NFPA® 1006

Standard for Technical Rescue Personnel Professional Qualifications

2017

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ISBN: 978-145591626-9 (Print)
ISBN: 978-145591625-2 (PDF)

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NFPA® 1006

Standard for

Technical Rescue Personnel Professional Qualifications

2017 Edition

This edition of NFPA 1006, *Standard for Technical Rescue Professional Qualifications*, was prepared by the Technical Committee on Rescue Technician Professional Qualifications and released by the Correlating Committee on Professional Qualifications. It was issued by the Standards Council on November 11, 2016, with an effective date of December 1, 2016, and supersedes all previous editions.

This edition of NFPA 1006 was approved as an American National Standard on December 1, 2016.

Origin and Development of NFPA 1006

In 1994, the NFPA Standards Council, after receipt of a request for the development of a standard for the professional qualifications of rescue technicians, approved the establishment of a technical committee on Rescue Technician Professional Qualifications under the Professional Qualifications project. The committee developed the first edition of NFPA 1006, *Standard for Rescue Technician Professional Qualifications*, which established general job performance requirements (JPRs) for a rescue technician as well as specific job performance requirements for special rescue operations. These performance requirements included rope rescue, surface water rescue, vehicle and machinery rescue, confined space rescue, structural collapse rescue, and trench rescue.

For the 2003 edition of NFPA 1006, all the chapters were reviewed, and changes were made to comply with the *Manual of Style for NFPA Technical Committee Documents*. Three new chapters were added to the document: Subterranean Rescue, Dive Rescue, and Wilderness Rescue.

For the 2008 edition of NFPA 1006, the document was updated, and chapters for Swiftwater Rescue, Ice Rescue, and Surf Rescue were added. The Subterranean Rescue chapter was broken into two chapters: one on Mine and Tunnel Rescue and the other on Cave Rescue.

Each chapter in the document was broken into two levels, Level I and Level II, and the document was retitled as *Standard for Technical Rescuer Professional Qualifications*. Additional language was added to clarify the use of the standard.

The 2013 edition of NFPA 1006 was updated to recognize passive power sources and new and emerging technologies as challenges that create hazards to the technical rescuer. The goals for meeting these challenges and hazards were as follows:

(1) To isolate and manage potentially harmful energy sources, so that all hazards are identified, systems are managed, system use is evaluated, and hazards to rescue personnel are minimized minimized
(2) To identify types of energy sources, isolate system methods, recognize specialized features, ensure availability of proper tools and equipment, and ensure that operations support the tactical objective

Because of the new power sources in automobiles, Chapter 10 of the 2008 edition, Vehicle and Machinery Rescue, was separated into two chapters: Chapter 10, Vehicle Rescue, and Chapter 19, Machinery Rescue.

The simple-rope mechanical advantage system minimum travel distance for loads was modified, based on the response area and the discipline-specific application. The distance traveled should reflect a typical distance experienced by a rescuer operating the equipment and performing the task.

Because of the nature and specific knowledge and skills required during a technical rescue incident, language was included in Chapter 1, Administration, that mandates a rescuer to remain current and "demonstrate competency on an annual basis."

The prerequisite knowledge and skills found in Chapter 5 were clarified based on discipline-specific job performance requirements found in Chapters 6 through 19. The intent was to address all applicable areas of Chapter 5 unless otherwise exempted in the discipline-specific chapters. In other words, each JPR should be addressed in a manner consistent with the discipline.

In Chapter 6, Rope Rescue, specific reference to *highline system* was changed to *operation of a rope system* to broaden the definition to include other methods for moving a load horizontally.

Chapter 17, Mine and Tunnel Rescue, was modified and restructured to include Level I and Level II so that it complements the other disciplines within the document.

Annex material, including dive charts, air compression tables, and dive site diagrams, was upgraded. Annex E, Marking Systems, was updated to reflect similar references found in NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*.

In the 2017 edition, rescuer training levels have been changed from Level I and II to Awareness, Operations, and Technician, which better align with NFPA 1670. JPRs have been refined for all positions within the scope of the standard. Chapters on Floodwater, Animal, Tower, Helicopter, and Watercraft Rescue have been added. Definitions have been updated and several added to create consistency with NFPA 1670. In addition, the title of the standard has been revised to be inclusive of all personnel associated with technical rescue.

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Standard for

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Information on referenced publications can be found in Chapter 2 and Annex M.

Chapter 1 Administration

1.1* Scope. This standard identifies the minimum job performance requirements (JPRs) for technical rescue personnel.

1.2 Purpose. The purpose of this standard is to specify the minimum JPRs for service as technical rescue personnel.

1.2.1 This standard shall define technical rescue personnel.

1.2.2 The intent of this standard shall be to ensure that individuals serving as technical rescue personnel are qualified.

1.2.3* This standard shall not address organization or management responsibility.

1.2.4 It is not the intent of this standard to restrict any jurisdiction from exceeding or combining these minimum requirements.

1.2.5 JPRs for each level and position are the tasks personnel shall be able to perform to carry out the job duties.

1.2.6* Technical rescue personnel shall remain current with the general knowledge, skills, and JPRs addressed for each level or position of qualification. Technical rescue personnel shall remain current with technical rescue practices and applicable standards and shall demonstrate competency on an annual basis.

1.3* Application. The application of this standard is to specify which requirements within the document shall apply to specific technical rescue personnel.

1.3.1* The JPRs shall be accomplished in accordance with the requirements of the authority having jurisdiction (AHJ) and all applicable NFPA standards.

1.3.2 It shall not be required that the JPRs be mastered in the order in which they appear. The AHJ shall establish instructional priority and the training program content to prepare personnel to meet the JPRs of this standard.

1.3.3* Performance of each requirement of this standard shall be evaluated by personnel approved by the AHJ.

1.3.4 The JPRs for each level or position shall be completed in accordance with recognized practices and procedures or as defined by law or by the AHJ.

1.3.5 Prior to being qualified, personnel assigned to certain duties shall meet all the requirements defined in the chapter outlining those requirements. Requirements for specific duties are defined in the following chapters:

(1) The duties of tower rescue are defined in Chapter 4.
(2) The duties of rope rescue are defined in Chapter 5.
(3) The duties of structural collapse rescue are defined in Chapter 6.
(4) The duties of confined space rescue are defined in Chapter 7.
(5) The duties of vehicle rescue are defined in Chapter 8.
(6) The duties of animal rescue are defined in Chapter 9.
(7) The duties of wilderness rescue are defined in Chapter 10.
(8) The duties of trench rescue are defined in Chapter 11.
(9) The duties of machinery rescue are defined in Chapter 12.
(10) The duties of cave rescue are defined in Chapter 13.
(11) The duties of mine and tunnel rescue are defined in Chapter 14.
(12) The duties of helicopter rescue are defined in Chapter 15.
(13) The duties of surface water rescue are defined in Chapter 16.
(14) The duties of swiftwater rescue are defined in Chapter 17.
(15) The duties of dive rescue are defined in Chapter 18.
(16) The duties of ice rescue are defined in Chapter 19.
(17) The duties of surf rescue are defined in Chapter 20.
(18) The duties of watercraft rescue are defined in Chapter 21.
(19) The duties of flood rescue are defined in Chapter 22.

1.3.6 The AHJ shall provide the personal protective clothing and equipment necessary to conduct assignments.

1.3.7 JPRs involving exposure to products of combustion shall be performed in approved PPE.

1.3.8* Prior to training to meet the requirements of this standard, personnel shall meet the following requirements:

(1) Educational requirements established by the AHJ
(2) Age requirements established by the AHJ
(3) Medical requirements established by the AHJ
(4) Job-related physical performance requirements established by the AHJ
(5) Emergency medical care performance requirements for entry-level personnel developed and validated by the AHJ
(6) Minimum requirements for hazardous materials incident and contact control training for entry-level personnel and validated by the AHJ
(7) Psychological support/education requirements established by the AHJ

1.3.9 Wherever in this standard the terms *rules, regulations, policies, procedures, supplies, apparatus,* or *equipment* are referred to, it is implied that they are those of the AHJ.

1.3.10 Because technical rescue is hazardous and technical rescue personnel are required to perform rigorous activities in adverse conditions, regional and national safety standards shall be included in agency policies and procedures.

1.3.11 Technical rescue personnel shall complete all activities in the safest possible manner and shall follow national, federal, state, provincial, and local safety standards as they apply to technical personnel.

1.4 Units. In this standard, equivalent values in SI units shall not be considered as the requirement, as these values can be approximate. *(See Table 1.4.)*

1.5 Operational Levels. The AHJ shall establish written standard operating procedures (SOPs) consistent with one of the following operational levels for each of the disciplines defined in this document:

(1) *Awareness level.* This level represents the minimum capability of individuals who provide response to technical search and rescue incidents.
(2) *Operations level.* This level represents the capability of individuals to respond to technical search and rescue incidents and to identify hazards, use equipment, and apply limited techniques specified in this standard to support and participate in technical search and rescue incidents.
(3) *Technician level.* This level represents the capability of individuals to respond to technical search and rescue incidents and to identify hazards, use equipment, and apply advanced techniques specified in this standard necessary to coordinate, perform, and supervise technical search and rescue incidents.

Table 1.4 U.S.-to-SI Conversions

Quantity	U.S. Unit/ Symbol	SI Unit/ Symbol	Conversion Factor
Length	inch (in.)	millimeter (mm)	1 in. = 25.4 mm
	foot (ft)	meter (m)	1 ft = 0.305 m
Area	square foot (ft^2)	square meter (m^2)	1 ft^2 = 0.0929 m^2

1.6* General.

1.6.1 Job performance requirements shall not be required to be mastered in the order in which they appear.

1.6.2 The AHJ shall be responsible for determining which disciplines are required to achieve the desired types of service and to provide training or certification as necessary to satisfy the service needs.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. (Reserved)

2.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code,* 2015 edition.

NFPA 402, *Guide for Aircraft Rescue and Fire-Fighting Operations,* 2013 edition.

NFPA 1000, *Standard for Fire Service Professional Qualifications Accreditation and Certification Systems,* 2017 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* 2017 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2013 edition.

NFPA 1521, *Standard for Fire Department Safety Officer Professional Qualifications,* 2015 edition.

NFPA 1581, *Standard on Fire Department Infection Control Program,* 2015 edition.

NFPA 1620, *Standard for Pre-Incident Planning,* 2015 edition.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents,* 2017 edition.

NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services,* 2017 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Abrasion. The damaging effect on rope and other equipment caused by friction-like movement.

3.3.2 Access. See 3.3.31, Confined Space Approach.

3.3.3 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. [**1670,** 2017]

3.3.3.1 ***High-Point Anchor.*** A point above an obstacle to be negotiated used for attachment of rescue systems.

3.3.4 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. [**1670,** 2017]

3.3.4.1* ***Multiple-Point Anchor System.*** System configuration providing load distribution over more than one anchor point, either proportionally or disproportionally.

3.3.4.2* ***Single-Point Anchor System.*** An anchor system configuration utilizing a single anchor point to provide the primary support for the rope rescue system.

3.3.5 Ascending (Line). A means of safely traveling up a fixed line with the use of one or more ascent devices. [**1670,** 2017]

3.3.6 Ascending Device. An auxiliary equipment system component; a friction or mechanical device utilized to allow ascending a fixed line. [**1983,** 2017]

3.3.7 Atmospheric Monitoring. A method of evaluating the ambient atmosphere of a space, including but not limited to its oxygen content, flammability, and toxicity.

3.3.8* Basic First Aid Kit. Equipment or devices for managing infection exposure, airways, spinal immobilization, fracture immobilization, shock, and bleeding control.

3.3.9* Belay. The method by which a potential fall distance is controlled to minimize damage to equipment and/or injury to a live load. [**1670,** 2017]

3.3.10* Belay System. A nontensioned, manually operated system designed to belay a load.

3.3.11 Belayer. The rescuer who operates the belay system.

3.3.12 Belt. A system component; material configured as a device that fastens around the waist only and designated as a ladder belt, an escape belt, or a ladder/escape belt.

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

3.3.14 Beneficial System. Auxiliary-powered equipment in motor vehicles or machines that can enhance or facilitate rescues such as electric, pneumatic, or hydraulic seat positioners, door locks, window operating mechanisms, suspension systems, tilt steering wheels, convertible tops, or other devices or systems to facilitate the movement (extension, retraction, raising, lowering, conveyor control) of equipment or machinery.

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

3.3.16* Bombproof. A term used to refer to a single anchor point capable of sustaining the actual or potential forces exerted on the rope rescue system without possibility of failure.

3.3.17 Breach. An opening made in the wall, floor, or ceiling of a structure, based on construction type, that can be used for moving rescuers, equipment, or victims into or out of the structure.

3.3.18 Breaching Techniques. Methods that utilize breaking and cutting tools to create safe openings in masonry, concrete, and wood structures.

3.3.19 Buoyancy Compensator Device (BCD). Device worn by a diver containing a bladder that is inflated or deflated by the diver to manage their buoyancy while immersed in a liquid.

3.3.20 Cave. A natural underground void formed by geologic process.

3.3.21 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. [**1670,** 2017]

3.3.22 Collapse Support Operations. Operations performed at the scene that include providing for rescuer comfort, scene lighting, scene management, and equipment readiness.

3.3.23 Collapse Type. Five general types of collapse include lean-to collapse, "V" shape collapse, pancake collapse, cantilever collapse, and A-frame collapse. *(See Annex D.)*

3.3.24 Collapse Zone. See 3.3.140, Rescue Area.

3.3.25 Common Passenger Vehicle. Light or medium duty passenger and commercial vehicles commonly encountered in the jurisdiction and presenting no unusual construction, occupancy, or operational characteristics to rescuers during an extrication event.

3.3.26 Communications Team. As related to caves, a specific combination of resources with a leader, personnel, and common equipment assembled for the purpose of establishing and maintaining communications between various locations in and out of the cave.

3.3.27* Community Resource List. A list that includes all private and public contact numbers that provide the available community resources to mitigate a specified type or range of rescue incidents and hazardous conditions in the community.

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

3.3.29* Confined Space. An area large enough and so configured that a member can bodily enter and perform assigned work but which has limited or restricted means for entry and exit and is not designed for continuous human occupancy. [**1500,** 2013]

3.3.30 Confined Space Approach. The means of approach to the entry opening of a confined space.

3.3.31 Confined Space Entry. Includes ensuing work activities in a confined space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

3.3.32 Confined Space Entry Opening. The port or opening used to enter a confined space.

3.3.33 Confined Space Entry Permit. A written or printed document established by an employer in applicable U.S. federally regulated industrial facilities for nonrescue entry into confined spaces, that authorizes specific employees to enter a confined space and contains specific information as required. *(See Annex E.)*

3.3.34* Confined Space Rescue Preplan. An informational document completed by rescue personnel pertaining to a specific space that should include, but is not limited to, information concerning hazard abatement requirements, access to the space, size and type of entry openings, internal configuration of the space, and a suggested action plan for rescue of persons injured within the space.

3.3.35 Confined Space Rescue Team. A combination of individuals trained, equipped, and available to respond to confined space emergencies. [**1670,** 2017]

3.3.36 Confined Space Retrieval Equipment. See 3.3.146, Retrieval Equipment (Retrieval System).

3.3.37* Confined Space Type. A classification of confined spaces that incorporates the size, configuration, and accessibility of an entry opening as well as the internal configuration/entanglement structures within the space.

3.3.38* Construction Type. Based on major construction categories, these categories include, but are not limited to, wood frame, steel, unreinforced masonry (URM), tilt-up; precast, high-rise, and formed in place.

3.3.39 Cribbing. Short lengths of timber/composite materials, usually 4 in. × 4 in. (101.60 mm × 101.60 mm) and 18 in. × 24 in. (457.20 mm × 609.60 mm) long that are used in various configurations to stabilize loads in place or while load is moving.

3.3.40 Critical Incident Stress Debriefing (CISD). A post-incident meeting designed to assist rescue personnel in dealing with psychological trauma as the result of an emergency.

3.3.41 Critique. A post-incident analysis of the effectiveness of the rescue effort.

3.3.42 Cross Bracing. Lumber (generally 2 × 4 or 2 × 6 lumber) used to horizontally or diagonally heavier support struts (generally 4 × 4, 4 × 6, 6 × 6, or larger), usually by diagonally intersecting across struts needing support.

3.3.43* Crush Syndrome. A condition in which muscle death occurs because of pressure applied by an external load (e.g., a vehicle, parts of a fallen building, a rock, or a squeeze in a tight hole).

3.3.44* Cut Sheet. A document that specifies the dimensions, slope, and other pertinent information regarding a particular excavation.

3.3.45 Cut Station. A functional area that utilizes lumber, timber, and an assortment of hand and power tools to complete operational objectives for stabilizing or shoring at a rescue incident or training evolution.

3.3.46 Descending a Line. A means of traveling down a fixed line using a descent control device.

3.3.47 Descent Control Device. An auxiliary equipment item; a friction or mechanical device utilized with rope to control descent. [**1983,** 2017]

3.3.48 Dewatering Equipment. Electric- or fuel-powered pumps, hose, and appliances that are used in combination to remove water.

3.3.49 Dive. Exposure of an individual to a hyperbaric environment.

3.3.50* Dive Supervisor. The member of a dive team who has the authority and expertise to manage and direct all aspects of the dive operation and has been trained to meet all nondiving job performance requirements of technician-level dive rescue.

3.3.51 Dive Team. A collection of divers and trained support personnel acting under the direction of a single team leader who are trained and equipped to act collectively to achieve a subsurface mission using a common set of practices or guidelines.

3.3.52* **Dive Tender** A member of the dive team responsible for assisting divers with assembly and donning of equipment, communicating with divers, tracking the diver's status and location, and managing subsurface search operations, and trained to meet all the job performance requirements of operations-level dive rescue.

3.3.53 Diver. An individual exposed to a hyperbaric environment while using a compressed gas or supplied breathing gas system.

3.3.53.1* ***90 Percent Diver.*** A diver who is dressed, equipped, and positioned to quickly enter the water and assume the role of safety diver or otherwise assist the operation as necessary.

3.3.53.2* ***Safety Diver.*** A diver who is equipped and positioned to immediately submerge and lend assistance to a diver in distress or to engage in a search for a missing diver.

3.3.54 Dive Profile. Description and documentation of a diver's potential or actual exposure to a hyperbaric environment, which includes depth, duration of exposure, and, where applicable, intervals between exposures, which are intended to document and communicate the diver's nitrogen load.

3.3.55 Dive Tables. Tools used to calculate a diver's nitrogen loading based on depth, length of exposure to a hyperbaric environment, and intervals between exposures of an actual or a planned dive.

3.3.56 Double Block and Bleed. The closure of a line, duct, or pipe by closing, locking, and tagging two valves in line and opening, locking, and tagging a drain or vent valve in line between the two closed valves.

3.3.57 Downstream Safety. A trained swiftwater rescuer, located downstream of the entry point, who is ready to deploy a rescue device or perform a swiftwater rescue tactic to a victim or rescuer unable to self-extricate from a hazardous environment.

3.3.58 Dynamic Loads. Forces created by moving loads as well as those caused by the sudden cessation of that movement.

3.3.59 Edge Protection. A means of protecting software components within a rope rescue system from the potentially harmful effects of exposed sharp or abrasive edges. [**1670,** 2017]

3.3.60 Emergency. A fire, explosion, or hazardous condition that poses an immediate threat to the safety of life or damage to property. [**1,** 2015]

3.3.61 Emergency Medical Services. The treatment to patients, including first aid, cardiopulmonary resuscitation, basic life support, advanced life support, and other medical protocols prior to arrival at a hospital or other health care facility. [**1581,** 2015]

3.3.62 Entry. The action by which a person passes into a confined space. Entry includes ensuing work or rescue activities in that environment and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space, trench, or excavation. [**1670,** 2017] *(See also 3.3.32, Confined Space Entry.)*

3.3.63 Entry Opening. See 3.3.33, Confined Space Entry Opening.

3.3.64 Environmental Controls. See 3.3.23, Collapse Support Operations.

3.3.65 Excavation. Any man-made cut, cavity, trench, or depression in an earth surface, formed by the removal of earth. [**1670,** 2017]

3.3.66* **Extinguishing Devices.** Devices used to suppress fire, including, but not limited to, CO_2 extinguishers, dry chemical extinguishers, hose lines, and fire-fighting foam.

3.3.67* **Face(s).** The vertical or inclined earth surface formed as a result of excavation work. [**1670,** 2017]

3.3.68 Failure. The breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities. [**1670,** 2017]

3.3.69 Fire Control Measures. Methods used to secure ignition sources at an incident scene that can include hose line placement and utilization of chemical agents to suppress fire potential.

3.3.70 Fixed Line System. A rope rescue system consisting of a nonmoving rope attached to an anchor system. [**1670,** 2017]

3.3.71 Flotation Aids. Devices that provide supplemental flotation for persons in the water but do not meet U.S. Coast Guard performance criteria such as breaking strength of the thread used in sewing the device, the usable life of the flotation materials including compressibility factors, the colors and fading potential of certain dyes used in the fabrication of the device, and the strength and breaking force required for buckles and tie straps.

3.3.72* **General Area.** An area surrounding the incident site, of which the size is proportional to the size and nature of the incident, and to which access by people, heavy machinery, and vehicles is limited and strictly controlled.

3.3.73 Hardware. Rigid mechanical auxiliary equipment that can include, but is not limited to, anchor plates, carabiners, and mechanical ascent and descent control devices. [**1670,** 2017]

3.3.74 Harness. See 3.3.96, Life Safety Harness.

3.3.75 Hasty Search. An initial deployment of search resources that involves a quick search of areas or segments likely to contain survivors. [**1670,** 2017]

3.3.76 Hazard Mitigation. Activities taken to isolate, eliminate, or reduce the degree of risk to life and property from hazards, either before, during, or after an incident.

3.3.77* **Hazardous Atmospheres.** Any atmosphere that can expose personnel to the risk of death, incapacitation, injury, acute illness, or impairment of ability to self-rescue. [**1670,** 2017]

3.3.78 Hazardous Material. A substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated.

3.3.79 Heavy Construction Type. Construction that utilizes masonry, steel, and concrete in various combinations, including, but not limited to, tilt-up, steel frame with infill, concrete moment resisting frame, concrete shearwall, unreinforced

masonry infill in concrete frame, heavy floor, heavy wall, and precast concrete. *(See Annex F.)*

3.3.80* Heavy Equipment. Heavy-duty vehicles, specially designed for executing construction tasks, most frequently ones involving earthwork operations.

3.3.81 Heavy Object. An item of such size and weight that it cannot be moved without the use of power tools (e.g., hydraulic lifting devices) or mechanical advantage systems.

3.3.82* Heavy Vehicle. Heavy duty highway, off-road, construction, or mass transit vehicles constructed of materials presenting resistance to common extrication procedures, tactics, and resources and posing multiple concurrent hazards to rescuers from occupancy, cargo, size, construction, weight, or position.

3.3.83 High Angle. Refers to an environment in which the load is predominantly supported by the rope rescue system. [**1670,** 2017]

3.3.84 Highline System. A system of using rope or cable suspended between two points for movement of persons or equipment over an area that is a barrier to the rescue operation, including systems capable of movement between points of equal or unequal height.

3.3.85 Hitch. A knot that attaches to or wraps around an object so that when the object is removed, the knot will fall apart. [**1670,** 2017]

3.3.86 Incident Command System (ICS). A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in the management of resources during incidents. It is used for all kinds of emergencies and is applicable to small as well as large and complex incidents. ICS is used by various jurisdictions and functional agencies, both public and private, to organize field-level incident management operations.

3.3.87 Inclined Plane. A simple machine, a plane surface inclined to the horizon, or forming with a horizontal plane any angle but a right angle, creating mechanical advantage by distributing the work required to lift a load over a distance along an incline rather than straight up and down.

3.3.88* Isolation. The process by which an area is rendered safe through mitigation of dangerous energy forms.

3.3.89* Isolation System. An arrangement of devices, including isolation devices, applied with specific techniques, that collectively serve to isolate a victim of a trench or excavation emergency from the surrounding product (e.g., soil, gravel, sand).

3.3.90 Job Performance Requirement (JPR). A written statement that describes a specific job task, lists the items necessary to complete the task, and defines measurable or observable outcomes and evaluation areas for the specific task. [**1000,** 2017]

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

3.3.92 Large Machinery. Complex machines (or machinery systems) constructed of heavy materials, not capable of simple disassembly, and presenting multiple concurrent hazards (e.g., control of energy sources, hazardous materials, change in elevation, multiple rescue disciplines, etc.), complex victim entrapment, or partial or complete amputation, and requiring the direct technical assistance of special experts in the design, maintenance, or construction of the device or machine.

3.3.93 Laser Target. A square or rectangular plastic device used in conjunction with a laser instrument to set the line and grade of pipe. [**1670,** 2017]

3.3.94 Levers. Tools that have a relationship of load/fulcrum/force to create mechanical advantage and move a load.

3.3.95 Life Safety Harness. An equipment item; an arrangement of materials secured about the body and used to support a person. [**1983,** 2017]

3.3.96 Life Safety Rope. See 3.3.151.2.

3.3.97 Lifting Tools. Hydraulic, pneumatic, mechanical, or manual tools that can lift heavy loads.

3.3.98 Light Frame Construction. Structures that have framework made out of wood or other lightweight materials. *(See Annex F.)*

3.3.99 Lip (Trench Lip). The area 2 ft horizontal and 2 ft vertical (0.61 m × 0.61 m) from the top edge of the trench face.

3.3.100 Lip Collapse. A collapse of the trench lip, usually subsequent to surcharge loading, impact damage from the excavating bucket, and/or inherent cohesive properties of the soil type.

3.3.101 Lip-In. See 3.3.101, Lip Collapse.

3.3.102 Litter. A transfer device designed to support and protect a victim during movement. [**1670,** 2017]

3.3.103 Litter Tender. A person who both accompanies and physically manages the litter. [**1670,** 2017]

3.3.104 Load (Mass). That which is being lowered, raised, or otherwise supported by a rope rescue system. Relative to rope rescue qualification, a minimum weight of 100 lb (45.5 kg).

3.3.105 Load Stabilization. The process of preventing a load from shifting in any direction.

3.3.106* Load Test. A method of preloading a rope rescue system to ensure all components are set properly to sustain the expected load.

3.3.107 Locating Devices. Devices utilized to locate victims in rescue incidents and structural components, including but not limited to voice, seismic, video, K-9, and fiber optic.

3.3.108 Low Angle. Refers to an environment in which the load is predominantly supported by itself and not the rope rescue system (e.g., flat land or mild sloping surface). [**1670,** 2017]

3.3.109* Lowering System. A rope rescue system used to lower a load under control. [**1670,** 2017]

3.3.110 Maintenance Kits. Items required for maintenance and inspection that include, but are not limited to, manufacturer product specifications; preventive maintenance checklists; periodic logbook records; inventory equipment lists; appropriate fluids, parts, and hardware; and testing instruments as required.

3.3.111 Marking Systems. Various systems used to mark hazards, victim location, and pertinent structural information. *(See Annex E.)*

3.3.112 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. [**1670,** 2017]

3.3.113 Mechanical Advantage System.

3.3.113.1 ***Compound Rope Mechanical Advantage System.*** A combination of individual rope mechanical advantage systems created by stacking the load end of one rope mechanical advantage system onto the haul line of another or others to multiply the forces created by the individual system(s).

3.3.113.2* ***Simple Rope Mechanical Advantage System.*** A rope mechanical advantage system containing a single rope and one or more moving pulleys (or similar devices), all traveling at the same speed and in the same direction, attached directly or indirectly to the load mass, and might contain one or more stationary pulleys (or similar devices), so that the force on the system is distributed approximately evenly among its supporting rope segments.

3.3.114 Member. A person involved in performing the duties and responsibilities of an emergency response organization on a full-time or part-time basis, with or without compensation.

3.3.115* Minimum Primary Reserve Pressure. Minimum permissible breathing gas pressure remaining in a SCUBA diver's primary delivery system on reaching the surface and establishing positive buoyancy.

3.3.116 Nonintersecting Trench. See 3.3.206.2.

3.3.117 One-Call Utility Location Service. A service from which contractors, emergency service personnel, and others can obtain information on the location of underground utilities in any area. [**1670,** 2017]

3.3.118 Packaging. The process of securing a victim in a transfer device, with regard to existing and potential injuries or illness, so as to prevent further harm during movement.

3.3.119 Parbuckling. A technique for moving a load utilizing a simple 2:1 mechanical advantage system in which the load is placed inside a bight formed in a length of rope, webbing, tarpaulin, blanket, netting, and so forth that creates the mechanical advantage, rather than being attached to the outside of the bight with ancillary rope rescue hardware.

3.3.120 Patient Evacuation Team. As related to caves, a specific combination of resources with a leader, personnel, and common equipment assembled for the purpose of evacuating the patient from the cave.

3.3.121 Permit-Required Confined Space. See 3.3.34, Confined Space Entry Permit.

3.3.122 Personal Escape. See 3.3.161, Self-Rescue.

3.3.123* Personal Flotation Device (PFD). A device manufactured in accordance with U.S. Coast Guard specifications that provides supplemental flotation for persons in the water.

3.3.124* Personal Protective Equipment (PPE). The equipment provided to shield or isolate a person from the chemical, physical, or thermal hazards that can be encountered at a specific rescue incident.

3.3.125* Pneumatic Struts. Pneumatic or gas-filled tube and piston assemblies in vehicles or machinery.

3.3.126 Pre-Entry Medical Exam. A baseline medical evaluation of the rescue entrants performed immediately prior to a rescue entry.

3.3.127* Pre-Incident Plan. A document developed by gathering general and detailed data that is used by responding personnel in effectively managing emergencies for the protection of occupants, responding personnel, property, and the environment. [**1620,** 2015]

3.3.128* Protective System. A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. [**1670,** 2017]

3.3.129 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. [**1670,** 2017]

3.3.130 Qualification. Having satisfactorily completed the requirements of the objectives.

3.3.131* Rapid Intervention Crew/Company (RIC). A minimum of two fully equipped personnel on site, in a ready state, for immediate rescue of disoriented, injured, lost, or trapped rescue personnel.

3.3.132 Reach/Extension Device. Any device for water rescue that can be extended to a person in the water so that he or she can grasp it and be pulled to safety without physically contacting the rescuer.

3.3.133 Recovery. Nonemergency operations taken by responders to retrieve property or remains of victims.

3.3.134* Redundant Air System. A system composed of a compressed breathing gas source, pressure gauge, primary and secondary regulator, and a means of affixing the system to the diver so that it will not be dropped or dislodged; is completely independent of the diver's primary air system and is configured to be accessed without delay when the diver is under duress; and of sufficient capacity to permit the diver to ascend to the surface from the maximum recognized operational depth while complying with a prescribed ascent rate and any necessary safety stops.

3.3.135* Registered Professional Engineer. A person who is registered as a professional engineer in the state where the work is to be performed. [**1670,** 2017]

3.3.136 Requisite Equipment. Specific tools and equipment that are critical to performing a specific type of technical rescue.

3.3.137 Rescue. Activities directed at locating endangered persons at an emergency incident, removing those persons

from danger, treating the injured, and providing for transport for the injured to an appropriate health care facility. [**1670,** 2017]

3.3.138 Rescue Area. Sometimes called the "hot," "danger," or "collapse" zone, an area surrounding the incident site (e.g., collapsed structure or trench) that has a size proportional to the hazards that exist.

3.3.139* Rescue Attendant. A rescue team member positioned outside the entrance of a confined space during a rescue incident who monitors the conditions in and immediately adjacent to the space, monitors rescue entrants, and performs rescue duties as assigned.

3.3.140* Rescue Entrant. A confined space rescue team member designated to enter confined spaces for rescue and who meets specified training requirements for each specific space he or she enters.

3.3.141 Rescue Incident. An emergency incident that primarily involves the rescue of persons subject to physical danger and that could include the provision of emergency medical care, but not necessarily. [**1670,** 2017]

3.3.142 Rescue Service. The rescue team designated for confined space rescue by the AHJ.

3.3.143* Rescue Team. A combination of rescue-trained individuals who are equipped and available to respond to and perform technical rescues.

3.3.144* Retrieval Equipment (Retrieval System). Combinations of rescue equipment used for nonentry (external) rescue of persons from confined spaces.

3.3.145 Rigging. The process of building a system to move or stabilize a load.

3.3.146 Rigging Systems. Systems used to move people or loads that can be configured with rope, wire rope, or cable and utilize different means, both mechanical and manual, to move the load.

3.3.147 Rigging Team. As related to caves, a specific combination of resources with a leader, personnel, and common equipment assembled for the purpose of rigging rope systems to negotiate obstacles to assist patient and rescuer movement in or out of the cave.

3.3.148 Risk/Benefit Analysis. A decision made by a responder based on a hazard identification and situation assessment that weighs the risks likely to be taken against the benefits to be gained for taking those risks. [**1670,** 2017]

3.3.149 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. *(See also 3.3.151.2, Life Safety Rope.)*

3.3.149.1* *Large Animal.* Domesticated livestock including, but not limited to, horses, cows, mules, donkeys, goats, llamas, alpacas, pigs, and exotic animals, such as zoo species, wildlife, and excluding household pets. [**1670,** 2017]

3.3.149.2 *Life Safety Rope.* Rope dedicated solely for the purpose of supporting people during rescue, fire fighting, other emergency operations, or during training evolutions. *(See also 3.3.151, Rope.)*

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

3.3.149.4 *Water Rescue Rope.* Rope that floats, has adequate strength for anticipated use, is not weakened to the point of inadequacy for the task by saturation or immersion in water, and is of sufficient diameter to be gripped by bare wet hands.

3.3.150 Rope Rescue Equipment. Components used to build rope rescue systems including life safety rope, life safety harnesses, and auxiliary equipment. [**1670,** 2017]

3.3.151 Rope Rescue System. A system comprised of rope rescue equipment and an appropriate anchor system intended for use in the rescue of a subject. [**1670,** 2017]

3.3.152 SDS. Safety data sheets.

3.3.153 Scene Security. The means used to prevent or restrict entry to the scene of a rescue incident, either during or following the emergency.

3.3.154 Screw Jack. Shoring system component made of sections of threaded bar stock that are incorporated with lengths of pipe or wood.

3.3.155* Secondary Collapse. A subsequent collapse in a building or excavation.

3.3.156 Security Measures. See 3.3.156, Scene Security.

3.3.157 Self-Rescue. Escaping or exiting a hazardous area under one's own power.

3.3.158 Sheeting and Shoring.

3.3.158.1 *Supplemental Sheeting and Shoring.* Sheeting and shoring operations that involve the use of commercial sheeting/shoring systems and/or isolation devices or that involve cutting and placement of sheeting and shoring when greater than 2 ft (0.61 m) of shoring exist below the bottom of the strongback. [**1670,** 2017]

3.3.158.2 *Traditional Sheeting and Shoring.* The use of 4 ft × 8 ft (1.22 m × 2.44 m) sheet panels, with a strongback attachment, supplemented by a variety of conventional shoring options such as hydraulic, screw, and/or pneumatic shores. [**1670,** 2017]

3.3.159 Sheeting or Sheathing. A component of a shoring system with a large surface area supported by the uprights and cross-bracing of the shoring system that is used to retain the earth in position when loose or running soils are encountered.

3.3.160* Shield or Shield System. An engineered structure that is able to withstand the forces imposed on it by a cave-in and thereby protect persons within the structures.

3.3.161 Shore-Based Rescue. Any technique or procedure that provides a means for extracting a person from the water that does not require any member of the rescue team to leave the safety of the shore.

3.3.162 Shoring System. A system that supports unstable surfaces.

3.3.163 Shoring Team. The group of individuals, with established communications and leadership, assigned to construct, move, place, and manage the shoring or shoring system inside the space, trench, or excavation. [**1670,** 2017]

3.3.164 Sides. See 3.3.68, Face(s).

3.3.165* Signaling Device. Any resource that provides a distinct and predictable display, noise, or sensation that can be used to communicate a predetermined message or to attract the attention of other persons as desired by the initiator of the signal.

3.3.166 Size-Up. The ongoing observation and evaluation of factors that are used to develop strategic goals and tactical objectives.

3.3.167* Sloping System. A protecting system that uses inclined excavating to form sides that are inclined away from the excavation so as to prevent cave-in.

3.3.168 Slough-In. A type of collapse characterized by an interior portion of the trench wall spalling out and potentially leaving an overhanging ledge or void that needs to be filled.

3.3.169 Small Machine. Machinery or equipment capable of simple disassembly, or constructed of lightweight materials, presenting simple hazards, which are capable of being controlled by the rescuer(s).

3.3.170 Software (Rope Rescue). A flexible fabric component of rope rescue equipment that can include, but is not limited to, anchor straps, pick-off straps, and rigging slings. [**1670,** 2017]

3.3.171 Soldier Shoring or Skip Shoring. A shoring system that employs a series of uprights spaced at intervals with the exposed soil of the trench wall showing.

3.3.172 Spoil Pile (Spoil). A pile of excavated soil next to the excavation or trench.

3.3.173 Stabilization Points. Key points where stabilization devices can be installed on a vehicle or machine to keep the vehicle or object from moving during rescue operations.

3.3.174 Stabilization System. See 3.3.40, Cribbing.

3.3.175 Standard Operating Guideline. A written organizational directive that establishes or prescribes specific operational or administrative methods to be followed routinely, which can be varied due to operational need in the performance of designated operations or actions. [**1521,** 2015]

3.3.176 Static Loads. Forces applied within a system when the load is not moving.

3.3.177 Stemple. A man-made or natural beam or bar that, when wedged, serves as a removable anchor point.

3.3.178 Structural Load Calculations. Load calculations based on the weight per cubic foot of construction materials such as concrete, steel, and wood.

3.3.179 Structural Support System. See 3.3.166, Shoring System.

3.3.180 Strut. A compression element used in the support of structures, excavation openings, or other loads.

3.3.181 Superimposed Load. See 3.3.187, Surcharge Load.

3.3.182 Support System. A structure, such as underpinning, bracing, or shoring that provides support to an adjacent structure, underground installation, or the sides of an excavation. [**1670,** 2017]

3.3.183 Surcharge Load. Any weight in the proximity of the trench that increases instability or the likelihood of secondary cave-in.

3.3.184 Surface. A base that is secure and conducive to supporting and stabilizing a vehicle or object.

3.3.185 Surface Encumbrance. A natural or man-made structural object adjacent to or in the immediate vicinity of an excavation or trench.

3.3.186 Surface Water Rescue. Rescue of a victim who is afloat on the surface of a body of water.

3.3.187 Swift Water. Water moving at a rate greater than one (1) knot [1.15 mph (1.85 km/hr)]. [**1670,** 2017]

3.3.188* System Safety Check. A method of evaluating the safe assembly of a rescue system.

3.3.189 Tabulated Data. Any set of site-specific design data used by a professional engineer to design a protective system at a particular location. [**1670,** 2017]

3.3.190 Task. A specific job behavior or activity. [**1002,** 2017]

3.3.191 Team. See 3.3.36, Confined Space Rescue Team.

3.3.192 Technical Rescuer. A person who is trained to perform or direct the technical rescue.

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

3.3.194 Technical Search and Rescue Incident. Complex search and/or rescue incidents requiring specialized training of personnel and special equipment to complete the mission.

3.3.195 Throw Bag. A water rescue system that includes 50 ft to 75 ft (15.24 m to 22.86 m) of water rescue rope, an appropriately sized bag, and a closed-cell foam float.

3.3.196 Tide Tables. Schedule of predicted rise and fall of the surface of tidal waters above or below a mean water level at predictable times of each day of the year.

