TRENCH AND EXCAVATION COLLAPSE

A. GENERAL

This guideline provides operational guidance at rescue incidents that involve the location, disentanglement and removal of victims from sub-surface trench and excavation locations where they are trapped by material or equipment, by collapse, or have a medical emergency in an unprotected trench. This guideline is used in conjunction with NFPA 1670, NFPA 1006 and WAC 296.305.

The Incident Commander shall assign the Rescue Group Supervisor. The Rescue Group Supervisor will make position assignments in accordance with the Thurston County Technical Rescue Guidelines and Mobilization Plan as required by the needs of the incident.

Definitions:

**Trench**: A narrow excavation in relation to its length made below the surface of the ground. In general, the depth is greater than the width, but the width is not greater than 15 feet.

**Excavation**: A man-made cut, cavity, trench or depression in an earth surface, formed by earth removal and usually is wider than it is deep.

**Unprotected Trench**: Any trench greater than 4’ in depth without proper protection.

Shoring operations are limited to trenches 20 feet or less in depth without additional specialized resources.

**Rescue Group Supervisor**: Coordinates rescue operations and the functions associated with all activity in the “rescue area”. The Rescue Group Supervisor will serve as the on-site “competent person” and will report to the Incident Commander.

**Technical Rescue Safety Officer**: Responsible for monitoring safety at the confined space site and will coordinate actions with the Rescue Group Supervisor. The Technical Rescue Safety Officer has the authority to stop any and all rescue site actions deemed unsafe and immediately report them to the Rescue Group Supervisor. The Technical Rescue Safety Officer reports to the Rescue Group Supervisor.
Entry Team Leader: Directs disentanglement and removal operations. Controls access into the trench. The Entry Team Leader is responsible to insure that a CS Permit is filled out. The Entry Team Leader reports to the Rescue Group Supervisor.

Shore Team Leader: Directs the installation of shoring and sheeting systems. The following systems may include wood, pneumatic, hydraulic or mechanical as required by the incident. This function may be assisted by operations level personnel. The Shore Team Leader reports to the Rescue Group Supervisor.

Panel Team: Responsible for directing the installation of panels and all edge protection and preparation prior to the installation of the panels. The Panel Team members report to the Shore Team Officer.

Extrication: Responsible for any rescue extrication that needs to be done to extricate the patient. Extrication reports to the Entry Team Leader.

Hazard Control: Responsible for ventilation, atmospheric monitoring (as assigned), de-watering operation supervision. This assignment may be supported by operations personnel. Hazard Control reports to the Rescue Group Supervisor.

The Thurston County Passport System will be used by all onsite personnel.

All entries into a trench will follow confined space entry procedures.

Anyone entering a trench will wear a class III harness and appropriate personal protective equipment.

B. OPERATIONAL GUIDELINES

First Arriving Units

1. Establish Command keeping emergency vehicles 100’ from collapse area.

2. Size Up

First arriving units will attempt to gather the following incident information:

- General description of the incident.
- Number and location of victims.
- Determine if it is a rescue or a recovery.
- Remove non-essential personnel.
- Identify the type of trench (straight, L, intersecting)
- Width, length and depth of the trench or excavation.
- Incident scene hazards including; disrupted or exposed utilities, flowing water, mechanical or equipment, hazardous materials or explosives, secondary collapse.
- Locate all utilities.
- Contact competent on site representatives.
3. Request SORT response as appropriate.

4. Request Law Enforcement assistance for incident scene control.

**Site Safety**

1. No personnel shall be allowed to enter an unprotected trench to render patient care or perform disentanglement operations. All trenches shall be “safe and protected” using approved methods prior to entry.

2. Restrict entry and establish visible access control points. Stop and detour traffic within 300 feet of the collapse zone. Establish a hazard zone at least 75 feet around the perimeter of the collapse zone with fire line tape.

3. Shut down all heavy equipment operations. Prior to touching or moving equipment or machinery check to be sure there is no contact with electrical wires.

**C. Rescue Area Operations**

**Operations Level Personnel**

1. Operations level personnel are authorized to carry out the following basic activities in establishing and supporting rescue area operations.

2. Personnel shall approach the trench from the end.

3. Place ladders at each end of the trench for emergency egress.

4. Ground pad the trench or collapse site lip with plywood or other appropriate material.

5. Ventilate the trench.


7. Provide a helmet, goggles and oxygen (if needed) for the victim.

8. If the victim is conscious and trapped pass them a shovel so that they can attempt to self-rescue.

9. Sheetling and shoring, entry and disentanglement operations may be carried out under the direction and supervision of SORT personnel.

10. Initiate atmospheric monitoring.

11. Move spoil pile as needed to provide a clear area for ground pads.

12. Conduct debris removal from above to expose victim if possible.

**STOP: Await the arrival of SORT personnel and equipment before proceeding.**
Technician Level Personnel

Pre-Entry
All Confined Space Pre-Entry procedures apply to trench rescue. Prior to rescuers entering the trench, atmospheric monitoring will be performed and ventilation started.

