

# Chapter 9

## Trench Rescue Operations: Putting It All Together

# Objectives

- By the end of this chapter, you should be able to:
  - Conduct a size-up of a collapsed trench
  - Implement a trench emergency action plan
  - Implement support operations at trench emergencies
  - Support a nonintersecting straight wall trench of 2.4 meters or less as a member of a team
  - Remove a victim from a trench

# Objectives (cont'd.)

- By the end of this chapter, you should be able to (cont'd.):
  - Disassemble support systems at a trench emergency incident
  - Support an intersecting trench as a member of a team
  - Install supplemental sheeting and shoring for each 0.61 meters (2 feet) of depth dug below an existing approved shoring system
  - Construct load stabilization systems

# Objectives (cont'd.)

- By the end of this chapter, you should be able to (cont'd.):
  - Lift a load, given a trench tool kit
  - Release a victim from entrapment by components of a collapsed trench

# Introduction

- From 1992 to 2001, the Census of Fatal Occupational Injuries (CFOI) data identified 542 fatalities associated with trenching and excavation
  - Average of 54 fatalities per year
  - Industries most frequently reporting fatalities were those involved in excavation work, followed by water, sewer, pipeline, and communications and power-line construction

# Phase One: Assessment

- Size-up considerations
  - Target hazard assessment
  - Pre-incident planning
  - Dispatch information
  - The initial incident size-up
    - Who, what, where, when, why, and how the incident came to fruition, or why you are there



Figure 9-1 Introduce yourself to building and planning department members in your response area



# Phase One: Assessment (cont'd.)

TARGET HAZARD BULLETIN


LOCATION:		DATE:	
TIME OF INSPECTION(S)			
WEATHER CONDITIONS:		APPROX. TEMP.:	
OFFICER:		DISTRICT:	
DIMENSIONS:	DEPTH =	Yes	No
	TOP = W L	<input type="checkbox"/>	<input type="checkbox"/>
	BOTTOM = W L	<input type="checkbox"/>	<input type="checkbox"/>
SOIL TYPE:		TESTED:	
<input type="checkbox"/> Solid rock (most stable)	<input type="checkbox"/> Yes	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Average soil	<input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Fill material		<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Loose sand		<input type="checkbox"/>	<input type="checkbox"/>
PROTECTION METHODS:		PLACEMENT OF SPOILS & EQUIPMENT	
<i>(Walls MUST be vertical—NO voids)</i>		<input type="checkbox"/>	
SHORING		<input type="checkbox"/>	
<input type="checkbox"/> Timber		<input type="checkbox"/>	
<input type="checkbox"/> Pneumatic		<input type="checkbox"/>	
<input type="checkbox"/> Hydraulic		<input type="checkbox"/>	
<input type="checkbox"/> Screw Jacks		<input type="checkbox"/>	
<input type="checkbox"/> Trench Shield		<input type="checkbox"/>	
UNEVEN, IRREGULAR WALLS		LADDER LOCATION	
<input type="checkbox"/> Trench Box		<input type="checkbox"/>	
Sloping: q 1:1 (45°) q 1 1/2:1 (34°)		<input type="checkbox"/>	
Yes No	ENVIRONMENTAL CONDITIONS:	OTHER:	
<input type="checkbox"/>	<input type="checkbox"/> Gas detector used?	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/> Confined space permit issued?	<input type="checkbox"/>	
		COMMENTS	
NOTE		TO BE FILLED OUT BY COMPETENT PERSON	
All unsafe conditions must be corrected prior to trench entry. If any hazardous conditions are observed, the trench must be immediately evacuated and no one allowed re-entering until corrective action has been taken.		Excavation Entry Authorized By: _____ COMPETENT PERSON	

Figure 9-2 Sending out target hazard bulletins can give your members valuable pre-incident information related to target hazards

# Phase One: Assessment (cont'd.)

TRENCH RESCUE INCIDENT INFORMATION			SPECIFIC CHARACTERISTICS
<input type="checkbox"/> Responsible person:	Dispatch time:		<input type="checkbox"/> Trench Type:
<input type="checkbox"/> Contact Phone Number:	Date:		<input type="checkbox"/> Non-Intersecting:
<input type="checkbox"/> Incident address:			<input type="checkbox"/> Intersecting:
<input type="checkbox"/> Specific location on site:			<input type="checkbox"/> Collapse:
<input type="checkbox"/> Number of victims trapped:		Time of Collapse:	<input type="checkbox"/> Complete:
<input type="checkbox"/> Number of victims not trapped but injured and in trench:	Rescue: ____ Recovery: ____		<input type="checkbox"/> Partial:
<input type="checkbox"/> Are victims conscious, unconscious or obviously dead:	C: ____ U: ____ D: ____	Call #:	<input type="checkbox"/> Dimensions
<input type="checkbox"/> Is all equipment, hazards, and traffic shut down within 300'	E: ____ H: ____ T: ____	IC:	<input type="checkbox"/> Total length
<b>NOTES</b>			<input type="checkbox"/> Total depth
			<input type="checkbox"/> Total Approximate width
			<input type="checkbox"/> Approximate collapse area