3.3.197 Toe. The point where the trench wall meets the floor of the trench.

3.3.198* Tool Kit. Equipment available to the rescuer as defined in this document.

3.3.199 Traffic Control. The direction or management of vehicle traffic such that scene safety is maintained and rescue operations can proceed without interruption.

3.3.200 Traffic Control Devices. Ancillary equipment/resources used at the rescue scene to facilitate traffic control such as flares, barricades, traffic cones, or barrier tape.

3.3.201 Transfer Device. Various devices, including litters and harnesses, used with rope rescue systems to package and allow safe removal of a subject from a specific rescue environment.

3.3.202* Trench/Trench Excavation. An excavation, narrow in relation to its length, made below the surface of the earth.

3.3.202.1* ***Intersecting Trench.*** A trench where multiple trench cuts or legs converge at a single point.

3.3.202.2 ***Nonintersecting Trench.*** A trench cut in a straight or nearly straight line with no crossing or converging trench legs or cuts.

3.3.203 Trench Box. See 3.3.164, Shield or Shield System.

3.3.204 Trench Floor. The bottom of the trench.

3.3.205 Trench Upright. A vertical support member that spans the distance between the toe of the trench and the trench lip to collect and distribute the force from the opposing wall over a large area.

3.3.206 Triage. The sorting of casualties at an emergency according to the nature and severity of their injuries. [**402,** 2013]

3.3.207 Upright. See 3.3.209, Trench Upright.

3.3.208 Upstream Spotter. An individual with proper alerting equipment tasked with providing notification of impending hazards or changes of conditions that could affect search and/or rescue operations downstream.

3.3.209 Victim Management. The manner of treatment given to those requiring rescue assistance.

3.3.210 Victim Removal System. Those systems used to move a victim to a safe location.

3.3.211 Wales. Also called walers or stringers; horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of a shoring system or earth.

3.3.212 Water Rescue Rope. See 3.3.151.4.

3.3.213 Waterborne Transportation Aid. A nonmotorized watercraft or rescue aid.

3.3.214 Waterbound Victim. A victim that is in the water needing assistance.

3.3.215* Watercraft. Manned vessels that are propelled across the surface of a body of water by means of oars, paddles, water jets, propellers, towlines, or air cushions and are used to transport personnel and equipment while keeping their occupants out of the water.

3.3.216* Watercraft Conveyance. Devices intended for the purpose of transporting, moving, lifting, or lowering watercraft that might be required to be operated prior to and at the conclusion of every watercraft deployment.

3.3.217 Watermanship Skills. Capabilities that include swimming, surface diving, treading water, and staying afloat with a reasonable degree of comfort appropriate to the required task. [**1670,** 2017]

3.3.218 Wedges and Shims. Material used to tighten or adjust cribbing and shoring systems.

3.3.219 Wilderness. A setting in which the delivery of services including search, rescue, and patient care by response personnel is adversely affected by logistical complications, such as an environment that is physically stressful or hazardous to the patient, response personnel, or both; remoteness of the patient's location, such that it causes a delay in the delivery of care to the patient; anywhere the local infrastructure has been compromised enough to experience wilderness-type conditions, such as lack of adequate medical supplies, equipment, or transportation; remoteness from public infrastructure support services; poor to no medical services or potable water; compromised public safety buildings, public utilities or communications systems; city, county, state, provincial, tribal, or national recreational areas or parks with mountains, trails; areas they define as wilderness. [**1670,** 2017]

Chapter 4 Tower Rescue

4.1 Awareness Level. The job performance requirements defined in 4.1.1 through 4.1.5 shall be met prior to awareness-level qualification in tower rescue.

4.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

4.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

4.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, and ventilation and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, function within an incident management system (IMS), follow and implement an incident action plan, report task progress status to supervisor or Incident Command.

4.1.4 Size up an incident, given an incident, background information, and applicable reference materials, so that the operational mode is defined, resource availability and response time are considered, types of rescues are determined, the number of victims is ascertained, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk/benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the IMS, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

4.1.5 Perform a tower rescue using an aerial truck or other similar equipment without ascending the tower, given an incident, the means to transfer the victim to the aerial apparatus, fall protection, and the rescue objective, so that risks to victims and rescue personnel are minimized.

(A) Requisite Knowledge. Standard operating procedure for aerial equipment, specific procedures for using aerial equipment for victim transfer from tower.

(B) Requisite Skills. Perform from or operate aerial equipment capable of accessing and rescuing the tower victim providing positive transfer from the tower to the aerial while providing fall protection to the victim and rescue personnel.

4.2 Operations Level. The job performance requirements defined in Section 5.2, Section 4.1, and 4.2.1 through 4.2.10 shall be met prior to operations-level qualification in tower rescue.

4.2.1 Participate in a prerescue survey given a tower rescue preplan, the specific tower targeted in the preplan, an operations-level tower rescue tool kit, and a tower rescue team, so that the targeted elevation in the tower is attained using the tools and techniques designated for use during a rescue operation, all elements of the rescue plan are implemented, and the full scope of the plan is exercised.

(A) Requisite Knowledge. Tower preplan, contents, and use of the operations-level tower rescue tool kit, and organizations' policies and procedures for operations tower rescue.

(B) Requisite Skills. Tower climbing to the designated height, selection, and transportation of designated tools.

4.2.2 Isolate and manage exposure to potentially harmful energy sources found in erected structures, including power systems such as mechanical, radio frequency (RF), and electrical hazards, given lock-out tag-out (LOTO) equipment and construction materials and PPE, so that all hazards are identified, systems are managed, beneficial system use is evaluated, and hazards to rescue personnel and victims are minimized.

(A) Requisite Knowledge. Types and uses of PPE, hazardous energy monitoring and testing equipment, types of energy sources, system isolation methods, specialized system features, tools for disabling hazards, and policies and procedures of the AHJ.

(B) Requisite Skills. The ability to select and use task- and incident-specific PPE, monitor and test equipment, identify hazards, operate beneficial systems in support of tactical objectives, and operate tools and devices for securing and disabling hazards. Engage in practices that minimize exposure to known or suspected hazards.

4.2.3 Assess the integrity of the tower structure and related components, given an incident, a preclimb checklist, and an unobstructed climb path so that safe access to the victim is assured, and determine any integrated safety systems such as vertical lifelines (cable or rail type structure) are accessible.

(A) Requisite Knowledge. Types of structures within area of response including self-supported lattice type, guyed, monopole, or non-standard type towers, potential structural compromise that would create additional hazards to rescuers.

(B) Requisite Skills. Perform physical inspection of accessible tower components to determine structural integrity to the extent possible.

4.2.4 Recognize, identify, and utilize typical fall protection and work positioning equipment used by climbers, given a specific tower structure, so that the victim can be transferred to the rescue system.

(A) Requisite Knowledge. Review tower rescue preplan to gain familiarity with tower climber safety and work positioning equipment.

(B) Requisite Skills. Operate tower climber safety and work positioning equipment.

4.2.5 Perform an ascent using proper PPE and safe climbing technique equipment, given an incident, so that access to the level of the victim is achieved.

(A) Requisite Knowledge. Determine proper PPE given the type of tower structure and integrated temporary or permanent safety systems to perform safe climbing techniques.

(B) Requisite Skills. Don appropriate PPE, such as but not limited to fall protection, helmet, and gloves as appropriate, and using 100 percent tie off or vertical lifeline equipment systems ascend the tower structure.

4.2.6 Perform transfer between the ladder or climbing peg safety system, given an incident so that tie off is maintained, equipment is utilized, and procedures are followed as part of identified rescue plan.

(A) Requisite Knowledge. Familiarity with the engagement and disengagement procedures from vertical lifeline cable or rope grabs and the use of Y-lanyard and work positioning lanyards.

(B) Requisite Skills. Perform safe transfer between integrated vertical lifeline systems and climbing and maneuvering on the tower structure while maintaining tie off.

4.2.7 Access a victim in a tower environment according to the rescue preplan, given an incident so that the risks from a fall are minimized or eliminated, the patient is accessed, and the objective is achieved.

(A) Requisite Knowledge. Tactics identified in the rescue preplan. An understanding of fall factors and methods for reducing them for a rescuer performing tower climbing operations.

(B) Requisite Skills. The ability to implement the tactics and employ the tools identified in the preplan to achieve the objective.

4.2.8 Perform removal of a victim suspended from rope, webbing, or integrated safety system in a tower environment, given an incident, methods requiring up to a 15-degree deviation from plumb and can be performed with a tag line and a rescue preplan, so that there is a means of removal of the victim to the ground, risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the elements of the preplan are maintained, and the objective is achieved.

(A) Requisite Knowledge. Tactics identified in the rescue preplan for the removal of a victim suspended from rope, webbing, or integrated safety system.

(B) Requisite Skills. Employ tactics identified in the rescue preplan for the removal of a victim suspended from rope, webbing, or integrated safety system.

4.2.9 Direct a team in removal of a victim suspended from rope, webbing, or integrated safety system in a tower environment given an incident, methods requiring up to a 15-degree deviation from plumb and can be performed with a tag line, a rescue preplan, a means of removal of the victim to the ground or other safe area, so that risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the elements of the preplan are maintained, and the objective is achieved.

(A) Requisite Knowledge. Tactics identified in the rescue preplan for the removal of a victim suspended from rope, webbing, or integrated safety system.

(B) Requisite Skills. Direct the employment of tactics identified in the rescue preplan for the removal of a victim suspended from rope, webbing, or integrated safety system.

4.2.10 Develop and adhere to contingency plans for when inclement weather or other factors make operations-level response ineffective or dangerous to rescuers, given an incident so that a risk/benefit decision can be made.

(A) Requisite Knowledge. (Reserved)

(B) Requisite Skills. (Reserved)

4.2.11* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

4.3 Technician Level. The job performance requirements defined in Section 4.2 and 4.3.1 through 4.3.5 shall be met prior to technician-level qualification in tower rescue.

4.3.1 Direct a tower rescue team, given a tower rescue technician-level scenario, incident action plan, preincident plan data, and resources from the tower rescue tool kit, so that resources are deployed to best advantage, the incident action plan is supported, and objectives are attained.

(A) Requisite Knowledge. AHJ policies and procedures, incident management, site safety and hazard control techniques, and preplan usage.

(B) Requisite Skills. Interpret and apply policies and protocols, initiate and operate within the IMS, situational awareness, interpret and apply preincident planning data, risk management, and site safety control techniques.

4.3.2* Develop an incident action plan for a technician-level tower rescue incident on a structure that might accommodate only one rescuer, given an unfamiliar (not preplanned) tower rescue scenario, so that a climbing path plan is established in the absence of an integrated ladder, climbing pegs, or an integrated vertical lifeline, hazardous energy sources are identified and managed, fall protection is maintained throughout the event, anchor points are identified and utilized to best advantage, and the incident application plan objectives are met.

(A) Requisite Knowledge. AHJ policies and procedures, data gathering and collection methods, climbing plan elements, anchor point identification and construction methods, hazardous energy source recognition, identification and control methods, free climb ascent and descent techniques, and fall protection methods.

(B) Requisite Skills. Size-up and assessment, hazard identification and control, identification and control of hazardous energy sources, use of monitoring equipment to detect hazardous energy sources, construction of anchor and belay systems, and selection of PPE and other resources from the tower rescue tool kit.

4.3.3* Ascend a simulated or actual tower to conduct a technician-level rescue, given an incident action and site safety plan, so that a pre-climb checklist is used, fall protection systems are utilized, horizontal lifelines are utilized, the rescuer transitions between structural elements of the tower and the rescue system, and the objectives of the incident action plan are attained in a safe and expedient manner.

(A) Requisite Knowledge. Incident action plan data, preclimb checklist data, identification of site specific tower features and components, type- and hazard-specific PPE selection, and climbing plan development.

(B) Requisite Skills. Use of incident action plans, development and use of preclimbing checklists and site safety plans, types of fall protection and lifeline systems, tower anatomy and features, climbing techniques and methods, ground-based tower rescue techniques.

4.3.4 Perform a technician-level ground-based tower rescue requiring the release of an entrapped victim from an elevated position, given an incident action plan, climbing plan, task-specific PPE, and resources from the tower rescue tool kit, so that the victim is released/transferred from an existing fall arrest system to one created by the rescuer, and the victim

moved both horizontally and vertically a distance representative of demonstrating competency.

(A) Requisite Knowledge. Incident action plan data, hazard and risk assessment, climbing plan elements, PPE selection and use, types of fall protection systems, fall protection system transfer procedures, and horizontal and vertical movement methods.

(B) Requisite Skills. Data collection and analysis, scene assessment, hazard control techniques, PPE use and application, fall protection system operation, horizontal and vertical climbing and movement techniques.

4.3.5 Perform a technician-level tower-based rescue requiring the release of an entrapped victim from an elevated position in excess or a height allowing for ground-based rescue, given an incident action plan, climbing plan, task-specific PPE, and resources from the tower rescue tool kit, so that the victim is released/transferred from an existing fall arrest system to one created by the rescuer and the victim is moved both horizontally and vertically a distance representative of demonstrating competency.

(A) Requisite Knowledge. Incident action plan data, hazard and risk assessment, climbing plan elements, PPE selection and use, types of fall protection systems, fall protection system transfer procedures, and horizontal and vertical movement methods.

(B) Requisite Skills. Data collection and analysis, scene assessment, hazard control techniques, PPE use and application, fall protection system operation, horizontal and vertical climbing and movement techniques, and tower-based rescue techniques including multi-pitch techniques.

Chapter 5 Rope Rescue

5.1 Awareness Level. The job performance requirements defined in 5.1.1 through 5.1.7 shall be met prior to awareness level qualification in rope rescue.

5.1.1 Recognize the need for support resources, given a specific type of rescue incident, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operation facilitates rescue operational objectives.

(A) Requisite Knowledge. Equipment organization and tracking methods, lighting resource type(s), shelter and thermal control options, and rehab criteria.

(B) Requisite Skills. The ability to track equipment inventory, identify lighting resources and structures for shelter and thermal protection, select rehab areas, and manage personnel rotations.

5.1.2 Recognize incident hazards and initiate isolation procedures, given scene control barriers, personal protective equipment (PPE), requisite equipment, and available specialized resources, so that all hazards are identified, resource application fits the operational requirements, hazard isolation is considered, risks to rescuers and victims are minimized, and rescue time constraints are taken into account.

(A) Requisite Knowledge. Resource capabilities and limitations, types and nature of incident hazards, equipment types and their use, isolation terminology, methods, equipment and implementation, operational requirement concerns, common types of rescuer and victim risk, risk/benefit analysis methods and practices, and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess victim viability (risk/benefit), utilize technical references, place scene control barriers, and operate control and mitigation equipment.

5.1.3 Recognize needed resources for a rescue incident, given incident information, a means of communication, resources, tactical worksheets, personnel accountability protocol, applicable references, and standard operating procedures, so that references are utilized, personnel are accounted for, necessary resources are deployed to achieve desired objectives, incident actions are documented, rescue efforts are coordinated, the command structure is established, task assignments are communicated and monitored, and actions are consistent with applicable regulations.

(A) Requisite Knowledge. Incident management system; tactical worksheet application and purposes; accountability protocols; resource types and deployment methods; documentation methods and requirements; availability, capabilities, and limitations of rescuers and other resources; communication problems and needs; communications requirements, methods, and means; types of tasks and assignment responsibilities; policies and procedures of the agency; and technical references related to the type of rescue incident.

(B) Requisite Skills. The ability to implement an incident management system, complete tactical worksheets, use reference materials, evaluate incident information, match resources to operational needs, operate communications equipment, manage incident communications, and communicate in a manner so that objectives are met.

5.1.4 Initiate a discipline-specific search, given hazard-specific PPE, equipment pertinent to search mission, an incident location, and victim investigative information, so that search parameters are established; the victim profile is established; the entry and exit of all people either involved in the search or already within the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims are located as quickly as possible; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.

(A) Requisite Knowledge. Local policies and procedures and how to operate in the site-specific search environment.

(B) Requisite Skills. The ability to enter, maneuver in, and exit the search environment and provide for and perform self-escape/self-rescue.

5.1.5* Perform ground support operations for helicopter activities, given a rescue scenario/incident, helicopter, operational plans, PPE, requisite equipment, and available specialized resources, so that rescue personnel are aware of the operational characteristics of the aircraft and demonstrate operational proficiency in establishing and securing landing zones and communicating with aircraft personnel until the assignment is complete.

(A) Requisite Knowledge. Ground support operations relating to helicopter use and deployment, operation plans for heli-

copter service activities, type-specific PPE, aircraft familiarization and hazard areas specific to helicopters, scene control and landing zone requirements, aircraft safety systems, and communications protocols.

(B) Requisite Skills. The ability to provide ground support operations, review standard operating procedures for helicopter operations, use PPE, establish and control landing zones, and communicate with aircrews.

5.1.6 Initiate triage of victims, given triage tags and local protocol, so that rescue versus recovery factors are assessed, triage decisions reflect resource capabilities, severity of injuries is determined, and victim care and rescue priorities are established in accordance with local protocol.

(A) Requisite Knowledge. Types and systems of triage according to local protocol, resource availability, methods to determine injury severity, ways to manage resources, and prioritization requirements.

(B) Requisite Skills. The ability to use triage materials, techniques, and resources and to categorize victims correctly.

5.1.7 Assist a team in operation of the haul line of a rope mechanical advantage system raising operation, given rescue personnel, an established rope rescue system, a load to be moved, and an anchor system, so that the movement is controlled; a reset is accomplished; the load can be held in place when needed; commands are followed in direction of the operation; and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Principles of mechanical advantage, operation of a haul line in a raising operation, personnel assignments, and operational commands.

(B) Requisite Skills. The ability to recognize operational commands and identify safety concerns during raising operations.

5.2 Operations Level. The job performance requirements defined in Section 5.1 and 5.2.1 through 5.2.27 shall be met prior to operations-level qualification in rope rescue.

5.2.1 Perform size up a rescue incident, given background information and applicable reference materials, so that the type of rescue is determined, the number of victims is identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read technical rescue reference materials, gather information, relay information, and use information gathering sources.

5.2.2* Inspect and maintain hazard-specific PPE, given clothing or equipment for the protection of the rescuers, cleaning and sanitation supplies, maintenance logs or records, and such tools and resources as are indicated by the manufacturer's guidelines for assembly or disassembly of components during repair or maintenance, so that damage, defects, and wear are identified and reported or repaired, equipment functions as designed, and preventive maintenance has been performed and documented consistent with the manufacturer's recommendations.

(A) Requisite Knowledge. Functions, construction, and operation of PPE; use of recordkeeping systems of the AHJ; requirements and procedures for cleaning, sanitizing, and infectious disease control; use of provided assembly and disassembly tools; manufacturer and department recommendations; pre-use inspection procedures; and ways to determine operational readiness.

(B) Requisite Skills. The ability to identify wear and damage indicators for PPE; evaluate operational readiness of PPE; complete logs and records; use cleaning equipment, supplies, and reference materials; and select and use tools specific to the task.

5.2.3* Inspect and maintain rescue equipment, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, equipment replacement protocol, and organizational standard operating procedure, so that the operational status of equipment is verified and documented, all components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement protocol are correctly disposed of and changed.

(A) Requisite Knowledge. Functions and operations of rescue equipment, use of recordkeeping systems, manufacturer and organizational care and maintenance requirements, selection and use of maintenance tools, replacement protocol and procedures, disposal methods, and organizational standard operating procedures.

(B) Requisite Skills. The ability to identify wear and damage indicators for rescue equipment, evaluate operation readiness of equipment, complete logs and records, and select and use maintenance tools.

5.2.4* Demonstrate knots, bends, and hitches, given ropes, webbing, and a list of knots used by the agency, so that the knots are dressed, recognizable, and backed up as required.

(A) Requisite Knowledge. Knot efficiency, knot utilization, rope construction, and rope terminology.

(B) Requisite Skills. The ability to tie representative knots, bends, or hitches for the following purposes:

(1) End-of-line loop
(2) Midline loop
(3) Securing rope around desired objects
(4) Joining rope or webbing ends together
(5) Gripping rope

5.2.5 Construct a single-point anchor system, given life safety rope and other auxiliary rope rescue equipment, so that the chosen anchor system fits the incident needs, meets or exceeds the expected load, and does not interfere with rescue operations, an efficient anchor point is chosen, the need for redundant anchor points is assessed and used as required, the anchor system is inspected and loaded prior to being placed into service, and the integrity of the system is maintained throughout the operation.

(A) Requisite Knowledge. Application of knots, rigging principles, anchor selection criteria, system safety check procedures, rope construction, and rope rescue equipment applications and limitations.

(B) Requisite Skills. The ability to select rope and equipment; tie knots; rig systems; evaluate anchor points for required strength, location, and surface contour; and perform a system safety check.

5.2.6 Construct a multiple-point anchor system, given life safety rope and other auxiliary rope rescue equipment, so that the chosen anchor system fits the incident needs, the system strength meets or exceeds the expected load and does not interfere with rescue operations, equipment is visually inspected prior to being put in service, the nearest anchor point that will support the load is chosen, the anchor system is system safety checked prior to being placed into service, the integrity of the system is maintained throughout the operation, and weight will be distributed between more than one anchor point.

(A)* Requisite Knowledge. Relationship of angles to forces created in the rigging of multiple-point anchor systems, safety issues in choosing anchor points, system safety check methods that allow for visual and physical assessment of system components, methods to evaluate the system during operations, integrity concerns, weight distribution issues and methods, knots and applications, selection and inspection criteria for hardware and software, formulas needed to calculate safety factors for load distribution, and the concepts of static loads versus dynamic loads.

(B) Requisite Skills. The ability to determine incident needs as related to choosing anchor systems, select effective knots, determine expected loads, evaluate incident operations as related to interference concerns and setup, choose anchor points, perform a system safety check, and evaluate system components for compromised integrity.

5.2.7 Conduct a system safety check, given a rope rescue system and rescue personnel, so that a physical/visual check of the system is made to ensure proper rigging, a load test is performed prior to life-loading the system, and verbal confirmation of these actions is announced and acknowledged before life-loading the rope rescue system.

(A) Requisite Knowledge. System safety check procedures, construction and operation of rope rescue systems and their individual components, use of PPE, equipment inspection criteria, signs of equipment damage, principles of rigging, and equipment replacement criteria.

(B) Requisite Skills. The ability to apply and use PPE, inspect rope rescue system components for damage, assess a rope rescue system for configuration, secure equipment components, inspect all rigging, and perform a system safety check.

5.2.8 Place edge protection, given life safety rope or webbing traversing a sharp or abrasive edge, edge protection, and other auxiliary rope rescue equipment, so that the rope or webbing is protected from abrasion or cutting, the rescuer is safe from falling while placing the edge protection, the edge protection is secure, and the rope or webbing is securely placed on the edge protection.

(A) Requisite Knowledge. Materials and devices that can be used to protect ropes or webbing from sharp or abrasive edges, fall protection measures, dangers associated with sharp or abrasive edges, and methods for negotiation of sharp or abrasive edges.

(B) Requisite Skills. The ability to select protective devices for rope and webbing, provide personnel fall protection while working near edges, secure edge protection, and secure ropes or webbing in a specific location.

5.2.9* Construct a belay system, given life safety rope, anchor systems, PPE, and rope rescue equipment, so that the system is capable of arresting a fall, a fall will not result in system failure, the system is not loaded unless actuated, actuation of the system will not injure or otherwise incapacitate the belayer, the belayer is not rigged into the equipment components of the system, and the system is suitable to the site and is connected to an anchor system and the load.

(A) Requisite Knowledge. Principles of belay systems, capabilities and limitations of various belay devices, application of knots, rigging principles, and system safety check procedures.

(B) Requisite Skills. The ability to select a system, tie knots, perform rigging, attach to anchor system and load, don and use task-specific PPE, and perform a system safety check

5.2.10 Operate a belay system during a lowering or raising operation, given an operating lowering or raising mechanical advantage system, a specified minimum travel distance for the load, a belay system, and a load, so that the potential fall factor is minimized, the belay device system is not actuated during operation of the primary rope rescue system, the belay system is prepared for actuation at all times during the operation, the belayer is attentive at all times during the operation, the load's position is continually monitored, and the belayer moves rope through the belay device as designed.

(A) Requisite Knowledge. Application and use of belay devices, proper operation of belay systems in conjunction with normal lowering and raising operations, and operational commands.

(B) Requisite Skills. The ability to tend a belay system as designed, tie approved knots, assess system effectiveness, properly attach a belay line to a belay device, don and use task-specific PPE, perform a system safety check, and manage and communicate belay system status effectively.

5.2.11* Belay a falling load in a high-angle environment, given a belay system and a dropped load, so that the belay line is not taut until the load is falling, the belay device is actuated when the load falls, the fall is arrested in a manner that minimizes the force transmitted to the load, the belayer utilizes the belay system as designed, and the belayer is not injured or otherwise incapacitated during actuation of the belay system.

(A) Requisite Knowledge. Application and use of belay devices, effective emergency operation of belay devices to arrest falls, use of PPE, and operating procedures.

(B) Requisite Skills. The ability to operate a belay system as designed, tie approved knots, use task-specific PPE, recognize and arrest a falling load, and communicate belay system actuation.

5.2.12 Construct a fixed rope system, given an anchor system, a life safety rope, and rope rescue equipment, so that the system constructed can accommodate the load, is efficient, and is connected to an anchor system and the load, and a system

safety check is performed and the results meet the incident requirements for descending or ascending operations.

(A) Requisite Knowledge. Knot selection, calculating expected loads, incident evaluation operations as related to interference concerns and setup, rigging principles, system safety check procedures, and methods of evaluating system components for compromised integrity.

(B) Requisite Skills. The ability to select effective knots, calculate expected loads, use rigging principles, evaluate incident operations as related to interference concerns and setup, perform a system safety check, and evaluate system components for compromised integrity.

5.2.13* Ascend a fixed rope in a high-angle environment, given an anchored fixed rope system, a specified minimum distance for the rescuer, a system to allow ascent of a fixed rope, a structure, a belay system, a life safety harness worn by the person ascending, and PPE, so that the person ascending is secured to the fixed rope in a manner that will not allow him or her to fall; the person ascending is attached to the rope by means of an ascent control device(s) with at least two points of contact; injury to the person ascending is minimized; the person ascending can stop at any point on the fixed rope and rest suspended by his or her harness; the system will not be stressed to the point of failure; the person ascending can convert his or her ascending system to a descending system; obstacles are negotiated; the system is suitable for the site; and the objective is reached.

(A) Requisite Knowledge. Task-specific selection criteria for life safety harnesses and systems for ascending a fixed rope, PPE selection criteria, design and intended purpose of ascent control devices utilized, rigging principles, techniques for high-angle environments, converting ascending systems to descending systems, and common hazards posed by maneuvering and harnessing.

(B) Requisite Skills. The ability to select and use rescuer harness, a system for ascending a fixed rope, and PPE for common environments; attach the life safety harness to the rope rescue system; configure ascent control devices to form a system for ascending a fixed rope; make connections to the ascending system; maneuver around existing environment and system-specific obstacles; convert the ascending system to a descending system while suspended from the fixed rope; and evaluate surroundings for potential hazards.

5.2.14* Descend a fixed rope in a high-angle environment, given an anchored fixed-rope system, a specified minimum travel distance for the rescuer, a system to allow descent of a fixed rope, a belay system, a life safety harness worn by the person descending, and PPE, so that the person descending is attached to the fixed rope in a manner that will not allow him or her to fall; the person descending is attached to the rope by means of a descent control device; the speed of descent is controlled; injury to the person descending is minimized; the person descending can stop at any point on the fixed rope and rest suspended by his or her harness; the system will not be stressed to the point of failure; the system is suitable for the site; and the objective is reached.

(A) Requisite Knowledge. Task-specific selection criteria for life safety harnesses and systems for descending a fixed rope; PPE selection criteria; design, intended purpose, and operation of descent control devices utilized; safe rigging principles; techniques for high-angle environments; and common hazards posed by maneuvering and harnessing.

(B) Requisite Skills. The ability to select and use rescuer harness, a system for descending a fixed rope, and PPE for common environments; attach the life safety harness to the rope rescue system; make attachment of the descent control device to the rope and life safety harness; operate the descent control device; maneuver around existing environment and system-specific obstacles; and evaluate surroundings for potential hazards.

5.2.15 Demonstrate the ability to escape from a jammed or malfunctioning device during a fixed rope descent in a high-angle environment, given an anchored fixed-rope system with a simulated malfunctioning descent control device, a system to allow escape from the malfunctioning device, a belay system, a life safety harness worn by the person descending, and PPE, so that the person descending is attached to the fixed rope in a manner that will not allow him or her to fall; the person descending is attached to the rope by means of a descent control device; the means for escape will allow the rescuer to escape either upward or downward from the malfunctioning descent control device; injury potential to the rescuer is minimized; the system will not be stressed to the point of failure; the system is suitable for the site; and the objective is reached.

(A) Requisite Knowledge. Task-specific selection criteria for escape equipment and methods used for escape from a malfunctioning descent control device; PPE selection criteria; design, intended purpose, and operation of escape systems utilized; safe rigging principles; techniques for high-angle environments; and common hazards posed by malfunctioning descent control devices.

(B) Requisite Skills. The ability to select and use rescuer harness, a system for escaping a malfunctioning descent control device, and PPE for common environments; attach the life safety harness to the rope rescue system; make attachment of the descent control device to the rope and life safety harness; attach and operate the escape system to remove the rescuer from the malfunctioning descent control device while maintaining patent attachment to the fixed rope and belay; use the escape system to maneuver upward or downward from the malfunctioning descent control device; and evaluate surroundings for potential hazards.

5.2.16 Construct a lowering system, given an anchor system, life safety rope(s), descent control device, and auxiliary rope rescue equipment, so that the system can accommodate the load, is efficient, is capable of controlling the descent, is capable of holding the load in place or lowering with minimal effort over the required distance, and is connected to an anchor system and the load.

(A) Requisite Knowledge. Capabilities and limitations of various descent control devices, capabilities and limitations of various lowering systems, application of knots, rigging principles, and system safety check procedures.

(B) Requisite Skills. The ability to tie knots; perform rigging; attach to descent control device, anchor system, and load; and perform a system safety check.

5.2.17* Direct a lowering operation in a high-angle environment, given rescue personnel, an established lowering system, a specified minimum travel distance for the load, and a load to be moved, so that the movement is controlled, the load can be

held in place when needed, operating methods do not stress the system to the point of failure, rope commands are used to direct the operation, and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Application and use of descent control devices, capabilities and limitations of various lowering systems in a high-angle environment, operation of lowering systems in a high-angle environment, personnel assignments, and operational commands.

(B) Requisite Skills. The ability to direct personnel, use operational commands, analyze system efficiency, manage movement of the load in a high-angle environment, identify safety concerns in a high-angle environment, and perform a system safety check.

5.2.18 Construct a simple rope mechanical advantage system, given life safety rope, carabiners, pulleys, rope grab devices, and auxiliary rope rescue equipment, so that the system constructed can accommodate the load, is efficient, and is connected to an anchor system and the load.

(A) Requisite Knowledge. Principles of mechanical advantage, capabilities and limitations of various simple rope mechanical advantage systems, application of knots, rigging principles, and system safety check procedures.

(B) Requisite Skills. The ability to select rope and equipment, tie knots, choose and rig systems, attach the mechanical advantage system to the anchor system and load, and perform a system safety check.

5.2.19* Direct a team in the operation of a simple rope mechanical advantage system in a high-angle raising operation, given rescue personnel, an established rope rescue system incorporating a simple rope mechanical advantage system, a specified minimum travel distance for the load, a load to be moved, and an anchor system, so that the movement is controlled, a reset is accomplished, the load can be held in place when needed, operating methods do not stress the system to the point of failure, commands are used to direct the operation, and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Principles of mechanical advantage, capabilities and limitations of various simple rope mechanical advantage systems and high-angle raising operations, correct operation of simple rope mechanical advantage systems, personnel assignments, and operational commands.

(B) Requisite Skills. The ability to direct personnel effectively, use operational commands, analyze system efficiency, identify safety concerns, and perform a system safety check.

5.2.20 Construct a compound rope mechanical advantage system, given a load, an anchor system, life safety rope, carabiners, pulleys, rope grab devices, and rope rescue equipment, so that the system constructed accommodates the load and reduces the force required to lift the load, operational interference is factored and minimized, the system is efficient, a system safety check is completed, and the system is connected to an anchor system and the load.

(A) Requisite Knowledge. Determination of incident needs as related to choosing compound rope systems, the elements of efficient design for compound rope systems, knot selection, methods for reducing excessive force to system components, evaluation of incident operations as related to interference concerns and setups, rope commands, rigging principles, system safety check procedures, and methods of evaluating system components for compromised integrity.

(B) Requisite Skills. The ability to determine incident needs as related to choosing compound rope systems, select effective knots, calculate expected loads, evaluate incident operations as related to interference concerns and setups, perform a system safety check, and evaluate system components for compromised integrity.

5.2.21* Direct the operation of a compound rope mechanical advantage system in a high-angle environment, given a rope rescue system incorporating a compound rope mechanical advantage system and a load to be moved, and a specified minimum travel distance for the load, so that a system safety check is performed; a reset is accomplished, and the movement is controlled; the load can be held in place when needed; operating methods do not stress the system to the point of failure; operational commands are clearly communicated; and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Methods to determine incident needs, types of interference concerns, rope commands, system safety check protocol, procedures for continued evaluation of system components for compromised integrity, common personnel assignments and duties, common and critical commands, methods for controlling a load's movement, system stress issues during operations, and management methods for common problems.

(B) Requisite Skills. The ability to determine incident needs, evaluate incident operations as related to interference concerns, complete a system safety check, continually evaluate system components for compromised integrity, direct personnel effectively, communicate commands, analyze system efficiency, manage load movement, and identify concerns.

5.2.22 Negotiate an edge while attached to a rope rescue system during a high-angle lowering and raising operation, given a rope rescue system, a specified minimum travel distance for the rescuer, life safety harnesses, an edge to negotiate during the lower and raise, and specialized equipment necessary for the environment, so that risk to the rescuer is minimized; the means of attachment to the rope rescue system is secure; and all projections and edges are negotiated while minimizing risks to the rescuer or equipment.

(A) Requisite Knowledge. Techniques and practices for negotiating existing projections and edges along the travel path while suspended from operating rope-based lowering and raising mechanical advantage systems and common hazards imposed by those projections and edges.

(B) Requisite Skills. The ability to select and use rescuer harness and PPE for common environments, attach the life safety harness to the rope rescue system, maneuver across existing projections and an edge along the travel path, and evaluate surroundings for potential hazards.

5.2.23 Access, assess, stabilize, package, and transfer victims, given diagnostic and packaging equipment and an actual or simulated EMS agency, so that rescuers and victim are protected from hazards, the victim's injuries or illnesses are managed, and the victim is delivered to the appropriate EMS provider with information regarding the history of the rescue activity and victim's condition.

(A) Requisite Knowledge. Victim and scene assessment methods; victim treatment, immobilization, and packaging methods; and medical information management and communication methods.

(B) Requisite Skills. The ability to use victim immobilization, packaging, and treatment methods appropriate to the situation and provide victim transfer reports, both verbally and in written format.

5.2.24 Direct a litter-lowering and litter-raising operation in a low-angle environment, given rescue personnel, litter tender(s), an established lowering/mechanical advantage system, a specified minimum travel distance for the load and a victim packaged in a litter to be moved, so that the litter is attached to the lowering/raising and belay systems, movement is controlled; litter tender(s) are used to manage the litter during the lower and raise, the litter can be held in place when needed; operating methods do not stress the system to the point of failure; rope commands are used to direct the operation; and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Application and use of lowering and mechanical advantage system in the low-angle environment, capabilities and limitations of various lowering and mechanical advantage systems in a low-angle environment, litter tender functions and limitations in the low-angle environment, management of a litter in a low-angle environment during raises and lowers, personnel assignments, and operational commands.

(B) Requisite Skills. The ability to direct personnel, use operational commands, analyze system efficiency, manage movement of the litter in a high-angle environment, identify safety concerns in a high-angle litter operation, and perform a system safety check.

5.2.25* Operate as a litter tender in a low-angle lowering or raising operation, given a rope rescue system, a specified minimum travel distance for the litter tender, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to victims and rescuers are minimized; the means of attachment to the rope rescue system is secure; and the terrain is negotiated while minimizing risks to equipment or persons.

(A) Requisite Knowledge. Task-specific selection criteria for life safety harnesses, PPE selection criteria, variations in litter design and intended purpose, low-angle litter attachment principles, techniques and practices for low-angle environments, and common hazards imposed by the terrain.

(B) Requisite Skills. The ability to select and use rescuer harness and PPE for common environments, attach the life safety harness to the rope rescue system, maneuver across the terrain, manage the litter while suspended from the rope rescue system, and evaluate surroundings for potential hazards.

5.2.26* Direct a litter-lowering or litter-raising operation in a high-angle environment, given rescue personnel, an established lowering/mechanical advantage system, a specified minimum travel distance for the load, a victim packaged in a litter to be moved, and a means for negotiating edges and projections along the travel path, so that the litter is attached to the lowering/raising and belay systems, an edge is negotiated during a lower and raise; tag lines are used to manage the litter during the lower and raise; the litter can be held in place when needed; operating methods do not stress the system to the point of failure; rope commands are used to direct the operation; and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Application and use of lowering and mechanical advantage system in the high-angle environment, capabilities and limitations of various lowering and mechanical advantage systems in a high-angle environment, use of tag lines for management of litter position during high-angle lowers and raises, personnel assignments, and operational commands.

(B) Requisite Skills. The ability to direct personnel, use operational commands, analyze system efficiency, manage movement of the litter in a low-angle environment, identify safety concerns in a low-angle environment, and perform a system safety check.

5.2.27* Terminate a technical rescue operation, given an incident scenario, assigned resources, and site safety data, so that rescuer risk and site safety are managed, scene security is maintained and custody transferred to a responsible party, personnel and resources are returned to a state of readiness, recordkeeping and documentation occur, and post event analysis is conducted.

(A) Requisite Knowledge. Incident Command functions and resources, hazard identification and risk management strategies, logistics and resource management, personnel accountability systems, and AHJ-specific procedures or protocols related to personnel rehab.

(B) Requisite Skills. Hazard recognition, risk analysis, use of site control equipment and methods, use of data collection and management systems, and use of asset and personnel tracking systems.

5.3 Technician Level. The job performance requirements defined in Section 5.2 and 5.3.1 through 5.3.6 shall be met prior to technician level qualification in rope rescue.

5.3.1 Direct a team in the operation of a rope rescue system to remove a victim stranded on or clinging to a natural or manmade feature in a high-angle environment, given a victim stranded on or clinging to a feature and a means of removal of the victim to the ground or other safe area, so that risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the victim is removed and brought to a safe area for transfer to EMS.

(A) Requisite Knowledge. Techniques and systems for safe transfer of stranded victims from a natural or man feature, various techniques for handling stranded victims without inducing a fall.

(B) Requisite Skills. Select and construct systems for rapid removal of stranded victims from natural or manmade features, manage operation of the selected system, determine condition of the stranded victim, reduce hazards for rescuers and victims, and determine specialized equipment needs for victim movement.

5.3.2 Direct a team in the operation of a rope rescue system to remove a victim suspended from rope or webbing in a high-angle environment, given a victim suspended by a harness attached to anchored rope or webbing, systems for removal of the victim from the rope or webbing, and a means of removal

of the victim to the ground or other safe area, so that risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the victim is removed from the rope or webbing, and the victim is brought to a safe area for transfer to EMS.

