

Technical Rescue Awareness **Objectives**

1-1 Definitions:

Aluminum Hydraulic Shoring. Pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers) and designed specifically to support the sidewalls of an excavation and prevent cave-ins.

Anchor Point. A single, structural component used either alone or in combination with other components to create an anchor system capable of sustaining the actual and potential load on the rope rescue system.

Anchor System. One or more anchor points rigged in such a way as to provide a structurally significant connection point for rope rescue system components.

Angle of Repose. The greatest angle above the horizontal plane at which loose material (such as soil) will lie without sliding.

Ascending (Line). A means of safely traveling up a fixed line with the use of one or more ascent devices.

Ascent Device. An auxiliary equipment system component that is a friction or mechanical device utilized alone or in combination with other mechanical devices to allow ascending a fixed rope.

Attendant. A term used to describe U.S. federally regulated industrial workers who are qualified to be stationed outside one or more confined spaces, who monitor authorized entrants, and who perform all of the following duties:

- (a) Remain outside the confined space during entry operations until relieved by another attendant
- (b) Summon rescue and other needed resources as soon as the attendant determines that authorized entrants might need assistance to escape from confined space hazards
- (c) Perform nonentry rescues as specified by the rescue procedure listed on the permit (see Entry Permit)

Auger. A screw-like shaft that is turned to move grain or other commodities.

Authority Having Jurisdiction. (AHJ) The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

Authorized Entrant. A term used to describe U.S. federally regulated industrial workers who are designated to enter confined spaces and who meet the following training requirements for each specific space they enter:

- (a) Hazard Recognition. The ability to recognize the signs and symptoms of exposure to a hazardous material or atmosphere within the space and to understand the consequences of exposure and the mode of transmission (i.e., injection, ingestion, inhalation, or absorption) for the hazard.
- (b) Communications. The ability to carry out the method by which rescue services are to be summoned in the event of an emergency, the method by which the entrant will communicate with the attendant on the outside of the space, and a backup method of communication should the primary system fail.
- (c) Personal Protective Equipment (PPE). The ability to use all PPE appropriate for the confined space.
- (d) Self-Rescue. The ability to carry out the method by which the entrant will escape from the space should an emergency occur.

Auxiliary Rope Rescue Equipment. System components (rescue hardware and software) other than life-safety rope and harnesses, that are load-bearing accessories — including, but not limited to, ascending devices, carabiners, descent control devices, rope grab devices, and snap-links — designed to be utilized for rescue.

Bastard Search. No victim exists due to the report being inaccurate or the victim/individual has left the area.

Belay. The method by which a potential fall distance is controlled to minimize damage to equipment and/or injury to a live load.

Benching or Benching System. A method of protecting employees from cave-ins by excavating the side of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Bend. A knot that joins two ropes or webbing pieces together.

Bight. The open loop in a rope or piece of webbing formed when it is doubled back on itself.

Blanking and Blinding. A form of hydraulic energy isolation that is the absolute closure of a pipe, line, or duct by fastening a solid plate (such as a spectacle blind or skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure within the pipe, line, or duct with no leakage beyond the plate.

Blitz or Hasty Team. Minimum number of experienced rescuers that are sent out to locate the victim

Boil. The hydraulic backwash below a dam, sometimes described as a vertical whirlpool.

Boil Line. A point, below a dam, where the current splits, flowing upstream and downstream.

Bow. Front part of a boat.

Cave-In. The separation of a mass of soil or rock material from the side of an excavation or trench, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Cavitation. Slipping or non development of thrust by a boat's propeller.

Collapse Zone. See Rescue Area.

Competent Person. One who is capable of identifying existing and predictable conditions in the surroundings or in the working area that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate such conditions.

Confined Space. A space that has the following characteristics:

- (a) Is large enough and so configured that a person can enter and perform assigned work
- (b) Has limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits)
- (c) Is not designed for continuous human occupancy

Conveyor belt. A system to transfer goods, products or stock along a continual moving track.

Cribbing. Various lengths and dimensions of sturdy material, usually wood or plastic, used in rescue operations to stabilize or support vehicles, machinery or parts of structures.

Cross Braces (or Struts). The individual horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales. (See also Shoring.)

Descending (Line). A means of safely traveling down a fixed line using a descent control device.

Descent Control Device. A rope rescue system component that is a friction or mechanical device utilized with rope to control descent.

Electrical Drain Time. The time frame in which the electrical potential is completely lost in the electrical circuit.

Engulfment. The surrounding and effective capture of a person by a fluid (e.g., liquid, finely divided particulate) substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry Permit. A written or printed document, established by an employer, for non-rescue entry into confined spaces.

