DEPARTMENT OF FIRE SERVICES
Massachusetts Firefighting Academy

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Trench Rescue Technician Student Guide



Students will be able to:

- Define what a trench is
- Identify all applicable laws and standards associated with Trenches and Trench Rescue
- Identify hazards associated within a Trench Rescue Incident
- Learn about soil conditions and types of Trench Collapses
- Conduct size up procedures and identify needed resources
- Identify ICS structure in a technical rescue incident
- Develop and implement a Trench Rescue Shoring Plan for:
  - Straight Wall Trench
  - Intersecting Trench
  - Deep Trench
- Select, operate, and inspect trench rescue equipment
- Operate various systems used in the trench rescue environment
- Conduct patient care, packaging, and transfer of victims

Notes:

What is a Trench?

- A trench is defined as a narrow underground excavation that is deeper than it is wide; no wider than 15’
- An excavation is any removal of earth, all trenches are excavations, not all excavations are trenches



Regulations:

National Fire Protection Association (NFPA)

NFPA 1006: Standard for Technical Rescue Personnel

- **Awareness Level**
  - Recognize, non-entry, assist, call resources
- **Operations Level**
  - Size up and mitigate Straight Wall trenches <8’ deep
- **Technician Level**
  - Size up and mitigate Intersecting trenches and Deep trenches up to 20’ deep

NFPA 2500: Standard for Operations and Training for Technical Search and Rescue Incidents and Life Safety Rope and Equipment for Emergency Services

Encompasses:

- NFPA 1670 Training for departments and teams
- NFPA 1983 Equipment manufactures
- NFPA 1858 Selection, care, and maintenance of gear and PPE for Tech Rescue

Occupational Safety and Health Administration Specific Excavation Requirements

- Part 1926, Subpart P

Massachusetts General Laws:

- MGL Chapter 82A
- 520 CMR 14.00: Jackie’s Law

Trench Hazards:

- Collapse
- Fall and Trip hazards
- Utilities and Water
- Hazardous Atmosphere

Soil:



- Made of rock-based material, minerals, water, and air.
- Types of soil include:
  - Sand
  - Silt
  - Clay
- Most soil is a combination of the three

Types of Collapse:

- Spoil Pile Slide_____
- Lip Shear_____
- Slough Failure_____
- Rotational Failure_____
- Toe Failure_____
- Wall Sheer Failure_____

Principles of Trench Shoring:



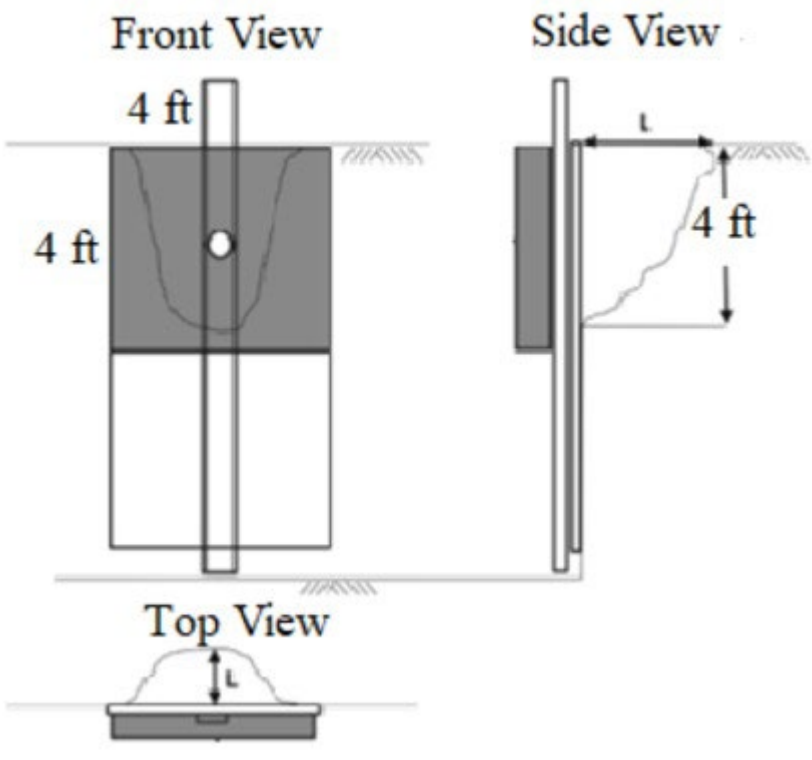
- Collect the Load
- Distribute the Load
- Transfer the Load
- Resist Loads