(A)* Requisite Knowledge. Techniques and systems for safe transfer of suspended victims from an existing anchored rope or webbing to a rope rescue system, various techniques for handling suspended victims, and principles of suspension-induced injuries.

(B) Requisite Skills. Select and construct systems for rapid removal of victims from lanyards or rope or webbing, manage operation of the selected system, determine condition of the suspended victim, reduce hazards for rescuers and victims, and determine specialized equipment needs for victim movement.

5.3.3* While suspended from a rope rescue system, perform the transfer and movement of a victim suspended from rope or webbing in a high-angle environment to a separate rope rescue lowering or mechanical advantage system, given a rope rescue system, a specified minimum travel distance for the victim, victim transfer systems, and specialized equipment necessary for the environment, so that risks to victims and rescuers are minimized; undesirable victim movement during the transfer is minimized; the means of attachment to the rope rescue system is maintained; the victim is removed from the static line and lowered or raised to a stable surface; victim positioning is managed to reduce adverse effects associated with suspension-induced injuries; selected specialized equipment facilitates efficient victim movement; and the victim can be transported to the local EMS provider.

(A) Requisite Knowledge. Task-specific selection criteria for victim transfer systems, various physical and psychological victim management techniques, PPE selection criteria, design characteristics and intended purpose of various transfer systems, rigging principles, cause and effects of suspension-induced injuries, methods to minimize common environmental hazards, and hazards created in high-angle environments.

(B) Requisite Skills. The ability to choose victim transfer systems, select and use PPE appropriate to the conditions, perform a transfer of the victim from a static line to the lowering or mechanical advantage system, reduce hazards for rescuers and victims, and determine specialized equipment needs for victim movement.

5.3.4* Perform the activities of a litter tender in a high-angle lowering or raising operation, given a rope rescue system, a specified minimum travel distance for the litter tender, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to victims and rescuers are minimized; the means of attachment to the rope rescue system is secure; and the travel path is negotiated while minimizing risks to equipment or persons.

(A) Requisite Knowledge. Task-specific selection criteria for life safety harnesses, PPE selection criteria, variations in litter design and intended purpose, high-angle litter attachment principles, techniques and practices for high-angle environments, and common hazards imposed by the various structures and terrain.

(B) Requisite Skills. The ability to select and use rescuer harness and PPE for common environments, attach the life safety harness to the rope rescue system, maneuver the litter past obstacles or natural structural features, manage the litter while attached to the rope rescue system, and evaluate surroundings for potential hazards.

5.3.5* Participate as a member of a team in the construction of a rope rescue system intended to move a suspended rescue load along a horizontal path to avoid an obstacle, given rescue personnel, life safety rope, rope rescue equipment, and a suitable anchor capable of supporting the load, so that personnel assignments are made and clearly communicated; the system constructed can accommodate the load; tension applied within the system will not exceed the rated capacity of any of its components' parts; a system safety check is performed; movement on the load is efficient; and loads can be held in place or moved with minimal effort over the required distance.

(A) Requisite Knowledge. Determination of incident needs as related to operation of a system, capabilities and limitations of various systems (including capacity ratings), methods for limiting excessive force to system components, incident site evaluation as related to interference concerns and obstacle negotiation, rigging principles, system safety check protocol, common personnel assignments and duties, common and critical operational commands, and common problems and ways to minimize these problems during construction.

(B) Requisite Skills. The ability to determine incident needs as related to construction of a system, evaluate an incident site as related to interference concerns and setup, identify the obstacles or voids to be negotiated, select a system for defined task, perform system safety checks, use rigging principles that will limit excessive force to system components, and communicate with personnel effectively.

5.3.6* Direct a team in the operation of a rope system to move a suspended rescue load along a horizontal path, given rescue personnel, an established system, a target for the load, a load to be moved, and PPE, so that the movement is controlled; the load is held in place when needed; operating methods do not stress the system to the point of failure; personnel assignments are made; tasks are communicated; and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Determination of incident needs as related to the operation of a system, capabilities and limitations of various systems, incident site evaluation as related to interference concerns and obstacle negotiation, system safety check protocol, procedures to evaluate system components for compromised integrity, common personnel assignments and duties, common and critical operational commands, common problems and ways to minimize or manage those problems, and ways to increase the efficiency of load movement.

(B) Requisite Skills. The ability to determine incident needs, complete a system safety check, evaluate system components for compromised integrity, select personnel, communicate with personnel effectively, manage movement of the load, and evaluate for any potential problems.

5.3.7 Climb, ascend, descend, and traverse natural features or man-made structures that require the use of climbing aids, positioning equipment, or fall protection systems to prevent the fall or unwanted movement of the rescuer, given the equipment used by the agency, and a task that reflects the anticipated rescue environment so that the objective is achieved, the rescuer can perform the required task, and fall protection is maintained.

(A)* Requisite Knowledge. The application and limitations of climbing, positioning, and fall protection systems and equipment commensurate with the organization's needs.

(B) Requisite Skills. The ability to climb vertical or near-vertical paths using the surfaces provided by the environment or climbing aids used by the agency and the use of positioning equipment to support the weight of the rescuer in a vertical or near-vertical environment permitting the rescuer to perform a task.

5.3.8* Interact with a person at height who is in an emotional or psychological crisis given an environment consistent with the mission of the agency, the policies and procedures of the organization, and a person in a crisis scenario so that the condition is recognized and communicated to the team, the rescuer is prevented from harm, and the actions of the rescuer do not escalate the incident.

(A) Requisite Knowledge. Indicators of a person in emotional crisis, typical triggers that can cause individuals to become agitated or anxious, methods of interacting to prevent harm to the rescuer and the subject, and best practices to de-escalate incidents involving persons in crisis.

(B) Requisite Skills. Methods of approach that minimize the risk to the rescuer from subjects whose psychological or emotional state is unknown, interview techniques that provide insight to the motives and state of mind of the subject, and communicating and interacting with the subject in a manner that does not escalate the incident.

Chapter 6 Structural Collapse Rescue

6.1 Awareness Level. The job performance requirements defined in 6.1.1 through 6.1.8 shall be met prior to awareness level qualification in structural collapse rescue.

6.1.1 Identify the need for structural collapse rescue, given a specific type of collapse incident, so that resource needs are identified and the emergency response system for structural collapse is initiated.

(A) Requisite Knowledge. Characteristics of structural collapse incidents, resource capabilities, procedures for activation of emergency response for collapse incidents.

(B) Requisite Skills. Ability to use communication equipment, track resources, and communicate needs.

6.1.2 Size up a collapse rescue incident, given background information and applicable reference materials, so that the scope of the rescue is determined, the number of victims is identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, primary search parameters are identified, and information required to develop an initial incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, availability and capability of the resources, elements of an incident action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process, and basic search criteria for collapse incidents.

(B) Requisite Skills. The ability to read technical rescue reference materials, gather information, use interview techniques, relay information, and use information-gathering sources.

6.1.3 Initiate the incident management system given a structural collapse incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, and the incident action plan is developed.

(A) Requisite Knowledge. Incident management system structure, implementation procedures, expansion methodology, resource management techniques, tracking methods, incident action plan components, accountability systems, IMS documentation forms, and rescuer rehabilitation criteria.

(B) Requisite Skills. Ability to utilize IMS forms and command tools, and use communication devices and accountability tracking systems.

6.1.4 Identify incident hazards, given scene control barriers, PPE, requisite safety equipment, and available specialized resources, so that construction type is determined, all associated hazards are identified, safety perimeter is established, hazard isolation is initiated, risks to rescuers and victims are minimized, and rescue time constraints are taken into account.

(A) Requisite Knowledge. Resource capabilities and limitations, types and nature of incident hazards, isolation terminology, methods and equipment, implementation techniques, operational requirement concerns, common risks in collapse incidents, risk/benefit analysis methods and practices, construction types and collapse characteristics, 13 building collapse types, subsequent collapse potential and causes, and associated types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards based on construction type, identify collapse zones, assess victim viability and access (risk/benefit), utilize technical references, place scene control barriers, and operate control and mitigation equipment.

6.1.5 Initiate a search, given PPE, an incident location, and victim investigative information, so that search parameters are established and include surface and nonentry void search; the information found is updated and relayed to command; the personnel assignments match their expertise; all victims are located as quickly as possible; risks to searchers are minimized; and accountability is achieved.

(A) Requisite Knowledge. Local policies and procedures, basic sight and hailing search techniques, and operational techniques necessary to operate in the search environment.

(B) Requisite Skills. The ability to use hailing techniques, PPE, and triangulation methods, and to provide for and perform self-escape/self-rescue.

6.1.6 Apply the building marking system given a structural collapse incident, so that the search phase of the floor or structure is marked, victim locations and condition are applied to the area, hazards are noted on the structure, and the access and egress points are marked.

(A) Requisite Knowledge. FEMA and United Nations' International Search and Rescue Advisory Group (INSARAG) search marking systems, victim marking systems, structural

marking systems, and the location criteria for application of each system.

(B) Requisite Skills. The ability to use marking materials, and recognize hazards.

6.1.7 Perform triage of victims, given triage tags and local protocol, so that rescue versus recovery factors are assessed, triage decisions reflect resource capabilities, severity of injuries is determined, and victim care and rescue priorities are established in accordance with local protocol.

(A) Requisite Knowledge. Types and systems of triage according to local protocol, resource availability, methods to determine injury severity, ways to manage resources, and prioritization requirements.

(B) Requisite Skills. The ability to use triage materials, techniques, and resources and to categorize victims correctly.

6.1.8 Move a victim, given victim transport equipment, litters, other specialized equipment, and victim removal systems specific to the rescue environment, so that the victim is moved without further injuries, risks to rescuers are minimized, the victim is secured to the transfer device, and the victim is removed from the hazard.

(A) Requisite Knowledge. Types of transport equipment and removal systems, selection factors with regard to specific rescue environments, methods to reduce and prevent further injuries, types of risks to rescuers, ways to secure the victim to transport devices, and transport techniques.

(B) Requisite Skills. The ability to secure a victim to transport equipment, assemble and operate environment-specific victim removal systems, and choose an incident-specific transport device.

6.2 Operations Level. The job performance requirements defined in Section 5.2, Section 6.1, and 6.2.1 through 6.2.16 shall be met prior to operations-level qualification in structural collapse rescue.

6.2.1* Conduct a size-up of a light frame or unreinforced masonry (URM) collapsed structure, given an incident and specific incident information, so that existing and potential conditions within the structure and the immediate periphery are evaluated, needed resources are defined, hazards are identified, construction and occupancy types are determined, collapse type is identified if possible, the need for rescue is assessed, a scene security perimeter is established, and the size-up is conducted within the scope of the incident management system.

(A) Requisite Knowledge. Identification of light frame and URM construction types, characteristics, and probable occupant locations; methods to assess rescue needs; expected behavior of light frame and URM construction in a structural collapse incident; causes and associated effects of structural collapses; types and capabilities of resources; general hazards associated with structural collapse and size-up; and procedures for implementing site control and scene management.

(B) Requisite Skills. The ability to categorize light frame and URM construction types, evaluate structural stability and hazards, and implement resource and security (scene management) protocols.

6.2.2 Determine potential victim locations in light frame and URM construction collapse incidents, given size-up information, a structural collapse tool kit, the type of construction and occupancy, time of day, and collapse pattern, so that search areas are established and victims can be located.

(A) Requisite Knowledge. Capabilities and limitation of search instruments and resources, types of building construction, occupancy classifications, collapse patterns, victim behavior, and potential areas of survivability.

(B) Requisite Skills. The ability to use size-up information, occupancy classification information, and search devices, and assess and categorize type of collapse.

6.2.3 Develop a collapse rescue incident action plan, given size-up information and a light frame and URM construction collapsed structure, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.

(A) Requisite Knowledge. Incident-specific size-up information, incident management system components, dynamics of incident conditions and peripheral areas, incident-specific resources in a given geographical area, construction and occupancy types, scene security requirements, personnel needs and limitations, and rescue scene operational priorities.

(B) Requisite Skills. The ability to utilize size-up information, implement an incident management system, monitor changing conditions specific to the incident, identify potential specialized resources, determine construction and occupancy types, identify specific incident security requirements, and create written documentation.

6.2.4 Implement a collapse rescue incident action plan, given an action plan and a light frame and URM construction collapsed structure, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.

(A) Requisite Knowledge. Components of an action plan specific to collapse incidents, incident management systems, dynamics of incident conditions and peripheral areas, identification of specialized resource lists, hazard identification, rescue and extrication techniques consistent with each collapse and construction type, perimeter security measures, and personnel needs and limitations.

(B) Requisite Skills. The ability to implement the components of an action plan in a collapse incident, implement an incident management system, initiate hazard mitigation objectives, request specialized resources, initiate rescue objectives, and demonstrate perimeter security measures.

6.2.5 Search a light frame and URM construction collapsed structure, given PPE, the structural collapse tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified,

marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained. *(See also Annex F.)*

(A) Requisite Knowledge. Concepts and operation of the incident management system as applied to the search function, application of specialty tools and locating devices, application of recognized marking systems, voice sounding techniques, potential victim locations as related to the type of structure and occupancy, building construction, collapse types and their influence on the search function, operational protocols, and various hazards and their recognition.

(B) Requisite Skills. The ability to implement an incident management system, apply search techniques, use marking systems, identify and mitigate hazards, and select and use victim locating devices.

6.2.6* Stabilize a collapsed light frame and URM construction structure as a member of a team, given size-up information, a specific pattern of collapse, a basic structural collapse tool kit, and an assignment, so that strategies to effectively minimize the movement of structural components are identified and implemented; hazard warning systems are established and understood by participating personnel; incident-specific PPE is identified, provided, and utilized; physical hazards are identified; confinement, containment, and avoidance measures are discussed; and a rapid intervention team is established and staged.

(A) Requisite Knowledge. Identification and required care of PPE; structural load calculations for shoring system requirements; shoring systems for stabilization; specific hazards associated with light frame and URM construction structural collapse; strategic planning for collapse incidents; communications and safety protocols; atmospheric monitoring equipment needs; identification, characteristics, expected behavior, type, causes, and associated effects of light frame and URM construction structural collapses; and recognition of, potential for, and signs of impending secondary collapse.

(B) Requisite Skills. The ability to select and construct shoring systems for collapses in light frame and URM construction structures, use PPE, perform structural load calculations, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and safety protocols, and mitigate specific hazards associated with shoring tasks.

6.2.7 Implement collapse support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.

(A) Requisite Knowledge. Resource management protocols, principles for establishing lighting, environmental control methods, and rescuer rehabilitation protocols.

(B) Requisite Skills. The ability to manage resources, set up lights, initiate environmental controls, and set up rehabilitation for rescuers.

6.2.8 Release a victim from entrapment by components of a light frame and URM construction collapsed structure, given PPE and resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating the offending structural component, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.

(A) Requisite Knowledge. Identification, utilization, and required care of PPE; general hazards associated with each type of structural collapse; methods of evaluating structural integrity; crush syndrome protocols; identification of construction types and collapse characteristics of light frame and URM construction structures; causes and associated effects of structural collapses; potential signs of impending secondary collapse; selection and application of rescue tools and resources; and risk/benefit assessment techniques for extrication methods and time constraints.

(B) Requisite Skills. The ability to select, use, and care for PPE, operate rescue tools and stabilization systems, recognize crush syndrome indicators, and complete risk/benefit assessments for selected methods of rescue and time constraints.

6.2.9* Remove a victim from a light frame and URM construction collapse incident, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required, victim is evaluated for signs of crush syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.

(A) Requisite Knowledge. Identification, utilization, and required care of PPE resources for structural collapse incidents; general hazards associated with structural collapse; identification of light frame and URM construction types; characteristics and expected behavior of each type in a structural collapse incident; causes and associated effects of structural collapses; recognition of potential for and signs of impending secondary collapse; characteristic mechanisms of injury and basic life support; and patient packaging principles.

(B) Requisite Skills. Selection, use, and care of PPE, basic prehospital care of soft-tissue injuries, fracture stabilization, airway maintenance techniques, and cardiopulmonary resuscitation; and selection and use of patient packaging equipment.

6.2.10* Lift a heavy load as a team member, given a structural collapse tool kit and a load to be lifted, so that the load is lifted; control and stabilization are maintained before, during, and after the lift; and access can be gained.

(A) Requisite Knowledge. Applications of levers; classes of levers; principles of leverage, gravity, and load balance; resistance force; mechanics of load stabilization; mechanics of load lifting; application of pneumatic, hydraulic, mechanical, and manual lifting tools; how to calculate the weight of the load; safety protocols; and stabilization systems.

(B) Requisite Skills. The ability to evaluate and estimate the weight of the load, the operations of lifting tools, the application of a lever, and the application of load stabilization systems.

6.2.11* Move a heavy load as a team member, given a structural collapse tool kit, so that the load is moved the required distance to gain access and so that control is constantly maintained.

(A) Requisite Knowledge. Applications of rigging systems, applications of levers, classes of levers, inclined planes, gravity and load balance, friction, mechanics of load stabilization and load lifting, capabilities and limitations of lifting tools, how to calculate the weight of the load, and safety protocols.

(B) Requisite Skills. The ability to evaluate and estimate the weight of the load, operate required tools, construct and use levers and incline planes, utilize rigging systems, and stabilize the load.

6.2.12 Breach light frame and URM construction structural components, given an assignment, PPE, various types of construction materials, and a structural collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.

(A) Requisite Knowledge. Effective breaching techniques; types of building construction and characteristics of materials used in each; the selection, capabilities, and limitations of tools; safety protocols for breaching operations; calculation of weight; and anticipation of material movement during breaching and stabilization techniques.

(B) Requisite Skills. Select and use breaching tools, implement breaching techniques based on building frame and URM construction types, use PPE, and apply stabilization where required.

6.2.13* Construct cribbing systems, given an assignment, PPE, a structural collapse tool kit, various lengths and dimensions of lumber, wedges, and shims, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.

(A) Requisite Knowledge. Different types of cribbing systems and their construction methods, limitations of construction lumber, load calculations, principles of and applications for cribbing, and safety protocols.

(B) Requisite Skills. The ability to select and construct cribbing systems, evaluate the structural integrity of the system, determine stability, and calculate loads.

6.2.14 Inspect and maintain hazard-specific PPE, given clothing or equipment for the protection of the rescuers, including respiratory protection, cleaning and sanitation supplies, maintenance logs or records, and such tools and resources as are indicated by the manufacturer's guidelines for assembly or disassembly of components during repair or maintenance, so that damage, defects, and wear are identified and reported or repaired, equipment functions as designed, and preventive maintenance has been performed and documented consistent with the manufacturer's recommendations.

(A) Requisite Knowledge. Functions, construction, and operation of PPE; use of recordkeeping systems of the AHJ; requirements and procedures for cleaning, sanitizing, and infectious disease control; use of provided assembly and disassembly tools; manufacturer and department recommendations; preuse inspection procedures; and ways to determine operational readiness.

(B) Requisite Skills. The ability to identify wear and damage indicators for PPE; evaluate operational readiness of PPE; complete logs and records; use cleaning equipment, supplies, and reference materials; and select and use tools specific to the task.

6.2.15 Inspect and maintain rescue equipment, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, equipment replacement protocol, and organizational standard operating procedure, so that the operational status of equipment is verified and documented, all components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement are correctly disposed of and changed out.

(A) Requisite Knowledge. Functions and operations of rescue equipment, use of recordkeeping systems, manufacturer and organizational care and maintenance requirements, selection and use of maintenance tools, replacement protocol and procedures, disposal methods, and organizational standard operating procedures.

(B) Requisite Skills. The ability to identify wear and damage indicators for rescue equipment, evaluate operation readiness of equipment, complete logs and records, and select and use maintenance tools.

6.2.16* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

6.3 Technician Level. The job performance requirements defined in Section 6.2 and 6.3.1 through 6.3.16 shall be met prior to technician level qualification in structural collapse rescue.

6.3.1 Conduct a size-up of a collapsed heavy construction–type structure, given an incident and specific incident information, so that existing and potential conditions within the structure and the immediate periphery are evaluated, needed resources are defined, hazards are identified, construction and occupancy types are determined, collapse type is identified if possible, the need for rescue is assessed, a scene security perimeter is established, and the size-up is conducted within the scope of the incident management system. *(See Annexes D, F, and E for additional information.)*

(A) Requisite Knowledge. Identification of heavy construction types, characteristics, and probable occupant locations; methods to assess rescue needs; expected behavior of heavy construction in a structural collapse incident; causes and associated effects of structural collapses; types and capabilities of resources; general hazards associated with structural collapse and size-up; and procedures for implementing site control and scene management.

(B) Requisite Skills. The ability to categorize heavy construction types, evaluate structural stability and hazards, and implement resource and security (scene management) protocols.

6.3.2 Determine potential victim locations in a heavy construction–type incident, given size-up information, a structural collapse tool kit, the type of construction and occupancy, time of day, and collapse pattern, so that search areas are established and victims can be located.

(A) Requisite Knowledge. Capabilities and limitation of search instruments and resources, types of building construction, occupancy classifications, collapse patterns, victim behavior, and potential areas of survivability.

(B) Requisite Skills. The ability to use size-up information, occupancy classification information, and search devices, and assess and categorize type of collapse.

6.3.3 Develop a collapse rescue incident action plan, given size-up information and a heavy collapsed structure, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.

(A) Requisite Knowledge. Incident-specific size-up information, incident management system components, dynamics of incident conditions and peripheral areas, incident-specific resources in a given geographical area, construction and occupancy types, scene security requirements, personnel needs and limitations, and rescue scene operational priorities.

(B) Requisite Skills. The ability to utilize size-up information, implement an incident management system, monitor changing conditions specific to the incident, identify potential specialized resources, determine construction and occupancy types, identify specific incident security requirements, and create written documentation.

6.3.4 Implement a collapse rescue incident action plan, given an action plan and a heavy construction–type collapsed structure, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.

(A) Requisite Knowledge. Components of an action plan specific to collapse incidents, incident management systems, dynamics of incident conditions and peripheral areas, identification of specialized resource lists, hazard identification, rescue and extrication techniques consistent with each collapse and construction type, perimeter security measures, and personnel needs and limitations.

(B) Requisite Skills. The ability to implement the components of an action plan in a collapse incident, implement an incident management system, initiate hazard mitigation objectives, request specialized resources, initiate rescue objectives, and demonstrate perimeter security measures.

6.3.5 Search a heavy construction–type collapsed structure, given PPE, the structural collapse tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained. *(See also Annex E.)*

(A) Requisite Knowledge. Concepts and operation of the incident management system as applied to the search function, application of specialty tools and locating devices, application of recognized marking systems, voice sounding techniques, potential victim locations as related to the type of structure and occupancy, building construction, collapse types and their influence on the search function, operational protocols, and various hazards and their recognition.

(B) Requisite Skills. The ability to implement an incident management system, apply search techniques, use marking systems, identify and mitigate hazards, and select and use victim locating devices.

6.3.6* Stabilize a collapsed heavy construction–type structure as a member of a team, given size-up information, a specific pattern of collapse, a basic structural collapse tool kit, and an assignment, so that strategies to effectively minimize the movement of structural components are identified and implemented; hazard warning systems are established and understood by participating personnel; incident-specific PPE is identified, provided, and utilized; physical hazards are identified; confinement, containment, and avoidance measures are discussed; and a rapid intervention team is established and staged.

(A) Requisite Knowledge. Identification and required care of PPE; structural load calculations for shoring system requirements; shoring systems for stabilization; specific hazards associated with heavy structural collapse; strategic planning for collapse incidents; communications and safety protocols; atmospheric monitoring equipment needs; identification, characteristics, expected behavior, type, causes, and associated effects of heavy structural collapses; and recognition of, potential for, and signs of impending secondary collapse.

(B) Requisite Skills. The ability to select and construct shoring systems for collapses in heavy structures, use PPE, perform structural load calculations, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and safety protocols, and mitigate specific hazards associated with shoring tasks.

6.3.7 Implement collapse support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.

(A) Requisite Knowledge. Resource management protocols, principles for establishing lighting, environmental control methods, and rescuer rehabilitation protocols.

(B) Requisite Skills. The ability to manage resources, set up lights, initiate environmental controls, and set up rehabilitation for rescuers.

6.3.8 Release a victim from entrapment by components of a heavy construction–type collapsed structure, given PPE and resources for breaching, breaking, lifting, prying, shoring,

and/or otherwise moving or penetrating the offending structural component, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.

(A) Requisite Knowledge. Identification, utilization, and required care of PPE; general hazards associated with each type of structural collapse; methods of evaluating structural integrity; crush syndrome protocols; identification of construction types and collapse characteristics of heavy construction–type structures; causes and associated effects of structural collapses; potential signs of impending secondary collapse; selection and application of rescue tools and resources; and risk/benefit assessment techniques for extrication methods and time constraints.

(B) Requisite Skills. The ability to select, use, and care for PPE, operate rescue tools and stabilization systems, recognize crush syndrome indicators, and complete risk/benefit assessments for selected methods of rescue and time constraints.

6.3.9 Remove a victim from a heavy construction–type collapse incident, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required, victim is evaluated for signs of crush syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.

(A) Requisite Knowledge. Identification, utilization, and required care of PPE resources for structural collapse incidents; general hazards associated with structural collapse; identification of heavy construction types; characteristics and expected behavior of each type in a structural collapse incident; causes and associated effects of structural collapses; recognition of, potential for, and signs of impending secondary collapse; characteristic mechanisms of injury and basic life support; and patient packaging principles.

(B) Requisite Skills. Selection, use, and care of PPE; basic pre-hospital care of soft-tissue injuries; fracture stabilization; airway maintenance techniques, and cardiopulmonary resuscitation; and selection and use of patient packaging equipment.

6.3.10 Lift a heavy load as a team member, given a structural collapse tool kit and a load to be lifted, so that the load is lifted; control and stabilization are maintained before, during, and after the lift; and access can be gained.

(A) Requisite Knowledge. Applications of levers; classes of levers; principles of leverage, gravity, and load balance; resistance force; mechanics of load stabilization; mechanics of load lifting; application of pneumatic, hydraulic, mechanical, and manual lifting tools; how to calculate the weight of the load; safety protocols; and stabilization systems.

(B) Requisite Skills. The ability to evaluate and estimate the weight of the load, the operations of lifting tools, the application of a lever, and the application of load stabilization systems.

6.3.11 Move a heavy load as a team member, given a structural collapse tool kit, so that the load is moved the required distance to gain access and so that control is constantly maintained.

(A) Requisite Knowledge. Applications of rigging systems, applications of levers, classes of levers, inclined planes, gravity and load balance, friction, mechanics of load stabilization and load lifting, capabilities and limitations of lifting tools, how to calculate the weight of the load, and safety protocols.

(B) Requisite Skills. The ability to evaluate and estimate the weight of the load, operate required tools, construct and use levers and incline planes, utilize rigging systems, and stabilize the load.

6.3.12 Breach heavy structural components, given an assignment, PPE, various types of construction materials, and a structural collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.

(A) Requisite Knowledge. Effective breaching techniques; types of building construction and characteristics of materials used in each; the selection, capabilities, and limitations of tools; safety protocols for breaching operations; calculation of weight; and anticipation of material movement during breaching and stabilization techniques.

(B) Requisite Skills. Select and use breaching tools, implement breaching techniques based on building construction type, use PPE, and apply stabilization where required.

6.3.13 Construct cribbing systems, given an assignment, PPE, a structural collapse tool kit, various lengths and dimensions of lumber, wedges, and shims, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.

(A) Requisite Knowledge. Different types of cribbing systems and their construction methods, limitations of construction lumber, load calculations, principles of and applications for cribbing, and safety protocols.

(B) Requisite Skills. The ability to select and construct cribbing systems, evaluate the structural integrity of the system, determine stability, and calculate loads.

6.3.14* Stabilize a collapsed heavy construction–type structure as a member of a team, given size-up information, hazard-specific PPE, an assignment, a specific pattern of collapse, a structural collapse tool kit, specialized equipment necessary to complete the task, and engineering resources if needed, so that hazard warning systems are established and understanding by team members is verified, all unstable structural components that can impact the work and egress routes are identified, alternative egress routes are established when possible, expert resource needs are determined and communicated to command, load estimates are calculated for support system requirements, all shoring systems meet or exceed load-bearing demands, shoring systems are monitored continuously for integrity, safety protocols are followed, a rapid intervention crew (RIC) is established and staged to aid search and rescue personnel in the event of entrapment, an accountability system is established, atmospheric monitoring is ongoing, and progress is communicated as required.

(A) Requisite Knowledge. Identification and required care of PPE, structural load calculations for shoring system requirements, shoring systems for stabilization, specific hazards associated with heavy structural collapse, hazard warning systems,

specialized resource and equipment needs, communications and rescuer safety protocols, atmospheric monitoring equipment needs, identification of construction types, characteristics and expected behavior of each type in a structural collapse incident, causes and associated effects of structural collapses, and recognition of potential for and signs of impending secondary collapse.

(B) Requisite Skills. The ability to select and construct shoring systems for heavy construction–type collapses, use PPE, perform structural load calculations, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and rescuer safety protocol, and mitigate specific hazards associated with shoring tasks.

6.3.15 Cut through structural steel, given a structural collapse tool kit, PPE, and an assignment, so that the steel is efficiently cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.

(A) Requisite Knowledge. Safety considerations; the selection, capabilities, and limitations of steel cutting tools; cutting tool applications; types of potential and actual hazards and mitigation techniques; and characteristics of steel used in building construction.

(B) Requisite Skills. The ability to assess tool needs, use cutting tools, implement necessary extinguishment techniques, mitigate hazards, and stabilize heavy loads.

6.3.16 Coordinate the use of heavy equipment, given PPE, means of communication, equipment and operator, and an assignment, so that common communications are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.

(A) Requisite Knowledge. Types of heavy equipment, capabilities, application and hazards of heavy equipment and rigging, safety protocols, and types and methods of communication.

(B) Requisite Skills. The ability to use hand signals and radio equipment, recognize hazards, assess for operator and rescuer safety, and use PPE.

Chapter 7 Confined Space Rescue

7.1 Awareness Level. The job performance requirements defined in 7.1.1 through 7.1.6 shall be met prior to awareness-level qualification in confined space rescue.

7.1.1 Recognize the need for confined space support resources, given a specific type of rescue incident, so that the confined space is recognized, a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operation facilitates rescue operational objectives.

(A) Requisite Knowledge. Confined space incident recognition, equipment organization and tracking methods, lighting resource type(s), shelter and thermal control options, and rehab criteria.

(B) Requisite Skills. The ability to recognize confined spaces, track equipment inventory, identify lighting resources and structures for shelter and thermal protection, select rehab areas, and manage personnel rotations.

7.1.2 Recognize incident hazards and initiate isolation procedures, given scene control barriers, personal protective equipment (PPE), requisite equipment, and available specialized resources, so that all hazards are identified, resource application fits the operational requirements, hazard isolation is considered, risks to rescuers and victims are minimized, and rescue time constraints are taken into account.

(A) Requisite Knowledge. Resource capabilities and limitations, types and nature of incident hazards, equipment types and their use, isolation terminology, methods, equipment and implementation, operational requirement concerns, common types of rescuer and victim risk, risk/benefit analysis methods and practices, and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess victim viability (risk/benefit), utilize technical references, place scene control barriers, and operate control and mitigation equipment.

7.1.3 Recognize the need for technical rescue resources at an incident, given incident information, a means of communication, resources, tactical worksheets, personnel accountability protocol, applicable references, and standard operating procedures, so that references are utilized, personnel are accounted for, necessary resources are deployed to achieve desired objectives, incident actions are documented, rescue efforts are coordinated, the command structure is established, task assignments are communicated and monitored, and actions are consistent with applicable regulations.

(A) Requisite Knowledge. Incident management system; tactical worksheet application and purposes; accountability protocols; resource types and deployment methods; documentation methods and requirements; availability, capabilities, and limitations of rescuers and other resources; communication problems and needs; communications requirements, methods, and means; types of tasks and assignment responsibilities; policies and procedures of the agency; and technical references related to the type of rescue incident.

(B) Requisite Skills. The ability to implement an incident management system, complete tactical worksheets, use reference materials, evaluate incident information, match resources to operational needs, operate communications equipment, manage incident communications, and communicate in a manner so that objectives are met.

7.1.4 Initiate a search in areas immediately adjacent to the space, given hazard-specific PPE, equipment pertinent to search mission, a confined space incident location, and victim investigative information, so that search parameters are established; the victim profile is established; the entry and exit of all people either involved in the search or already within the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims in the adjacent areas to the space are located as quickly as possible; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.

(A) Requisite Knowledge. Local policies and procedures and how to operate in the environment surrounding the area of the confined space access area.

(B) Requisite Skills. The ability to enter, maneuver in, and exit the adjacent areas to the confined space incident and perform escape from the area if conditions become untenable.

7.1.5* Communicate with victim(s), given a clear environment and a confined space, so that victim communication is established when possible and information relative to patient condition is documented and conveyed to incoming confined space rescue resources.

(A) Requisite Knowledge. Victim communication methods appropriate to confined spaces and use of information acquired for initial victim assessment.

(B) Requisite Skills. Use communication methods that are effective from the outside to the inside of a confined space, identify victim communication needs and use methods for documentation and transfer of victim information.

7.1.6 Perform nonentry rescue, given PPE; an anchored retrieval system attached to a victim located inside a confined space with a clear interior; safety, communication, and operational protocols; and a confined space rescue tool kit, so that the retrieval system is operated to extract the victim, the rescuer is protected from fall hazards when working near unprotected edges, victim communication is established and maintained, the victim is managed through the portal and patient care is initiated on extraction.

(A) Requisite Knowledge. Principles of operation for retrieval equipment; methods for fall prevention; and safety, communication, medical, and operational protocols.

(B) Requisite Skills. The ability to use and apply PPE and fall prevention methods, operate nonentry rescue (retrieval) systems and equipment; implement safety, communication, and operational protocols; and use methods for assuring victim passage through the portal without obstruction.

7.2 Operations Level. The job performance requirements defined in Section 5.2, Section 7.1, and 7.2.1 through 7.2.18 shall be met prior to operations-level qualification in confined space rescue.

7.2.1* Initiate a search inside a confined space in those areas immediately visible from the confined space entry portal, given hazard-specific PPE, equipment pertinent to search mission, a confined space, and victim investigative information, so that search parameters are established; the victim profile is established; the people in or around the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims inside the space that are immediately visible from outside the portal are located and identified quickly; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.

(A) Requisite Knowledge. Local policies and procedures and how to operate in the environment surrounding the area of the confined space access area.

(B) Requisite Skills. The ability to work in the immediate area of the confined space entry portal and perform immediate escape from the area if conditions become untenable.

7.2.2 Perform size-up of a confined space rescue incident, given background information and applicable reference materials, so that the type of rescue is determined, the number of victims is identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read technical rescue reference materials, gather information, relay information, and use information gathering sources.

7.2.3* Conduct monitoring of the environment, given monitoring equipment reference material, PPE, accurately calibrated detection and monitoring equipment, and size-up information, so that a representative sample of the space is obtained, accurate readings are made, readings are documented, and effects of ventilation in determining atmospheric conditions and the conditions of the space have been determined for exposures to existing or potential environmental hazards.

(A) Requisite Knowledge. Capabilities and limitations of detection and monitoring equipment, ways to confirm calibration, defining confined space configuration as it applies to obtaining a representative sample of space, basic physical properties of contaminants, and how to determine contents of a confined space.

(B) Requisite Skills. The ability to use and confirm calibration of detection and monitoring equipment and acquire representative samples of space.

7.2.4* Assess the incident, given size-up information, information from technical resources, monitoring equipment, and PPE required to perform the assessment, so that general area and space-specific hazards are identified, bystanders and victims are interviewed, immediate and ongoing monitoring of the space is performed, the victims' conditions and location are determined, a risk/benefit analysis is performed, methods of ingress and egress for rescuer and victims are identified, rescue systems for victim removal are determined, and an emergency means of retrieval for rescue entrants is established.

(A) Requisite Knowledge. Use of size-up information and interview techniques; types of PPE; monitoring equipment protocols; rescue and retrieval systems; permit programs; types of and uses for available resources; risk/benefit analysis methods; common hazards and their influence on the assessment; methods to identify egress from and ingress into the space; and processes to identify size, type, and configuration of the opening(s) and internal configuration of the space.

(B) Requisite Skills. The ability to select and interpret size-up information, conduct interviews, choose and utilize PPE, operate monitoring equipment, identify hazard mitigation options, identify probable victim location, perform risk/benefit analysis, recognize characteristics and hazards of confined spaces, and evaluate specific rescue systems for confined space entry and retrieval of rescuers and victims during confined space incidents.

7.2.5 Control hazards, given PPE and a confined space tool kit, so that the rescue area is established; access to the incident

scene is controlled; rescuers are protected from exposure to hazardous materials and atmospheres, all forms of harmful energy releases, and physical hazards; and victims are protected from further harm.

(A) Requisite Knowledge. PPE; safety protocols; monitoring equipment and procedures; ventilation equipment and procedures; incident hazards; types of hazardous materials exposure risks; forms, sources, and control of harmful energy and physical hazards in the confined space.

(B) Requisite Skills. The ability to utilize PPE, place scene control barriers, operate atmospheric monitoring equipment, ventilate a confined space, identify dangerous forms of energy, and mitigate physical and atmospheric hazards.

7.2.6* Apply and use self-contained breathing apparatus (SCBA) as a rescue entrant, given a confined space incident requiring respiratory protection, a rescue assignment, a means of entry into and exit from the space, a rescue attendant outside the space, SCBA, breathing apparatus cylinders, and a confined space with the following characteristics:

(1) The internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement.
(2) The victim can be seen easily from the outside of the space's primary access opening.
(3) Rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer.
(4) The space can accommodate two or more rescuers in addition to the victim.
(5) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that the rescue entrant passes through the portal without removal of the SCBA, the assigned rescue duty is performed, the rescue entrant frequently assesses the level of air remaining in the cylinder and communicates this level to rescuers outside of the space, and the rescue entrant exits the space prior to activation of the low-pressure alarm on the SCBA.

(A) Requisite Knowledge. Capabilities and limitations of SCBA in confined space rescue, breathing air conservation and communication methods appropriate to breathing apparatus use in confined spaces.

(B) Requisite Skills. The ability to use SCBA in a confined space entry for rescue, use of breathing techniques that will conserve the air supply and use of communication methods that effectively convey information between rescuers inside and outside of the space.

7.2.7* Apply an atmosphere supplying respirator to a victim, given a confined space incident requiring respiratory protection, a live victim, an atmosphere supplying respirator and associated equipment, and a confined space with the following characteristics:

(1) The internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement.
(2) The victim can be easily seen from the outside of the space's primary access opening.
(3) Rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer.
(4) The space can accommodate two or more rescuers in addition to the victim.
(5) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that the apparatus face piece is applied rapidly, positioned properly on the face and without air leakage; application of the face piece can be performed simultaneously with spinal precautions; the breathing apparatus unit is securely placed during victim movement, the face piece will not be pulled from the victim's face during movement; the level of air remaining in the victim's breathing apparatus is frequently accessed and communicated, and the victim is removed from the space without interruption of the air supply.

(A) Requisite Knowledge. Capabilities and limitations of atmosphere supplying respirators (SCBA or SAR) for victims in confined space rescue, expected victim air usage, methods for application of face pieces to victims wearing helmets and for those with spinal injuries, methods for securement of a victim's breathing apparatus unit when packaged in litters, attached to rope rescue systems, or being dragged along a horizontal plane; and communication methods in confined spaces.