Excavation. Any man-made cut, cavity, trench, or depression in an earth surface, formed by the removal of earth.

Extrication. The removal of trapped victims from a vehicle or machinery.

FEMA Task Force Search and Rescue Marking System. Distinct markings made with international orange spray paint near a collapsed structure's most accessible point of entry.

Fixed Line (Fixed Line System). A rope rescue system consisting of a nonmoving rope attached to an anchor system.

Full-Cycle Machines. Machinery that is thought to be isolated (electrically or mechanically) may continue to move to complete its cycle.

Groundpads. Plywood or similar material used to distribute weight around a trench operation.

Hardware. A rigid mechanical auxiliary rope rescue component that can include, but is not limited to, anchor plates, carabiners, and mechanical ascent and descent control devices.

Hasty or Blitz Team. Minimum number of experienced rescuers that are sent out to locate the victim

Hazard Analysis. The process of identifying situations or conditions that have the potential to cause injury to people, damage to property, or damage to the environment.

Hazardous Atmosphere. Any atmosphere that is oxygen deficient, contains a toxic or disease-producing contaminant, or is potentially explosive. A hazardous atmosphere could be immediately dangerous to life and health, but not necessarily.

Hazardous Atmosphere for Confined Space. Any atmosphere that could expose personnel to the risk of death, incapacitation, injury, acute illness, or impairment of the ability to self-rescue, due to one or more of the following causes:

- (a) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL)
- (b) Airborne combustible dust at a concentration that meets or exceeds its LFL
- (c) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
- (d) Atmospheric concentration of any hazardous substance that could result in exposure to personnel in excess of its dose or permissible exposure limit (PEL)
- (e) Any other atmospheric condition that is immediately dangerous to life or health (IDLH)

High Angle. Refers to an environment in which the load is predominately supported by the rope rescue system.

Hitch. A knot that attaches to or wraps around an object so that when the object is removed, the knot will fall apart.

IDOL. Illinois Department of Labor

Immediately Dangerous to Life or Health (IDLH). Any condition that would do one of the following:

- (a) Pose an immediate or delayed threat to life
- (b) Cause irreversible adverse health effects
- (c) Interfere with an individual's ability to escape unaided from a hazardous environment

Incident Command System (ICS). The combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident (as described in the document *Incident Command System*) or training exercise.

Incident Management System. The management system or command structure used during emergency operations to identify clearly who is in command of the incident and what roles and responsibilities are assigned to various members.

Knot. A fastening made by tying together lengths of rope or webbing in a prescribed way.

Last-Seen-Point. The most likely location to find a victim or object under the water obtained by witness interviews, use of reference points or objects, and/or physical evidence.

Life Safety Harness. A system component that is an arrangement of materials secured about the body and used to support a person during rescue.

Life Safety Rope. A compact but flexible, torsionally balanced, continuous structure of fibers produced from strands that are twisted, plaited, or braided together and that serve primarily to support a load or transmit a force from the point of origin to the point of application.

Litter. A transfer device designed to support and protect a victim during movement.

Litter Attendant. A person who both accompanies and physically manages the litter.

Load. That which is being lowered or raised by rope in a high angle system. Some examples include a rescue subject, a rescuer, and subjects in a litter with a litter attendant.

Lockout. A method for keeping equipment from being set in motion and endangering workers.

Low Angle. Refers to an environment in which the load is predominately supported by itself and not the rope rescue system (e.g., flat land or mild sloping surface).

Machinery. The moving parts of a particular machine.

Mechanical Advantage (M/A). A force created through mechanical means including, but not limited to, a system of levers, gearing, or ropes and pulleys usually creating an output force greater than the input force and expressed in terms of a ratio of output force to input force.

NFPA. *National Fire Protection Association.* This organization develops safety standards for the fire service. The proposed standards can then be adopted by the individual departments or local governments.

National Search and Rescue Plan. A document that identifies responsibilities of U.S. federal agencies and serves as the basis for the National Search and Rescue Manual, which discusses search and rescue organizations, resources, methods, and techniques utilized by the federal government.

OSHA. *Occupational Safety and Health Administration.* A part of the Department of Labor entrusted with enforcing safety in the workplace.

Oxygen-Deficient Atmosphere. Air atmospheres containing less than 19.5 percent oxygen by volume at one standard atmosphere pressure.

Oxygen-Enriched Atmosphere. Air atmospheres containing more than 23.5 percent oxygen by volume at one standard atmosphere pressure.

Permit Required Confined Space. A Confined Space that has one or more of the following characteristics:

1. Contains or has a potential to contain a hazardous atmosphere
2. Contains a material that has the potential for engulfing an entrant
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section
4. Contains any other recognized serious safety or health hazards (including fall, environmental, and equipment hazards)

Personal Protective Equipment (PPE). The equipment provided to shield or isolate personnel from infectious, chemical, physical, and thermal hazards.