Figure 9-3 Dispatchers and the information they provide are your eyes and ears until the first unit arrives on the scene



# Phase One: Assessment (cont'd.)

- Initial incident size-up and investigation include confirmation of information provided by the communications center



Figure 9-4 One of the first things that need to happen upon arrival of the first unit is the removal of coworkers attempting to extricate, before they become your additional patients

# Phase One: Assessment (cont'd.)

- Answer the following questions:
  - Who is in the trench that could not be removed by rapid non-entry self-rescue, and does the incident involve one or multiple patients?
  - Where was the patient's last seen point?
  - When did the collapse happen?
  - Why did this incident occur?
  - How do you begin?

# Phase One: Assessment (cont'd.)

- First arrival unit's objectives:
  - Determining general type of trench
  - Determining approximate dimensions of trench
  - Recognizing the hazards associated with the incident
  - Mitigating of incident hazards
  - Isolating the trench area up to 300 feet in every direction if possible
  - Atmospheric monitoring

# Phase One: Assessment (cont'd.)

- Technical rescue size-up
  - Conditions
  - Actions
  - Needs
  - Designations and assignments
  - Operational considerations



Figure 9-5 What factor does weather play in your operations at a trench emergency?

# Phase One: Assessment (cont'd.)

TRENCH RESCUE TACTICAL WORKSHEET

Location of incident: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Incident Commander: \_\_\_\_\_ Unit: \_\_\_\_\_ Call #: \_\_\_\_\_

SITE ASSESSMENT/INCIDENT INFORMATION	Fill in Blanks
<input type="checkbox"/> Knowledgeable contact person (NAME and Phone #):	
<input type="checkbox"/> Cut sheet:	
<input type="checkbox"/> Tabulated data:	
<input type="checkbox"/> Other documentation:	
<input type="checkbox"/> # and condition of victims: Total burial, Partial burial, Not trapped	T: ___ P: ___ NT: ___
<input type="checkbox"/> Determine mode of operation: Rescue mode OR Recovery mode	Rescue: ___ Recovery: ___
<input type="checkbox"/> Size and area of collapse: Width, Length, Depth	W: ___ L: ___ D: ___
<input type="checkbox"/> Soil type: A B C Typing method used:	A: ___ B: ___ C: ___
<input type="checkbox"/> Visual	Visual: ___
<input type="checkbox"/> Manual	Manual: ___
<input type="checkbox"/> Mechanical device	Mechanical Device: ___

Figure 9-9 Tools such as checklists help ensure critical tasks are accomplished

HAZARD ASSESSMENT	Initial Inspection Time	Re-Inspection Time	Re-Inspection Time	Re-Inspection Time	Re-Inspection Time
<input type="checkbox"/> Utilities					
<input type="checkbox"/> Building instability					
<input type="checkbox"/> Secondary collapse					
<input type="checkbox"/> Heavy equipment					
<input type="checkbox"/> Water in trench					
<input type="checkbox"/> Blasting					
<input type="checkbox"/> Atmospheric hazards					
<input type="checkbox"/> Road traffic					
<input type="checkbox"/> Ground-level hazards					
<input type="checkbox"/> Railroads					
<input type="checkbox"/> Tripping hazards					
<input type="checkbox"/> Other vibration sources					
<input type="checkbox"/> Surface encumbrances					



# Phase Two: Pre-Rescue

- Pre-rescue phase includes the following:
  - Update your risk/benefit analysis
  - Conduct a pre-rescue briefing
    - Strategy, tactics, and operational considerations as well as safety and assignments are reviewed
  - Assign a technical rescue safety officer
  - Confirm technical assignments



# Phase Two: Pre-Rescue (cont'd.)

- Technical assignments
  - Operations
  - Planning and logistics
  - Safety
  - Rescue branch
    - Equipment group
    - Panel group
    - Shoring group
    - Rigging group
    - Entry/Extraction group

# Phase Two: Pre-Rescue (cont'd.)

- Technical assignments (cont'd.)
  - Support branch
    - Medical group
    - Hazardous materials team
    - Public information and the media

# Phase Two: Pre-Rescue (cont'd.)

- General site overview
  - Initial hazard mitigation
    - Create a hot, warm, and cold zone
    - Control utilities from the trench to the cold zone perimeter
    - Control traffic movement
    - Control the crowd
    - Shut down all heavy equipment operating within 300 feet of the rescue area