(B) Requisite Skills. The ability to apply a patent air supply to a victim in a confined space rescue, move the victim wearing breathing apparatus without interruption or compromise of their air supply or face piece seal; continuous monitoring of the victim's air supply during operations and use of communication methods that effectively convey information between rescuers inside and outside of the space.

7.2.8* Perform full spinal immobilization of a victim inside a confined space, given a confined space incident requiring spinal precautions, a victim, full spinal immobilization equipment, a second rescuer to assist and a confined space with the following characteristics:

(1) The internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement.
(2) The victim can be easily seen from the outside of the space's primary access opening.
(3) Rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer.
(4) The space can accommodate two or more rescuers in addition to the victim.
(5) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that the victim's cervical spine is manually maintained in a neutral position immediately on contact and maintained until the body and head are completely immobilized and secure, victim movement onto the spinal immobilization device creates minimal manipulation of the spine, void spaces between the victim and immobilization device are padded as appropriate, victim securement to the immobilization device will prevent spinal manipulation during movement, and applicable local treatment protocols are followed.

(A) Requisite Knowledge. Capabilities and limitations of long spine immobilization equipment for victims in confined space rescue, methods for movement of a victim onto a long spine immobilizer with minimum spinal manipulation, methods for securement of a victim's body on a long spine immobilizer, methods for securement of a victim's head on a long spine

immobilizer and other long spinal immobilization treatment modalities and procedures.

(B) Requisite Skills. The ability to maintain manual immobilization of a victim's head during the immobilization process, assist in moving the victim to a long spine immobilizer with only two persons with minimal spinal manipulation, apply void space padding as needed based on the immobilization device and apply and secure the victim's body and head to a long spinal immobilization device.

7.2.9 Prepare for entry into horizontally oriented confined space, given a confined space rescue tool kit and a confined space with the following characteristics:

(1) The internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement.
(2) The victim can be easily seen from the outside of the space's primary access opening.
(3) Rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer.
(4) The space can accommodate two or more rescuers in addition to the victim.
(5) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that victim communication is established when possible, continuous atmospheric monitoring is initiated, rescuer readiness is verified, rescuers' limitations are identified and evaluated, rescuers unsuitable to confined space entry operations are reassigned and replaced, route and methods of entry are determined, and rescuer evacuation is planned.

(A) Requisite Knowledge. Effects of hazardous atmospheres on victims and rescuers, types and operation of required hazard-specific monitoring equipment, organization protocol for medical and psychological evaluation related to confined space entry, methods of entry into confined spaces in accordance with operational protocols, and rescuer evaluation methods.

(B) Requisite Skills. The ability to operate monitoring equipment, perform rescuer pre-entry medical exam, evaluate rescuer capabilities and limitations, identify victim communication needs, evaluate for point and route of confined space entry, and select evacuation methods.

7.2.10 Enter a horizontally oriented confined space for rescue, given PPE; safety, communication, and operational protocols; portable lighting; and a confined space rescue tool kit, a retrieval system, and a confined space with the following characteristics:

(1) The internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement.
(2) The victim can be easily seen from the outside of the space's primary access opening.
(3) Rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer.
(4) The space can accommodate two or more rescuers in addition to the victim.
(5) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that the victim is contacted, controlled confined space entry is established and maintained, atmosphere is monitored continuously, the victim's mental and physical conditions are assessed further, the rescue entrant is aided by portable lighting, rescue entrants are attached to retrieval lines at all times, patient care is initiated, the patient is packaged to restrictions of the space, and patient removal can be initiated.

(A) Requisite Knowledge. Principles of operation for atmospheric monitoring equipment; methods for patient care in confined spaces; portable lighting methods; safety, communication, medical, and operational protocols; and controlled confined space entry and egress procedures for confined spaces.

(B) Requisite Skills. The ability to use and apply PPE and rescue-related systems and equipment; use portable lighting in a darkened environment; implement safety, communication, and operational protocols; use medical protocols to determine treatment priorities; use medical equipment specific to confined space victim needs; and reassess and confirm mode of operation.

7.2.11* Package the victim in a litter for removal from a horizontally oriented confined space, given a confined space rescue tool kit, a litter and associated rigging equipment, a space that provides enough internal and external clearance to maneuver a litter in and around the space, so that the victim is secured to the litter, the litter is secured to the rescue system if needed, the litter will pass through the portal, the victim is protected during the extraction, and further harm to the victim is minimized.

(A) Requisite Knowledge. Spinal management techniques, victim packaging techniques, how to use low-profile packaging devices and equipment, methods to reduce or avoid damage to equipment, and the similarities and differences between packaging for confined spaces and for other types of rescue.

(B) Requisite Skills. The ability to immobilize a victim's spine; package victims in litters, low-profile devices, and litters; recognize and perform basic management of various traumatic injuries and medical conditions; support respiratory efforts; and perform local treatment modalities as required based on the environment.

7.2.12 Assemble a portable anchor system for application of a high point of attachment to a confined space rescue system given a portable anchor device, additional rescuers to assist in the assembly, and a vertically oriented space with a portal above which to set the portable anchor, so that the portable anchor is assembled in accordance with the manufacturer's recommendations, rescue systems are attached and secured to the anchor device and the portable anchor provides enough clearance above the portal to fully extract a victim packaged in a vertically oriented litter.

(A) Requisite Knowledge. Capabilities and limitations of portable anchor devices in confined space rescue, assembly procedures for the portable anchor utilized, methods for stabilization of portable anchors to prevent unnecessary movement, force application to portable anchors and proper direction of that force to prevent movement or collapse.

(B) Requisite Skills. The ability to assemble the portable anchor device with assistance of other rescuers, attach the rescue system to the portable anchor, position the device high enough to provide adequate clearance area above the portal to

allow removal of a vertically oriented litter, and operate the system in a way that will keep the portable anchor stable while lifting a load.

7.2.13 Prepare for entry into vertically oriented confined space, given a confined space rescue tool kit and a confined space with the following characteristics:

(1) The internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement.
(2) The victim can be easily seen from the outside of the space's primary access opening.
(3) Rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer.
(4) The space can accommodate two or more rescuers in addition to the victim.
(5) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that victim communication is established when possible, continuous atmospheric monitoring is initiated, rescuer readiness is verified, rescuers' limitations are identified and evaluated, rescuers unsuitable to entry operations are reassigned and replaced, route and methods of confined space entry are determined, and rescuer evacuation is planned.

(A) Requisite Knowledge. Effects of hazardous atmospheres on victims and rescuers, types and operation of required hazard-specific monitoring equipment, organization protocol for medical and psychological evaluation related to entry, methods of entry into confined spaces in accordance with operational protocols, and rescuer evaluation methods.

(B) Requisite Skills. The ability to operate monitoring equipment, perform rescuer pre-entry medical exam, evaluate rescuer capabilities and limitations, identify victim communication needs, evaluate for point and route of confined space entry, and select evacuation methods.

7.2.14 Enter a vertically oriented confined space for rescue, given PPE; safety, communication, operational protocols; a confined space rescue tool kit; and a confined space with the following characteristics:

(1) The internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement.
(2) The victim can be easily seen from the outside of the space's primary access opening.
(3) Rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer.
(4) The space can accommodate two or more rescuers in addition to the victim.
(5) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that the victim is contacted, controlled confined space entry is established and maintained, atmosphere is continuously monitored, the victim's mental and physical conditions are further assessed, patient care is initiated, the patient is packaged to restrictions of the space, and patient removal can be initiated.

(A) Requisite Knowledge. Principles of operation for atmospheric monitoring equipment; methods for patient care in confined spaces; safety, communication, medical, and operational protocols; and controlled confined space entry and egress procedures for confined spaces.

(B) Requisite Skills. The ability to use and apply PPE and rescue-related systems and equipment; implement safety, communication, and operational protocols; use medical protocols to determine treatment priorities; use medical equipment specific to confined space victim needs; and reassess and confirm mode of operation.

7.2.15* Package the victim in a litter for removal from a vertically oriented confined space, given a confined space rescue tool kit, a vertically oriented litter and associated rigging equipment, a work area that provides enough vertical clearance to extract a vertically oriented litter and a victim, so that the victim is secured to the litter, the litter is secured to the rescue system in a vertically configuration, the litter will pass through the portal, the litter can be raised high enough to clear the portal, the victim is protected during the extraction, and further harm to the victim is minimized.

(A) Requisite Knowledge. Spinal management techniques, victim packaging techniques, how to use low-profile packaging devices and equipment, methods to reduce or avoid damage to equipment, and the similarities and differences between packaging for confined spaces and for other types of rescue.

(B) Requisite Skills. The ability to immobilize a victim's spine; package victims in litters, low-profile devices, and litters; recognize and perform basic management of various traumatic injuries and medical conditions; support respiratory efforts; and perform local treatment modalities as required based on the environment.

7.2.16* Access and rapidly remove a victim from a vertically oriented confined space, given a confined space rescue tool kit, victim harnesses and rigging, a victim who has been discovered to be in respiratory arrest, and conditions inside the space requiring immediate extraction to prevent imminent death of the victim, so that the victim is rapidly secured in an extraction harness, the harness is secured to the rescue system, and the victim is removed from the space.

(A) Requisite Knowledge. Rapid victim harness application techniques, methods to reduce or avoid damage to equipment, and the similarities and differences between packaging for conditions of imminent danger as compared to those that are stable.

(B) Requisite Skills. The ability to recognize the immediate threat and need for rapid extraction, and rapid application of victim harnesses and rigging to rescue systems.

7.2.17 Remove all entrants from a confined space, given PPE, rope and related rescue and retrieval systems, personnel to operate rescue and retrieval systems, and a confined space rescue tool kit, so that internal obstacles and hazards are negotiated, all persons are extricated from a space in the selected transfer device, the victim and rescuers are decontaminated as necessary, and the victim is delivered to the EMS provider.

(A) Requisite Knowledge. Personnel and equipment resource lists, specific PPE, types of confined spaces and their internal obstacles and hazards, rescue and retrieval systems and equipment, operational protocols, medical protocols, EMS providers, and decontamination procedures.

(B) Requisite Skills. The ability to select and use PPE, select and operate rescue and retrieval systems used for victim

removal, utilize medical equipment, and use equipment and procedures for decontamination.

7.2.18* Terminate a technical rescue operation, given an incident scenario, assigned resources, and site safety data so that rescuer risk and site safety are managed, scene security is maintained and custody transferred to a responsible party, personnel and resources are returned to a state of readiness, recordkeeping and documentation occur, and post-event analysis is conducted.

(A) Requisite Knowledge. Incident Command functions and resources, hazard identification and risk management strategies, logistics and resource management, personnel accountability systems, and AHJ-specific procedures or protocols related to personnel rehab.

(B) Requisite Skills. Hazard recognition, risk analysis, use of site control equipment and methods, use of data collection and management systems, and use of asset and personnel tracking systems.

7.3 Technician Level. The job performance requirements defined in Section 7.2 and 7.3.1 through 7.3.6 shall be met prior to technician-level qualification in confined space rescue.

7.3.1 Initiate a search inside a confined space in those areas not immediately visible from the confined space entry portal, given hazard-specific PPE, confined space rescue entrant(s) to perform the search, equipment pertinent to search mission, a confined space, and victim investigative information, so that search parameters are established; the victim profile is established; search result information is acquired and relayed to command; the personnel assignments match their expertise; all victims inside the space are located and identified quickly; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.

(A) Requisite Knowledge. Local policies and procedures and how to operate inside the confined space.

(B) Requisite Skills. The ability to work inside the confined space; communicate with rescuers outside the confined space portal; and, when possible, perform self-rescue if conditions become untenable.

7.3.2 Preplan a confined space incident, given applicable guidelines and regulations and a preplan form, so that a standard approach is used during a confined space rescue emergency, hazards are recognized and documented, isolation methods are identified and documented, all accesses to the location of the confined space entry opening are identified and documented, all types of confined space entry openings are identified and documented, and internal configurations and special resource needs are documented for future rescuer use.

(A) Requisite Knowledge. Operational protocols, specific preplan forms, types of hazards common to jurisdictional boundaries, hazards that should and must be identified on preplans, isolation methods and issues related to preplanning, issues and constraints relating to the types of confined space openings, internal configuration special resource needs of a confined space, and applicable legal issues.

(B) Requisite Skills. The ability to select a specific preplan form; draft or draw a sketch of confined spaces; complete supplied forms; identify and evaluate various configurations of confined spaces, access points, confined space entry openings, isolation procedures, and energy control locations; recognize general and site-specific hazards; document all data; and apply all regulatory compliance references.

7.3.3 Apply and use supplied-air respirators (SARs) as a rescue entrant, given a confined space incident requiring respiratory protection, a rescue assignment, a means of entry into and exit from the space, a rescue attendant outside the space, personnel to manage air lines outside of the space, a SAR, a breathing air supply system with air lines to supply the SAR, breathing apparatus cylinders, personnel to monitor and maintain the air supply system, and a confined space with the following characteristics:

(1) The internal configuration of the space will not create entanglement hazards when using air lines.
(2) The victim cannot be seen from the outside of the space's primary access opening.
(3) The portal size and configuration will not allow a rescuer to pass through the access/egress opening(s) using SCBA when worn in the manner recommended by the manufacturer.
(4) All hazards in and around the confined space have been identified and might be mitigated by using respiratory protection so that the rescue entrant passes through the portal without removal of the SAR and the assigned rescue duty is performed.

(A) Requisite Knowledge. Capabilities and limitations of SAR in confined space rescue, breathing air conservation, air-line management and communication methods appropriate to breathing apparatus use in confined spaces.

(B) Requisite Skills. The ability to use SAR in a confined space entry for rescue, use of breathing techniques that will conserve the air supply, manage airlines while working within the space and use of communication methods that effectively convey information between rescuers inside and outside of the space.

7.3.4* Perform short spinal immobilization of a victim inside a confined space, given a confined space incident requiring spinal precautions, a stable victim, a short spinal immobilization device, a second rescuer to assist, and a confined space with the following characteristics:

(1) The portal size or internal configuration will not allow the application of a full spine immobilization device.
(2) All hazards in and around the confined space have been identified and might be mitigated by using respiratory protection so that the victim's cervical spine is manually maintained in a neutral position immediately on contact and maintained until the short immobilization device is completely applied and secure, victim movement onto the spinal immobilization device creates minimal manipulation of the spine, void spaces between the victim and immobilization device are padded as appropriate, victim securement to the immobilization device will reduce spinal manipulation during movement, and applicable local treatment protocols are followed.

(A) Requisite Knowledge. Capabilities and limitations of short spine immobilization equipment for victims in confined space rescue, methods for movement of a victim onto a long spine immobilizer with minimum spinal manipulation, methods for securement of a victim onto a short spine immobilizer, methods for securement of a victim's head on a short spine immobilizer, and other short spinal immobilization treatment modalities and procedures.

(B) Requisite Skills. The ability to maintain manual immobilization of a victim's head during the immobilization process, assist in moving the victim to a short spine immobilizer with only two persons with minimal spinal manipulation, apply void space padding as needed based on the immobilization device, and apply and secure the victim's upper body and head to a short spinal immobilization device.

7.3.5 Prepare for entry into the confined space with a hazardous atmosphere, given a confined space with a hazardous atmosphere, atmosphere-supplied respirators, a confined space rescue tool kit, and a confined space that contains one or more of the following characteristics:

(1) The internal configuration of the space could create entanglement hazards and retrieval might not be effective.
(2) The victim cannot be seen from the outside of the space's primary access opening.
(3) The portal size and configuration will not allow a rescuer to pass through the access/egress opening(s) using SCBA when worn in the manner recommended by the manufacturer.
(4) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that continuous atmospheric monitoring is initiated, the atmosphere is assessed to be manageable with atmosphere supplying respirators, victim communication is established when possible, atmosphere supplying respirators are used by rescue entrants while within the space, atmosphere supplying respirators are rapidly applied to the victim, rescuer readiness is verified, rescuers' limitations are identified and evaluated, rescuers unsuitable to entry operations are reassigned and replaced, route and methods of confined space entry are determined, and rescuer evacuation is planned.

(A) Requisite Knowledge. Effects of hazardous atmospheres on victims and rescuers, types and operation of required hazard-specific monitoring equipment, types and operation of required atmosphere supplying respirators, organization protocol for medical and psychological evaluation related to confined space entry, methods of entry into confined spaces with hazardous atmospheres in accordance with operational protocols, and rescuer evaluation methods.

(B) Requisite Skills. The ability to operate monitoring equipment, perform rescuer pre-entry medical exam, evaluate rescuer capabilities and limitations, identify victim communication needs, evaluate for point and route of confined space entry, and select evacuation methods.

7.3.6 Enter a confined space with atmospheric hazards, given hazard-specific PPE; safety, communication, and operational protocols; a confined space with a hazardous atmosphere; a confined space rescue tool kit so that the victim is contacted; and a confined space that contains one or more of the following characteristics:

(1) The internal configuration of the space could create entanglement hazards and retrieval might not be effective.
(2) The victim cannot be seen from the outside of the space's primary access opening.
(3) The portal size and configuration will not allow a rescuer to pass through the access/egress opening(s) using SCBA when worn in the manner recommended by the manufacturer.
(4) All hazards in and around the confined space have been identified and can be mitigated by using respiratory protection so that a controlled confined space entry is established and maintained, the atmosphere is continuously monitored, the rescuers and patient(s) are protected from the hazards, the victim's mental and physical conditions are further assessed, patient care is initiated, the patient is packaged to restrictions of the space, and patient removal can be initiated.

(A) Requisite Knowledge. Principles of operation for atmospheric monitoring equipment; methods for patient care in confined spaces; application of hazard-specific PPE; safety, communication, medical, and operational protocols; and controlled confined space entry and egress procedures for confined spaces.

(B) Requisite Skills. The ability to use and apply hazard-specific PPE and rescue-related systems and equipment; implement safety, communication, and operational protocols; use medical protocols to determine treatment priorities; use medical equipment specific to confined space victim needs; and reassess and confirm mode of operation.

Chapter 8 Vehicle Rescue

8.1 Awareness Level. The job performance requirements defined in 8.1.1 through 8.1.4 shall be met prior to awareness-level qualification in vehicle rescue.

8.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

8.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify

and mitigate existing or potential hazards, and personal safety techniques.

8.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation, and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, function within an IMS, follow and implement an incident action plan, report task progress status to supervisor or Incident Command.

8.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

8.2 Operations Level. The job performance requirements defined in Section 5.2, Section 8.1, and 8.2.1 through 8.2.9 shall be met prior to operations level qualification in vehicle rescue.

8.2.1 Create an incident action plan for a vehicle incident, and conduct an initial and ongoing size-up, given agency guidelines, planning forms, and an operations-level vehicle incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; vehicle stabilization needs are evaluated; and resource needs are identified and documented for future use.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of vehicles common to the AHJ boundaries, vehicle hazards, incident support operations and resources, vehicle anatomy, and fire suppression and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of vehicles, identify and evaluate various types of vehicles within the AHJ boundaries, request support and resources, identify vehicle anatomy, and determine the required fire suppression and safety measures.

8.2.2* Establish fire protection, given an extrication incident and fire control support, so that fire and explosion potential is managed and fire hazards and rescue objectives are communicated to the fire support team.

(A) Requisite Knowledge. Types of fire and explosion hazards, incident management system, types of extinguishing devices, agency policies and procedures, types of flammable and combustible substances and types of ignition sources, and extinguishment or control options.

(B) Requisite Skills. The ability to identify fire and explosion hazards, operate within the incident management system, use extinguishing devices, apply fire control strategies, and manage ignition potential.

8.2.3* Stabilize a common passenger vehicle, given a vehicle tool kit and PPE, so that the vehicle is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise vehicle stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

(A) Requisite Knowledge. Types of stabilization devices, mechanism of common passenger vehicle movement, types of stabilization points, types of stabilization surfaces, AHJ policies and procedures, and types of vehicle construction components as they apply to stabilization.

(B) Requisite Skills. The ability to apply and operate stabilization devices.

8.2.4* Isolate and manage potentially harmful energy sources, including propulsion power, restraint systems, and construction materials, given passenger vehicle, vehicle tool kit, and PPE, so that all hazards are identified; systems are managed; beneficial system use is evaluated; and hazards to rescue personnel and victims are minimized.

(A) Requisite Knowledge. Types and uses of PPE, types of energy sources, system isolation methods, specialized system features, tools for disabling hazards, and policies and procedures of the AHJ.

(B) Requisite Skills. The ability to select and use task- and incident-specific PPE, identify hazards, operate beneficial systems in support of tactical objectives, and operate tools and devices for securing and disabling hazards.

8.2.5 Determine the common passenger vehicle access and egress points, given the structural and damage characteristics and potential victim location(s), so that the victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, victim, and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise vehicle stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced.

(A) Requisite Knowledge. Common passenger vehicle construction/features, entry and exit points, routes and hazards operating systems, AHJ standard operating procedure, and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify entry and exit points and probable victim locations, and to assess and evaluate impact of vehicle stability on the victim.

8.2.6 Create access and egress openings for rescue from a common passenger vehicle, given a vehicle tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and vehicle stability is maintained.

(A) Requisite Knowledge. Common passenger vehicle construction and features; electrical, mechanical, hydraulic, pneumatic, and alternative entry and exit equipment; points and routes of ingress and egress; techniques and hazards; agency policies and procedures; and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify common passenger vehicle construction features, select and operate tools and equipment, apply tactics and strategy based on assignment, apply victim care and stabilization devices, perform hazard control based on techniques selected, and demonstrate safety procedures and emergency evacuation signals.

8.2.7 Disentangle victim(s), given an operations-level extrication incident, a vehicle tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.

(A) Requisite Knowledge. Tool selection and application, stabilization systems, protection methods, disentanglement points and techniques, and dynamics of disentanglement.

(B) Requisite Skills. The ability to operate disentanglement tools, initiate protective measures, identify and eliminate points of entrapment, and maintain incident stability and scene safety.

8.2.8 Remove a packaged victim to a designated safe area, as a member of a team, given a victim transfer device, a designated egress route, and PPE, so that the team effort is coordinated; the designated egress route is used; the victim is removed without compromising victim packaging; undue injury is prevented; and stabilization is maintained.

(A) Requisite Knowledge. Patient handling techniques; incident management system; types of immobilization, packaging, and transfer devices; types of immobilization techniques; and uses of immobilization devices.

(B) Requisite Skills. Use of immobilization, packaging, and transfer devices for specific situations; immobilization techniques; application of medical protocols and safety features to immobilize, package, and transfer; and all techniques for lifting the patient.

8.2.9* Terminate a vehicle incident, given PPE specific to the incident, isolation barriers, and an extrication tool kit, so that rescuers and bystanders are protected during termination operations; the party responsible for the operation, maintenance, or removal of the affected vehicle is notified of any modification or damage created during the extrication process; scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, post incident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard specific PPE, decontamination, use of barrier protection techniques, data collection and record keeping/reporting protocols, post incident analysis activities.

8.3 Technician. The job performance requirements defined in Section 8.2 and 8.3.1 through 8.3.6 shall be met prior to technician level qualification in vehicle rescue.

8.3.1* Create an incident action plan for a commercial or heavy vehicle incident, and conduct initial and ongoing size-up, given agency guidelines, planning forms, and a technician-level vehicle incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; vehicle stabilization needs are evaluated; and resource needs are identified and documented for future use.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of commercial/heavy vehicles common to the AHJ boundaries, vehicle hazards, incident support operations and resources, vehicle anatomy, and fire suppression and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of commercial/heavy vehicles, identify and evaluate various types of commercial/heavy vehicles within the AHJ boundaries, request support and resources, identify commercial/heavy vehicles anatomy, and determine the required fire suppression and safety measures.

8.3.2* Stabilize commercial/heavy vehicles, given a vehicle and machinery tool kit and PPE, so that the vehicle is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise vehicle stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

(A) Requisite Knowledge. Types of stabilization devices, mechanism of heavy vehicle movement, types of stabilization points, types of stabilization surfaces, AHJ policies and procedures, and types of vehicle construction components as they apply to stabilization.

(B) Requisite Skills. The ability to apply and operate stabilization devices.

8.3.3 Determine the heavy vehicle access and egress points, given the structural and damage characteristics and potential victim location(s), so that the victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, the victim(s), and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise vehicle stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced.

(A) Requisite Knowledge. Heavy vehicle construction/features, entry and exit points, routes and hazards, operating systems, AHJ standard operating procedure, and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify entry and exit points and probable victim locations and assess and evaluate impact of heavy vehicle stability on the victim(s).

8.3.4 Create access and egress openings for rescue from a heavy vehicle, given vehicle tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and vehicle stability is maintained.

(A) Requisite Knowledge. Heavy vehicle construction and features; electrical, mechanical, hydraulic, and pneumatic systems; alternative entry and exit equipment; points and routes of ingress and egress; techniques and hazards; agency policies and procedures; and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify heavy vehicle construction features, select and operate tools and equipment, apply tactics and strategy based on assignment, apply victim care and stabilization devices, perform hazard control based on techniques selected, and demonstrate safety procedures and emergency evacuation signals.

8.3.5 Disentangle victim(s), given an extrication incident, a vehicle tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.

(A) Requisite Knowledge. Tool selection and application, stabilization systems, protection methods, disentanglement points and techniques, and dynamics of disentanglement.

(B) Requisite Skills. The ability to operate disentanglement tools, initiate protective measures, identify and eliminate points of entrapment, and maintain incident stability and scene safety.

8.3.6 Isolate and manage potentially harmful energy sources, including propulsion power, restraint systems, and construction materials, given heavy vehicle, vehicle tool kit, and PPE, so that all hazards are identified; systems are managed; beneficial system use is evaluated; and hazards to rescue personnel and victims are minimized.

(A) Requisite Knowledge. Types and uses of PPE, types of energy sources, system isolation methods, specialized system features, tools for disabling hazards, and policies and procedures of the AHJ.

(B) Requisite Skills. The ability to select and use task- and incident-specific PPE, identify hazards, operate beneficial systems in support of tactical objectives, and operate tools and devices for securing and disabling hazards.

Chapter 9 Animal Technical Rescue

9.1 Awareness Level. The job performance requirements defined in 9.1.1 through 9.1.4 shall be met prior to awareness-level qualification in animal technical rescue.

9.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

9.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment, so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of personal protective equipment, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use personal protective equipment, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques

9.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, function within an IMS, follow and implement an incident action plan, report task progress status to supervisor or IC.

9.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

9.2 Operations-Level General Requirements. The job performance requirements defined in Section5.2, Section 9.1, and 9.2.1 through 9.2.14 shall be met prior to operations-level qualification in animal technical rescue.

9.2.1 Assess and stabilize a representative victim, given a first aid kit, and an actual or simulated EMS agency, so that rescuers and a representative victim are protected from hazards, the representative victim's injuries or illnesses are managed, and the representative victim is delivered to the appropriate EMS provider with information regarding the history of the rescue activity and the representative victim's condition with the assistance of local policy determined personnel, when available.

(A) Requisite Knowledge. Animal and scene assessment methods; animal treatment, methods of physical and chemical immobilization, and packaging methods; resource availability; and medical information management and communication methods.

(B) Requisite Skills. The ability to use animal immobilization, packaging, and treatment methods appropriate to the situation and provide animal transfer reports, both verbally and in written format.

9.2.2 Perform basic level triage, given triage tags and AHJ protocols, so that determination between rescue and recovery modes are made, triage decisions reflect resource capabilities, severity of injuries are determined, and animal care and rescue priorities are established in accordance with local protocol.

(A) Requisite Knowledge. Types and systems of triage according to AHJ protocol, resource availability, methods to determine injury severity, ways to manage resources, and prioritization requirements.

(B) Requisite Skills. The ability to use triage materials, techniques, and resources.

9.2.3 Construct an improvised restraint device, given an available rope or accessory cord, so that the device includes a long enough standing end to ensure rescuer control and that the representative victim is able to be led to a safe area.

(A) Requisite Knowledge. Task specific PPE selection and use, application of knots, animal halter pressure principles, rope or webbing material selection, and device positioning techniques on animals.

(B) Requisite Skills. Select and use task and hazard specific PPE, tie knots, construct and rig animal halters, and evaluate correct placement.

9.2.4 Move a representative victim, in a low-angle environment, as a member of a team, given an incident action plan, basic animal transport equipment, so that hazards are identified, the representative victim is moved without further injury, risks to rescuers are managed, the representative victim securement is maintained, and the objective attained.

(A) Requisite Knowledge. Types of basic animal transport equipment, hazard identification, task and hazard specific PPE, methods to reduce and prevent further injuries from the environment and/or specie specific, animal securement methods (physical and chemical), and transport techniques.

(B) Requisite Skills. Operate transport equipment, assemble and operate environment/task specific animal removal systems, and the use of transport devices.

9.2.5 Move a representative victim in a low-angle environment, as a member of a team, given animal transport equipment, litters, and animal removal systems specific to the rescue environment, so that the a representative victim is moved without further injuries, risks to rescuers are minimized from both the hazard and the representative victim, the integrity of the a representative victim's securement within the transfer device is established and maintained, the means of attachment to the rope rescue system is maintained, and the a representative victim is removed from the hazard.

(A) Requisite Knowledge. Types of transport equipment and removal systems, selection factors with regard to specific rescue environments, methods to reduce and prevent further injuries from the hazard and from the specie specific hazards, types of risks to rescuers to include the hazard as well as specie specific hazards, ways to establish and maintain animal securement (both physical and chemical), transport techniques, rope rigging applications and methods, and types of specialized equipment and their uses.

(B) Requisite Skills. The ability to secure an animal to transport equipment, the ability to assemble and operate environment-specific animal removal systems, and to choose an incident-specific transport device.

9.2.6 Inspect and maintain rescue equipment, given maintenance logs and records, tools, resources, manufacturer's guidelines, organizational standard operating procedures, which should include keeping the large animal technical rescue cache subjected to greater than 600 lb (272 kg) loads, separate from the regular cache, so that the operational status of equipment is verified and documented, components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement protocol are correctly disposed of and changed.

(A) Requisite Knowledge. Functions and operations of rescue equipment, use of record-keeping systems, manufacturer and organizational care and maintenance requirements, selection and use of maintenance tools, replacement protocol and procedures, disposal methods, and organizational standard operating procedures.

(B) Requisite Skills. The ability to identify wear and damage indicators for rescue equipment, evaluate operation readiness of equipment, complete logs and records, and select and use maintenance tools.

9.2.7 Construct a simple rope mechanical advantage system, given an incident, representative victim load, an anchor system, life safety rope, carabiners, pulleys, rope grab devices, and rope rescue equipment, so that the system constructed accommodates the load and reduces the force required to lift the load, operational interference is factored and minimized, the system is efficient, a system safety check is completed, and the system is connected to an anchor system and the load, with recognition a sub optimal SSSF might be required to accomplish the rescue.

(A) Requisite Knowledge. Determination of incident needs as related to choosing simple rope systems, the elements of efficient design for compound rope systems, knot selection, methods for reducing excessive force to system components, evaluation of incident operations as related to interference concerns and set-up, rope commands, rigging principles,

system safety check procedures, and methods of evaluating system components for compromised integrity.

(B) Requisite Skills. The ability to determine incident needs as related to choosing simple rope systems, select effective knots, calculate expected loads, evaluate incident operations as related to interference concerns and set-up, perform a system safety check, and evaluate system components for compromised integrity.

9.2.8 Construct a compound rope mechanical advantage system, given an incident, a representative victim load, an anchor system, life safety rope, carabiners, pulleys, rope grab devices, and rope rescue equipment, so that the system constructed accommodates the load and reduces the force required to lift the load, operational interference is factored and minimized, the system is efficient, a system safety check is completed, and the system is connected to an anchor system and the load, with recognition a sub optimal SSSF might be required to accomplish the rescue.

(A) Requisite Knowledge. Determination of incident needs as related to choosing compound rope systems, the elements of efficient design for compound rope systems, knot selection, methods for reducing excessive force to system components, evaluation of incident operations as related to interference concerns and set-up, rope commands, rigging principles, system safety check procedures, and methods of evaluating system components for compromised integrity.

(B) Requisite Skills. The ability to determine incident needs as related to choosing compound rope systems, select effective knots, calculate expected loads, evaluate incident operations as related to interference concerns and set-up, perform a system safety check, and evaluate system components for compromised integrity.

9.2.9 Construct and operate a portable highpoint anchor and multiple compound rope mechanical advantage system in a high-angle environment, as a member of a team, given an incident, multiple rope rescue systems incorporating a compound rope mechanical advantage system, a representative victim load to be moved, and a specified minimum travel distance for the load, so that a system safety check is performed; a reset is accomplished, and the movement is controlled; the load can be held in place when needed; operating methods do not stress the system to the point of failure; operational commands are clearly communicated; and potential problems are identified, communicated, and managed.

(A) Requisite Knowledge. Methods to determine incident needs, types of interference concerns, rope commands, safe operating limits of the portable highpoint anchor, system safety check protocol, procedures for continued evaluation of system components for compromised integrity, common personnel assignments and duties, common and critical commands, methods for controlling a load's movement, system stress issues during operations, animal stress issues during movement, and management methods for common problems.

(B) Requisite Skills. The ability to determine incident needs, evaluate incident operations as related to interference concerns, complete a system safety check, continually evaluate system components for compromised integrity, direct personnel effectively, operate multiple mechanical advantage systems in balance, communicate commands, analyze system efficiency, manage load movement, and identify concerns.

9.2.10 Move a representative victim load in a high-angle environment, as a member of a team, given animal transport equipment, litters, other specialized equipment, and animal removal systems specific to the rescue environment, so that the representative victim is moved without further injury, risks to rescuers are minimized from both the hazard and the a representative victim, the integrity of the representative victim's securement within the transfer device is established and maintained, the means of attachment to the rescue system is maintained, and the representative victim is removed from the hazard.

(A) Requisite Knowledge. Types of transport equipment and removal systems, selection factors with regard to specific rescue environments, methods to reduce and prevent further injuries from the hazard and from the specie specific hazards, types of risks to rescuers to include the hazard as well as specie specific hazards, ways to establish and maintain animal securement (specie specific), transport techniques, rope rigging applications and methods, and types of specialized equipment and their uses.

(B) Requisite Skills. The ability to secure an animal to transport equipment, assemble and operate environment-specific animal removal systems, and choose an incident-specific transport device.

9.2.11 Release a representative victim from soil entrapment, as a member of a team, given an incident, a representative victim load, personal protective equipment, a mud rescue tool kit, and specialized equipment, so that hazards to rescue personnel and a representative victim are minimized, considerations are given to animal hypothermia, dehydration and other injuries, techniques are used to enhance animal survivability, tasks are accomplished within projected time frames.

(A) Requisite Knowledge. Identification, utilization, and required care of personal equipment; general hazards associated with mud rescue to both the animal and the rescuers to include adhesive forces; selection and application of rescue tools and resources; risk/benefit assessment techniques for extrication methods; and time restraints.

(B) Requisite Skills. The ability to select, use, and care for personal protective equipment, operate rescue tools and stabilization systems, and complete risk/benefit assessments for selected methods of rescue and time restraints.

9.2.12 Develop a plan for an animal transport vehicle incident, given an incident, agency guidelines, planning forms, so that size-up is conducted and continued throughout the incident, a standard approach is used during training and operational scenarios; hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; vehicle stabilization needs are evaluated; and resource needs including veterinary personnel are identified.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of vehicles common to the AHJ boundaries, vehicle hazards, animal hazards to the rescuers, incident support operations and resources, vehicle anatomy, and fire suppression and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of vehicles, identify and evaluate various types of vehicles within the AHJ boundaries, request support and resources, identify vehi-

cle anatomy, and determine the required fire suppression and safety measures.

9.2.13 Remove a packaged representative victim to a designated safe area, as a member of a team, given an animal transfer device, a designated egress route, and personal protective equipment, so that effort is coordinated; the designated egress routes are used; a representative victim is removed without compromising animal packaging; injury is prevented; and stabilization is maintained.

(A) Requisite Knowledge. Animal handling techniques; incident management system; types of immobilization, packaging, appropriate animal attachment points, and transfer devices; types of immobilization techniques; and uses of immobilization devices.

(B) Requisite Skills. Use of immobilization, packaging, and transfer devices for specific situations; immobilization techniques; to include chemical with the assistant of AHJ designated personnel, application of medical protocols and safety features to immobilize, package, and transfer; and all techniques for lifting or moving the animal.

9.2.14 Terminate an incident, given personal protective equipment specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, post incident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard specific PPE, decontamination, use of barrier protection techniques, data collection and record keeping/reporting protocols, post incident analysis activities.

9.3 Technician Level. The job performance requirements defined Section 9.2 and 9.3.1 through 9.3.5 shall be met prior to technician-level qualification in animal technical rescue.

9.3.1 Move a representative victim load in an extended duration high-angle environment, as a member of a team, given animal transport equipment, litters, and animal removal systems specific to the rescue environment, so that the a representative victim is moved without further injuries, risks to rescuers are minimized from both the hazard and the a representative victim, the integrity of the a representative victim's securement within the transfer device is established and maintained, the means of attachment to the rope rescue system is maintained, and the representative victim is removed from the hazard.

(A) Requisite Knowledge. Types of transport equipment and removal systems, selection factors with regard to specific rescue environments, methods to reduce and prevent further injuries from the hazard and from the specie specific hazards, types of risks to rescuers to include the hazard as well as specie specific hazards, ways to establish and maintain animal securement (both physical and chemical), transport techniques, rope rigging applications and methods, and types of specialized equipment and their uses.

(B) Requisite Skills. The ability to secure an animal to transport equipment, ability to assemble and operate environment-specific animal removal systems, and to choose an incident-specific transport device.

9.3.2 Direct a team in the removal of a representative victim, in a high-angle environmentusing a means of transporting the representative victim to the ground or other safe area, given an incident, a representative victim load, a high-angle rope system when raising or lowering animals, an assignment, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to animals and rescuers are minimized, injury to the animal is minimized, the means of attachment to the rope rescue system is maintained, and a representative victim is brought to a safe area for transfer to appropriate authorities.

(A) Requisite Knowledge. Techniques and systems for safe transfer of animals from an existing stable platform, various techniques for handling and securing animals.

(B) Requisite Skills. Select and construct systems for securing animals from a stable platform, manage operation of the selected system, determine condition of the animal, reduce hazards for rescuers and animals, and determine specialized equipment needs for animal movement.

9.3.3 Complete an assignment while suspended from a rope rescue system in a high-angle environment, given an independent rescuer rope rescue system, a representative victim and an independent animal rope rescue system, when raising or lowering animals in excess of 300 lbs (136 kgs), an assignment, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to animals and rescuers are minimized; the means of attachment to the rope rescue system is secure; selected specialized equipment facilitates efficient rescuer movement; and specialized equipment does not unduly increase risks to rescuers or animals.

(A) Requisite Knowledge. Task-specific selection criteria for life safety harnesses, personal protective equipment selection criteria, variations in litter design and intended purpose, rigging principles, techniques and practices for high-angle environments, and common hazards posed by improper maneuvering and harnessing.

(B) Requisite Skills. The ability to select and use rescuer harness and personal protective equipment for common environments, attach the life safety harness to the rope rescue system, maneuver around existing environment and system-specific obstacles, perform work while suspended from the rope rescue system, and evaluate surroundings for potential hazards.

9.3.4 Direct a team in the operation of a rope system to move a suspended representative victim load along a horizontal path, given rescue personnel, an established system, a target for the load, a load to be moved, and personal protective equipment, so that the movement is controlled; the load is held in place when needed; the weight of the rescuer and a representative victim, or a representative victim being moved alone is under 600lbs (272 kgs); operating methods do not stress the system to the point of failure; personnel assignments are made; tasks are

communicated; and potential problems are identified, communicated and managed.