Pretensioner. A device attached to seat belts which will tighten during frontal impacts. This device is a pyrotechnic device designed to activate when the frontal air bags are activated.

Public Safety Diving. Underwater diving, related to team operations and training, performed by any member, group, or agency of a community or government-recognized public safety diving or water rescue team.

Rapid Intervention Crew. At least two members available for rescue of a member or a team if the need arises.

“Reach, Throw, Row, Go.” The four sequential steps in water rescue with progressively more risk to the rescuer. Specifically, a “go” rescue involves physically entering the medium (e.g., in the water or on the ice).

Recovery Mode. Level of operational urgency where there is no chance of rescuing a victim alive.

Reference Object. An object, (like a person or a boat), that is the same size as the object that sank below the surface of the water. This reference object is used to assist a witness in describing the last seen point.

Registered Professional Engineer. A person who is registered as a professional engineer in the state where the work is to be performed.

Rescue. Those activities directed at locating endangered persons at an emergency incident, removing those persons from danger, treating the injured, and providing for transport to an appropriate health care facility.

Rescue Area. (or Hot, Danger, or Collapse Zone). An area surrounding the incident site (e.g., collapsed structure or trench) whose size is proportional to the hazards that exist.

Rescue Mode. A level of operational urgency where there is a chance that a victim will be rescued alive.

Risk. A measure of the probability and severity of adverse effects that result from an exposure to a hazard.

Risk Assessment. An assessment of the likelihood, vulnerability, and magnitude of incidents that could result from exposure to hazards.

Risk/Benefit Analysis. A decision made by a responder based on a hazard and situation assessment that weighs the risks likely to be taken against the benefits to be gained for taking those risks.

Rocker Panels. These are the usually rounded narrow body panels on each side of an automobile below the doors and between the kick panel and the quarter panel.

Rope Rescue Equipment. Components used to build rope rescue systems including life safety rope, life safety harnesses, and auxiliary rope rescue equipment.

Safety Officer. An individual qualified by the authority having jurisdiction to maintain a safe working environment.

SAR. Search and rescue.

Sheeting. The members of a shoring system that support the sides of an excavation and are in turn supported by other members of the shoring system.

Shield (or Shield System). A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structures.

Shoring (or Shoring System). A structure such as a metal hydraulic, pneumatic/mechanical, or timber shoring system that supports the sides of an excavation and is designed to prevent cave-ins.

Size-Up. A mental process of evaluating the influencing factors at an incident prior to committing resources to a course of action.

Software. A flexible fabric component of rope rescue equipment that can include, but is not limited to, anchor straps, pick-off straps, and rigging slings.

Spoil Pile. The material excavated from the trench.

Stern. The back of a boat.

Strainer. An obstruction in a flowing body of water that allows the current to pass through it but does not allow the clear passage of larger objects such as people or boats.

Superimposed loads. Loads that place stress on trench walls. Examples include backhoes, pipes, cable, trench shields, rescuers, students, spoil pile, etc.

Surcharge Loads. Any weight near the lip of the trench that increases the likelihood of instability or secondary cave-in.

Surface encumbrances Structures that were designed to be supported by the dirt which was in the trench. Examples include utility poles, roadways, foundations, etc.

Swift Water. Water moving at a rate greater than one knot (1.15 mph).

Tabulated Data. Any set of site-specific design data used by a professional engineer to design a protective system at a particular location.

Tagout. A method of tagging, labeling, or otherwise marking an isolation device during hazard abatement operations to prevent accidental removal of the device. (See also Lockout.)

Technical Rescue. The application of special knowledge, skills, and equipment to safely resolve unique and/or complex rescue situations.

Tender. An individual trained in the responsibilities of diver safety who provides control of search patterns from the surface of the water.

Terrain. Specific natural and topographical features within an environment.

Thermocline. Dividing line between sun-warmed, upper layers of still water and markedly cooler lower layers.

Topographical Map. A graphical representation of the earth's surface, drawn to scale and reproduced in two dimensions, that reflects the topographical features of the area depicted.

Transom. Vertical panel at the back of a boat.

Trench (or Trench Excavation). A narrow (in relation to its length) excavation made below the surface of the earth.

(OSHA definition of Trench – An excavation that is deeper than it is wide and less than 15 feet wide.

Trench Box (or Trench Shield). A manufactured protection system unit made from steel, fiberglass, or aluminum that is placed in a trench to protect workers from cave-in and that can be moved as a unit. (See also Shield.)