1. The Rescue Group Supervisor will report to and work with the Incident Commander.

2. All personnel entering the trench will wear a Class III harness. Tag lines will not be worn as they can become a hazard if caught on a strut or shoring.

3. Conduct size-up if not already completed.

4. Evaluate the collapse incident site to determine appropriate sheeting and shoring requirements. Arrange for adequate materials to be on site

Spoil Pile Slide
The result of the excavated earth placed too close to the lip of the trench. The pile must be 2’ from the lip of the trench.

Slough Failure
The loss of part of the trench wall that can be the result of several conditions.
Shear Wall Collapse
Indicated by a section of soil losing its ability to stand and collapsing into the trench along a mostly vertical plane.

Toe Failure
A slough that occurs at the bottom of the trench where the floor meets the wall. As the soil falls into the trench it creates an opening at the bottom that is characteristic of a cantilever.
Water Accumulation
May cause a bell pier condition.

![Bell Pier Condition](image1)

Rotational Failure
A scoop shaped collapse that starts back from the trench lip and transmits itself to the trench wall in a half moon shape.

![Rotational Failure](image2)

Wedge Failure
This type of failure normally occurs with intersecting trenches. It is characterized by an angle section of earth falling from the corner of two intersecting trenches.

![Wedge Failure](image3)
5. Only vactor trucks or hand methods of material removal should be used within proximity of the victim.


7. Evaluate the collapse site for the following special hazards:

   **Running sand or material**
   It may be necessary to encase the victim(s) in inter-locking drums used as an isolation tunnel. These drums should be used in the vertical position only. Horizontal placement may result in failure under the weight of the material. Other items which may be used for isolation tunnels in either the vertical or horizontal configuration are concrete, steel or corrugated pipe.

   **Pier Holes or Caissons**
   These bell shaped excavations are used mainly as “footers” to pour support columns for concrete buildings. They present an extreme danger due to the difficulty in sheeting and shoring their bell shaped bottoms.

   **Trench and Tunnel Operations**
   In some incidents it may be necessary to dig a trench or excavation to create a parallel shaft. Any trench cut for a rescue operation should be properly protected by either benching or sloping methods.

   A safe area will be established prior to personnel entering a trench. Trenches that are 4’ or greater in depth will have a shore placed 1.5’ – 2’ from the top and bottom with no more than 4’ between the struts

   Whenever possible 4x8 panels with 2x12 strong backs will be used to create safe areas. When trench walls do not allow for traditional sheeting and shoring operations then Spot shoring techniques should be used. All void areas behind panels and shores will be filled.

8. Request outside expertise, equipment and resources through the Incident Commander as required by the nature and extent of the incident. Including:
   - Utility Company Representatives
   - Public Works equipment and personnel
   - Engineers

9. Plan operational activities at least two steps ahead of the operation. Have a secondary plan ready in the event that the initial tactical plan proves un-workable.

10. Provide for the regular rotation of personnel. Personnel involved in disentanglement and digging operations should be rotated as needed.
D. **Patient Considerations**

1. When the “safe zone” is established Paramedic or EMS personnel can assess the condition of the victim and provide treatment.

2. Patient should be treated for Crush Syndrome by Paramedics in accordance with Thurston County ALS Protocols.

3. Consider and threat for hypothermia.

4. Request helicopter transport to a trauma center if required.

E. **Termination**

1. Rehab all personnel prior to termination and removal operations.

2. Debrief all personnel on the operation and its outcome.

3. Systems will normally be left in place pending Labor and Industries review.

4. If systems are removed, conduct removal operations in reverse order of placement.

5. Consider the potential for secondary collapse zones during equipment removal operations. When in doubt, leave equipment in place. No equipment is worth an injury.

6. Parallel shaft construction, tunnels or isolation tunnels should be left in place. Removing them may cause a collapse.

7. Stage, clean and inventory all equipment. Report lost or damaged equipment.

8. Identify who is responsible for backfill and when.


10. Schedule post incident analysis.
TRENCH RESCUE GROUP LEADER
OPERATIONAL CHECKLIST

DATE _______________ TIME________________

_____ Assign Technical Rescue incident management positions

_____ Begin Confined Space Entry Permit

_____ Develop operations plan to include an incident action plan

_____ Ensure adequate resources are on scene or en route

_____ Brief all personnel on plan of action

_____ Establish communication with logistics area and between Entry Team Supervisor and Entry Team and others as required.

_____ Provide updates to Incident Commander

_____ Rotate personnel as needed

_____ Provide for positive pressure ventilation and atmospheric monitoring

_____ Provide for de-watering systems as necessary

_____ Assure utilities are controlled and identified

_____ Limit personnel at lip and collapse zone

_____ Provide EMS as needed

_____ Get 2 sets of panels in place ASAP in order to create a safe zone for Rescue personnel