# Phase Two: Pre-Rescue (cont'd.)

TRENCH RESCUE TACTICAL WORKSHEET	
RESOURCE ASSESSMENT/REQUEST	Fill in Blanks
Trench rescue staffing On SCENE:	Level I: ___ Level II: ___ Command: ___
Trench rescue staffing RESPONDING:	Level I: ___ Level II: ___ Command: ___
Trench rescue staffing REQUIRED:	Level I: ___ Level II: ___ Command: ___
Hazardous materials resources:	Level I: ___ Level II: ___ Command: ___
Trench rescue equipment:	Level I: ___ Level II: ___ Command: ___
Utility companies:	Gas: ___ Electric: ___ Water: ___ Sewer: ___
EMS:	Medical Group: ___ Entry Team: ___
Heavy equipment:	Track Hoe: ___ Back Hoe: ___ Crane: ___
Police department:	Traffic Control: ___ Perimeter Security: ___
Other resources:	Vacuum Truck: ___ Pump Truck: ___ LDH Pumps: ___
NOTES:	

Figure 9-15 Assessment of the rescue area should include the use of a tactical worksheet

HAZARD CONTROL
<input type="checkbox"/> Secure perimeter:
<input type="checkbox"/> Control trench lip: (ground pads)
<input type="checkbox"/> Establish an entry control point:
<input type="checkbox"/> Install ladders in trench:
<input type="checkbox"/> Stage incoming apparatus:
<input type="checkbox"/> Control utility leaks:
<input type="checkbox"/> Atmospheric monitoring:
<input type="checkbox"/> Support utilities:
<input type="checkbox"/> Ventilation:
<input type="checkbox"/> Move spoil pile as needed:
<input type="checkbox"/> Control vibrations:
<input type="checkbox"/> Install shoring & supplemental shoring:
<input type="checkbox"/> Remove tripping hazards:
<input type="checkbox"/> Two methods of Egress + every 25 feet:

# Phase Two: Pre-Rescue (cont'd.)

- Pre-rescue briefing
  - Strategic goal of the incident
  - Tactical objectives to accomplishing goal
  - Team leader designations and crew assignments
  - Safety, including abandon signal, escape routes, and identification of incident safety officer
  - Clarification of questions or concerns

# Phase Three: Rescue

- General considerations
  - Always approach the trench from ends
  - Be aware of unidentified or changing hazards
  - Assess spoil pile for improper angle of repose and general raveling or instability
  - Remove any tripping hazards
  - Provide level area for ground pads
  - Place additional ground pads around the lip of the trench as needed
    - Mark appropriately



## Phase Three: Rescue (cont'd.)

- Excavation-specific considerations encompass an area encircling twice the trench depth
- Patient assessment and care includes:
  - Initial rapid assessment of airway, breathing, circulation and cervical, thoracic, and lumbar spine assessments

# Phase Three: Rescue (cont'd.)



Figure 9-17 The safety officer should pick a good vantage point to see as much as possible. They also move around the rescue site periodically



Figure 9-18 Place ladders for ingress and egress



# Phase Three: Rescue (cont'd.)



Figure 9-19 Create a safe zone in the uncollapsed portion of the trench by using appropriate protective systems



Figure 9-20 Secure all utilities, pipe, and any other obstruction in the trench not already secured due to inaccessibility issues

## Phase Three: Rescue (cont'd.)

- Primary concern when removing patients from a trench without a collapse or cave-in:
  - Remove any hazards to patient and rescuers
- Primary concern when removing a patient who has been involved with a cave-in:
  - Weight on the victim
  - Time it takes to move the weight

# Phase Four: Termination and Recovery

- Most dangerous phase
  - Exhaustion
  - Emotional high is gone
  - Images of victim(s) is fresh

## Phase Four (cont'd.)

- Preparation for incident termination
  - Accountability of the rescuers
  - Remove tools and equipment that can be safely
  - Remove trench shoring system
    - Use last-in first-out principal
  - Return apparatus and equipment to in-service
  - Hot wash or tailboard/quick critique
  - Turn the scene over to law enforcement
  - Return to service
  - Consider a critical incident stress debriefing



# Summary

- This chapter reviewed:
  - Process of size-up
  - Implementation of a trench emergency action plan
  - Implementation of support operations branch
  - Supporting nonintersecting straight wall trenches, intersecting trenches, and deep wall trenches
  - Releasing a victim from soil entrapment
  - Removing a victim from a trench

# Summary (cont'd.)

- This chapter reviewed (cont'd.):
  - Disassembly of support systems
  - Installation of supplemental sheeting and shoring
  - Construction of load lifting and stabilization system and the subsequent release of a victim from implements of entrapment