

TRENCH RESCUE

Trench Rescue Operations present a significant danger to Fire Department personnel and may involve complex requirements for shoring, hand tools, earth-moving equipment and other specialized resources. The safe and effective management of these operations requires special considerations. **Therefore, it shall be the policy of the Clay County Fire Department's to NOT allow the entry of any personnel into an unsafe trench or excavation.** This procedure identifies some of the critical issues which must be included in managing these incidents.

For the purpose of emergency response, an excavation shall be defined by any depression, whole, trench or earth wall, man-made or natural, of four feet or greater.

Cave-ins and collapses generally occur because of unstable soil conditions combined with improper or inadequate shoring. The potential for additional collapse must always be considered as a primary hazard and personnel must be aware that any action may disrupt the temporary stability and cause an additional collapse. The temporary stability, at any point in an operation, may be disturbed by removing soil or debris, by adding weight near the edge of an open cut, by vibration (such as vehicle movement), rain, or simply by the passage of time.

Responsibilities of Command at an Excavation Emergency

Due to the dangerous nature of this type of incident, it is imperative that the first arriving Fire Department unit assume Command at all trench/excavation emergency incidents. In addition to the current procedure for Command responsibilities, the individual assuming Command at an excavation incident must consider several tactical needs related to this type of emergency and provide a Command structure to address these needs. Some specific Sectors which must be established are Safety, Lobby, Resource, Extrication, Staging and Rehab.

Strategic Considerations for Command

Secondary Collapse - The soil making up the walls of the excavation has already proven itself unstable. Do not make assumptions concerning the relative stability of the remaining earthen walls, it should be noted here that when the Fire Department arrives and takes Command of an incident, we have a moral and legal responsibility to the other personnel (civilian, police, and fire) to provide a safe working environment during the emergency. Therefore, it shall also be the policy of the Clay County Fire Departments to cause the removal of all personnel from the excavation scene until a safe working environment can be assured.

Personnel and Equipment Placement - Earthen walls collapse because of many physical stresses; do not add more pressure or stress to excavations by placing apparatus, equipment, or personnel on top of, or in close proximity to, the excavations. The guidelines listed below should be followed in order to reduce this potential.

1. All non-essential personnel are to be kept a minimum of 50 feet from the edge of the collapsed area. A Hazard Zone should be established, using hazard tape to define this area.
2. Vehicles will not be allowed to approach within 150 feet of the collapsed area during rescue operations. If the apparatus is not needed for extrication, the Engine is to be shut down to minimize vibration.
3. All traffic will be stopped or re-routed for at least 300 feet around the excavation to minimize vibrations.
4. A staging area shall be established a minimum of 150 feet away from the collapsed area for vehicles that are not directly involved in the extrication.

If the **secondary collapse** should occur, personnel that was originally on top of the spoil piles or at the lip of the trench may become trapped. Keep all personnel back and reduce exposure by limiting the number of operating personnel to only those necessary to perform the work safely.

Contaminated Atmospheres - Since a trench may be considered a confined space, Command should also be aware of the possibility of contaminated or

oxygen deficient atmospheres in below grade operations. Therefore, the procedures concerning the use of Self Contained Breathing Apparatus shall be followed. Specific concerns include on-going air monitoring, ventilation, and use of SCBA by rescuers when indicated.

Victim Survival Profile - Since personnel safety is a high priority, an early determination must be made by Command as to the survivability profile of the victim(s), and risk/benefit analysis must be made prior to allowing rescuers to enter an excavation.

A cubic yard of soil weights 1,000 pounds or more, and quite often several cubic yards have collapsed into the trench. The weight of the soil may cause traumatic crushing injuries to any trapped victim(s). Where the collapsed soil has not caused immediate fatal crushing injuries, the weight of the soil may impair breathing, which may cause the victim(s) to suffocate prior to rescue. There are two potential scenarios that rescuers will be faced with upon arrival:

The evidence indicates that the potential for a viable, savable victim is extremely low. The operation now becomes a body recovery, which does not require any quick actions.

Or

There is a very high probability that there is a viable patient and that he/she can be safely extricated. Quick action is indicated, but all safety procedures **must** be followed in order to protect the rescuers and provide the highest probability of success.

The decision regarding the survivability profile shall be made by Command and shall include input from personnel from the EMS personnel, Safety, Special Operations, and other specialists involved in the operation, if they are present on the scene.