(A) Requisite Knowledge. Determination of incident needs as related to the operation of a system, capabilities and limitations of various systems, incident site evaluation as related to interference concerns and obstacle negotiation, system safety check protocol, procedures to evaluate system components for compromised integrity, common personnel assignments and duties, common and critical operational commands, common problems and ways to minimize or manage those problems, and ways to increase the efficiency of load movement.

(B) Requisite Skills. The ability to determine incident needs, complete a system safety check, evaluate system components for compromised integrity, select personnel, communicate with personnel effectively, manage movement of the load, and evaluate for any potential problems.

9.3.5* Conduct an animal helicopter rescue, as a member of a team, given a representative helicopter system, size-up information, and a representative victim needing rescue, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions are included, specialized resource needs are identified, work parameters are determined, associated hazards are identified, incident objectives are established, and scene security and safety measures are addressed.

(A) Requisite Knowledge. Incident-specific size-up information, incident management system components, dynamics of incident conditions and peripheral areas, incident-specific resources, including specific helicopter selection, and animal chemical restraint assistance, scene security and safety requirements, use of specialized animal technical rescue sling systems for extended duration lifts, and hazards to rescuers.

(B) Requisite Skills. The ability to utilize size-up information, implement an incident management system, monitor changing conditions specific to the incident, identify potential specialized resources, use of specialized animal technical rescue sling systems for extended duration lifts, identify specific incident security and safety requirements.

Chapter 10 Wilderness Search and Rescue

10.1 Awareness Level. The job performance requirements defined in 10.1.1 through 10.1.5 shall be met prior to awareness-level qualification in wilderness search and rescue.

10.1.1 Identify the environment, type of terrain, and associated hazards involved in a wilderness incident given the environment, terrain, and hazards involved in the incident so that the personnel and equipment match the environment and terrain.

(A) Requisite Knowledge. Distinguish between types of environment such as wilderness *(see 3.3.222)* as it applies in the area of the AHJ, forest, alpine, altitude affected, desert, swamp, jungle, subterranean, and others found in the area of the AHJ; types of terrain such as high- or low-angle, snow-covered, water-covered, dense vegetation, and others found in the area of the AHJ; and associated hazards such as disorientation, darkness, weather extremes, hazardous vegetation and wildlife, avalanche, and others found in the area of the AHJ.

(B) Requisite Skills. The ability to describe environmental, terrain, and hazard types found in the AHJ's jurisdiction.

10.1.2 Recognize the need for technical search and rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, collect and record necessary information, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

10.1.3 Establish scene hazard zones, given an incident, scene barriers, incident location, and incident information, so that hazard zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to Incident Command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

10.1.4 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. Operational protocols; hazard recognition; initial incident management; resource selection and use while recognizing the limitations of conventional resources; scene support requirements including lighting, food, water, and supplies; and monitoring access into the environment.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system (IMS), follow an incident action plan, and report task progress status to supervisor or Incident Command.

10.1.5 Size up a given incident; obtain background information and applicable reference materials so that the operational mode is defined; determine resource availability and response time; determine potential types of searches and rescues; identify the number of subjects; establish the last reported location of all subjects; identify, interview, and retain for further information witnesses and reporting parties; assess resource needs; identify search parameters; and obtain information required to develop an incident action plan.

(A) Requisite Knowledge. Types of reference materials and their uses, risk/benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the IMS, and information-gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific search and rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

10.2 Operations Level. The job performance requirements defined in Sections 4.2 and 10.1, in 10.2.1 through 10.2.10, and in Section 5.2 shall be met prior to operations-level qualification in wilderness search and rescue.

10.2.1 Identify specific environments and conditions in their area in which operations-level search and rescue incidents are permitted as well as exceeded.

(A) Requisite Knowledge. Environments, hazards, and AHJ procedures that will assist in determining when operations-level search and rescue operations are permitted or exceeded.

(B) Requisite Skills. The ability to apply AHJ procedures and specific environments into decisions to conduct or not to conduct operations-level search and rescue and to request additional specialized resources.

10.2.2 Preplan and size-up existing and potential conditions where wilderness search and rescue will be performed.

(A) Requisite Knowledge. Where to acquire in advance an incident-by-incident weather history; weather forecast; reports on winds, avalanches, tides, areas, trails, climbing routes; topographical maps; and other AHJ-specific tactical information. Perform ICS-consistent size-up; size-up of environment, terrain, weather, and other actual or potential hazards; ongoing search versus rescue versus recovery decision making; given checklists and resources to help determine the general and specialized resources, personnel, and equipment necessary to perform.

(B) Requisite Skills. The ability to describe or perform how to acquire weather history, forecasts, and maps. The ability to apply the size-up components together, given checklists, to form plans for, and execution of, the search and rescue.

10.2.3 Request and interface with wilderness search and rescue resources.

(A) Requisite Knowledge. How to request various internal and external resources related to wilderness search and rescue and other related emergency services; recognizing other interface agencies' equipment.

(B) Requisite Skills. Ability to apply the request for resources and to interface effectively with other responding wilderness search and rescue and emergency response resources. Ability to recognize interface agencies' equipment.

10.2.4 Interview reporting party(ies) given interview recording forms, so that available information in regard to the potential locationof the subject and other factors affecting the incident are documented.

(A) Requisite Knowledge. Interviewing techniques, interviewing forms, subject identity and description, and other information that will assist the responding resources.

(B) Requisite Skills. The ability to apply interviewing techniques and documentation.

10.2.5 Collect, interpret, and document evidence to determine subject's potential location, given various items of evidence, collection and documentation equipment, and wilderness tool kit, so that the scene (area) is searched and evidence is protected, documented, cataloged, and collected.

(A) Requisite Knowledge. How to maintain the chain of evidence, scene protection, search procedures, evidence protection methods, documentation and catalog methods, and evidence collection procedures.

(B) Requisite Skills. The ability to protect the scene, operate photography equipment, utilize standard evidence collection tools, and implement procedures to collect, document, and catalog evidence.

10.2.6 Prepare to work in a wilderness environment for an 8-hour period given personal support equipment so that the rescuer can be self-sustaining in the wilderness environment.

(A) Requisite Knowledge. How to prepare for, personal (self) first aid needs, anticipated environment, anticipated weather conditions, hydration and nutrition requirements for mission duration, personal safety, medical and comfort needs, night operations, and wilderness navigation.

(B) Requisite Skills. The ability to prepare for wilderness search and rescue incidents by assembling, packing, and carrying the following supplies: personal medical supplies, clothing for the environment, hydration and nutrition, lighting equipment, navigation tools, general marking and documentation tools, emergency shelter or bivouac, and communications including emergency backup, and by operating effectively for 8 hours in such an environment in the AHJ area.

10.2.7 Navigate to a given location with directions from reporting parties, on nontechnical terrain, given maps and trail guides so that local recreational areas are known.

(A) Requisite Knowledge. Location of response area trails and recreational areas with history of search and rescue incidents.

(B) Requisite Skills. Ability to read trail maps and trail guides, describe access to trail heads, and navigate on established trails to locate subject.

10.2.8 Establish the need for specialized resources in wilderness search and rescue operations, given aircraft, watercraft, or specialized vehicles and trained operators, given operational protocols and specialized vehicle resources, so that resources are allocated and utilized during the operation to locate and/or remove the subject.

(A) Requisite Knowledge. Available specialized resources and their capabilities, landing zone requirements, risk factors associated with specialized resource operations, and local protocols and procedures.

(B) Requisite Skills. The ability to establish and control landing zones and helispots, assess fire protection needs as they pertain to landing zones and helispots, and identify hazards associated with specialized resources.

10.2.9 Manage a subject in a wilderness environment, given basic life support equipment and wilderness tool kit, so that the

basic medical care of the subject is managed during transport, and the potential for further injury is minimized.

(A) Requisite Knowledge. Medical care in a wilderness environment.

(B) Requisite Skills. The ability to provide medical care in a wilderness environment.

10.2.10 Move a subject in a wilderness environment a minimum of 0.25 mi (0.4 km), given subject transport equipment, litters, other specialized equipment, and subject removal systems specific to the search and rescue environment, so that the subject is moved without further injuries, risks to rescuers are minimized, the integrity of the subject's packaging within the transfer device is established and maintained, and the subject is removed from the hazard.

(A) Requisite Knowledge. Types of transport equipment and removal systems; selection factors with regard to specific search and rescue environments, methods to reduce, treat, and prevent further medical, nutritional, hydration, waste, and environmental challenges and injuries; types of risks to rescuers; ways to establish and maintain subject packaging transport techniques; and types of specialized equipment and their uses.

(B) Requisite Skills. The ability to address the subject's medical, nutritional, hydration, waste, and environmental challenges; secure a subject to transport equipment, assemble and operate environment-specific subject removal systems; and choose an incident-specific transport device.

10.2.11 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, and postincident analysis techniques.

(B) Requisite Skills. The ability to select and use task and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, and postincident analysis activities.

10.2.12 Travel through a wilderness environment by foot given off-road on a trail or on nontechnical terrain typical of the response area of the AHJ so that the rescuer maintains personal safety and has the ability to reach the subject.

(A) Requisite Knowledge. Selection of travel footwear and travel equipment such as hiking boots, snowshoes, and poles as determined by the terrain.

(B) Requisite Skills. The ability to don and use footwear and travel equipment on a trail or on nontechnical terrain typical of the AHJ's wilderness areas.

10.3 Technician Level. The job performance requirements defined in Sections 5.2, 9.2,10.2, and 15.2, and 10.3.1 through 10.3.8 shall be met prior to technician-level qualification in wilderness search and rescue.

10.3.1 Identify specific environments and conditions in their area in which technician-level search and rescue incidents are permitted as well as exceeded.

(A) Requisite Knowledge. Environments, hazards, and AHJ procedures that will assist in determining when technician-level search and rescue operations are permitted and exceeded.

(B) Requisite Skills. The ability to apply AHJ procedures and specific environments to decisions to conduct or not to conduct technician-level search and rescue, and to request additional specialized resources.

10.3.2 Identify how certain factors affect preparing, choosing, and using equipment in the AHJ's wilderness area.

(A) Requisite Knowledge. Describe how the following factors affect the effective and safe operation of a training or incident, given a variety of such conditions in the AHJ area:

(1) Temperature
(2) Weather
(3) Terrain
(4) Flora and fauna
(5) Altitude
(6) Travel time
(7) Patient care
(8) Duration of incident
(9) Logistics
(10) Communications
(11) Navigation
(12) Management needs

(B) Requisite Skills. Ability to apply these factors given classroom-type discussions, training, and incidents.

10.3.3 Develop profile(s) for the subject(s) in a wilderness environment, given subject information and collected evidence, so that a search plan can be developed and implemented.

(A) Requisite Knowledge. Interviewing techniques, evidence collection, lost person behavior, and weather conditions.

(B) Requisite Skills. The ability to interpret evidence, conduct subject analysis, and evaluate present and predicted weather conditions.

10.3.4 Collect and purify water, given a natural source of water in the wilderness environment, so that the rescuer can have potable water.

10.3.4.1 Requisite Knowledge. Water filters and purifiers, collection methods, and potential water sources.

10.3.4.2 Requisite Skills. The ability to use water filters and purifiers, collect water, and identify water sources.

10.3.5 Develop a wilderness search and rescue incident action plan, given an incident, size-up information, and local weather forecasts and current conditions, so that the IMS is utilized, communication needs are addressed, existing and potential conditions are identified, the search area is designated, operational periods are identified, safety plans are developed, and objectives are established.

(A) Requisite Knowledge. Incident-specific size-up information, IMSs, safety planning, communication resources, hazards and work conditions, and specialized resources for wilderness search and rescue.

(B) Requisite Skills. The ability to use size-up assessment information, implement an IMS, identify special resource needs, create written documentation, and develop safety and communications plans.

10.3.6 Develop a search plan given standard search tactics, the lost person profile, lost person behavior statistics, reporting party interviews and available resources, and revise the search plan based on clues identified by search teams so that resources can be deployed.

(A) Requisite Knowledge. Search tactics, developing a lost person profile, lost person behavior, interviewing reporting parties, and revising the search plan given located clues.

(B) Requisite Skills. The ability to develop an initial search plan after interviewing a reporting party, develop a lost person profile, and update the search plan given clues located by a field team.

10.3.7 Navigate in the wilderness to a specified location, given navigation equipment, topographical maps of the area to be navigated, and communication equipment, so that the specified location is identified and reached, search patterns are conducted, teams are guided to the desired location, and all clues relative to the location of the subject are identified and communicated to the incident commander.

(A) Requisite Knowledge. Search patterns, navigation equipment, map reading, map types and systems, and use of communication equipment.

(B) Requisite Skills. The ability to read maps, use navigation equipment, measure a distance in varied terrain, navigate accurately around obstacles, and effectively use communications equipment compatible with the AHJ and its mutual aid partners.

10.3.8 Manage and direct a team at a wilderness search and rescue incident, given search and rescue personnel, capabilities and limitations of search and rescue members, and incident and site information, so that an IMS is established, needed support resources are identified, the incident action plan is communicated, tasks are communicated, resources are allocated, the incident is stabilized, personnel assignments are made, potential problems are identified and managed, and accountability is provided.

(A) Requisite Knowledge. Incident Command Systems, procedures to evaluate incidents, common personnel assignments and duties, common and critical operational commands, safety protocols, and ways to increase efficiency.

(B) Requisite Skills. The ability to implement an IMS, evaluate an incident, evaluate personnel, and implement procedures.

10.3.9 Locate a subject in a wilderness environment, given a lost person profile, established search area, navigation equipment, topographical maps, and communication equipment, so that the subject's location is determined.

(A) Requisite Knowledge. Man-tracking skills, search patterns, communication skills, passive (indirect) and active (direct) search techniques, and sign cutting techniques.

(B) Requisite Skills. The ability to implement man tracking, search patterns, communication techniques, passive and active search, sign cutting; and to communicate findings to others using a track ID form.

10.3.10 Construct an emergency shelter in a wilderness environment, given supplies in the search and rescue response pack, so that the rescuer is protected from the elements.

(A) Requisite Knowledge. Determining whether to transport the subject or to shelter in place.

(B) Requisite Skills. The ability to construct an emergency shelter with equipment carried by the rescuer.

10.3.11* Negotiate technical terrain typical of the response area, given the technical wilderness travel equipment used by the responders, so that technical terrain access skills can be assessed.

(A) Requisite Knowledge. Knowledge of the technical terrain and associated hazards in the response area, personal skills and specialized equipment to conduct operations on the technical terrain, and available resources that would be required.

(B) Requisite Skills. The ability to respond to the various terrain types in which the organization expects to perform search and rescue operations, using technical skills and equipment to travel and transport a patient.

Chapter 11 Trench Rescue

11.1 Awareness Level. The job performance requirements defined in 11.1.1 through 11.1.5 shall be met prior to awareness-level qualification in trench rescue.

11.1.1 Identify the need for trench and excavation collapse rescue, given a specific type of collapse incident, so that resource needs are identified and the emergency response system for trench and excavation collapse is initiated.

(A) Requisite Knowledge. Equipment organization and tracking method, recognition the hazards associated with the weight of soil and its entrapping characteristics, resource capabilities, procedures for activation of emergency response for collapse incidents.

(B) Requisite Skills. Ability to use communication equipment, track resources and communicate needs.

11.1.2* Conduct a size-up of a collapsed trench, given an incident and background information and applicable reference material, so that the size-up is conducted within the scope of the incident management system; the existing and potential conditions are evaluated within the trench and the rescue area; general hazards are identified; a witness or "competent person" is secured; the probability of victim existence, number, condition, and location is determined; potential for rapid, nonentry rescues or victim self-rescue is recognized; needed personnel, supply, and equipment resources are evaluated; and utility involvement and location are determined. *(See Annex H.)*

(A) Requisite Knowledge. Methods to distinguish soil types, collapse mechanics, and other contributing factors such as severe environmental conditions and other general hazards; need to immediately secure "competent person" or witness; signs and evidence of victim involvement, number, and location; jurisdictional and community resource lists and agreements; effects and hazards of collapse and rescue efforts on utilities at the incident site; personnel training level and availability; risk/benefit analysis; protocols; incident management system; and all applicable regulations, laws, and standards.

(B) Requisite Skills. The ability to measure dimensions of trench, categorize soil, identify type and degree of collapse, and determine severe environmental conditions with implications for secondary collapse and victim survivability; demonstrate interview techniques; implement protocols and resource acquisition agreements; implement public works utility notification, response, and location procedures; perform a risk/benefit analysis for determining self-rescue, rescue, or recovery mode; implement an incident management system for span of control; and apply governing regulations, laws, and standards.

11.1.3* Implement a trench emergency action plan, given size-up information and a trench incident, so that initial size-up information is utilized; prebriefing is given to rescuers; documentation is ongoing; the collapse zone is established; a risk/benefit analysis is conducted; rapid, nonentry rescues or victim self-rescues are performed; the rescue area and general area are made safe; strategy and tactics are confirmed and initiated for existing and potential conditions; rapid intervention team and operational tasks are assigned; other hazards are mitigated; rescue resources are staged; and a protective system is being utilized.

(A) Requisite Knowledge. Size-up information and documentation; need to brief rescuers; areas that could be affected by collapse; variables to factor risk/benefit analysis; criteria for rapid, nonentry rescues; methods to control hazards in the general area; options for strategy and tactical approach by factoring time frame, risk/benefit, approved shoring techniques, and personnel and equipment available; incident management system; rescue personnel and equipment cache staging; and options for victim isolation and/or protective systems.

(B) Requisite Skills. The ability to use and document tactical worksheets; disseminate information; understand mechanics and extent of collapse effects; perform risk/benefit analysis; execute rapid, nonentry rescues; mitigate hazards by isolation, removal, or control; reduce imposed loads at or near the lip of the trench; choose strategy and tactics that will enhance successful outcome; use incident management system and resource staging; and apply choice of isolation and/or protective system promptly to surround victim.

11.1.4* Implement support operations at trench emergencies, given an assignment, and equipment and other resources, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, a cut station is established, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, operations proceed without interruption, extrication methods are in place, and the support operations facilitate rescue operational objectives.

(A) Requisite Knowledge. Equipment organization and tracking methods, lighting resources, dewatering methods, shelter and thermal control options, basic carpentry methods, hand and power tool applications, atmospheric monitoring protocol, rehab criteria, and extrication and removal equipment options.

(B) Requisite Skills. The ability to track equipment inventory, provide power, use lighting, choose and deploy dewatering techniques, acquire or construct structures for shelter and thermal protection, select rehab areas and personnel rotations, operate atmospheric monitoring and ventilation equipment, and perform patient packaging and removal.

11.1.5 Initiate the incident management system given a trench or excavation collapse incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, and the incident action plan is developed.

(A) Requisite Knowledge. Incident management system structure, implementation procedures, expansion methodology, resource management techniques, tracking methods, incident action plan components, accountability systems, and IMS documentation forms rescuer rehabilitation criteria.

(B) Requisite Skills. Ability to utilize IMS forms and command tools, and use communication devices and accountability tracking systems.

11.2 Operations Level. The job performance requirements defined in Section 5.2, Section 11.1, and 11.2.1 through 11.2.5 shall be met prior to operation-level qualification in trench rescue.

11.2.1* Support a nonintersecting straight wall trench of 8 ft (2.4 m) or less in depth as a member of a team, given size-up information, an action plan, a trench tool kit, and an assignment, so that strategies to minimize the further movement of soil are implemented effectively; trench walls, lip, and spoil pile are monitored continuously; rescue entry team(s) remains in a safe zone; any slough-in and wall shears are mitigated; emergency procedures and warning systems are established and understood by participating personnel; incident-specific personal protective equipment is utilized; physical hazards are identified and managed; victim and rescuer protection is maximized; victim extrication methods are considered; and a rapid intervention team is staged.

(A) Requisite Knowledge. Shoring and shielding, tabulated data, strategies and tactics, protocols on making the general area safe, criteria for a safe zone within the trench, types of collapses and techniques to stabilize, emergency procedures, selection of personal protective equipment, and consideration of selected stabilization tactics on extrication and victim safety.

(B) Requisite Skills. The ability to interpret tabulated data information and tables, place shoring and shielding systems, install supplemental shoring, use protocols, choose methods to stabilize, use personal protective equipment, anticipate extrication logistics, and create systems in trenches 8 ft (2.4 m) deep.

11.2.2* Release a victim from soil entrapment by components of a nonintersecting collapsed trench of 8 ft (2.4 m) or less in depth, given personal protective equipment, a trench rescue tool kit, and specialized equipment, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome and other injuries, techniques are used to enhance patient survivability, tasks are accomplished within

projected time frames, and techniques do not compromise the integrity of the existing trench shoring system.

(A) Requisite Knowledge. Identification, utilization, and required care of personal equipment; general hazards associated with each type of trench collapse; methods of evaluating shoring systems and trench wall stability; crush syndrome protocols; identification of collapse characteristics; causes and associated effects of trench collapse; potential signs of subsequent collapse; selection and application of rescue tools and resources; risk/benefit assessment techniques for extrication methods; and time restraints.

(B) Requisite Skills. The ability to select, use, and care for personal protective equipment; operate rescue tools and stabilization systems; identify crush syndrome clinical settings; and complete risk/benefit assessments for selected methods of rescue and time restraints.

11.2.3* Remove a victim from a trench, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required; the victim is evaluated for signs of crush syndrome; methods and packaging devices selected are compatible with intended routes of transfer; universal precautions are employed to protect personnel from bloodborne pathogens; and extraction times meet time constraints for medical management.

(A) Requisite Knowledge. Medical protocols, available medical resources, transfer methods and time needed to execute, universal precautions protocol, rope rescue systems, high-point anchor options, and patient ladder raise removal techniques.

(B) Requisite Skills. The ability to select and use personal protective equipment, provide basic medical care and immobilization techniques, identify the need for advanced life support and crush syndrome management, and use a removal system that matches logistical and medical management time frame concerns.

11.2.4* Disassemble support systems at a trench emergency incident, given personal protective equipment, trench tool kit, and removal of victim(s), so that soil movement is minimized, all rescue equipment is removed from the trench, sheeting and shoring are removed in the reverse order of their placement, emergency protocols and safe zones in the trench are adhered to, rescue personnel are removed from the trench, the last supporting shores are pulled free with ropes, equipment is cleaned and serviced, reports are completed, and a postbriefing is performed.

(A) Requisite Knowledge. Selection of personal protective equipment, equipment used and its location, shoring and shielding tactics and order of placement, shoring removal protocols, criteria for a "safe zone" within the trench, personnel accountability, emergency procedures, manufacturer's recommended care and maintenance procedures, and briefing protocols.

(B) Requisite Skills. The ability to use personal protective equipment, remove equipment and protective systems, use trench safety protocols, clean and service equipment, and perform an incident debriefing.

11.2.5* Terminate a technical rescue operation, given an incident scenario, assigned resources, and site safety data, so that rescuer risk and site safety are managed; scene security is maintained and custody transferred to a responsible party; personnel and resources are returned to a state of readiness; recordkeeping and documentation occur; and post-event analysis is conducted.

(A) Requisite Knowledge. Incident Command functions and resources, hazard identification and risk management strategies, logistics and resource management, personnel accountability systems, and AHJ-specific procedures or protocols related to personnel rehab.

(B) Requisite Skills. Hazard recognition, risk analysis, use of site control equipment and methods, use of data collection and management systems, and use of asset and personnel tracking systems.

11.3 Technician Level. The job performance requirements defined in Section 11.2 and 11.3.1 through 11.3.6 shall be met prior to technician level qualification in trench rescue.

11.3.1* Support an intersecting trench as a member of a team, given size-up information and an action plan, a trench tool kit, and an assignment, so that strategies to minimize the further movement of soil are implemented effectively; trench walls, lip, and spoil pile are monitored continuously; rescue entry team(s) in the trench remains in a safe zone; any slough-in and wall shears are mitigated; emergency procedures and warning systems are established and understood by participating personnel; incident-specific personal protective equipment is utilized; physical hazards are identified and managed; victim protection is maximized; victim extrication methods are considered; and a rapid intervention team is staged.

(A) Requisite Knowledge. Shoring and shielding, tabulated data, strategies and tactics, types of intersecting trenches and techniques to stabilize, protocols on making the general area safe, criteria for safe zones in the trench, types of collapses and techniques to stabilize, emergency procedures, selection of personal protective equipment, and consideration of selected stabilization tactics on extrication and victim safety.

(B) Requisite Skills. The ability to interpret tabulated data information and tables, place shoring and shielding systems, identify type of intersecting trench, use trench rescue protocols, select types of collapse and methods to stabilize, identify hazards in a trench, use personal protective equipment, and anticipate extrication logistics.

11.3.2* Install supplemental sheeting and shoring for each 2 ft (0.61 m) of depth dug below an existing approved shoring system, given size-up information, an action plan, and a trench tool kit, so that the movement of soil is minimized effectively, initial trench support strategies are facilitated, rescue entry team safe zones are maintained, excavation of entrapping soil is continued, victim protection is maximized, victim extrication methods are considered, and a rapid intervention team is staged.

(A) Requisite Knowledge. Shoring and shielding, tabulated data, strategies and tactics, methods and techniques to install supplemental sheeting and shoring, protocols on making the general area safe, criteria for safe zones in the trench, types of collapses and techniques to stabilize, emergency procedures, selection of personal protective equipment, and consideration of selected stabilization tactics on extrication and victim safety.

(B) Requisite Skills. The ability to interpret tabulated data information and tables, place shoring and shielding systems, identify supplemental sheeting and shoring, use all trench

rescue protocols, identify types of collapse and methods to stabilize, identify exposure to hazards within the trench relative to existing safe zones, select and use personal protective equipment, and anticipate extrication logistics.

11.3.3* Construct load stabilization systems, given an assignment, personal protective equipment, and a trench tool kit, so that the stabilization system will support the load safely, the system is stable, and the assignment is completed.

(A) Requisite Knowledge. Different types of stabilization systems and their construction methods, limitations of the system, load calculations, principles of and applications for stabilization systems, and safety considerations.

(B) Requisite Skills. The ability to select and construct stabilization systems, evaluate structural integrity of the system, determine stability, and calculate loads.

11.3.4* Lift a load, given a trench tool kit, so that the load is lifted the required distance to gain access; settling or dropping of the load is prevented; control and stabilization are maintained before, during, and after the lift; and operational objectives are attained.

(A) Requisite Knowledge. Applications of levers; classes of levers; principles of leverage, gravity, and load balance; resistance force; mechanics and types of load stabilization; mechanics of load lifting; application of pneumatic, hydraulic, mechanical, and manual lifting tools; how to calculate the weight of the load; and safety protocols.

(B) Requisite Skills. The ability to evaluate and estimate the weight of the load, the correct operations of the tools, operation of a lever, and application of load stabilization systems.

11.3.5* Coordinate the use of heavy equipment, given personal protective equipment, means of communication, equipment and operator, and an assignment, so that operator capabilities and limitations for task are evaluated, common communications are maintained, equipment usage supports the operational objectives, and hazards are avoided.

(A) Requisite Knowledge. Types of heavy equipment, capabilities, application and hazards of heavy equipment and rigging, operator training, types of communication, and methods to establish communications.

(B) Requisite Skills. The ability to use hand signals, use radio equipment, recognize hazards, assess operator for skill and calm demeanor, assess heavy equipment for precision of movement and maintenance, monitor rescuer and victim safety, and use personal protective equipment.

11.3.6* Release a victim from entrapment by components of a collapsed trench, given personal protective equipment, a trench rescue tool kit, and specialized equipment, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome and other injuries, techniques are used to enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing trench shoring system.

(A) Requisite Knowledge. Identification, utilization, and required care of personal equipment; general hazards associated with each type of trench collapse; methods of evaluating shoring systems and trench wall stability; crush syndrome protocols; identification of collapse characteristics; causes and associated effects of trench collapse; potential signs of subsequent collapse; selection and application of rescue tools and resources; risk/benefit assessment techniques for extrication methods; and time restraints.

(B) Requisite Skills. The ability to select, use, and care for personal protective equipment; operate rescue tools and stabilization systems; identify crush syndrome clinical settings; and complete risk/benefit assessments for selected methods of rescue and time restraints.

Chapter 12 Machinery Rescue

12.1 Awareness Level. The job performance requirements defined in 12.1.1 through 12.1.4 shall be met prior to awareness-level qualification in machinery rescue.

12.1.1 Recognize the need for technical rescue resources at a machinery incident, given AHJ guidelines, an operations- or technician-level machinery incident or simulation, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational/incident action plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of machinery common to the AHJ boundaries, machinery hazards, incident support operations and resources, machinery anatomy, and fire suppression and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of machinery, identify and evaluate various types of machinery within the AHJ boundaries, request support and resources, identify machinery anatomy, and determine the required fire suppression and safety measures.

12.1.2 Establish scene safety zones, given prearrival instructions from operations- or technician-level resources, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that action hot, warm, and cold safety zones are designated; zone perimeters are consistent with incident requirements; perimeter markings can be recognized and understood by others; zone boundaries are communicated to incident command; and only authorized personnel are allowed access to the rescue scene.

(A) Requisite Knowledge. Use and selection of PPE, barrier control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and types of zones and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply traffic control concepts, position traffic control devices, identify and mitigate existing or potential hazards, and apply zone identification and personal safety techniques.

12.1.3 Identify the needed support resources, given a specific type of rescue incident, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operation facilitates rescue operational objectives.

(A) Requisite Knowledge. Equipment organization and tracking methods, lighting resource type(s), shelter and thermal control options, and rehab criteria.

(B) Requisite Skills. The ability to track equipment inventory, identify lighting resources and structures for shelter and thermal protection, select rehab areas, and manage personnel rotations.

12.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined; resource availability, response time, and types of rescues are determined; the number of victims are identified; the last reported location of all victims are established; witnesses and reporting parties are identified and interviewed; resource needs are assessed; search parameters are identified; and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system (IMS), and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

12.2 Operations Level. The job performance requirements defined in Section 5.2, Section 12.1, and 12.2.1 through 12.2.11 shall be met prior to operations-level qualification in machinery rescue.

12.2.1* Plan for a machinery incident, and conduct an initial and ongoing size-up, given agency guidelines, planning forms, and an operations-level machinery incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; machinery stabilization needs are evaluated; and resource needs are identified and documented for future use.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types and machinery common to the AHJ boundaries, machinery hazards, incident support operations and resources, machinery anatomy, and fire suppression and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of machinery, identify and evaluate various types of machinery within the AHJ boundaries, request support and resources, identify machinery anatomy, and determine the required fire suppression and safety measures.

12.2.2* Establish "scene" safety zones, given scene security barriers, incident location, incident information, and PPE, so that hot, warm, and cold safety zones are designated; zone perimeters are consistent with incident requirements; perimeter markings can be recognized and understood by others; zone boundaries are communicated to incident command; and only authorized personnel are allowed access to the rescue scene.

(A) Requisite Knowledge. Use and selection of PPE, traffic control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and types of zones and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply hazard control concepts, identify and mitigate existing or potential hazards, and apply zone identification and personal safety techniques.

12.2.3* Establish fire protection, given an extrication incident and fire control support, so that fire and explosion potential is managed and fire hazards and rescue objectives are communicated to the fire support team.

(A) Requisite Knowledge. Types of fire and explosion hazards, IMS, types of extinguishing devices, agency policies and procedures, types of flammable and combustible substances and types of ignition sources, and extinguishment or control options.

(B) Requisite Skills. The ability to identify fire and explosion hazards, operate within the IMS, use extinguishing devices, apply fire control strategies, and manage ignition potential.

12.2.4* Stabilize a small or simple machine, given a machinery tool kit and PPE, so that the machinery is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise machinery stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

(A) Requisite Knowledge. Types of stabilization devices, mechanism of small machinery movement, types of stabilization points, types of stabilization surfaces, AHJ policies and procedures, and types of machinery construction components as they apply to stabilization.

(B) Requisite Skills. The ability to apply and operate stabilization devices.

12.2.5* Isolate potentially harmful energy sources, given machinery tool kit and PPE, so that all hazards are identified; systems are managed; beneficial system use is evaluated; and hazards to rescue personnel and victims are minimized.

(A) Requisite Knowledge. Types and uses of PPE, types of energy sources, system isolation methods, specialized system features, tools for disabling hazards, and policies and procedures of the AHJ.

(B) Requisite Skills. The ability to select and use task- and incident-specific PPE, identify hazards, operate beneficial systems in support of tactical objectives, and operate tools and devices for securing and disabling hazards.

12.2.6 Determine small machinery access and egress points, given the structural and damage characteristics and potential victim location(s), so that victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, victims(s), and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced.

(A) Requisite Knowledge. Small machinery construction/features, entry and exit points, routes and hazards operating

systems, AHJ standard operating procedure, and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify entry and exit points and probable victim locations, and to assess and evaluate impact of machine stability on the victim.

12.2.7 Create access and egress openings for rescue from a small or simple machine, given a machinery tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and stability is maintained.

(A) Requisite Knowledge. Small machinery construction and features; electrical, mechanical, hydraulic, pneumatic, and alternative entry and exit equipment; points and routes of ingress and egress; techniques and hazards; agency policies and procedures; and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify common small machinery construction features, select and operate tools and equipment, apply tactics and strategy based on assignment, apply victim care and stabilization devices, perform hazard control based on techniques selected, and demonstrate safety procedures and emergency evacuation signals.

12.2.8 Disentangle victim(s), given an extrication involving a small or simple machine, a machinery tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.

(A) Requisite Knowledge. Tool selection and application, stabilization systems, protection methods, disentanglement points and techniques, and dynamics of disentanglement.

(B) Requisite Skills. The ability to operate disentanglement tools, initiate protective measures, identify and eliminate points of entrapment, and maintain incident stability and scene safety.

12.2.9 Identify potential emergency events in buildings where mechanical equipment exists, such as elevators. Determine entry and egress points, given the structural and damage characteristics and potential victim location(s), so that victim location(s) is identified; designate entry and exit points for victim(s) and rescuer(s); chosen points can be protected; determine the need for a specialized elevator technician; stabilize and isolate all machinery involved, given an elevator tool kit and PPE; control the hazards presented by the release of fluids or mechanical release devices; determine elevator position to optimize the removal of victim(s); secure all elevators and weight systems in common hoistways so that chosen points do not compromise the removal of a victim or rescuer; equipment and victim stabilization are initiated; package and remove victim(s) so that undue injury is prevented; and AHJ safety points are enforced.

(A) Requisite Knowledge. Types of stabilization devices, mechanism of elevator movement and travel, types of stabilization points, types of energy sources, system isolation and release methods, entry and exit points, specialized system features, tool selection and application, and special features of elevator systems.

(B) Requisite Skills. The ability to identify entry and exit points and probable victim locations, the ability to identify common elevator control devices, construction and energy sources, perform hazard control based on techniques selected, apply tactics and strategy based on assignment, select and operate tools and equipment specific to elevator rescue, apply victim care and stabilization devices, and demonstrate safety procedures.

12.2.10 Remove a packaged victim to a designated safe area, as a member of a team, given a victim transfer device, a designated egress route, and PPE, so that the team effort is coordinated; the designated egress route is used; the victim is removed without compromising victim packaging; undue injury is prevented; and stabilization is maintained.

(A) Requisite Knowledge. Patient handling techniques; operation of IMS; types of immobilization, packaging, and transfer devices; types of immobilization techniques; and uses of immobilization devices.

(B) Requisite Skills. Use of immobilization, packaging, and transfer devices for specific situations; immobilization techniques; application of medical protocols and safety features to immobilize, package, and transfer; and use of all techniques for lifting the patient.

12.2.11* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

12.3 Technician Level. The job performance requirements defined in Section 12.2 and 12.3.1 through 12.3.5 shall be met prior to technician-level qualification in machinery rescue.

12.3.1* Plan for a large machinery incident, and conduct initial and ongoing size-up, given agency guidelines, planning forms, and operations-level machinery incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; machinery stabilization needs are evaluated; and resource needs are identified and documented for future use.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of large, commercial/heavy machinery common to the AHJ boundaries, machinery hazards, incident support operations and resources, machinery anatomy, and fire suppression and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of large machinery, identify and evaluate various types of large machinery within the AHJ boundaries, request support and resources, identify large machinery anatomy, and determine the

required fire suppression and safety measures. Level I rescue skills are applicable to vehicle or machinery events that involve simple or small machinery, are limited to digital entrapment of the victim, and involve environments where rescuer intervention does not constitute a high level of risk to either the victim or rescuers based on the environment or other factors. Level II skills apply to those incidents that involve heavy machinery, complex extrication processes, multiple uncommon concurrent hazards, or more than digital entrapment of a victim.

12.3.2* Stabilize large machinery, given a machinery tool kit and PPE, so that the machinery is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise machinery stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

(A) Requisite Knowledge. Types of stabilization devices, mechanism of machinery movement, types of stabilization points, types of stabilization surfaces, AHJ policies and procedures, and types of machinery construction components as they apply to stabilization.

(B) Requisite Skills. The ability to apply and operate stabilization devices.

12.3.3 Determine large machinery access and egress points, given the structural and damage characteristics and potential victim location(s), so that victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, victim(s), and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise machinery stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced.

(A) Requisite Knowledge. Large machinery construction/features, entry and exit points, routes and hazards, operating systems, AHJ standard operating procedure, and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify entry and exit points and probable victim locations and to assess and evaluate impact of large machinery stability on the victim(s).

12.3.4 Create access and egress openings for rescue from large machinery, given a machinery tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and stability is maintained.

(A) Requisite Knowledge. Large machinery construction and features; electrical, mechanical, hydraulic, and pneumatic systems; alternative entry and exit equipment; points and routes of ingress and egress; techniques and hazards; agency policies and procedures; and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify large machinery construction features, select and operate tools and equipment, apply tactics and strategy based on assignment, apply victim care and stabilization devices, perform hazard control based on techniques selected, and demonstrate safety procedures and emergency evacuation signals.

12.3.5 Disentangle victim(s), given an extrication incident, a machinery tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.

(A) Requisite Knowledge. Tool selection and application, operation of stabilization systems, protection methods, disentanglement points and techniques, and dynamics of disentanglement.

(B) Requisite Skills. The ability to operate disentanglement tools, initiate protective measures, identify and eliminate points of entrapment, and maintain incident stability and scene safety.

Chapter 13 Cave Rescue

13.1 Awareness Level. The job performance requirements defined in 13.1.1 through 13.1.5 shall be met prior to awareness level qualification in cave rescue.

13.1.1 Identify the need for cave rescue, given a cave incident, so that resource needs are identified and the emergency response system for cave rescue incident is initiated.

(A) Requisite Knowledge. Equipment organization and tracking method, recognition the hazards associated with cave rescue incident and its entrapping characteristics; resource capabilities, procedures for activation of emergency response for cave incidents.

(B) Requisite Skills. Ability to use communication equipment, track resources, and communicate needs.

13.1.2* Conduct a size-up of a cave incident, given an incident and background information, site maps, charts, diagrams, blueprints, forms, information from technical resources and on-site personnel, monitoring equipment, and personal protective equipment (PPE) necessary to perform the assessment, so that existing and potential conditions within the cave and the rescue area are evaluated; general and site-specific hazards are identified; witnesses are interviewed; the total number and probability of victim existence, number, condition, and location is determined; a risk/benefit analysis is performed; potential for rapid, nonentry rescues or victim self-rescue is recognized; ventilation requirements are determined; entry and egress points are identified; and specialized resource needs are identified.