Uprights (or Strongback). The vertical members of a trench shoring system placed in contact with the earth, usually held in place against sections of sheeting with shores and positioned so that individual members do not contact each other.

Utilities. Gas/electrical/water/pneumatic sources of energy or power.

Vehicle. A device or structure for transporting persons or things; a conveyance.

Vehicle Posts. Starting at the front of the vehicle, alphabetically with A, the areas of the vehicle where the roof support is connected to the body.

Wales (or Walers or Stringers). Horizontal members of a shoring system placed parallel to the excavation face and whose sides bear against the vertical members of a shoring system or earth.

Watermanship Skills. Capabilities that include swimming, surface diving, treading water, and staying afloat with a reasonable degree of comfort appropriate to the required task.

Wilderness. An uncultivated, uninhabited, and natural area usually, but not necessarily, far from human civilization and trappings.

2-1 General:

- 2-1.1 Identify the Office of the State Fire Marshals certification requirements as presented in class.
- 2-1.2 Identify the need for the AHJ to have action plans and policies in place for technical rescues.
- 2-1.3 Identify the need for the AHJ to conduct a hazard analysis of the response area and determine the feasibility of conducting a technical rescue.
- 2-1.4 Identify the NFPA recognized levels of operational capability at technical rescue incidents.
- 2-1.5 Identify general necessary elements to afford safety at technical rescue incidents.
- 2-1.6 Identify hazard analysis and risk assessment principles at technical rescue incidents (Size up).
- 2-1.7 Identify the need for establishing an Incident Command System (ICS)/ Incident Management System (IMS) at technical rescue incidents.
- 2-1.8 Identify the need and methods for scene control.
- 2-1.9 Identify the initial company operations.

3-1 Structural Collapse:

- 3-1.1 Identify the general principles for structural collapse incidents.
- 3-1.2 Identify the destructive forces placed on a structure to cause collapse.
- 3-1.3 Identify triage criteria for a collapsed structure at a structural collapse incident.
- 3-1.4 Identify general collapse patterns for structural collapses.

3-1.5 Identify the initial company operations at a structural collapse incident.

4-1 Rope Rescue:

4-1.1 Identify the types of incidents requiring rope rescue.

4-1.2 Identify general hazards associated with rope rescue operations.

4-1.3 Identify the initial tasks of first in companies of a rope rescue.

5-1 Confined Space:

5-1.1 Identify the definition of different confined spaces based on OSHA standard 29CFR 1910.146. (non-permit, permit, alternate entry).

5-1.2 Identify OSHA statistics on employee and rescuer injury and death in confined spaces.

5-1.3 Identify reasons for entering confined spaces.

5-1.4 Identify general hazards associated with confined space rescue operations.

5-1.5 Identify the initial tasks of first-in companies at the scene of a confined space rescue.

6-1 Vehicle and Machinery:

6-1.1 Identify the size up that must occur at a vehicle/machinery incident.

6-1.2 Identify and notify the resources necessary to conduct safe and effective operations.

6-1.3 Identify the hazards associated with vehicle and machinery rescues.

6-1.4 Describe the need for control at the scene of an incident.

6-1.5 Identify the initial company operations at a vehicle/machinery incident.

7-1 Water:

7-1.1 Identify the hazards associated with a water rescue incident.

7-1.2 Identify the personal protective equipment requirements for a water rescue incident.

7-1.3 Identify the rescue vs. recovery mode when concerned with a cold water near drowning patient.

7-1.4 Identify when there is need to request additional equipment and trained personnel at a water rescue incident.

7-1.5 Identify the initial tasks of first-in companies at water rescue incident.

Wilderness Search and Rescue:

8-1.1 Identify the four hazards associated with wilderness SAR operations.

8-1.2 Identify the four core elements in wilderness SAR operations.

8-1.3 Identify the seven (7) components that are used to complete the elements of a SAR operation.

8-1.4 Identify the five resources that can be used for wilderness search and rescue.

8-1.5 Identify the method of calculating search urgency.

8-1.6 Identify the types of responses that are used dependant on search urgency.

8-1.7 Identify the components of a lost person(s) report.

8-1.8 Identify the four basic means of establishing a search area.

8-1.9 Identify three types of search tactics.

8-1.10 Identify the initial company operations at a wilderness search and rescue incident.

9-1 Trench and Excavation:

9-1.1 Identify the OSHA definition of a trench.

9-1.2 Identify common hazards associated with trench rescues.

9-1.3 Identify four types of trench collapses.

9-1.4 Identify the characteristics of soil.

9-1.5 Identify the methods of victim and rescuer protection.

9-1.6 Identify the initial tasks of first in companies at the scene of a trench rescue.