same order they were established.
- (d) Air shores should be used in available situations, unless dictated by distance, and then replaced with timber shoring.
- (e) The first set of panels should be placed as close as possible to the patients head area for early EMS access.
- (f) Ventilate the trench until air quality returns to acceptable range in all categories. If the situation dictates entering the trench for any reason prior to acceptable air quality, SCBAs or supplied air with escape bottles must be worn at all times. Negative pressure ventilation may also be used as determined by personnel and intrinsically safe fans should be used whenever possible.
- (g) Shoring must start within 24 inches below the edge of the trench.
- (h) Placement of air shores is determined by the safest area.. Placement of timber shores is top, middle, bottom. Timber shores should be pressurized using wedges and secured on all four sides.

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- (i) Walers may be used to span horizontally and span voids and intersections. Allow a maximum of 8 feet between shores. Walers are placed in the order according to the shores and secured in a minimum of 2 spots.
 - (j) Ensure ventilation continues as needed and monitor air quality throughout incident. Ensure de-watering systems are operational.
- 2) Patient Access and Removal - The following describes the procedure for patient access and removal:
- (a) Once a safe zone is established, patient access may be made.
 - (1) Remove all debris and dirt from around patient's head first in order to access the patient's airway.
 - (2) Uncover the patient from the head down.
 - (3) Once the head and neck are clear of debris, place a cervical collar on the victim to stabilize any possible C-spine injuries.
 - (4) After the victim's extremities are uncovered, establish an IV.
 - (b) Hand tools should be used at all times when accessing the patient. Never use large machinery to gain access to the patient who is trapped or entangled.
 - (c) During hand digging operations, if more than 2 feet of trench wall is exposed, there is a danger of a slough-in and shoring should be placed prior to continuing digging operations.
 - (d) Personnel involved in digging and extrication should rotate approximately every 30 minutes or as Rescue ops deems necessary.
 - (e) Victim Consideration is as follows:

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- (1) Make access to the victim as soon as possible once safe zone is established.
- (2) Provide victim with goggles if possible.
- (3) Treat for crush syndrome as indicated by protocols.
- (4) Establish vital signs on the victim as soon as possible.
- (5) Extricate victim(s) by using the LSP Halfback, SKED, stokes basket, etc.
- (6) Once you are proximate to a victim, dig by hand.
- (7) Ensure technical rescue personnel and patient care personnel are in coordination at all times for patient extrication.
- (8) When removing victim from trench, take care not to dislodge any of the shoring materials.

E) Phase IV: Termination of the Trench Rescue

- 1) The termination of the incident should proceed in the following order:
- 2) Personnel accountability should be ensured prior to beginning termination of the incident and all command and safety positions should remain in effect during demobilization.
- 3) Shoring built solely from lumber should be left in trench, or removed with heavy equipment.
- 4) Perform removal operations in reverse order. First in / last out. Timber shoring should be removed from the bottom up per OSHA.
- 5) Beware of secondary collapse. If risk is too great, equipment should be left in place. Power equipment may be used to tear down all shoring if danger is too great to remove by hand.