(A) Requisite Knowledge. Methods to distinguish geologic and construction types, collapse mechanics, and other contributing factors such as severe environmental conditions and other general hazards; need to immediately secure "competent person" or witness; signs and evidence of victim involvement, number, and location; jurisdictional and community resource lists and agreements; personnel training level and availability; risk/benefit analysis; protocols; incident management system (IMS); and all applicable regulations, laws, and standards; cave hazards and characteristics, specialized resource requirements, information sources, search guidelines, risk/benefit analysis criteria, ventilation requirements, means of controlled entry and egress of cave spaces, and terminology.

(B) Requisite Skills. Categorize geology, identify type and degree of collapse, and determine severe environmental conditions with implications for secondary collapse and victim survivability; demonstrate interview techniques; implement protocols and resource acquisition agreements; implement public works

utility notification, response, and location procedures; perform a risk/benefit analysis for determining self-rescue, rescue, or recovery mode; implement an IMS for span of control; and apply governing regulations, laws, and standards. The ability to interpret size-up information choose and utilize PPE, identify hazard mitigation options, identify potential victim locations, and recognize characteristics and hazards of manmade cave spaces.

13.1.3* Implement an emergency action plan, given size-up information and a incident, so that initial size-up information is utilized; prebriefing is given to rescuers; documentation is ongoing; the Hazard zone is established; a risk/benefit analysis is conducted; rapid, nonentry rescues or victim self-rescues are performed; the rescue area and general area are made safe; strategy and tactics are confirmed and initiated for existing and potential conditions; rapid intervention team and operational tasks are assigned; other hazards are mitigated; rescue resources are staged; and a protective system is being utilized.

(A) Requisite Knowledge. Size-up information and documentation; need to brief rescuers; areas that could be affected by collapse; variables to factor risk/benefit analysis; criteria for rapid, nonentry rescues; methods to control hazards in the general area; options for strategy and tactical approach by factoring time frame, risk/benefit, approved shoring techniques, and personnel and equipment available; IMS; rescue personnel and equipment cache staging; and options for victim isolation and/or protective systems.

(B) Requisite Skills. The ability to use and document tactical worksheets; disseminate information; understand mechanics and extent of collapse effects; perform risk/benefit analysis; execute rapid, nonentry rescues; mitigate hazards by isolation, removal, or control; choose strategy and tactics that will enhance successful outcome; use IMS and resource staging; and apply choice of isolation and/or protective system promptly to surround victim.

13.1.4* Implement support operations at cave emergencies, given an assignment, and equipment and other resources, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, a cut station is established, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, operations proceed without interruption, extrication methods are in place, and the support operations facilitate rescue operational objectives.

(A) Requisite Knowledge. Equipment organization and tracking methods, lighting resources, dewatering methods, shelter and thermal control options, basic carpentry methods, hand and power tool applications, atmospheric monitoring protocol, rehab criteria, and extrication and removal equipment options.

(B) Requisite Skills. The ability to track equipment inventory, provide power, use lighting, choose and deploy dewatering techniques, acquire or construct structures for shelter and thermal protection, select rehab areas and personnel rotations, operate atmospheric monitoring and ventilation equipment, and perform patient packaging and removal.

13.1.5 Initiate the IMS given a cave rescue incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, the incident action plan is developed.

(A) Requisite Knowledge. IMS structure, implementation procedures, expansion methodology, resource management techniques, tracking methods, incident action plan components, accountability systems, IMS documentation forms, and rescuer rehabilitation criteria.

(B) Requisite Skills. Ability to utilize IMS forms and command tools and use communication devices and accountability tracking systems.

13.2 Operations Level. The job performance requirements defined in Section 5.2, Section 13.1, and 13.2.1 through 13.2.15 shall be met prior to operations level qualification in cave rescue.

13.2.1 Establish and maintain entrance control, given perimeter markings that can be recognized and understood by others, perimeter boundaries are communicated to Incident Command, and only authorized personnel are allowed access to the rescue scene, so that all known entrances are identified and secured.

(A) Requisite Knowledge. Traffic control flow and concepts, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, types of zones and staffing requirements, and familiarity with cave and topographic maps.

(B) Requisite Skills. The ability to apply traffic control concepts, position traffic control devices, identify and mitigate existing or potential hazards, apply perimeter identification and personal safety techniques, and read and understand cave and topographic maps.

13.2.2 Implement cave rescue support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.

(A) Requisite Knowledge. Resource management protocols, principles for establishing lighting, environmental control methods, and rescuer rehabilitation protocols.

(B) Requisite Skills. The ability to manage resources, set up lights, initiate environmental controls, and set up rehabilitation for rescuers.

13.2.3 Select PPE and provisions for extended cave rescue search, recovery, and extraction operations, given lights, food, water, batteries, hypothermic protection, self-rescue equipment, personal medical kit, and a low-profile durable carrying container, so that the rescuer can be self-sufficient for a minimum of 24 hours.

(A) Requisite Knowledge. Psychological considerations, risk of hypothermia, basic first aid techniques, self-extraction techniques, and rationing.

(B) Requisite Skills. Self-assessment situational evaluation and the ability to carry equipment and provisions in a manner conducive to efficient movement and maneuverability throughout the cave environment.

13.2.4 Select PPE for use in a cave rescue environment that includes water hazards, given a cave/water rescue assignment and assorted items of personal protective and life-support equipment, so that rescuer is protected from temperature

extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are in compliance, and self-rescue needs have been evaluated and met.

(A) Requisite Knowledge. Manufacturer's recommendations, selection criteria of insulating garments, buoyancy characteristics, applications for and capabilities of personal escape equipment, hazard assessment, and AHJ protocols for equipment positioning.

(B) Requisite Skills. The ability to use and select PPE according to the manufacturer's directions, proficiency in emergency escape procedures, proficiency in communications, and don and doff equipment in an expedient manner.

13.2.5* Maneuver in the cave rescue environment, given PPE, established routes, cave rescue tool kit (cache), size-up information, and cave map, so that obstacles specific to the cave environment are negotiated and situational awareness is maintained.

(A) Requisite Knowledge. Use of technical and size-up information, construction and use of rope or other systems for access as applicable to a given environment, and methods for following identified routes.

(B) Requisite Skills. The ability to interpret information sources, assess hazards, construct and use rope or other systems for access if applicable to the environment entered, apply PPE, interpret cave map symbols, locate and use identified routes for rescue, and identify surface and cave movement.

13.2.6 Use single rope techniques to ascend a minimum of 100 ft (30.5 m) in free space, given an anchored fixed rope system, so that the rescuer is secured to the rope with an ascending system that utilizes at least two gripping points of attachment at or above the waist and a quick attachment safety device, the person ascending can stop at any point on the fixed rope and rest suspended by his or her harness, the rescuer can convert the ascending system to a descent system at any time, and a rescuer demonstrates a level of proficiency and fitness that allows the rescuer to continue assigned operations immediately following the ascent.

(A) Requisite Knowledge. Equipment and methodology for fixed rope ascension, rigging principles, down climbing, weight transfer, knot passing, changeovers, passing re-belays, ascent-to-descent system conversion, and alternative techniques designed to cope with adverse environmental conditions and limited light sources.

(B) Requisite Skills. The ability to select equipment appropriate to length of the ascent, secure harness to ascending system and fixed line, self start, ascend line, maneuver around environmental and system-specific obstacles, rest while suspended, convert the ascending system to a descending system while suspended, and complete an edge transition.

13.2.7* Respond as a member of an initial response team given a known patient location so that access routes are established and marked, patient care is initiated, patient packaging considerations are communicated to the medical team, and obstacles to evacuation are identified and communicated to the rigging team.

(A) Requisite Knowledge. Fixed line systems used in the cave environment, methods for marking the route, patient care techniques specific to the cave environment, and concepts and operation of the IMS as applied to communicating critical information to the other operational task forces.

(B) Requisite Skills. The ability to construct fixed line systems, flag, treat hypothermia, stabilize traumatic injuries common to cave rescue victims, and package patients for long-term extractions.

13.2.8* Establish communications in a cave rescue environment as a member of a communications team, given size-up information and established routes, so that communications are established and maintained between the incident commander and the initial response team, search team, medical in-cave team, rigging teams, evacuation teams, communication teams, and patient transport teams.

(A) Requisite Knowledge. IMS, communications protocols, construction and operation of wired radio systems, emergency repair techniques, and familiarity with low-frequency cave radios and the use of runners.

(B) Requisite Skills. The ability to maintain communication logs, install wired communications, operate field telephones, troubleshoot communications failure, and emergency repair of wired communications systems.

13.2.9* Conduct a search in a cave environment as a member of a search team, given a specific area identified by the probability of area plan, PPE, the cave rescue tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.

(A) Requisite Knowledge. Concepts and operation of the IMS as applied to the search function, application of specialty tools and locating devices, application of recognized marking systems, voice sounding techniques, and potential victim locations as related to the probability of detection (POD) and the probability of area (POA).

(B) Requisite Skills. The ability to implement an IMS, apply search techniques, use marking systems, identify and mitigate hazards, and select and use victim locating devices.

13.2.10 Extract a victim from both vertical and horizontal crack and crevice entrapments, working as a member of a team, given extraction tools, stemples, airbags, and a medical kit, so that the victim is extracted without creating further harm, and the rescuers are not exposed to undue risk.

(A) Requisite Knowledge. Lifting techniques, anchoring techniques including use of stemples and airbags, and signs and symptoms of contact hypothermia, diaphragm breathing, compartment syndrome, and other medical considerations specific to the mode of entrapment.

(B) Requisite Skills. The ability to lift and move victim manually and with mechanical advantage, construct anchor systems utilizing stemples and airbags, and care for patients.

13.2.11* Manage a victim in a cave environment as part of a medical in-cave team, given a victim and basic life support kits and extended patient care plan, so that the basic support medical care of the victim is managed during transport and the potential for further injury is minimized.

(A) Requisite Knowledge. Medical care in a wilderness environment, long-term patient planning, extended medical management techniques, and logistical planning.

(B) Requisite Skills. The ability to develop chronological patient care and action plan, communicate logistical needs, perform ongoing patient assessment, and provide long-term medical care and basic life support in a wilderness environment.

13.2.12 Package the victim for removal from a cave, given a cave tool kit (cache) and patient transfer devices, so that design limitations are not exceeded, the victim is given the best profile for removal, methods and packaging devices selected are compatible with the intended routes of transfer, and further harm to the victim is minimized.

(A) Requisite Knowledge. Spinal management techniques, victim packaging techniques, use of vapor barriers to minimize further hypothermic injury, limitations and use of low-profile packaging devices and equipment, methods to ensure design limitations are not exceeded, and the similarities and differences between packaging for cave space and other types of rescue.

(B) Requisite Skills. The ability to immobilize a victim's spine; package victims in harnesses, low-profile devices, and litters; recognize and perform basic management of various traumatic injuries and medical conditions; support respiratory efforts; and perform cardiopulmonary resuscitation as required based on the environment.

13.2.13* Construct and use rope rescue systems as a member of a cave rescue rigging team, given rope rescue equipment designed for the cave rescue environment, so that natural anchor points are identified; anchoring hardware compatible with available anchor points is selected; load factors are considered; an anchor system is constructed; and ascent, descent, lifting, and lowering systems are attached and utilized as required.

(A) Requisite Knowledge. Selection of natural anchors, characteristics of unsafe formations, and selection of anchoring hardware and loading anchors.

(B) Requisite Skills. The ability to select natural anchors, use anchoring techniques using stemples, operate hand and electric drills, and site selection and setting of bolts and hangers correctly oriented.

13.2.14* Remove all victims from a cave as a member of a patient evacuation team, given PPE, rope and related rescue equipment, personnel to operate rescue systems, and a cave rescue tool kit, so that internal obstacles and hazards are negotiated, victims are extricated from the cave in the selected transfer device, and victims are delivered to the EMS provider.

(A) Requisite Knowledge. Personnel and equipment resource lists, specific PPE, internal obstacles and hazards, rescue systems and equipment (including applicable rope rescue systems for lowering, raising, and/or traversing a given area), operations protocols, medical protocols, and personnel staging to facilitate patient extraction.

(B) Requisite Skills. The ability to select and use PPE, select and operate rescue systems (including applicable rope rescue systems for lowering, raising, and/or traversing a given area) used for victim disentanglement and removal, utilize medical equipment, and use equipment.

13.2.15* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, and postincident analysis techniques.

(B) Selection and use of task and hazard specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, and postincident analysis activities.

13.3 Technician Level. The job performance requirements defined in Section 13.2 and 13.3.1 through 13.3.5 shall be met prior to technician level qualification in cave rescue.

13.3.1* Conduct a size-up of a cave rescue incident, given an incident and background information, maps, charts, diagrams, forms, information from technical resources and on-site personnel, and PPE necessary to perform the assessment, so that existing and potential conditions within the cave and the rescue area are evaluated, general and site-specific hazards are identified, witnesses are identified, the total number and probable locations of victims are determined, a risk/benefit analysis is performed, entry and egress are identified, and specialized resource needs are identified.

(A) Requisite Knowledge. Cave hazards, specialized resource requirements, information sources, search guidelines, risk/benefit analysis, means of controlled entry and egress of cave spaces, and terminology.

(B) Requisite Skills. The ability to interpret size-up information, conduct interviews, choose and utilize PPE, identify hazard mitigation options, identify potential victim locations, and recognize characteristics and hazards of natural and manmade cave spaces.

13.3.2 Develop a probability of area plan, given witnesses, local information statements, and scene assessments, so that intelligence is developed and correlated; last known location, activity, and direction of travel of the victim(s) are determined; procedures to recontact the witnesses are established; references are utilized; and an initial direction or pattern of search is determined.

(A) Requisite Knowledge. Elements of an action plan; types of information provided by reference materials and size-up; types of hazards associated with cave rescue practices, risk/benefit analysis; identification of hazard-specific PPE; factors influencing access and egress routes; behavioral patterns of victims; environmental conditions that influence victim location; safety, communications, and operational protocols; and resource capability and availability.

(B) Requisite Skills. The ability to interpret and correlate reference and size-up information; evaluate site conditions; complete risk/benefit analysis; apply safety, communications,

and operational protocols; specify PPE requirements; and determine rescue personnel requirements.

13.3.3* Develop a cave rescue incident action plan, given an incident, size-up information, probability of detection report, and reports from reporting persons or witnesses, so that size-up information and the IMS are utilized, safety requirements and communication needs are addressed, existing and potential conditions in the cave space are identified, and incident objectives are established and followed.

(A) Requisite Knowledge. Incident-specific size-up information, IMS, safety planning, communication resources, cave hazards and work conditions, and specialized resources for cave rescue.

(B) Requisite Skills. The ability to use size-up assessment information, implement an IMS, identify special resource needs, create written documentation, and develop safety and communications plans.

13.3.4 Coordinate the use of specialized resources, given a cave rescue scenario outside of the scope of training for a cave technical rescuer, so that specialized resources are considered with respect to the IMS; specialized resource usage supports incident objectives; hazards are identified, avoided, monitored, and controlled; and rescuer and resource safety is maintained.

(A) Requisite Knowledge. Specialized resources specific to cave rescue, Incident Command System (ICS), use of incident action plans, communications methods, and cave rescue hazards.

(B) Requisite Skills. The ability to coordinate resources, implement IMS components, utilize incident action plans, operate communications equipment, and interpret size-up information.

13.3.5 Terminate the cave rescue incident, given isolation barriers, documentation forms, and a cave rescue tool kit, so that all personnel are accounted for and removed from the space, injuries are avoided, further entry into the space is denied, and the scene is secured.

(A) Requisite Knowledge. Methods to secure a scene, forms for documentation, tools for securing space access points, accountability protocols, and methods for denying further entry.

(B) Requisite Skills. The ability to apply regulations as needed, use tools, complete reporting documentation of the incident, and apply protocols.

Chapter 14 Mine and Tunnel Rescue

14.1 Awareness Level. The job performance requirements defined in 14.1.1 through 14.1.5 shall be met prior to awareness level qualification in mine and tunnel rescue.

14.1.1 Identify the need for mine and tunnel rescue, given a mine and tunnel incident, so that resource needs are identified and the emergency response system for mine and tunnel rescue incident is initiated.

(A) Requisite Knowledge. Equipment organization and tracking method, recognition the hazards associated with mine and tunnel rescue incident and its entrapping characteristics, resource capabilities, and procedures for activation of emergency response for mine and tunnel incidents.

(B) Requisite Skills. Ability to use communication equipment, track resources, and communicate needs.

14.1.2* Conduct a size-up of a mine and tunnel rescue incident, given an incident and background information, site maps, charts, diagrams, blueprints, forms, information from technical resources and on-site personnel, monitoring equipment, and personal protective equipment (PPE) necessary to perform the assessment, so that existing and potential conditions within the mine and tunnel and the rescue area are evaluated; general and site-specific hazards are identified; witnesses are interviewed; the total number and probability of victim existence, number, condition, and location is determined; a risk/benefit analysis is performed; potential for rapid, nonentry rescues or victim self-rescue is recognized; ventilation requirements are determined; entry and egress points are identified; and specialized resource needs are identified.

(A) Requisite Knowledge. Methods to distinguish geologic and construction types, collapse mechanics, and other contributing factors such as severe environmental conditions and other general hazards; need to immediately secure "competent person" or witness; signs and evidence of victim involvement, number, and location; jurisdictional and community resource lists and agreements; personnel training level and availability; risk/benefit analysis; protocols; incident management system; and all applicable regulations, laws, and standards. Mine and tunnel hazards and characteristics, specialized resource requirements, information sources, search guidelines, risk/benefit analysis criteria, ventilation requirements, means of controlled entry and egress of mine and tunnel spaces, and terminology.

(B) Requisite Skills. Categorize geology, identify type and degree of collapse, and determine severe environmental conditions with implications for secondary collapse and victim survivability; demonstrate interview techniques; implement protocols and resource acquisition agreements; implement public works utility notification, response, and location procedures; perform a risk/benefit analysis for determining self-rescue, rescue, or recovery mode; implement an incident management system (IMS) for span of control; and apply governing regulations, laws, and standards. The ability to interpret size-up information, choose and utilize personal protective equipment, identify hazard mitigation options, identify potential victim locations, and recognize characteristics and hazards of manmade mine and tunnel spaces.

14.1.3* Implement an emergency action plan, given size-up information and an incident, so that initial size-up information is utilized; prebriefing is given to rescuers; documentation is ongoing; the hazard zone is established; a risk/benefit analysis is conducted; rapid, nonentry rescues or victim self-rescues are performed; the rescue area and general area are made safe; strategy and tactics are confirmed and initiated for existing and potential conditions; rapid intervention team and operational tasks are assigned; other hazards are mitigated; rescue resources are staged; and a protective system is utilized.

(A) Requisite Knowledge. Size-up information and documentation; need to brief rescuers; areas that could be affected by collapse; variables to factor risk/benefit analysis; criteria for rapid, nonentry rescues; methods to control hazards in the general area; options for strategy and tactical approach by

factoring time frame, risk/benefit, approved shoring techniques, and personnel and equipment available; incident management system; rescue personnel and equipment cache staging; and options for victim isolation and protective systems.

(B) Requisite Skills. The ability to use and document tactical worksheets; disseminate information; understand mechanics and extent of collapse effects; perform risk/benefit analysis; execute rapid, nonentry rescues; mitigate hazards by isolation, removal, or control; choose strategy and tactics that will enhance successful outcome; use IMS and resource staging; and apply choice of isolation and protective system promptly to surround victim.

14.1.4* Implement support operations at mine and tunnel emergencies, given an assignment, equipment, and other resources, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, a cut station is established, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, operations proceed without interruption, extrication methods are in place, and the support operations facilitate rescue operational objectives.

(A) Requisite Knowledge. Equipment organization and tracking methods, lighting resources, dewatering methods, shelter and thermal control options, basic carpentry methods, hand and power tool applications, atmospheric monitoring protocol, rehab criteria, and extrication and removal equipment options.

(B) Requisite Skills. The ability to track equipment inventory, provide power, use lighting, choose and deploy dewatering techniques, acquire or construct structures for shelter and thermal protection, select rehab areas and personnel rotations, operate atmospheric monitoring and ventilation equipment, and perform patient packaging and removal.

14.1.5 Initiate the IMS given a trench or excavation collapse incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, and the incident action plan is developed.

(A) Requisite Knowledge. IMS structure, implementation procedures, expansion methodology, resource management techniques, tracking methods, incident action plan components, accountability systems, IMS documentation forms, and rescuer rehabilitation criteria.

(B) Requisite Skills. Ability to utilize IMS forms and command tools, and use communication devices and accountability tracking systems.

14.2 Operations Level. The job performance requirements defined in Section 5.2, Section 14.1, and 14.2.1 through 14.2.15 shall be met prior to operations level qualification in mine and tunnel rescue.

14.2.1* Conduct a size-up of a mine and tunnel rescue incident, given an incident and background information, site maps, charts, diagrams, blueprints, forms, information from technical resources and on-site personnel, monitoring equipment, and PPE necessary to perform the assessment, so that existing and potential conditions within the mine and tunnel and the rescue area are evaluated, general and site-specific hazards are identified, witnesses are interviewed, the total number and probable locations of victims are determined, a risk/benefit analysis is performed, ventilation requirements are determined, entry and egress points are identified, and specialized resource needs are identified.

(A) Requisite Knowledge. Mine and tunnel hazards, specialized resource requirements, information sources, search guidelines, risk/benefit analysis criteria, ventilation requirements, means of controlled entry and egress of mine and tunnel spaces, and terminology.

(B) Requisite Skills. The ability to interpret size-up information, conduct interviews, choose and utilize PPE, identify hazard mitigation options, identify potential victim locations, and recognize characteristics and hazards of manmade mine and tunnel spaces.

14.2.2* Establish scene safety zones, given a mine and tunnel incident, scene security barriers, incident location, incident information, and PPE, so that action hot, warm, and cold safety zones are designated; zone perimeters are consistent with incident requirements; perimeter markings can be recognized and understood by others; zone boundaries are communicated to incident command; and personnel access to the rescue scene is managed.

(A) Requisite Knowledge. Use and selection of PPE, traffic control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and types of zones and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply traffic control concepts, position traffic control devices, identify and mitigate existing or potential hazards, and apply zone identification and personal safety techniques.

14.2.3* Establish fire protection, given a mine and tunnel rescue incident and fire control support, so that fire and explosion potential is determined, identified hazards are mitigated or isolated, and rescue objectives are communicated to the fire support team.

(A) Requisite Knowledge. Types of fire and explosion hazards at mine and tunnel incidents, incident management system, types of extinguishing devices, agency policies and procedures, potential sources of ignition, and extinguishment or control options.

(B) Requisite Skills. The ability to identify fire and explosion hazards, operate within the incident management system, use extinguishing devices, apply fire control strategies, and manage ignition potential.

14.2.4* Conduct atmospheric monitoring of the mine and tunnel environment, given PPE, atmospheric monitoring equipment, and reference material, so that atmospheric readings are continually assessed, readings are documented, and changes in the involved area are tracked and communicated to the incident command post (ICP).

(A) Requisite Knowledge. Capabilities and limitations of monitoring equipment, calibration methods, atmospheric hazards associated with mine and tunnel spaces and underground construction, PPE required for mine and tunnel rescue, use of reference material specific to mine and tunnel rescue, and communication methods.

(B) Requisite Skills. The ability to use and calibrate atmospheric monitoring equipment, interpret resource information,

choose and utilize PPE, operate communications equipment, and utilize tracking documents.

14.2.5* Establish mine and tunnel ventilation, given size-up information and atmospheric monitoring results, so that airflow needs are determined, the required airflow is established and maintained, required air changes are accomplished, and atmospheric hazards are monitored and controlled.

(A) Requisite Knowledge. Airflow criteria for mine and tunnel rescue, potential space configurations, types of ventilation equipment, and atmospheric hazards that are present in work spaces and that can pose problems during the rescue.

(B) Requisite Skills. The ability to set up and operate ventilation equipment, establish required airflow based on mine and tunnel configuration, and initiate monitoring and hazard control measures specific to ventilation.

14.2.6* Establish dewatering operations, given a mine and tunnel collapse incident, dewatering pumps, hose, and appliances, so that water is removed and directed away from the affected area, atmospheric conditions are not affected by the pumping equipment, and there are no power or flow interruptions during the operation.

(A) Requisite Knowledge. Basic pump theory and hydraulics, hose and pump configurations for mines and tunnels, and power supply requirements for dewatering equipment.

(B) Requisite Skills. The ability to connect components and create a dewatering systemand pump operation, troubleshooting, and hose management.

14.2.7* Implement support operations at mine and tunnel rescue scene given an assignment, equipment, and other resources, so that a resource staging area is established and managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, provisions for extended patient care and prolonged search and recovery are established, and the support operations facilitate operational objectives.

(A) Requisite Knowledge. Equipment organization and tracking methods, lighting resources, dewatering methods, thermal control options, hand and power tool applications, atmospheric monitoring protocol, rehab criteria, extrication and removal equipment options, and logistics and supply methodology for extended operations.

(B) Requisite Skills. The ability to track equipment inventory, provide power, use lighting, choose and deploy dewatering techniques, use thermal control personal protective equipment (PPE) for rescuers and victims, select rehab areas and personnel rotations, and operate atmospheric monitoring and ventilation equipment.

14.2.8* Develop a mine and tunnel rescue incident action plan, given a mine and tunnel collapse incident and size-up information, so that size-up information and the IMS are utilized; safety requirements and communication needs are addressed; existing and potential conditions in the mine and tunnel space are identified; and incident objectives are established and resources are managed.

(A) Requisite Knowledge. Incident-specific size-up information, incident management system, safety planning, communication resources, mine and tunnel hazards and work conditions, and specialized resources for mine and tunnel rescue.

(B) Requisite Skills. The ability to use size-up assessment information, implement an incident management system, identify special resource needs, create written documentation, and develop safety and communications plans.

14.2.9 Prepare for entry into a mine and tunnel space, given size-up information, mine and tunnel classification, site map, and a mine and tunnel rescue tool kit, so that PPE is checked for readiness; specific routes for rescue are identified; accountability is maintained; the rapid intervention crew (RIC) is standing by; entry team readiness is confirmed; communications systems are in place; continuous atmospheric monitoring capabilities are used; lighting is established; and safe access and egress control points are identified and managed.

(A) Requisite Knowledge. Use of technical and size-up information, knowledge of mine and tunnel rescue PPE, mine and tunnel classifications, mapping and routing systems, accountability systems, rescue team requirements, communications methods, atmospheric monitoring requirements, lighting methods, and mine and tunnel ingress and egress control points.

(B) Requisite Skills. The ability to choose and use PPE, follow identified rescue routes, interpret information sources, utilize accountability systems, operate communications systems, utilize monitoring equipment, and utilize lighting equipment.

14.2.10 Enter a mine and tunnel for rescue as a member of a team, given PPE, identified access/egress routes, a mine and tunnel rescue tool kit, and a pre-entry briefing, so that identified routes are followed; specific mine and tunnel environmental obstacles are negotiated; victims are located; patient respiratory protection is initiated; disentanglement is accomplished; atmospheric monitoring is maintained; hazard assessment continues; and secondary collapse potential is assessed.

(A) Requisite Knowledge. Use of technical and size-up information, construction and use of rope or other systems for access as applicable to a given environment, methods for following identified routes, classifications of mine and tunnel spaces, respiratory protection options, atmospheric monitoring considerations, and hazard assessment methods.

(B) Requisite Skills. The ability to interpret information sources; assess hazards; construct and use rope or other systems for access if applicable to the environment entered; apply PPE; interpret symbols; locate and use identified routes for rescue, surface, and mine and tunnel movement; and operate monitoring equipment.

14.2.11* Determine potential victim locations, given size-up information, witness reports, a mine and tunnel rescue tool kit, and the type and area of the collapse, so that search areas are established and victims can be located.

(A) Requisite Knowledge. Capabilities and limitation of search instruments and resources, types of mine and tunnel construction and potential collapse patterns, victim behavior, and potential areas of survivability.

(B) Requisite Skills. The ability to use size-up information, use search devices, and assess and map collapse areas.

14.2.12 Package the victim for removal from a mine and tunnel, given a mine and tunnel tool kit and patient transfer devices, so that design limitations are not exceeded; the victim is given the best profile for removal; and further harm to the victim is minimized.

(A) Requisite Knowledge. Spinal management techniques, victim packaging techniques, use of low-profile packaging devices and equipment, methods to ensure packaging equipment design limitations are not exceeded, and methods for preventing and treating hypothermia during a prolonged egress.

(B) Requisite Skills. The ability to immobilize a victim's spine; package victims in harnesses, low-profile devices, and litters; recognize and perform basic management of various traumatic injuries and medical conditions; develop a patient support plan for extended rescue operations; support respiratory efforts; and perform cardiopulmonary resuscitation as required based on the environment.

14.2.13 Evacuate all personnel from a mine and tunnel incident, given PPE, rope and related rescue equipment, support personnel to operate rescue systems, and a mine and tunnel rescue tool kit, so that internal obstacles and hazards are negotiated; all rescuers and victims are removed from the area; the rescuers and victims are decontaminated as necessary; and the victims are delivered to the EMS provider.

(A) Requisite Knowledge. Personnel and equipment resource lists, specific PPE, mine and tunnel classifications and their typical internal obstacles and hazards, rescue systems and equipment (including applicable rope rescue systems for lowering, raising, and traversing a given area), operations protocols, medical protocols, EMS providers, and decontamination procedures, as applicable.

(B) Requisite Skills. The ability to select and use PPE, select and operate rescue systems (including applicable rope rescue systems for lowering, raising, or traversing a given area) used for victim disentanglement and removal, utilize medical equipment, and use equipment and procedures for decontamination, as required.

14.2.14 Terminate the mine and tunnel rescue incident, given isolation barriers, documentation forms, and a mine and tunnel rescue tool kit, so that all personnel are accounted for and removed from the space; injuries are avoided; further entry into the space is denied; and the scene is secured.

(A) Requisite Knowledge. Methods to secure a scene, forms for documentation, tools for securing space access points, accountability protocols, and methods for denying further entry.

(B) Requisite Skills. The ability to apply regulations as needed, use tools, complete documentation of the incident, and apply protocols.

14.2.15* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, and postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

14.3 Technician Level. The job performance requirements defined in Section 14.2 and 14.3.1 through 14.3.10 shall be met prior to technician level qualification in mine and tunnel rescue.

14.3.1* Select and use specialized PPE and life-support equipment, consistent with the size, shape, and length of the tunnel or mine, so that the rescuer is protected from atmospheric hazards, temperature extremes, and environmental hazards; self-rescue needs have been evaluated and provided for; and pre-entry safety checks have been conducted.

(A) Requisite Knowledge. Manufacturer's recommendations; standard operating procedures; basic signals and communications techniques; selection criteria of service life; closed or open circuits; personal escape techniques; applications for, and capabilities of, personal escape equipment; hazard assessment; and AHJ protocols for rest and rehydration.

(B) Requisite Skills. The ability to use PPE according to the manufacturer's directions, proficiency in emergency procedures, proficiency in communications, ability to don and doff equipment in an expedient manner, and use of preentry checklists.

14.3.2* Coordinate the use of specialized resources at a mine and tunnel rescue incident, given PPE, communications equipment, size-up information, specialized resources, and an incident action plan, so that specialized resources usage supports incident objectives; hazards are identified, avoided, monitored, or controlled; and rescuer and resource safety is maintained.

(A) Requisite Knowledge. Specialized resources specific to mine and tunnel rescue, IMS, use of incident action plans, communications methods, and mine and tunnel rescue hazards.

(B) Requisite Skills. The ability to coordinate resources, implement IMS components, utilize incident action plans, operate communications equipment, and interpret size-up information.

14.3.3 Breach debris components, given an assignment, PPE, various types of construction materials, and a mine and tunnel collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, and debris stability is maintained.

(A) Requisite Knowledge. Effective breaching techniques; types of mine and tunnel construction and characteristics of materials used in each; selection, capabilities, and limitations of tools; safety protocols for breaching operations; calculation of weight; and anticipation of material movement during breaching and stabilization techniques.

(B) Requisite Skills. The ability to select and use breaching tools, implement breaching techniques based on construction type, use PPE, and apply stabilization where required.

14.3.4 Cut through steel components, given a mine and tunnel rescue tool kit, and PPE, so that the steel is cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.

(A) Requisite Knowledge. Safety considerations; the selection, capabilities, and limitations of steel cutting tools; cutting tool applications; types of potential and actual hazards and mitigation techniques; and characteristics of steel used in mine construction.

(B) Requisite Skills. The ability to assess tool needs, use cutting tools, implement necessary extinguishment techniques, mitigate hazards, and stabilize heavy loads.

14.3.5* Move a heavy load as a team member, given a mine and tunnel rescue tool kit, so that the load is moved the required distance to gain access, and control is constantly maintained.

(A) Requisite Knowledge. Applications of rigging systems, principles of leverage, classes of levers, inclined planes, gravity and load balance, friction, mechanics of load lifting and stabilization, capabilities and limitations of lifting tools, how to calculate the weight of the load, mechanical advantage systems, and safety protocols.

(B) Requisite Skills. The ability to evaluate and estimate the weight of the load, operate required tools, construct and use levers and incline planes, utilize rigging systems, and stabilize the load.

14.3.6 Coordinate the use of heavy equipment, given PPE, means of communication, equipment and operator, and an assignment, so that common communications are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.

(A) Requisite Knowledge. Types of heavy equipment; capabilities, application, and hazards of heavy equipment and rigging; safety protocols; and types and methods of communication.

(B) Requisite Skills. The ability to use hand signals and radio equipment, recognize hazards, assess for operator and rescuer safety, and use PPE.

14.3.7* Stabilize a collapsed mine and tunnel as a member of a team, given size-up information, PPE, a collapse assignment, a mine and tunnel rescue tool kit, engineering resources if needed, and specialized equipment necessary to complete the task, so that hazards are identified and acknowledged by team members, all unstable structural components are identified, egress routes are established, expert resource needs are determined and requested from command, load estimates are calculated for support system requirements, cribbing and shoring systems are constructed and monitored continuously for integrity, safety protocols are followed, rapid intervention crew (RIC) is staged, an accountability system is established, and progress is communicated as required.

(A) Requisite Knowledge. Identification and required care of PPE, structural load calculations for required shoring system for stabilization, specific hazards associated with mine and tunnel collapse, hazard warning systems, specialized resource and equipment needs, communications and rescuer safety protocols, atmospheric monitoring equipment needs, identification of mine and tunnel configurations, characteristics and cause and associated effects of mine and tunnel collapse incidents, and recognition of potential signs of impending secondary collapse.

(B) Requisite Skills. The ability to select and construct shoring systems to carry heavy loads, use PPE, perform load calculations, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and rescuer safety protocol, and mitigate specific hazards associated with shoring tasks.

14.3.8 Conduct a search in a mine and tunnel collapse environment, given PPE, the mine and tunnel rescue tool kit, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.

(A) Requisite Knowledge. Concepts and operation of the IMS as applied to the search function, application of specialty tools and locating devices, application of recognized marking systems, voice sounding techniques, potential victim locations, mine and tunnel construction and potential collapse types and their influence on the search function, operational protocols, and various hazards and their recognition.

(B) Requisite Skills. The ability to implement an IMS, apply search techniques, use marking systems, identify and mitigate hazards, and select and use victim locating devices.

14.3.9* Stabilize a vehicle or machine in a mine and tunnel environment, given a basic extrication tool kit and PPE, so that the vehicle or machinery is locked/tagged out during the rescue operation, vehicle or machinery is supported, rescue activities will not compromise vehicle or machinery stability, stabilization equipment can be monitored, and the risk to rescuers is minimized.

(A) Requisite Knowledge. Types of stabilization devices, lockout/tag-out procedures for vehicles and machinery, methods of vehicle and machinery movement, types of stabilization points and surfaces, AHJ policies and procedures, and vehicle and machinery construction components as they apply to stabilization.

(B) Requisite Skills. The ability to apply and operate stabilization devices.

14.3.10 Disentangle victim(s), given a mine and tunnel incident involving vehicles or machinery, a mine and tunnel tool kit, PPE, and specialized equipment as needed, so that victim injury is prevented, victim protection is provided, and stabilization is maintained.

(A) Requisite Knowledge. Tool selection and application, stabilization systems, protection methods, disentanglement points and techniques, and dynamics of disentanglement.

(B) Requisite Skills. The ability to operate disentanglement tools, initiate protective measures, identify and eliminate points of entrapment, and maintain incident stability and scene safety.

Chapter 15 Helicopter Rescue

15.1 Awareness Level. The job performance requirements defined in 15.1.1 through 15.1.5 shall be met prior to awareness-level qualification in helicopter search and rescue.

15.1.1 Recognize the need for technical search and rescue resources at an incident, given AHJ guidelines and an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

15.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

15.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation and monitoring hazards zones.

(B) Requisite Skills. Apply operational protocols, function within an IMS, follow and implement an incident action plan, and report task progress status to supervisor or Incident Command.

15.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time is considered, types of rescues are determined, the number of victims is ascertained, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk/benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the IMS, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

15.1.5 Identify potential landing zones (LZs) and helispots, given a search and/or rescue incident, so that the rescuer can begin the mitigation of the general hazards and the use of PPE, providing for the safety of rescuers, victims, and others within the operational area.

(A) Requisite Knowledge. LZ requirements of search and rescue (SAR) helicopters used by the AHJ, effects of rotor wash on terrain and materials; manufacturers' recommendations; policies, procedures, and guidelines for the appropriate AHJ; and applicable standards.

(B) Requisite Skills. Set up an LZ for SAR helicopters used by the AHJ and removal of foreign objects and debris within the LZ and operational areas.

15.2 Operations Level. The job performance requirements defined in Section 15.1 and 15.2.1 through 15.2.7 shall be met prior to operations-level qualification in helicopter rescue.

15.2.1 Operate as part of a flight crew, ground support, or other assignment in or attached to the aircraft, given an assignment, task-specific PPE, and an incident, so that situational awareness is maintained, safety issues are identified and communicated, and the assignment is completed.

(A) Requisite Knowledge. Roles and responsibilities of flight crew, ground support, and others assigned in or attached to the aircraft; airframe-specific operational characteristics; PPE selection and use; safe work practices; environmental hazards identification and management; and policies, procedures, and guidelines for the AHJ.

(B) Requisite Skills. Situational awareness of flight crew, ground support, and others assigned in or attached to the aircraft, hand signals, use of aircraft intercom and radio systems, operation of ingress and egress openings, operation of passenger and cargo restraint systems, and emergency procedures.

15.2.2 Select and use task-specific PPE, given an air transport assignment and an incident, so that hazards are identified and proactively managed, the search and rescuer and the patient are briefed on the identified hazards and PPE use, and the tasks are completed.

(A) Requisite Knowledge. Environmental-specific PPE; airframe-specific operational requirements; patient packaging equipment selection and use; manufacturers' recommendations; and policies, procedures, and guidelines for the AHJ.

(B) Requisite Skills. Select and use PPE, select and use patient packaging equipment, verbal briefing of passengers or patients, operation of airframe-specific communications systems, operation of hatches and other aircraft openings, and air crew situational awareness.

15.2.3 Select air operations resources, given an assignment and incident and a list of air operations resources, so that the type of aircraft and flight/rescue crew selected match the

assignment, and operational parameters and resources meet intended tasking.

(A) Requisite Knowledge. Policies, procedures, and guidelines for the AHJ; terrain characteristics; task analysis; airframe-specific operational capabilities; capabilities of air crew, others in or attached to the aircraft and ground support; weather and environmental variables; and crew resource management.

(B) Requisite Skills. Dynamic operational assessment, resource analysis, synthesizing multiple data sets, and selection of resources based on multiple factors.