***We will risk our lives a lot if necessary to protect savable lives.
We will not risk our lives at all to protect lives or property that are already lost.***

Technical Resources – Additional resource are available through emergency management these include:

Heavy equipment
Mn HSEM

Utilities - Look for hazards which may be caused by several natural gas lines, electrical lines, sewer lines, or water mains. An exposed intact water main still presents a hazard since the main has tremendous forces being applied to it by the moving water and it was dependent upon the earth to provide stability. With the removal of this stabilizing force, there is potential for the main “blowing out”. The appropriate utility companies should be requested to respond in order to control any potential hazards indicated.

Police - In order to accomplish functions such as crowd control, re-routing traffic, etc., Command shall request police assistance as early as possible in the operation. Since several areas of concern will have to be addressed, Command will want to have a police supervisor as liaison in the Command post to facilitate street closures and scene control.

Protective Clothing - Trench operations do not require that the rescuer wear full firefighting protective clothing. Some specific items that are required include:

Helmet with eye protection
Footwear that provides stability and toe protection
Gloves

Additional Concerns - There are additional concerns that are listed under Safety Sector that Command is responsible for ensuring are carried out, either by the Safety Officer or by assignment to available personnel.

Sectors

Safety Sector - A Safety Sector Officer shall be assigned as early as possible in the incident. The responsibilities of Safety Sector shall be to support Command and ensure that the appropriate procedures are being followed. Some specific concerns or responsibilities include:

1. Personnel access is being controlled via an established Lobby

Sector

2. Vehicles are being kept a safe distance away from the collapsed area
3. Traffic is being stopped or re-routed
4. Police are enroute for crowd and traffic control
5. All construction equipment is shut down to minimize vibrations
6. Look for additional hazards (natural gas, electrical, sewer lines, cracks in sides of trench or spoil piles, etc.)
7. Consult with Command about the complex technical nature of the incident
8. Liaison with outside agencies.
9. Monitor the condition of personnel for signs of exhaustion and the effects of contaminated atmospheres
10. Observe operations for compliance of existing safety procedures and precautions by all personnel
11. Assure the proper use of protective clothing and equipment by all personnel in operating areas
12. Observe the general rescue scene for unsafe or hazardous conditions and interact with Command to ensure that adequate precautions are taken
13. Ensure that the atmosphere being worked in is not contaminated and/or oxygen deficient

Personnel assigned to the Safety Sector recognizing a safety problem must take action to cause its correction immediately, using the Command structure to affect appropriate response. When the urgency of the situation demands it, the Safety Sector personnel have full authority to cause immediate action by direct order to any personnel, or by the use of "Emergency Traffic" on the appropriate tactical channel(s). Operating personnel receiving safety instructions from Safety Sector personnel shall immediately take the appropriate action.

Extrication Sector Officer - The Extrication Sector Officer is responsible for the placement of shoring materials and digging operations which will allow for the safe removal of the victim(s) from the trench. The Extrication Sector Officer must maintain the highest possible level of personnel safety throughout the operation and take whatever appropriate action that may be necessary to

ensure this. When temporary shoring, mechanical equipment and expert operations or advisors are needed; it may be necessary to suspend operations until they are available.

Any operation conducted without shoring present poses an extreme risk to personnel. Every effort shall be made to protect personnel working in the Extrication Sector with appropriate shoring. If it is necessary to work without shoring, operations shall be conducted with extreme caution, under direct supervision of the Extrication Sector Officer, and only after obtaining a survival profile of the victim(s) and the necessary equipment to reduce the risk profile of our personnel.

The Extrication Section Officer must maintain a constant awareness of the position and function of all personnel directly involved in the extrication effort. The number of personnel in the extrication area must be limited to those that can operate safely and effectively in a confined area. Additional personnel will increase the possibility of subsequent collapse and interfere with the efficiency of the operation.

The operation must be directly supervised by the Extrication Sector Officer in order to ensure that rescuers are working in a coordinated and safe manner.

Due to the exhausting nature of excavation rescue work, the Extrication Sector Officer must be prepared to rotate personnel at the first sign of fatigue. A sufficient reserve of personnel shall be maintained at the Resource Sector.

Resource Sector - will provide a pool of personnel and equipment that Extrication may require. Due to the specialized nature of the rescue being undertaken, specific equipment and personnel with specialized knowledge may be required.

Rehab Sector - A Rehab Sector may have to be established if the extrication indicates that it is going to be a prolonged operation.

Staging sector- All vehicles not immediately involved in the rescue operation will be staged a minimum of 150 feet from the excavation in order to minimize vibrations which may cause a secondary collapse. A Command Officer should be assigned to Staging in order to ensure that the proper equipment is available.