T-L Method

The T-L method was developed to assist the rescuer in determining load forces that would be encountered during a rescue. We have already responded to a trench failure, the T-L method is a hazard mitigation tool, a way to figure out how many forces we may encounter if a secondary collapse were to occur. It helps us understand what types of forces we are up against while conducting our shoring plan. If we know our expected forces, we can follow the manufactures' data in where our struts need to be placed. Through extensive testing of multiple pieces of trench shoring equipment, tabulated data has been recorded showing how much force (or Total L) each will withstand (different types of struts, panels, wales, etc.).

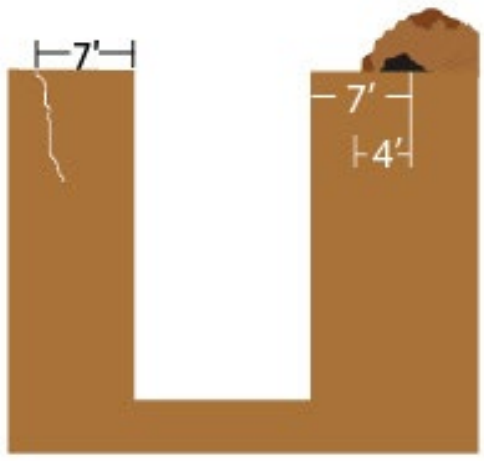
Each L=1100lbs of soil behind a 4'x4' section of panel.

Simple L:



- The distance (length) measured in feet from the original trench wall perpendicular to the furthest point of soil failure.
- If no trench collapse exists, we can use trench depth to figure out the SL

Surcharged L:



- Surcharged loads (spoil piles/equipment), that are within the area that is between the original trench faces and the furthest point of soil failure. Measured in feet perpendicular to the trench wall.

Total L equals the Simple L (SL) plus the Surcharge L (ScL) if one exists. Once we have the Total L, we can select the best equipment to shore the trench.

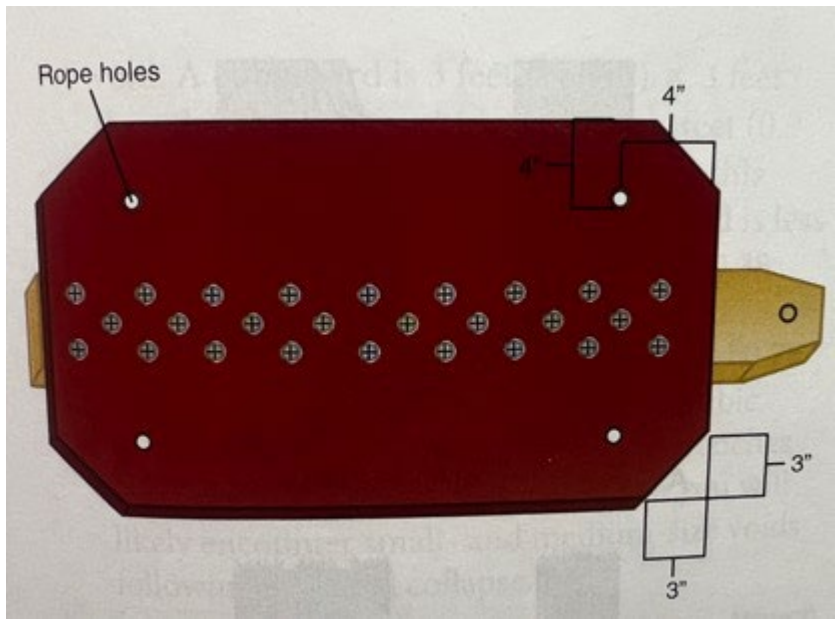
Trench Rescue Equipment:

Struts:



- Lumber
- Pneumatic
- Screw Jack

Panels:



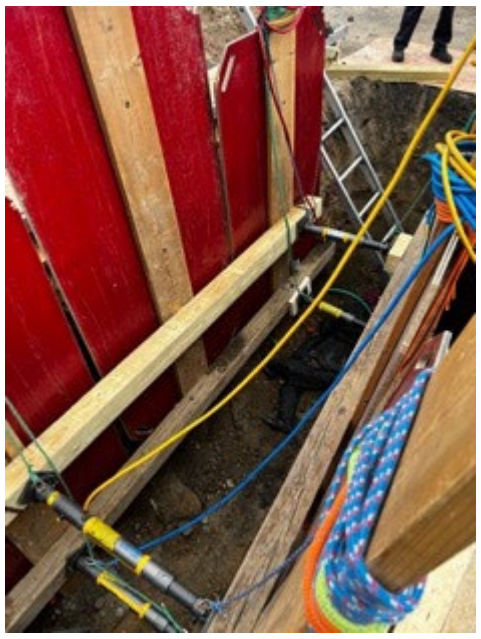
- Best practice is ¾-1” 4’x8’ FinnForm, Shorform, or Chudoform panel
- 2x12” Strongback glued and screwed to the panel
- Use of Half-Panels is advantageous
  - 2’x8’, 4’x4’, etc.

Lip Protection:



- Ground Pads
  - Used to transfer and distribute weight
  - Can be 2X12 boards or 4x8’ 1/2” sheets
- Lip Bridges
  - Used to greater transfer and distribute weight
  - Lumber, manufactured, ladder

Wales:

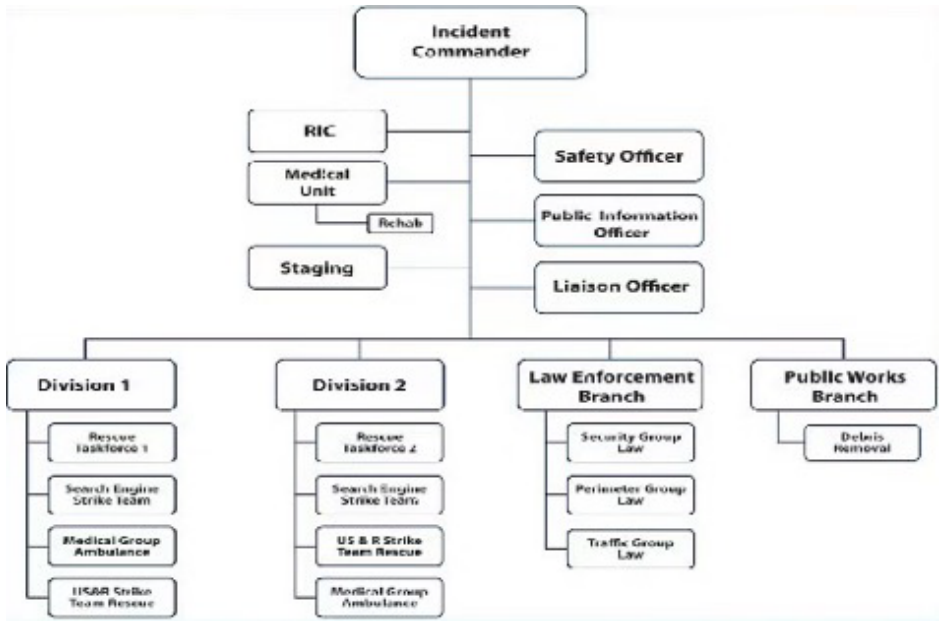


- Large beams to span large areas
- Can be Lumber, LVL, Manufactured
- Inside Wale
  - Placed inside after Panels are set
- Outside Wale
  - Placed directly on the trench wall

Backfill:

- Soil_____
- Lumber_____
- Airbags_____
- Backshores_____
- Buttress_____

Trench Shoring Plan; Size-Up:

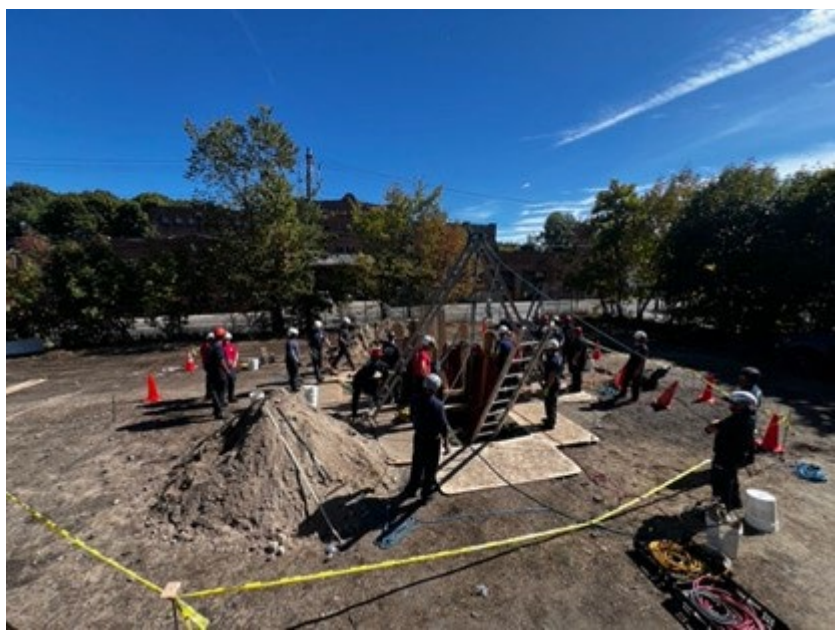


Set up ICS



Secure the Area:

- A 300’ radius around the trench must secured to limit vibration/possible secondary collapse
  - Road Traffic shut down
  - Heavy Equipment turned off
  - Rail lines?



Setup Operational Zones:

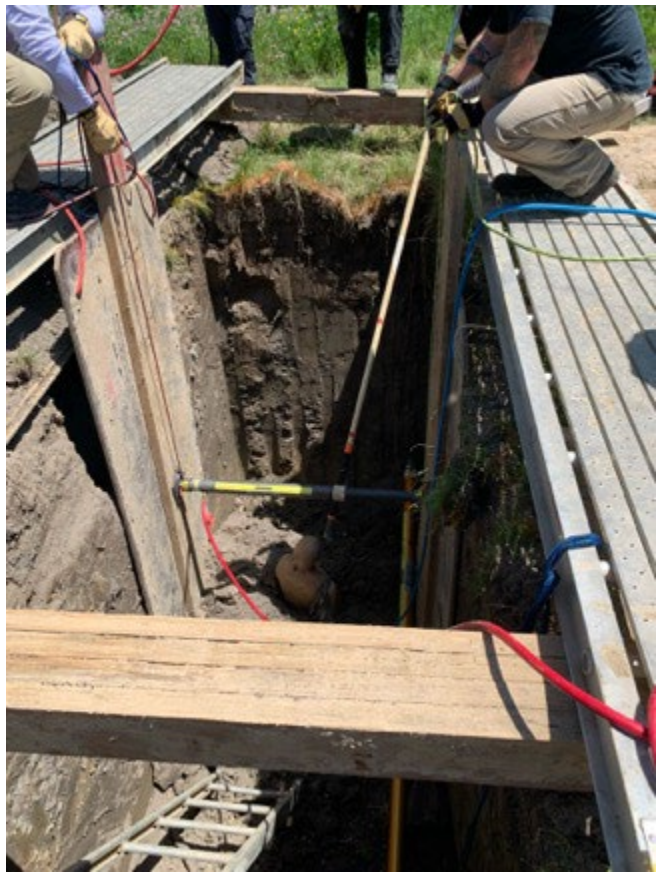
- Hot Zone of about 25’ area around the victim/trench
- Warm Zone includes:
  - Entry Point
  - Logistics
  - Rehab
  - Cut Station
- Cold Zone is for C.P. and staging



Hazard Control:

- Lip Protection
- Escape Ladder
- Utilities
- Atmospheric Monitoring
- Ventilation
- Dewatering

Trench Shoring Plan; Primary Shoring:



- First set of panels set over victim for maximum protection
- Positioning Strut shot to hold panels
- Top and Bottom struts placed

Secondary Shoring:



- Additional panels are placed to give rescuers a larger safe working area
- Minimum of 12’
  - 3 panel set

Complete Shoring:



- All struts are shot to manufacturer’s data
- Collars are locked
- Air Released
- Feet are secured to strongbacks
- Any backfill and supplemental sheeting is completed

Continual Assessment:



- Continuous assessment of trench conditions shall be set by AHJ/IC

Patient Care:



- When close to the victim, do not use metal tools to uncover dirt
- Look for crush injuries, asphyxiation, compartment syndrome
- Follow all Local EMS Protocols

Terminate an Incident:



- Breakdown the systems
- Decontaminate
- Document
- Debrief/CISM
- Return to a state of readiness