15.2.4 Demonstrate airframe-specific emergency procedures while operating as a member of a flight/rescue crew, ground support, or others in or attached to the aircraft, given an assignment and airframe, so that pre- and postemergency operations are completed, airframe safety systems are engaged, and the aircraft is egressed within established time frames.

(A) Requisite Knowledge. Characteristics of crash profiles, roles and responsibilities of flight crew and others in or attached to the aircraft and ground crew, dynamics of a mishap, water egress procedures, environmental-specific egress procedures, distress communication devices, airframe-specific life safety systems, egress systems, policies, personal survival, procedures, and guidelines for the AHJ.

(B) Requisite Skills. Use of airframe-specific egress systems, waterbound helicopter exit procedures, land-based helicopter exit procedures, emergency egress procedures and protocols, use of signaling devices, emergency shutdown procedures, crash rescue equipment use, fire suppression equipment use, and personal survival skills.

15.2.5 Demonstrate search observer skills while operating as a member of a flight/rescue crew, given a search assignment, so that a preflight briefing is conducted, tasks and assignments are communicated, the search mode and protocols are defined, and the task is completed.

(A) Requisite Knowledge. Observations techniques for inflight search techniques, helicopter configurations, passenger restraint systems, communications equipment, policies, search modes, protocols, hand signals, flight crew roles and responsibilities, use of airframe-specific search tools, procedures, and guidelines for the appropriate AHJ.

(B) Requisite Skills. Search techniques, preflight briefing, communicate via equipment and hand signals, and use of airframe-specific search tools.

15.2.6 Demonstrate landing zone management as a member of a ground crew, given an already established landing zone and an assignment, so that the area is secured, hazards are identified and controlled, movement in and around the LZ are positively controlled, and the task is completed.

(A) Requisite Knowledge. LZ physical requirements, PPE selection and use, airframe-specific operational requirements, methods of ground-to-air communications, scene security and control, hazard identification and management, policies, procedures, and guidelines for the AHJ.

(B) Requisite Skills. Control of LZ areas, hazard control and mitigation, use and selection of task-specific PPE, ground-to-air communications protocols, use of hand signals, aircraft ops lighting considerations, movement of people and materials, and safety.

15.2.7* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that search and rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, and postincident analysis techniques.

(B) Requisite Skills. Selection and use of task- and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, and postincident analysis activities.

15.3 Technician Level. The job performance requirements defined in Section15.2 and 15.3.1 through 15.3.5 shall be met prior to technician-level qualification in helicopter rescue.

15.3.1 Construct and manage a human and nonhuman external load to the aircraft, given an airframe, an assignment, and a load, so that all attachment points are connected, the load is lifted in a controlled manner, and the task is completed.

(A) Requisite Knowledge. Airframe-specific operational requirements, weight and balance considerations, load and force calculations, ground crew roles and responsibilities, ground-to-air communications methods and protocols, hazard identification, scene control, emergency procedures, manufacturers' recommendations, policies, procedures, and guidelines for the appropriate AHJ

(B) Requisite Skills. Weight and balance calculation, select and use PPE, select and use load management components, anchor point and lift point identification, ground-to-air communications techniques and protocols, emergency procedures, connecting life safety harness to the short haul line, and scene safety management techniques.

15.3.2 Demonstrate hoisting techniques, as a member of a flight/rescue crew, given an airframe, assignment, a packaged load, and incident, so that the load is moved in a controlled and safe manner, hoist activities are coordinated with flight operations, the airframe operational envelope is not exceeded, and the task is completed.

(A) Requisite Knowledge. Airframe-specific operational characteristics, weight and balance considerations, roles and responsibilities of the flight crew and others in or attached to the aircraft and ground support, operation of airframe-specific communications systems, hoist system operation, hoist specifications, load management, dynamic load factors and calculation, manufacturers' recommendations, environmental hazards, emergency procedures, communications equipment, hand signals, signaling devices, and policies, procedures, and guidelines for the appropriate AHJ.

(B) Requisite Skills. Hazard analysis, weight and balance calculation, dynamic load estimating, hoist preparation, delivery and recovery from environment-specific hazards, flight crew roles and responsibilities, situational awareness, flight

crew communications protocols, and terminology specific to hoist operations.

15.3.3 Demonstrate the ability to devise and implement, given a rescue incident, so that preincident planning, primary and secondary operational rescue plans, and the selection of a properly trained, equipped, and adequately staffed rescue crew for the environment and operational conditions to be encountered are accomplished.

(A) Requisite Knowledge. Operational capabilities of the helicopter, aircrew, and rescue personnel, effects of environmental conditions, and barriers to mission success.

(B) Requisite Skills. Devise a plan and implement the plan providing for a secondary plan.

15.3.4 Demonstrate, given a helicopter search and rescue mission, so that passengers are restrained, the patient is packaged, and cargo is secured for flight operations in accordance with the AHJ.

(A) Requisite Knowledge. Inflight search techniques, helicopter configurations, passenger restraint systems, communications equipment, and policies and practices of the AHJ.

(B) Requisite Skills. Passenger, occupant, victim, and cargo restraint for the given aircraft.

15.3.5 Perform weight and balance calculations for a specific airframe and task, given an assignment, reference materials, weather forecast, and airframe-specific operational parameters, so that the total weight of occupants, as well as the flight crew, fuel, external loads and equipment, is incorporated into the weight and balance calculations, the load does not exceed airframe operational parameters, and the task is completed.

(A) Requisite Knowledge. Helicopter operational specifications, weight and balance calculation formulas, center of gravity determination, and policies, procedures, and guidelines for the appropriate AHJ.

(B) Requisite Skills. Weight and balance calculation procedures and protocols, task-specific performance factors, and interpret and apply technical data.

Chapter 16 Surface Water Rescue

16.1* Awareness Level. The job performance requirements defined in 16.1.1 through 16.1.4 shall be met prior to awareness-level qualification in surface water rescue.

16.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards, request support and resources, and determine the required safety measures.

16.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to Incident Command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

16.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation, and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, functioning within an IMS, following and implementing an incident action plan, and reporting task progress status to supervisor or Incident Command.

16.1.4 Size up an incident, given an incident, background information, and applicable reference materials, so that the operational mode is defined, resource availability and response time is considered, types of rescues are determined, the number of victims are identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk/benefit assessment, availability and capability of resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview people, gather information, relay information, manage witnesses, and use information sources.

16.2* Operations Level. The job performance requirements defined in Section 16.1 and 16.2.1 through 16.2.14 shall be met prior to operations-level qualification in surface water rescue.

16.2.1* Develop a site survey for an existing water hazard, given historical data, specific PPE for conducting site inspections, flood insurance rate maps, tide tables, and meteorological projections, so that life safety hazards are anticipated, risk/benefit analysis is included, site inspections are completed, water conditions are projected, site-specific hazards are identified, routes of access and egress are identified, boat ramps

(put-in and take-out points) are identified, method of entrapment is considered, and areas with high probability for victim location are determined.

(A) Requisite Knowledge. Requisite contents of a site survey; types, sources, and information provided by reference materials; hydrology and influence of hydrology on rescues; types of hazards associated with water rescue practices scenarios, inspections practices, and considerations techniques; risk/benefit analysis; identification of hazard-specific PPE; factors influencing access and egress routes; behavioral patterns of victims; and environmental conditions that influence victim location.

(B) Requisite Skills. The ability to interpret reference materials, perform a scene assessment, evaluate site conditions, complete risk/benefit analysis, and select and use necessary PPE.

16.2.2* Select water rescue PPE, given a water rescue assignment and assorted items of personal protective and life-support equipment, so that the rescuer is protected from temperature extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, and preoperation safety checks have been conducted.

(A) Requisite Knowledge. Manufacturer's recommendations; standard operating procedures; basic signals and communications techniques; selection criteria of insulating garments; buoyancy characteristics; personal escape techniques; applications for and capabilities of personal escape equipment; hazard assessment; AHJ protocols for equipment positioning; classes of personal flotation devices; selection criteria for personal protective clothing, personal flotation devices, and water rescue helmets; personal escape techniques; applications for and capabilities of personal escape equipment; and equipment and procedures for signaling distress.

(B)* Requisite Skills. The ability to use PPE according to the manufacturer's directions, proficiency in emergency escape procedures, proficiency in communications, don and doff equipment in an expedient manner, use preoperation checklists, select personal flotation devices, don and doff personal flotation devices, select water rescue helmets, don and doff water rescue helmets, select personal protective clothing and equipment, don and doff in-water insulating garments, proficiency in emergency escape procedures, and proficiency in communicating distress signals.

16.2.3* Define search parameters for a water rescue incident, given topographical maps of a search area, descriptions of all missing persons and incident history, hydrologic data including speed and direction of current or tides, so that areas with high probability of detection are differentiated from other areas, witnesses are interviewed, critical interview information is recorded, passive and active search tactics are implemented, personnel resources are considered and used, and search parameters are communicated.

(A) Requisite Knowledge Topographical map components, hydrologic factors and wave heights, methods to determine high probability of detection areas, critical interview questions and practices, methods to identify track traps, ways to identify spotter areas and purposes for spotters, personnel available and effects on parameter definition, the effect of search strategy defining parameters, communication methods, and reporting requirements.

(B) Requisite Skills. The ability to interpret and correlate reference and size-up information; evaluate site conditions; complete risk/benefit analysis; apply safety, communications, and operational protocols; specify PPE requirements; and determine rescue personnel requirements.

16.2.4 Develop an action plan for a shore-based rescue of a single or multiple waterbound victim(s), given an operational plan and a water rescue tool kit, so that all information is factored, risk/benefit analysis is conducted, protocols are followed, hazards are identified and minimized, personnel and equipment resources will not be exceeded, assignments are defined, consideration is given to evaluating changing conditions, and the selected strategy and tactics fit the conditions.

(A) Requisite Knowledge. Elements of an action plan; types of information provided by reference materials and size-up; hydrology; types of hazards associated with water rescue practices; risk/benefit analysis; identification of hazard-specific PPE; factors influencing access and egress routes; behavioral patterns of victims; environmental conditions that influence victim location; safety, communications, and operational protocols; and resource capability and availability.

(B) Requisite Skills. The ability to interpret and correlate reference and size-up information; evaluate site conditions; complete risk/benefit analysis; apply safety, communications, and operational protocols; specify PPE requirements; and determine rescue personnel requirements.

16.2.5 Conduct a witness interview, given witnesses and checklists, so that witnesses are secured, information is gathered, last seen point can be determined, last known activity can be determined, procedures to re-contact the witnesses are established, and reference objects can be utilized.

(A) Requisite Knowledge. Elements of an action plan; types of and information provided by reference materials and size-up; hydrology; types of hazards associated with water rescue practices; risk/benefit analysis; identification of hazard-specific PPE; factors influencing access and egress routes; behavioral patterns of victims; environmental conditions that influence victim location; safety, communications, and operational protocols; and resource capability and availability.

(B) Requisite Skills. The ability to interpret and correlate reference and size-up information; evaluate site conditions; complete risk/benefit analysis; apply safety, communications, and operational protocols; specify PPE requirements; and determine rescue personnel requirements.

16.2.6* Deploy a water rescue reach device to a waterbound victim, given required equipment and PPE so that the deployed equipment reaches the victim(s), the rescue equipment does not slip through the rescuer's hands, the victim is moved to the rescuer's shoreline, the victim is not pulled beneath the surface by rescuer efforts, the rescuer is not pulled into the water by the victim, and neither the rescuer nor the victim is tied to or entangled in the device.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, physiological effects of immersion, hydrology and characteristics of water, behaviors of waterbound victims, water rescue rope-handling techniques, incident-specific hazard identification,

criteria for selecting victim retrieval locations based on water environment and conditions, hazards and limitations of shore-based rescue, local policies and procedures for rescue team activation, and information on local water environments.

(B) Requisite Skills. The ability to select PPE specific to the water environment, don PPE, identify water hazards (i.e., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

16.2.7* Deploy a water rescue rope to a waterbound victim, given a water rescue rope in a throw bag, a coiled water rescue rope 50 ft to 75 ft (15.24 m to 22.86 m) in length, and PPE, so that the deployed rope lands within reach of the victim, the rescue rope does not slip through the rescuer's hands, the victim is moved to the rescuer's shoreline, the victim is not pulled beneath the surface by rescuer efforts, the rescuer is not pulled into the water by the victim, and neither the rescuer nor the victim is tied to or entangled in the throw line.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, hydrology and characteristics of water, behaviors of waterbound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on water environment and conditions, hazards and limitations of shore-based rescue, local policies and procedures for rescue team activation, and information on local water environments.

(B) Requisite Skills. The ability to deploy both a water rescue rope bag and a coiled water rescue rope, select PPE specific to the water environment, don PPE, identify water hazards (e.g., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

16.2.8* Develop and implement an action plan for the use of watercraft to support the rescue of a single or multiple waterbound victims, given watercraft, trained operator(s), and policies and procedures used by the AHJ, so that watercraft predeployment checks are completed, watercraft launch or recovery is achieved, rescuers are deployed and recovered, both onboard and rescue operations conform with watercraft operational protocols and capabilities, communications are clear and concise, and the candidate is familiar with watercraft nomenclature, operational protocols, design limitations, and launch/recovery site issues.

(A) Requisite Knowledge. Entry/exit procedures, communications techniques, boat operation techniques, design limitations, climactic conditions, tides, and currents.

(B) Requisite Skills. Implement entry and exit procedures and communications with watercraft crew, use emergency/safety equipment, identify hazards, and operate within the rescue environment.

16.2.9* Define procedures to provide support for helicopter water rescue operations within the area of responsibility for the AHJ, given a helicopter service, operational protocols, helicopter capabilities and limitations, water rescue procedures, and risk factors influencing helicopter operations, so that air-to-ground communications are established and maintained, applications are within the capabilities and skill levels of the helicopter service, the applications facilitate victim extraction from water hazards that are representative of the bodies of water existing or anticipated within the geographic confines of the AHJ, air crew and ground personnel safety are not compromised, landing zones are designated and secured, and fire suppression resources are available at the landing zone.

(A) Requisite Knowledge. Local aircraft capabilities and limitations, landing zone requirements, hazards to aircraft, local protocols, procedures for operating around aircraft, dynamics of rescue options, crash survival principles, PPE limitations and selection criteria, ancillary helicopter rescue equipment, and helicopter surf rescue procedures.

(B) Requisite Skills. The ability to determine applicability of air operations, establish and control landing zones, assess fire protection needs, communicate with air crews, identify hazards, rig aircraft for anticipated rescue procedures, apply crash survival procedures, select and use PPE, and work with air crews to rescue a victim from the water.

16.2.10* Implement procedures for performing watercraft-based rescue of an incapacitated waterbound victim, as a member of a team, given a water hazard that is representative of the anticipated rescue environment watercraft that is available to the team (if applicable), designated victim packaging and management equipment, and water rescue PPE, so that the control and stability of the watercraft is maintained, risks to the victim and rescuers are minimized, and the victim is removed from the hazard.

(A) Requisite Knowledge. Limitations and uses of available watercraft, local environmental entry and exit procedures, parbuckling (rollup) techniques, dynamics of moving water and its effects on watercraft handling, conditional requirements for PPE, and effects of extrication on watercraft handling and stability.

(B) Requisite Skills. The ability to move about in a designated watercraft in conditions representative of the anticipated rescue environment while managing the movement of a waterbound victim using techniques identified by the AHJ.

16.2.11 Demonstrate fundamental survival swimming and self-rescue skills, given safety equipment, props, and a controlled setting representative of the anticipated rescue environment, so that the risk of injury is minimized, flotation is maintained, available PPE is utilized, and egress is accomplished.

(A) Requisite Knowledge. Basic forward stroke swimming theory (surface skills).

(B) Requisite Skills. Basic swimming skills, including the ability to swim and float in different water conditions with and without flotation aids or swimming aids as required and apply water survival skills; don and doff PPE; select and use PPE, flotation aids, and swim aids; use communications systems; and evaluate water conditions to identify entry points and hazards.

16.2.12 Identify procedures for operation of rope systems particular to the water rescue needs of the AHJ, given rescue personnel, an established rope system, a load to be moved, and PPE, so that the movement is controlled, the load is held in place when needed, and operating methods do not stress the system.

(A) Requisite Knowledge. Ways to determine incident needs as related to the operation of rope systems, capabilities and limitations of various rope systems, incident site evaluation as related to interference concerns and obstacle negotiation, system safety check protocol, procedures to evaluate system

components for compromised integrity, common personnel assignments and duties, assignment considerations, common and critical operational commands, common rope system problems and ways to minimize or manage them, and ways to increase the efficiency of load movement.

(B) Requisite Skills. The ability to determine incident needs, complete a system safety check, evaluate system components for compromised integrity, select personnel, communicate with personnel, manage movement of the load, and evaluate for potential problems.

16.2.13 Support operations, given a designated mission, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, correct buoyancy control is maintained, and emergency procedures are demonstrated.

(A) Requisite Knowledge. Support procedures, including search patterns, operation support equipment, and communications issues.

(B) Requisite Skills. Basic support skills, including the ability to assist technicians in different water conditions including ice, surf, swiftwater conditions, and so forth.

16.2.14* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, post incident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

16.3* Technician Level. The job performance requirements defined in Section 16.2 and 16.3.1 through 16.3.4 shall be met prior to technician-level qualification in surface water rescue.

16.3.1* Swim a designated water course, given a course designated by the AHJ as demonstrating the capabilities necessary to operate in the anticipated rescue environment, water rescue PPE, and swim aids as required, so that the specified objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuer has been staged for deployment.

(A) Requisite Knowledge. Hydrology and specific hazards anticipated for representative water rescue environments (shoreline, in-water, and climatic), selection criteria for water rescue PPE and swim aids for anticipated water conditions and hazards, and swimming techniques for representative body of water.

(B) Requisite Skills. The ability to swim and float over the required distances and necessary duration as outlined in the watermanship test found in Annex K with and without flotation aids or swim aids, apply water survival skills, don and doff PPE, select and use swim aids, use communications systems, and evaluate water conditions to identify entry points and hazards.

16.3.2* Perform a swimming surface water rescue, given a simulated victim, water rescue PPE, conditions representative of the anticipated rescue environment, swim aids as required, flotation aids for victims, and reach/extension devices, so that victim contact is maintained, the rescuer maintains control of the victim, the rescuer and the victim reach safety at a predetermined area, and medical conditions and treatment options are considered.

(A) Requisite Knowledge. Hydrology and specific hazards anticipated for representative water rescue environment (shoreline, in-water, and climatic); victim behavior patterns; emergency countermeasures for combative victims; selection criteria for water rescue PPE, swim aids and flotation aids for anticipated water conditions;, victim abilities and hazards; swimming techniques for representative bodies of water; and signs, symptoms, and treatment of aquatic medical emergencies.

(B) Requisite Skills. The ability to swim and float in different water conditions with and without flotation aids or swim aids; apply water survival skills; manage combative waterbound victims; don and doff PPE; select and use PPE, flotation aids, and swim aids; utilize communications systems; select equipment and techniques for treatment of aquatic medical emergencies; and evaluate water conditions to identify entry points and hazards.

16.3.3 Demonstrate defensive tactics in the water rescue environment, given a waterbound victim in a stressed or panicked situation so that the rescuer can maintain separation from the victim to create or maintain personal safety and can perform self-defense techniques to prevent rescuer submersion if direct contact is made between a panicked victim and the rescuer.

(A) Requisite Knowledge. Basic emergency procedures for applicable environments and situations with stressed or panicked victims at water rescues.

(B) Requisite Skills. The ability to release oneself effectively from the grasp of a panicked victim, including blocks, releases, and escapes.

16.3.4 Supervise, coordinate, and lead rescue teams during operations, given incident checklists, maps, topographic surveys, and charts, so that teams are managed, personnel are supervised, hazards are assessed and identified, safety and health of team is ensured, qualifications/abilities of rescuers are verified, pre-entry briefing is conducted, and debriefing is performed.

(A) Requisite Knowledge. Supervisory practices, emergency procedures, communications procedures, local protocols, and safety checks.

(B) Requisite Skills. The ability to implement emergency procedures, communications procedures, and leadership/management skills.

Chapter 17 Swiftwater Rescue

17.1 Awareness Level. The job performance requirements defined in 17.1.1 through 17.1.4 shall be met prior to awareness-level qualification in swiftwater rescue.

17.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

17.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

17.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation, and monitoring hazards zones.

(B) Requisite Skills. Apply operational protocols, function within an IMS, follow and implement an incident action plan, and report task progress status to supervisor or Incident Command.

17.1.4 Size up an incident, given an incident, background information, and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported locations of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk/benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview people, gather information, relay information, manage witnesses, and use information sources.

17.2 Operations Level. The job performance requirements defined in Section, 10.1, 10.2.1 through 10.2.5, Section 16.1 and 16.2.1 through 16.2.13 shall be met prior to operations-level qualification in swiftwater rescue.

17.2.1 Construct rope systems particular to the swiftwater rescue needs of the AHJ, given rescue personnel, rope equipment, a load to be moved, and PPE, so that the movement is controlled, the load is held in place when needed, and operating methods do not stress the system.

(A) Requisite Knowledge. Rope systems specific to the swiftwater environment, capabilities, and limitations of various rope systems, incident site evaluation as related to interference concerns and obstacle negotiation, system safety check protocol, procedures to evaluate system components for compromised integrity, common personnel assignments and duties, common and critical operational commands, and methods to increase the efficiency of load movement.

(B) Requisite Skills. The ability to determine incident needs, complete a system safety check, evaluate system components for compromised integrity, select personnel, communicate with personnel, manage movement of the load, and evaluate for potential problems.

17.2.2 Support operations, given a designated mission, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, and emergency procedures are demonstrated.

(A) Requisite Knowledge. Support procedures, including search patterns, equipment setup, operation support equipment, and communications issues.

(B) Requisite Skills. Basic support skills, including the ability to serve as an upstream or downstream safety or spotter, and tend a "go" rescuer.

17.2.3 Assess moving water conditions, characteristics, and features in terms of hazards to the rescuer and victims, given an incident scenario and swiftwater tool kit, so that flow and conditions are estimated accurately, mechanisms of entrapment are considered, hazards are assessed, depth and surrounding terrain are evaluated, and findings are documented.

(A) Requisite Knowledge. Flow calculation methods, map or chart reading, local water hazards and conditions, entrapment mechanisms, and human physiology and survival factors.

(B) Requisite Skills. Determination of flow and environmental factors, the effects on victims and rescuers, and interpretation of maps or charts.

17.2.4* Perform a nonentry rescue in the swiftwater and flooding environment, given an incident scenario, PPE, and swiftwater rescue tool kit, so that rescue is accomplished, and adopted policies and safety procedures are followed.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, hydrology and characteristics of water, behaviors of waterbound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on water environment and conditions, hazards and limitations of shore-based rescue, local policies/procedures for rescue team activation, and information on local water environments.

(B) Requisite Skills. Select PPE specific to the water environment, don PPE, identify water hazards (i.e., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

17.2.5* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, and scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered; and command is terminated.

(A) PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, postincident analysis techniques.

(B) Selection and use of task and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

17.3 Technician Level. The job performance requirements defined in Section 10.2, 10.3.1 through 10.3.3, and 16.3.1 through 16.3.4 shall be met prior to technician-level qualification in swiftwater rescue.

17.3.1 Perform an entry rescue in the swiftwater and flooding environment, given an incident scenario, PPE, and swiftwater rescue tool kit, so that rescue is accomplished, and adopted policies and safety procedures are followed.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, hydrology and characteristics of water, behaviors of waterbound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on water environment and conditions, hazards and limitations of shore-based rescue, local policies/procedures for rescue team activation, and information on local water environments.

(B) Requisite Skills. Select PPE specific to the water environment, don PPE, identify water hazards (i.e., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate victim removal techniques.

17.3.2 Negotiate a designated swiftwater course, given a course that is representative of the bodies of swiftwater existing or anticipated within the geographic confines of the AHJ, water rescue PPE, and swim aids as required, so that the specified objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuer has been staged for deployment.

(A) Requisite Knowledge. Hydrology and specific hazards anticipated for representative water rescue environments (shoreline, in-water, and climatic), selection criteria for water rescue PPE and swim aids for anticipated water conditions and hazards, and swimming techniques for representative body of water.

(B) Requisite Skills. The ability to swim and float in different water conditions with and without flotation aids or swim aids as required, apply water survival skills, don and doff PPE, select and use swim aids, utilize communications systems, and evaluate water conditions to identify entry points and hazards.

17.3.3 Perform a swiftwater rescue from a rescue platform such as a vessel, boat, watercraft, or other waterborne transportation aid while negotiating a designated swiftwater course, given a course that is representative of the bodies of swiftwater existing or anticipated within the geographical confines of the AHJ, water rescue PPE, and swim aids as required, so that the specific objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuers has been staged for deployment.

(A) Requisite Knowledge. The operator and/or crew of any waterborne transportation aid must be knowledgeable in the application and safe operation of the waterborne transportation device and its limitations, and follow all manufacturers' recommendations. The operator and crew of the waterborne transportation aid must comply with all regulatory and applicable laws of safe water transportation according to the AHJ.

(B) Requisite Skills. The ability of the operator and crew to enter and exit the waterborne transportation device in a swiftwater condition, to correct a capsized waterborne transportation aid, to assist with safe waterborne transportation operations as members of a swiftwater rescue team on a vessel.

Chapter 18 Dive Rescue

18.1 Awareness Level. The job performance requirements defined in 18.1.1 through 18.1.4 shall be met prior to awareness-level qualification in dive rescue.

18.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

18.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

18.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation, and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, function within an incident management system, follow and implement an incident action plan, report task progress status to supervisor or Incident Command.

18.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims is ascertained, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

18.2 Operations Level. The job performance requirements defined in Section 18.1 and 18.2.1 through 18.2.8 shall be met prior to operations-level qualification in dive rescue.

18.2.1 Define search parameters for a dive rescue incident, given topographical maps of a search area, descriptions of all missing persons and incident history, and hydrologic data, including speed and direction of current or tides, so that areas likely to contain the subject are differentiated from other areas, witnesses are interviewed, critical interview information is recorded, passive (indirect) and active (direct) search tactics are implemented, personnel resources are considered and used, and search parameters are communicated.

(A) Requisite Knowledge. Criteria for determining rescue versus recovery modes, human physiology related to dive environment, re-float theory, topographical map components, hydrologic factors, methods to increase probability of detection, methods to determine areas likely to contain the subject, critical interview questions and practices, methods to identify track traps, ways to identify spotter areas and purposes for spotters, personnel available and effects on parameter definition, the effect of search strategy defining the parameter, communication methods, and reporting requirements.

(B) Requisite Skills. The ability to interpret reference materials, perform a scene assessment, evaluate site conditions, complete risk/benefit analysis, and select and use necessary PPE.

18.2.2* Implement an action plan for a dive operation, given an operational plan and a dive rescue tool kit, so that all information is factored, risk/benefit analysis is conducted, protocols are followed, hazards are identified and minimized, personnel and equipment resources will not be exceeded, assignments are defined, consideration is given to evaluating changing conditions, and the selected strategy and tactics fit the conditions.

(A) Requisite Knowledge. Elements of an action plan; types of and information provided by reference materials and size-up; hydrology; types of hazards associated with dive rescue practices; risk/benefit analysis; identification of hazard-specific PPE; factors influencing access and egress routes; behavioral patterns of victims; environmental conditions that influence victim location; safety, communications, and operational protocols; and resource capability and availability.

(B) Requisite Skills. The ability to interpret and correlate reference and size-up information; evaluate site conditions; complete risk/benefit analysis; apply safety, communications, and operational protocols; specify PPE requirements; determine rescue personnel requirements; and monitor and record submerged diver location, breathing, and dive times.

18.2.3* Implement procedures for use of watercraft in dive operations, given watercraft used by the AHJ, trained operator(s), and the agency's procedures so that watercraft predeployment checks are completed; watercraft launch or recovery is achieved as stipulated by AHJ operational protocols; divers are deployed recovered, and protected from harm; both onboard and dive rescue operations conform with watercraft operational protocols and capabilities; communications are clear and concise; and the candidate is familiar with watercraft nomenclature, operational protocols, design limitations, and launch/recovery site issues.

(A) Requisite Knowledge. Entry/exit procedures, communications techniques, boat anchoring procedures specific to dive operations, and boat diving operation techniques.

(B) Requisite Skills. The ability to implement entry/exit procedures and communications with watercraft crew and use emergency/safety equipment.

18.2.4 Support entry-level dive rescue operations, given a designated mission, a dive plan, safety equipment, props, and conditions consistent with the anticipated rescue environment, so that communication is maintained with divers while they are on the surface and submerged; status of divers' bottom time, location, repetitive dive status, and the progress of subsurface search operations is tracked and documented; skills are demonstrated in a controlled environment; performance parameters are achieved; hazards are continually assessed; and emergency procedures are demonstrated.

(A) Requisite Knowledge. Support procedures, including search patterns, dive equipment setup, operation support equipment, air panels, and communications issues.

(B) Requisite Skills. Basic support skills, including the ability to assist technicians in different water conditions, use communication tools, read dive tables, and record necessary information.

18.2.5* Secure the area as a potential crime scene and generate an accurate record of possible evidence and its environment, given paper and pencil, evidence tube or container, marker float, GPS, and last seen point, so that items are secured; possible evidence is preserved by taking notes on, documenting, making sketches of, photographing, or retrieving evidence; chain of custody and evidentiary nature is maintained; and information is passed to law enforcement.

(A) Requisite Knowledge. Understand and maintain the "chain of evidence," camera operations, scent article handling and preservation, clue awareness, and specific scene situation considerations (i.e., wreckage, bodies, injury, evidence).

(B) Requisite Skills. Interview skills of corroborating witnesses and basic drawing skills.

18.2.6 Select and assemble PPE to assist rescue divers, given a subsurface mission and personal protective and life-support equipment, so that rescuer is protected from temperature extremes, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, and pre-dive safety checks have been conducted, to include complete encapsulation, including dry suit with attached hood, boots, and gloves and full facemask.

(A) Requisite Knowledge. Manufacturer's recommendations, standard operating procedures, basic signals and communications techniques, procedures for the use of electronic communications equipment, selection criteria of insulating garments, buoyancy characteristics, personal escape techniques, applications for and capabilities of personal escape equipment, hazard assessment, and AHJ protocols for equipment positioning.

(B) Requisite Skills. The ability to use PPE according to the manufacturer's directions, be proficient in emergency escape procedures, be proficient in communications, don and doff equipment in an expedient manner, and use pre-dive checklists.

18.2.7* Assist a surfaced diver in distress, given safety equipment; PPE; water hazard; and a tired, entrapped, or stressed diver, so that the diver is rescued or assisted, and the victim is extricated from the environment.

(A) Requisite Knowledge. Techniques for approach and assistance of surfaced victims or divers, buoyancy control techniques, disentanglement procedures, and communication procedures.

(B) Requisite Skills. The ability to use PPE, flotation devices, techniques for rescue or assistance, swimming techniques, and panicked diver evasion techniques.

18.2.8* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed and scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard specific PPE, decontamination; use of barrier protection techniques, data collection, and recordkeeping/reporting protocols; postincident analysis activities.

18.3* Technician Level. The job performance requirements defined in Section 18.2 and 18.3.1 through 18.3.10 shall be met prior to technician-level qualification in dive rescue.

18.3.1 Develop a dive plan, including the projected dive profile, given a predive checklist, dive tables, and a subsurface mission so that elements of the plan, including maximum bottom time, depth limit, minimum reserve breathing air pressure, risk/benefit analysis, hazard-specific equipment, access/egress routes, type of search to be performed, and communication methods, are defined.

(A) Requisite Knowledge. Use of references; use of dive tables; searcher limitations; incident management systems resource capabilities; search technique and theory; SCUBA limitations/abilities; float/refloat theory; and movement of a body, or evidence on the surface, during descent, and once on the bottom in still water and, if applicable, in moving water.

(B) Requisite Skills. The ability to use dive tables; develop plan; implement incident management; read and interpret maps; interview witnesses; translate information given into a search plan; use communications equipment; define search parameters; determine hydrology, critical interview questions, spotter placement, and strategies; and evaluate bottom topography, composition, debris, water visibility, current, and diver/tender capabilities to determine the safest and most appropriate search pattern.

18.3.2* Select and use PPE, given a subsurface mission and personal protective and life-support equipment, so that rescuer is protected from temperature extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and

provided for, predive safety checks have been conducted, and the diver returns to the surface with no less than the minimum specified reserve primary air supply pressure.

(A) Requisite Knowledge. Manufacturer's recommendations, standard operating procedures, basic signals and communications techniques, selection criteria of insulating garments, buoyancy characteristics, personal escape techniques, applications for and capabilities of personal escape equipment, hazard assessment, and AHJ protocols for equipment positioning.

(B) Requisite Skills. The ability to use PPE according to the manufacturer's directions, be proficient in emergency escape procedures, be proficient in communications, don and doff equipment in an expedient manner, and use predive checklists.

18.3.3* Select and use a standard or full-face mask, given a subsurface mission and personal protective and life-support equipment, so that rescuer is protected from temperature extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, and predive safety checks have been conducted.

(A) Requisite Knowledge. Manufacturer's recommendations, standard operating procedures, basic signals, communications techniques, selection criteria of insulating garments, buoyancy characteristics, personal escape techniques, applications for and capabilities of personal escape equipment, hazard assessment, and AHJ protocols for equipment positioning.

(B) Requisite Skills. The ability to use PPE according to the manufacturer's directions, be proficient in emergency escape procedures, be proficient in communications, don and doff equipment in an expedient manner, and use predive checklists.

18.3.4* Negotiate a SCUBA water course, given a SCUBA dive designated course, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, correct buoyancy control is maintained, and emergency procedures are demonstrated.

(A) Requisite Knowledge. Basic SCUBA theory (subsurface skills).

(B) Requisite Skills. Basic SCUBA skills, including the ability to maneuver using SCUBA in different water conditions, including limited visibility, and apply water survival skills.

18.3.5 Supervise, coordinate, and lead dive teams during operations, given incident checklists, dive checklists, maps, topographic surveys, charts, and predive/postdive medical evaluation checklist, so that teams are managed, personnel are supervised, hazards are assessed and identified, safety and health of team is ensured, qualifications/abilities of divers are verified, predive briefing is conducted, and postdive medical evaluation and briefing are performed.

(A) Requisite Knowledge. Divemaster-level knowledge; knowledge of supervisory practices, dive tables, emergency procedures, communications procedures, local protocols, and predive safety checks.

(B) Requisite Skills. The ability to use SCUBA, dive tables, emergency procedures, communication procedures, and leadership and management skills.

18.3.6* Select and use dive rescue equipment, given a dive rescue assignment and assorted items of personal protective and life-support equipment, so that the rescuer is protected from temperature extremes, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, predive safety checks have been conducted, and the diver returns to the surface with no less than the minimum specified reserve primary air supply pressure.

(A) Requisite Knowledge. Manufacturer's recommendations, standard operating procedures, basic signals and communications techniques, selection criteria of PPE, including full-face masks, if applicable, and redundant air systems, buoyancy characteristics, personal escape techniques, applications for and capabilities of personal escape equipment, hazard assessment, AHJ protocols for equipment, personal escape techniques, applications for and capabilities of personal escape equipment, and equipment and procedures for signaling distress.

(B) Requisite Skills. The ability to use PPE, including full-face mask equipment and redundant air systems, according to the manufacturer's directions; proficiency in emergency escape procedures; proficiency in communications; can don and doff equipment in an expedient manner; use predive checklists; use water rescue PPE, so that the rescuer will be protected from temperature extremes and blunt trauma, the rescuer will have flotation for tasks to be performed, swimming ability will be maximized during rescue activities, self-rescue needs have been evaluated and provided for, and a means of summoning help has been provided; proficiency in emergency escape procedures; and communicating distress signals.

18.3.7 Manage physiological and psychological stressors in the aquatic environment for the diver and surface support personnel, given a simulated life-threatening situation, so that problems are recognized, corrective actions are initiated, and the situation is stabilized.

(A) Requisite Knowledge. Hazard identification and management techniques specific to the stressors and problems present with the environment of public safety diving, and commonly encountered life-threatening problems in the underwater environment.

(B) Requisite Skills. Diver monitoring and observation, communication and intervention techniques, use of diver checklists, and diver recall procedure implementation.

18.3.8* Assist a submerged diver in distress, given safety equipment; PPE; and an entrapped, tired, or distressed diver, so that the diver is rescued or assisted, and the victim is extricated from the environment.

(A) Requisite Knowledge. Techniques for approach and assistance of conscious and unconscious divers, buoyancy control techniques, out-of-air emergency procedures, use of secondary air systems, procedures for disentanglement, and communications procedures.

(B) Requisite Skills. The ability to use PPE, techniques for rescue or assistance of conscious and unconscious divers, buoyancy control devices, regulators, weight belt removal, communication via hand signals, and emergency ascents.

18.3.9* Escape from simulated life-threatening situations, including out-of-air emergencies, entanglements, malfunction of primary air supply source, loss of buoyancy control and disorientation, given safety equipment, a pool or controlled water environment, SCUBA equipment, and props, so that hazards are recognized, emergency procedures are performed, diver escapes from situation to safety, and problems can be identified prior to work in a high-stress environment.

(A) Requisite Knowledge. Basic SCUBA emergency procedures for applicable environments and emergency medical treatment protocols for oxygen toxicity, bends, decompression injuries, and other dive-related injuries and illnesses.

(B) Requisite Skills. The ability to implement loss of communications procedures; regulator loss, failure, or out-of-air procedures; disentanglement and self-extrication procedures; severed or entangled umbilical or tag line procedures; equipment loss or failure procedures; and emergency treatment of injured divers.

18.3.10 Perform environment-specific search of the water body, given search parameters for a dive rescue incident, hydrologic data (including speed and direction of current or tides), descriptions of missing persons and incident history, checklists, conditions affecting overlap, pattern selection, water body representative of the AHJ, and safety and SCUBA equipment, so that areas with high probability of detection are differentiated from other areas, witnesses are interviewed, critical interview information is recorded, personnel resources are considered, search parameters are communicated, search is performed, and object is found.

(A) Requisite Knowledge. Search theory, environmental considerations, procedures/protocols, hydrologic factors, methods to determine high probabilities of detection areas, and critical interview questions and practices.

(B) Requisite Skills. The ability to negotiate a body of water, use rope or items in search, and implement procedures for effective underwater communications.

Chapter 19 Ice Rescue

19.1 Awareness Level. The job performance requirements defined in 19.1.1 through 19.1.4 shall be met prior to awareness-level qualification in ice rescue.

19.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards, request support and resources, and determine the required safety measures.

19.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

19.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation, and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, function within an IMS, follow and implement an incident action plan, report task progress status to supervisor or Incident Command.

19.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims is identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

19.2 Operations Level. The job performance requirements defined in Section 19.1 and 19.2.1 through 19.2.4 shall be met prior to operations-level qualification in ice rescue.

19.2.1 Support Level II operations, given a designated mission, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are assessed continually, and emergency procedures are demonstrated.

(A) Requisite Knowledge. Support procedures, including search patterns, equipment setup, operation support equipment, and communications issues.

(B) Requisite Skills. Basic support skills, including the ability to serve as an upstream or downstream safety or spotter and tend a "go" rescuer.

19.2.2 Assess ice and water conditions, characteristics, and features in terms of hazards to the rescuer and victims, given an incident scenario and ice rescue tool kit, so that conditions are estimated accurately, mechanisms of entrapment are considered, hazards are assessed, depth and surrounding terrain are evaluated, and findings are documented.

(A) Requisite Knowledge. Ice assessment, flow calculation methods, map or chart reading, local water hazards and conditions, entrapment mechanisms, and human physiology and survival factors.

(B) Requisite Skills. Determination of flow and environmental factors and the effect on victims and rescuers, and interpretation of maps and charts.

19.2.3 Perform a nonentry rescue in the ice rescue environment, given an incident scenario, PPE, and ice rescue tool kit, so that rescue is accomplished and adopted policies and safety procedures are followed.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, physiological effects of immersion and cold water near-drowning, hydrology and characteristics of water/ice, behaviors of victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on water/ice environment and conditions, hazards and limitations of shore-based rescue, local policies/procedures for rescue team activation, and information on local water environments.

(B) Requisite Skills. The ability to select PPE specific to the ice rescue environment, don PPE, identify water hazards (e.g., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

19.2.4* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

19.3 Technician Level. The job performance requirements defined in Section 19.2 and 19.3.1 through 19.3.2 shall be met prior to technician-level qualification in ice rescue.

19.3.1 Demonstrate techniques for movement on ice, given an ice formation that is representative of the bodies of water and ice existing or anticipated within the geographic confines of the AHJ, ice rescue PPE, and swim aids as required, so that the specified objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuer has been staged for deployment.

(A) Requisite Knowledge. Hydrology and specific hazards anticipated for representative ice rescue environments (shoreline, in-water, and climatic), selection criteria for ice rescue PPE and swim aids for anticipated water conditions and hazards, and swimming techniques for representative body of water.

(B) Requisite Skills. The ability to swim and float in different water conditions with and without flotation aids or swim aids as required, apply water survival skills, self-rescue with and without use of grip aids in the event of breakthrough, don and doff PPE, select and use swim aids, utilize communications systems, use task-specific equipment, and evaluate water/ice conditions to identify entry points and hazards.

19.3.2 Perform an entry rescue in the ice rescue environment, given an incident scenario, PPE, and ice rescue tool kit, so that independent positive buoyancy is established for the victim, rescue is accomplished, and adopted policies and safety procedures are followed.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, hydrology and characteristics of water, behaviors of victims, physiological effects of immersion and cold water near-drowning, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on water environment and conditions, hazards and limitations of entry rescue, local policies/procedures for rescue team activation, and information on local water environments.

(B) Requisite Skills. The ability to select PPE specific to the water/ice environment, don PPE, identify water/ice hazards (i.e., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate victim removal techniques.

Chapter 20 Surf Rescue

20.1 Awareness Level. The job performance requirements defined in 20.1.1 through 20.1.4 shall be met prior to awareness-level qualification in surf rescue.

20.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the AHJ, request support and resources, and determine the required safety measures.

20.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques

20.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, ventilation, and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, function within an IMS, follow and implement an incident action plan, report task progress status to supervisor or Incident Command.

20.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview and gather information, relay information, manage witnesses, and use information sources.

20.2 Operations Level. The job performance requirements defined in Section 20.1 and 20.2.1 through 20.2.5 shall be met prior to operations-level qualification in surf rescue.

20.2.1 Develop a site survey for an existing surf site, given historical data, PPE for conducting site inspections, rescue equipment for effecting surf rescues, tide tables, currents, and wave heights and meteorological projections, so that life safety hazards are anticipated, risk/benefit analyses are included, site inspections are completed, ocean conditions are projected, site-specific hazards are identified, routes of access and egress are identified, boat ramps are identified, entry and exit points to surf sites are identified, methods of entrapment are considered, and areas with high probability for victim location are determined.

(A) Requisite Knowledge. Contents of a site survey; types, sources, and information provided by reference materials; hydrology and influence of hydrology on rescues; types of hazards associated with ocean rescue practice scenarios, inspection practices, and consideration techniques; risk/benefit analyses; identification of PPE; identification of rescue equipment for effecting surf rescues; factors influencing access and egress routes; behavioral patterns of victims; and environmental conditions that influence victim location.

(B) Requisite Skills. The ability to interpret reference materials, perform a scene assessment, evaluate site conditions, complete risk/benefit analyses, select and use necessary PPE, and select and use appropriate rescue equipment for effecting surf rescues.

20.2.2* Demonstrate survival swimming skills in low-surf environment, given safety equipment and a water body with low surf, so that basic survival skills are demonstrated in a representative environment as found in the jurisdiction, performance parameters are achieved, and problems can be identified prior to working in a low-surf environment.

(A) Requisite Knowledge. Types of fundamental swimming skills to enter a surf zone, maneuver within the surf zone, and exit the surf zone, and fundamental surf knowledge that includes knowing how waves form, why waves are seasonal, how to judge wave heights, recognizing the difference between plunging and spilling waves, knowing the dynamics of surf-related currents such as long-shore and riparian (or rip) currents, and familiarity with the user groups in the surf zone and the types of equipment they use.

(B) Requisite Skills. The ability to perform fundamental swimming skills in a surf zone, including the ability to enter, maneuver in, and exit the surf zone; swim in different surf conditions with and without flotation aids or swim aids; apply water survival skills; complete a distance swim in any open body of water using any stroke and without the aid of any surf rescue equipment; identify different types of waves, different types of currents, and the user groups in the surf zone and the types of equipment they use.

20.2.3* Deploy a nonmotorized watercraft and rescue a water-bound surf victim, given watercraft used by the AHJ, so that watercraft predeployment checks are completed, watercraft launch or recovery is achieved as stipulated by AHJ operational protocols, both onboard and surf rescue operations conform with watercraft operational protocols and capabilities, communications are clear and concise, and the candidate is familiar with watercraft nomenclature, operational protocols, design limitations, and launch/recovery site issues.

(A) Requisite Knowledge. Types of fundamental skills to enter a surf zone, maneuver within the surf zone, and exit the surf zone on a nonmotorized watercraft; fundamental surf knowledge that includes knowing how waves form, why waves are seasonal, how to judge wave heights, recognizing the difference between plunging and spilling waves, knowing the dynamics of surf-related currents such as longshore and rip currents, and familiarity with the user groups in the surf zone and the types

of equipment they use; and victim retrieval and removal techniques.

(B) Requisite Skills. The ability to perform fundamental deployment and maneuvering skills in a surf zone on a nonmotorized watercraft, including the ability to enter, maneuver in, and exit the surf zone; perform in different surf conditions; negotiate a measured distance in any open body of water using the watercraft used by the AHJ; identify different types of waves, different types of currents, and the user groups in the surf zone and the types of equipment they use; and maneuver in the surf zone after retrieving a victim and demonstrate appropriate victim removal techniques.

20.2.4* Define procedures to provide support for surf rescue operations within the area of responsibility for the AHJ, given motorized watercraft used by the AHJ, protocols and procedures, boat-to-shore communication, extraction issues, and safety procedures, so that communications are clear and concise, and the candidate is familiar with boat nomenclature, operational protocols, and design limitations.

(A) Requisite Knowledge. Limitations and uses of available boats, dynamics of moving water and its effects on boat handling, launch and docking procedures, conditional requirements for PPE, applications for motorized and appropriate boats, operating hazards as related to conditions, and crew assignments and duties.

(B) Requisite Skills. The ability to ride the boat, evaluate conditions for launch, don water rescue PPE, utilize communications systems, and apply procedures for rescuing a victim in the surf zone, including assisting the victim into the boat.

20.2.5* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincident analysis activities.

20.3 Technician Level. The job performance requirements defined in Section 20.2 and 20.3.1 through 20.3.3 shall be met prior to technician-level qualification in surf rescue.

20.3.1 Demonstrate advanced swimming skills in the surf environment, given safety equipment and a water body with high surf, so that advanced skills are demonstrated in an environment representative of conditions experienced in the jurisdiction, performance parameters and objectives are achieved, and problems can be identified prior to working in a high surf environment.

(A) Requisite Knowledge. Types of fundamental swimming skills to enter, maneuver, and exit a surf zone; wave formation theory; wave types; dynamics of surf-related currents such as longshore and rip currents; and familiarity with victim behavior and recreational equipment used.

(B) Requisite Skills. The ability to perform advanced swimming skills in the surf zone, including the ability to enter, maneuver in, and exit the surf zone; swim in different surf conditions with and without flotation aids or swim aids; apply water survival skills; complete a distance swim in any open body of water using any stroke without the aid of any surf rescue equipment; and identify wave types, current types, and potential victim behavior.

20.3.2 Perform a swimming rescue for a waterbound surf victim, given PPE, including a pair of swimming fins and a surf rescue tube with a shoulder strap, safety equipment, and a water body with high surf representative of the jurisdiction's conditions, so that the victim is secured within the surf rescue tube and towed out of the surf impact zone to shore or to a surf-free zone for pickup by a watercraft, boat, or helicopter.

(A) Requisite Knowledge. Types of fundamental swimming skills to enter, maneuver, and exit a surf zone; wave formation theory; wave types; dynamics of surf-related currents such as longshore and rip currents; and familiarity with victim behavior and recreational equipment used.

(B) Requisite Skills. The ability to perform advanced swimming skills in the surf zone, including the ability to enter, maneuver in, and exit the surf zone; swim in different surf conditions with and without flotation aids or swim aids; apply water survival skills; complete a distance swim in any open body of water using any stroke without the aid of any surf rescue equipment; identify wave types, current types, and potential victim behavior; and maneuver in the surf zone with a surf rescue tube, tow a victim with the tube, and demonstrate victim removal techniques.

20.3.3 Perform a subsurface retrieval of a submerged victim in a surf environment, given PPE; swimming fins, mask, and snorkel; and a water body with high surf representative of the jurisdiction's conditions, so that the victim is located and brought to the surface, removed out of the surf impact zone to shore or to a surf-free zone for pickup by a watercraft, boat, or helicopter.

(A) Requisite Knowledge. Types of fundamental swimming skills to enter, maneuver, and exit a surf zone; wave formation theory; wave types; dynamics of surf-related currents such as longshore and rip currents; and familiarity with victim behavior and recreational equipment used.

(B) Requisite Skills. The ability to perform free diving skills in the surf zone, including the ability to enter, maneuver in, and exit the surf zone while towing a victim; swim in different surf conditions with and without flotation aids or swim aids; apply water survival skills; complete a distance swim in any open body of water using any stroke without the aid of any surf rescue equipment; identify wave types, current types, and potential victim behavior; and maneuver in the surf zone with a surf rescue tube, tow a victim with the tube, and demonstrate victim removal techniques.

Chapter 21 Watercraft Rescue

21.1* Awareness Level. The job performance requirements defined in 21.1.1 through 21.1.8 shall be met prior to awareness level qualification in watercraft rescue.

21.1.1 Recognize the need for support resources, given a specific type of rescue incident, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operation facilitates rescue operational objectives.

(A) Requisite Knowledge. Equipment organization and tracking methods, lighting resource type(s), shelter and thermal control options, and rehab criteria.

(B) Requisite Skills. The ability to track equipment inventory, identify lighting resources and structures for shelter and thermal protection, select rehab areas, and manage personnel rotations.

21.1.2 Recognize incident hazards and initiate isolation procedures, given scene control barriers, personal protective equipment (PPE), requisite equipment, and available specialized resources, so that all hazards are identified, resource application fits the operational requirements, hazard isolation is considered, risks to rescuers and victims are minimized, and rescue time constraints are taken into account.

(A) Requisite Knowledge. Resource capabilities and limitations, types and nature of incident hazards, equipment types and their use, isolation terminology, methods, equipment and implementation, operational requirement concerns, common types of rescuer and victim risk, risk/benefit analysis methods and practices, and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess victim viability (risk/benefit), utilize technical references, place scene control barriers, and operate control and mitigation equipment.

21.1.3 Recognize needed resources for a rescue incident, given incident information, a means of communication, resources, tactical worksheets, personnel accountability protocol, applicable references, and standard operating procedures, so that references are utilized, personnel are accounted for, necessary resources are deployed to achieve desired objectives, incident actions are documented, rescue efforts are coordinated, the command structure is established, task assignments are communicated and monitored, and actions are consistent with applicable regulations.

(A) Requisite Knowledge. Incident management system (IMS); tactical worksheet application and purposes; accountability protocols; resource types and deployment methods; documentation methods and requirements; availability, capabilities, and limitations of rescuers and other resources; communication problems and needs; communications requirements, methods, and means; types of tasks and assignment responsibilities; policies and procedures of the agency; and technical references related to the type of rescue incident.

(B) Requisite Skills. The ability to implement an IMS, complete tactical worksheets, use reference materials, evaluate incident information, match resources to operational needs, operate communications equipment, manage incident communications, and communicate in a manner so that objectives are met.

21.1.4 Initiate a discipline specific search, given hazard-specific PPE, equipment pertinent to search mission, an incident location, and victim investigative information, so that search parameters are established; the victim profile is established; the entry and exit of all people either involved in the search or already within the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims are located as quickly as possible; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.

(A) Requisite Knowledge. Local policies and procedures and how to operate in the site-specific search environment.

(B) Requisite Skills. The ability to enter, maneuver in, and exit the search environment and provide for and perform self-escape and self-rescue.

21.1.5* Perform ground support operations for helicopter activities, given a rescue scenario/incident, helicopter, operational plans, PPE, requisite equipment, and available specialized resources, so that rescue personnel are aware of the operational characteristics of the aircraft and demonstrate operational proficiency in establishing and securing landing zones and communicating with aircraft personnel until the assignment is complete.

(A) Requisite Knowledge. Ground support operations relating to helicopter use and deployment, operation plans for helicopter service activities, type-specific PPE, aircraft familiarization and hazard areas specific to helicopters, scene control and landing zone requirements, aircraft safety systems, and communications protocols.

(B) Requisite Skills. The ability to provide ground support operations, review standard operating procedures for helicopter operations, use PPE, establish and control landing zones, and communicate with aircrews.

21.1.6 Initiate triage of victims, given triage tags and local protocol, so that rescue versus recovery factors are assessed, triage decisions reflect resource capabilities, severity of injuries is determined, and victim care and rescue priorities are established in accordance with local protocol.

(A) Requisite Knowledge. Types and systems of triage according to local protocol, resource availability, methods to determine injury severity, ways to manage resources, and prioritization requirements.

(B) Requisite Skills. The ability to use triage materials, techniques, and resources and to categorize victims correctly.

21.1.7 Select and don PPE, given including PFDs, helmets and exposure garments that are consistent with the needs of the incident and type of watercraft so that the wearer is protected from the effects accidental immersion, exposure to the elements and injury from unanticipated movement of the watercraft.

(A) Requisite Knowledge. Hazards present on and near the water and aboard watercraft used by the AHJ including those presented by weather, current, and water conditions and the capacities.

(B) Requisite Skills. Locate, identify, and don PPE and flotation devices.

21.1.8 Board and exit a watercraft given a selected watercraft used by the AHJ so that the stability of the craft is not compromised, the possibility of a fall is minimized, and the rescuer is protected from harm.

(A) Requisite Knowledge. Elements that affect the stability of watercraft, including mass, center of gravity, weight distribution, impact loads, current, sail area, and wind and water conditions.

(B) Requisite Skills. Boarding a watercraft in a manner that prevents injury and minimizes the impact on the stability of the watercraft.

21.2* Operations Level. The job performance requirements defined in Section 21.1 and 21.2.1 through 21.2.18 shall be met prior to operations level qualification in watercraft rescue.

21.2.1 Identify the types of watercraft, given a list of watercraft used by the organization, so that their limitations, capabilities, load ratings, performance criteria, and considerations for their deployment and recovery in the intended environment are identified.

(A) Requisite Knowledge. Types of watercraft used by the organization and the qualities and attributes of each craft that affect how it is utilized in the intended environment; inherent conditions of the intended environment including wind, current, and water conditions that affect vessel selection and use; mission scope and tactical objectives that affect watercraft selection.

(B) Requisite Skills. Identify watercraft characteristics such as draft, sail area, method of propulsion, size, weight, method of deployment, and configuration that affect its selection for use in a specific environment for a specific mission.

21.2.2 Identify the configuration of watercraft given a watercraft available to the agency so that the location of access and egress points, propulsion system components, steering controls, communication equipment, emergency equipment, through hull and deck fittings, portals, and fittings necessary for water- and weathertight integrity are located.

(A) Requisite Knowledge. Location of equipment, watercraft components, and configuration of watercraft.

(B) Requisite Skills. Identify fittings, portals, and other equipment.

21.2.3 Use the available methods of communicating between the watercraft and other rescuers in the water, on shore, in other watercraft, and in aircraft as applicable given communication tools, so that routine mission-related information and emergency messages are communicated to the intended recipient.

(A) Requisite Knowledge. Methods of communication available to rescuer and their limitations given specific weather conditions, visibility, and distances from the intended recipient.

(B) Requisite Skills. Select utilize available communication tools such as radios, hand signals, lights, audible signals, and loud hailers for the specific environment to communicate information.

21.2.4 Identify conditions that require the notification of local and federal authorities, given conditions that require their involvement, including vessels in distress, hazards to navigation, release of hazardous or toxic substances, and other conditions that affect the health and safety of those in and around navigable waters, so that the proper agency is notified and relevant information is communicated.

(A) Requisite Knowledge. Laws, regulations, and standards the identify conditions that require notification of outside agencies, the method of notification, and required other actions.

(B) Requisite Skills. Identification of specific conditions that require notification of outside agencies and perform methods for their notification.

21.2.5 Identify and interpret navigational aids given marine lights, structures and markings on land, other vessels, or on the water, so that nautical landmarks and other vessels are identified, intended course is selected, and collisions are avoided.

(A) Requisite Knowledge. Appearance and color of visual aids and navigation markers and their meaning.

(B) Requisite Skills. Interpret markers, lights, and signals to determine a course that will avoid other vessels.

21.2.6 Perform self-rescue and survival swimming skills so that flotation is maintained, body heat is conserved, and egress is accomplished.

(A) Requisite Knowledge. Effects of hypothermia and cold water immersion and survival skills.

(B) Requisite Skills. Performing techniques to float and move through the water to reach a point of egress or await rescue while conserving body heat.

21.2.7 Use PPE according to the manufacturer's directions, be proficient in emergency escape procedures, be proficient in communications, don and doff equipment in an expedient manner, use preoperation checklists, select personal flotation devices, don and doff personal flotation devices, select water rescue helmets, don and doff water rescue helmets, select personal protective clothing and equipment, don and doff in-water insulating garments, be proficient in emergency escape procedures, and be proficient in communicating distress signals.

(A) Requisite Knowledge. The capabilities and limitations of PPE and personal flotation devices.

(B) Requisite Skills. Donning and doffing PPE and personal flotation devices.

21.2.8 Navigate a watercraft as a helmsman given a watercraft, navigation tools, and a plotted course, so that the course is followed, obstacles and other vessels are avoided, wind and currents accounted for, awareness of position is maintained, and the destination is reached.

(A) Requisite Knowledge. Operation of the controls relevant to the watercraft and how they affect speed and direction of the vessel; how the associated navigational tools, such as compass and GPS devices, function and are interpreted; marking on charts or plotters and their meanings; and the effects of local water, wind, and weather conditions on the direction and speed of the watercraft.

(B) Requisite Skills. Operate the controls of the watercraft and use the navigational tools and indicators on the watercraft, and select a heading and speed for the vessel for the existing conditions so that it follows its intended course.

21.2.9 Perform docking or watercraft recovery operations given a watercraft and an operator so that communication is maintained with the operator, current and wind are accounted for mooring lines and fenders are rigged, the dock or slip and watercraft are protected from impacts, and the vessel is positioned properly at the slip and secured from unintended movement.

(A) Requisite Knowledge. Methods for securing a watercraft and rigging fenders to prevent damage and minimize undesired movement of the watercraft; means of maneuvering a watercraft using lines or other external systems to position the watercraft as desired; how wind, weather, and water conditions affect watercraft movement as it approaches the slip and after being secured; and considerations for specialized tools or conveyances used to recover watercraft such as trailers, jet docks, and davits.

(B) Requisite Skills. Rigging lines and tying knots, bends, and hitches related to mooring; securing and maneuvering vessels into or at a moorage location or conveyance; predicting direction and speed of approach to a moorage conveyance based on the boat operator actions; and the effects of wind, weather, and wave actions.

21.2.10 Launch or deploy a watercraft from a pier, dock, slip, trailer or other conveyance, given a watercraft and an operator so that communication is maintained with the operator, current and wind are accounted for, mooring lines are managed, and equipment is secured against unintended movement.

(A) Requisite Knowledge. Methods for launching or deploying a watercraft and rigging, and securing equipment to prevent damage and minimize undesired movement of the watercraft; means of maneuvering a watercraft using lines or other external systems to position the watercraft as desired; how wind, weather, and water conditions affect watercraft movement as it leaves the slip and after being deployed; and considerations for specialized tools or conveyances used to deploy watercraft such as trailers, jet docks, and davits.

(B) Requisite Skills. Rigging lines and tying knots, bends, and hitches related to mooring and maneuvering vessels into or at a moorage location or conveyance; predicting direction and speed of vessel departing from a moorage or conveyance based on the boat operator actions; and the effects of wind, weather, and wave action.

21.2.11 Perform anchoring operations given a watercraft, an operator, and anchoring equipment, so that the anchor is deployed to prevent vessel movement; and anchor swing, weather, and current and tide change is are accounted for.

(A) Requisite Knowledge. Techniques for setting anchor, requirements for anchor size, line length for the vessel and weather conditions, and the effects of vessel movement while at anchor.

(B) Requisite Skills. Set an anchor to minimize the potential for drag, and pay out anchor line to ensure proper scope is achieved for weather and tide changes.

21.2.12 Perform procedures for a crew overboard (COB) event so that the incident is communicated to the operator, visual location of the subject is maintained, the location is marked, and recovery of the subject is accomplished.

(A) Requisite Knowledge. Vessel procedures for man overboard, methods of communication of COB event to operator, crew tactics for marking location to assist with returning to location of event, and effects of immersion and hypothermia.

(B) Requisite Skills. Deploy a surface marker or utilize other methods for marking the location of the COB event, deploy flotation aid to the member, perform operations specific to maneuvering the vessel and preparing to recover the subject, and perform recovery operations.

21.2.13 Perform procedures for launching and recovery of "go" rescuers given a watercraft available to the agency, "go" rescuers and a watercraft operator so that the watercraft is not broached, control of the watercraft is maintained so that the rescuers are deployed and recovered at the designated location and are protected from injury.

(A) Requisite Knowledge. Watercraft specific procedures for deploying and recovering rescuers, including methods for avoiding contact with propulsion elements of the watercraft and uncontrolled falls or potential for entanglement on entry or exit.

(B) Requisite Skills. Rig or configure elements of the watercraft required for launching or recovery of rescuers, manage the operation of propulsion systems and other mechanical elements of the watercraft, and coordinate vessel movement and location so the rescuers are deployed and recovered at the desired location.

21.2.14 Perform a watercraft-based rescue of an incapacitated water bound victim given a watercraft that is available to the team, a water rescue tool kit, a means of securement, and water rescue PPE, so that the watercraft is not broached; control of the watercraft is maintained; risks to the victim and rescuers are minimized; and the victim is removed from the hazard.

(A) Requisite Knowledge. Watercraft-specific procedures for recovering victims, including methods for avoiding contact with propulsion elements of the watercraft and uncontrolled falls or potential for entanglement on recovery.

(B) Requisite Skills. Rig or configure elements of the watercraft required for recovery of a victim, manage the operation of propulsion systems and other mechanical elements of the watercraft, and coordinate vessel movement and location so the victim is recovered at the desired location.

21.2.15 Perform procedures to take another watercraft under tow so that the relative sizes of both watercraft are considered; neither vessel is broached; wind, weather, and water conditions are accounted for; lines are connected between the vessels; maneuverability and control are maintained; and the watercraft is protected from damage.

(A) Requisite Knowledge. Watercraft-specific procedures for taking a vehicle under tow, including rigging methods, anchor locations, methods for chafe and impact protection; watercraft handling dynamics while towing; propulsion capacities and impact of wind, weather, and water conditions on combined mass and surface area of both vessels; limitations on size and weight of vessel being towed.

(B) Requisite Skills. Rig lines; impact and chafe protection; control movement and direction of watercraft under tow; monitor position and condition of vessel under tow; and communicate with watercraft operator to maneuver the watercraft.

21.2.16 Perform emergency procedures for a watercraft, given a watercraft available to the agency and emergency equipment so that help is summoned, emergency actions are taken, and risks to the occupants of the vessel are minimized.

(A) Requisite Knowledge. Location of emergency equipment such as signaling devices, fire extinguishers, distress beacons, life rafts, PFDs, exposure suits, and other related equipment and how to operate and deploy them.

(B) Requisite Skills. Deploy and activate life safety and emergency equipment.

21.2.17 Conduct dewatering operations, given a watercraft available to the jurisdiction and dewatering equipment so that undesired water is reduced or eliminated in the watercraft, vessel stability is maintained, and damage to the watercraft is prevented.

(A) Requisite Knowledge. Watercraft specific dewatering plan, operation of onboard dewatering equipment, and effects of excessive water on stability and seaworthiness of the watercraft.

(B) Requisite Skills. Operate onboard dewatering equipment to remove water from the vessel.

21.2.18* Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed; scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, and postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, and postincident analysis activities.

21.3* Technician Level. The job performance requirements defined in Section 21.2 and 21.3.1 through 21.3.12 shall be met prior to technician level qualification in watercraft rescue.

21.3.1 Prepare a watercraft to get underway, given a watercraft available to the agency so that preoperational checks are performed, systems are energized, propulsions systems started, functional checks are conducted, and the watercraft is ready to be deployed.

(A) Requisite Knowledge. Watercraft system operational procedures and readiness checks.

(B) Requisite Skills. Check proper fluid levels, charges, connections, and lubrication of systems and connections.

21.3.2 Operate a watercraft to perform tasks typical of the mission defined by the AHJ in conditions representative of the waters and weather common to the jurisdiction, given a watercraft available to the agency so that the objectives are achieved, the occupants and crew are protected from harm, and damage to the watercraft is prevented.

(A) Requisite Knowledge. Vessel-specific policies and procedures for operating the watercraft; capabilities and limitations of the watercraft; common wind, weather, and water conditions for the jurisdiction.

(B) Requisite Skills. Operate the controls of the watercraft and maneuver to achieve the objective while preventing damage to the watercraft or other vessels.

21.3.3 Plot a course given navigational tools and charts so that heading, speed, and course are determined and wind, weather, current, and water conditions are taken into account.

(A) Requisite Knowledge. How to operate conventional and electronic navigation tools used by the agency.

(B) Requisite Skills. Determine location, heading, and speed to achieve the desired course.

21.3.4 Operate the watercraft while performing docking or watercraft recovery operations, given a watercraft and watercraft crewmember(s) so that communication is maintained with the crew, current and wind are accounted for, and the vessel is positioned properly at the slip and secured from unintended movement.

(A) Requisite Knowledge. Methods for maneuvering or approaching moorage; how wind, weather, and water conditions affect watercraft movement as it approaches the slip and after being secured; and considerations for specialized tools or conveyances used to recover watercraft such as trailers, jet docks, and davits.

(B) Requisite Skills. Control and maneuver vessel into or at a moorage location or conveyance, predicting direction and speed of approach to a moorage conveyance based on the boat operator actions and the effect of wind, weather, and wave actions.

21.3.5 Operate a watercraft as it is launched or deployed from a pier, dock, slip, trailer, or other conveyance, given a watercraft and watercraft crewmember(s) so that communication is maintained with the crew, current and wind are accounted for, and damage to the watercraft is prevented.

(A) Requisite Knowledge. Methods for maneuvering and operating the watercraft while launching or deploying a watercraft so it is positioned as desired, how wind, weather, and water conditions affect watercraft movement as it leaves the slip and after being deployed; and considerations for specialized tools or conveyances used to deploy watercraft such as trailers, jet docks, and davits.

(B) Requisite Skills. Maneuvering while departing the moorage location, predicting direction and speed of departure from a moorage or conveyance based on conditions, the characteristics of the watercraft, and the effect of wind weather and wave action.

21.3.6 Operate a watercraft to conduct anchoring operations, given a watercraft, watercraft crewmember(s), and anchoring equipment so that the anchor is deployed to prevent vessel

movement; and anchor swing, weather, current, and tide change are accounted for.

(A) Requisite Knowledge. Techniques for setting anchor, requirements for anchor size and line length for the vessel, weather conditions, and the impact of vessel movement while at anchor.

(B) Requisite Skills. Set an anchor to minimize the potential for drag, and pay out anchor line to ensure proper scope is achieved for weather and tide changes.

21.3.7 Operate a watercraft in response to a COB event, given a watercraft available to the agency and watercraft crewmember(s) so that the incident is communicated to the operator, visual location of the subject is maintained, the location is marked, and recovery of the subject is accomplished.

(A) Requisite Knowledge. Vessel procedures for man overboard, methods of communication of COB event to the crew and tactics for noting COB locations to assist with returning to location of event, methods of quickly maneuvering the watercraft back to the COB location.

(B) Requisite Skills. Note location of the COB event using traditional or electronic methods, maneuvering the vessel to return to the COB location, and approaching the target area to recover the subject.

21.3.8 Operate a watercraft to deploy and recover "go" rescuers, given a watercraft available to the agency, "go" rescuers and watercraft crewmember(s) so that the watercraft is not broached; control of the watercraft is maintained so that the rescuers are deployed and recovered at the designated location and are protected from injury.

(A) Requisite Knowledge. Watercraft-specific procedures for deploying and recovering rescuers, including methods for avoiding contact with propulsion elements of the watercraft and uncontrolled falls or potential for entanglement on entry or exit.

(B) Requisite Skills. Maneuver and control a watercraft, manage the operation of propulsion systems and other mechanical elements of the watercraft, coordinate vessel movement and location so the rescuers are deployed and recovered at the desired location.

21.3.9 Operate a watercraft to perform a rescue of an incapacitated waterbound victim, given a watercraft that is available to the team, a water rescue tool kit, watercraft crew member(s), a means of securement, and water rescue PPE, so that the watercraft is not broached; control of the watercraft is maintained; risks to the victim and rescuers are minimized; and the victim is removed from the hazard.

(A) Requisite Knowledge. Watercraft-specific procedures for recovering victims, including methods for approach, avoiding contact with propulsion elements of the watercraft, and communication methods with crew.

(B) Requisite Skills. Maneuver watercraft while approaching waterbound victim, manage the operation of propulsion systems and other mechanical elements of the watercraft, coordinate vessel movement and location so the victim is recovered at the desired location.

21.3.10 Operate a watercraft with another watercraft under tow, given a watercraft available to the agency and water rescue crewmember(s) so that the relative sizes of both watercraft are considered,; neither vessel is broached; wind, weather, and water conditions are accounted for; lines are connected between the vessels; maneuverability and control are maintained; and the watercraft is protected from damage.

(A) Requisite Knowledge. Watercraft-specific procedures for taking a vehicle under tow; watercraft handling dynamics while towing; propulsion capacities and impact of wind, weather, and water conditions on combined mass and surface area of both vessels; limitations on size and weight of vessel being towed.

(B) Requisite Skills. Control movement and direction of the watercraft and the watercraft under tow, monitor position and condition of vessel under tow, and communicate with crewmembers to maneuver the watercraft.

21.3.11 Operate ancillary navigation and electronic systems given a watercraft available to the agency so that the objective is achieved and the desired information is obtained.

(A) Requisite Knowledge. Watercraft- and agency-specific procedures for the use of radar, plotters, and visual aids.

(B) Requisite Skills. Operate equipment specific to the watercraft and the agency such as radar, plotters, and forward looking infrared radar (FLIR).

21.3.12 Shut down and secure a watercraft, given a watercraft available to the agency so that post-shutdown checks are conducted, and the craft is protected from damage and tampering.

(A) Requisite Knowledge. Agency-specific procedures for watercraft operations; shutdown procedures for propulsion and ancillary systems; methods of securing craft from unwanted movement, theft, and vandalism; connecting and ensuring shore systems are operational.

(B) Requisite Skills. Tie knots, bends, and hitches required to moor or secure craft for long-term storage; use conveyances such as trailers, davits, or jet docks that the agency might use for storing or securing the craft; activate or operate systems that control or maintain the environment inside the craft, such as climate control and bilge monitoring systems; and connect and verify operation of shore support systems such as ac power.

Chapter 22 Floodwater Rescue

22.1 Awareness Level. The job performance requirements defined in 22.1.1 through 22.1.4 shall be met prior to awareness-level qualification in floodwater rescue.

22.1.1 Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.

(A) Requisite Knowledge. Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.

(B) Requisite Skills. The ability to apply operational protocols, select specific planning forms based on the types of incidents, identify and evaluate various types of hazards within the

response area, request support and resources, and determine the required safety measures.

22.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.

(A) Requisite Knowledge. Use and selection of PPE, zone or area control flow and concepts, types of control devices and tools, types of existing and potential hazards, methods of hazard mitigation, organizational standard operating procedure, and staffing requirements.

(B) Requisite Skills. The ability to select and use PPE, apply crowd control concepts, position zone control devices, identify and mitigate existing or potential hazards, and personal safety techniques.

22.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.

(A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements including lighting, and monitoring hazards zones.

(B) Requisite Skills. Application of operational protocols, function within an IMS, follow and implement an incident action plan, report task progress status to supervisor or Incident Command.

22.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability, response times, and types of rescues are determined, the number of victims is identified, the last reported locations of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.

(A) Requisite Knowledge. Types of reference materials and their uses, risk/benefit assessment, availability and capability of the resources, elements of an action plan and related information, relationship of size-up to the incident management system, and information gathering techniques and how that information is used in the size-up process.

(B) Requisite Skills. The ability to read specific rescue reference materials, interview people, gather information, relay information, manage witnesses, and use information sources.

22.2* Operations Level. The job performance requirements defined in Sections 16.1, 16.2, 17.1, 17.2, 22.1, and in 22.2.1 through 22.2.5 shall be met prior to operations-level qualification in floodwater rescue.

22.2.1 Support technician-level floodwater rescue operations, given a designated mission, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, and emergency procedures are demonstrated.

(A) Requisite Knowledge. Support procedures, including search patterns, equipment setup, operating support equipment, and communications systems.

(B) Requisite Skills. Basic support skills, including the ability to serve as a safety or spotter and tend a "go" rescuer.

22.2.2* Assess floodwater conditions, characteristics, and features in terms of hazards to the rescuer and victims, given an incident scenario and a floodwater tool kit, so that flow and conditions are estimated, depth and surrounding terrain are evaluated, and findings are documented.

(A) Requisite Knowledge. Flow calculation methods, characteristics of floodwater events, map reading, interpreting local terrain data, local water hazards and conditions, entrapment mechanisms, weather forecasts, human physiology and survival factors.

(B) Requisite Skills. Assessment of water flow and environmental factors, the ability to acquire and interpret weather forecasts and local terrain data, and evaluate their impact on victims and rescuers.

22.2.3 Perform a nonentry rescue in the floodwater environment, given an incident scenario, PPE, and a floodwater rescue tool kit, so that rescue is accomplished, and adopted policies and safety procedures are followed.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, hydrology and characteristics of water, behaviors of waterbound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on water environment and conditions, hazards and limitations of shore-based rescue, local policies/procedures for rescue team activation, and information on local water environments.

(B) Requisite Skills. Select PPE specific to the water environment, don PPE, identify water hazards (i.e., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

22.2.4 Develop and implement an action plan for the use of watercraft to support floodwater search and rescue operations, given a watercraft, trained operator(s), policies, and procedures used by the AHJ, so that floodwater specific hazards are addressed, watercraft predeployment checks are completed, watercraft launch or recovery is achieved, rescuers are deployed and recovered, both onboard and rescue operations conform with watercraft operational protocols and capabilities, communications are clear and concise, and the candidate is familiar with watercraft nomenclature, operational protocols, design limitations, and launch/recovery site issues.

(A) Requisite Knowledge. Entry/exit procedures, communications techniques, boat operation techniques, design limitations, climactic conditions, characteristics of floodwater events, and specific hazards presented by floodwater events in the potential rescue environment.

(B) Requisite Skills. Implement entry and exit procedures and communications with watercraft crew, use emergency/safety equipment, identify hazards, and operate within the rescue environment.

22.2.5 Implement an action plan for the use of air assets to support floodwater search and rescue operations, given an action plan, access to air assets, policies, and procedures used by the AHJ, so that floodwater specific hazards are addressed, rescuers are deployed and recovered as required, both onboard and rescue operations conform with aircraft operational protocols and capabilities, communications are clear and concise, and the candidate is familiar with aircraft nomenclature, operational protocols, and design limitations.

(A) Requisite Knowledge. Means of contacting and accessing agencies with air assets, the role of aircraft in the support of floodwater events, the limitations of the available aircraft in the conditions associated with the rescue environment, the role of the rescuer as part of an aviation team.

(B) Requisite Skills. Implement a notification plan to request air assets, develop a list of tactical objectives to be achieved the aircraft, communicate mission priorities with the aircrew or operator of the aircraft.

22.2.6* Implement measures identified by the AHJ to limit exposure of victims and rescuers from potentially contaminated floodwater given a floodwater event, a flood rescue tool kit, protocols and practices identified by the AHJ, and access to the required engineering controls and decontamination tools so that the sources of potential contamination are identified, and its effects and those of cross contamination are minimized.

(A) Requisite Knowledge. Sources of contamination, indicators of the presence of contaminants, methods to limit exposure to contaminated water, and decontamination methods targeted at the potential specific contaminants.

(B) Requisite Skills. Use of related engineering controls and PPE and practices that limit an individual's likelihood of exposure to contaminants and implementing methods for the removal of potential contaminants or rendering them inert.

22.2.7* Identify locations at a floodwater search and rescue incident that have a high probability of containing victims, given an incident consistent with the predicted rescue environment and a flood water search and rescue tool kit so that all accessible areas of the incident are surveyed and the victim locations are marked.

(A) Requisite Knowledge. Locations that are specifically associated with areas of entrapment or refuge during floodwater events, including the interior of vehicles and attic spaces of structures.

(B) Requisite Skills. Assessing and surveying a floodwater environment for potential locations where victims might be trapped or have taken shelter.

22.2.8* Identify and manage the hazards unique to the terrain and environment when covered with floodwater or subject to differential pressures.

(A) Requisite Knowledge. Specific hazards that could be present in the floodwater environment that are hidden or covered by water.

(B) Requisite Skills. Ability to survey the rescue environment for indicators of potential hazards.

22.2.9* Navigate terrain covered in floodwater given a floodwater incident, a floodwater rescue tool kit, and practices identified by the AHJ so that the positions of the rescuers are known, hazards are avoided, search progress is documented, and geographic baselines are established.

(A) Requisite Knowledge. The use and implementation of GPSs and alternate mapping techniques.

(B) Requisite Skills. The ability to establish a baseline location using a GPS or other improvised method from which to conduct a search or coordinate the movement of resources and use of methods to determine the location of submerged hazards and geographical features.

22.2.10 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, and scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and postincident analysis and critique are considered, and command is terminated.

(A) Requisite Knowledge. PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, and postincident analysis techniques.

(B) Requisite Skills. Selection and use of task and hazard-specific PPE, decontamination, use of barrier protection techniques, data collection and recordkeeping/reporting protocols, postincide analysis activities.

22.2.11 Perform a floodwater rescue from a rescue platform such as a vessel, boat, watercraft or other waterborne transportation aid, given a trained operator(s), a course representative of the anticipated rescue environment, water rescue PPE, floodwater rescue tool kit, so that the specific objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, and any related distress signals are communicated.

(A) Requisite Knowledge. The operator and/or crew of any waterborne transportation aid must be knowledgeable in the application and safe operation of the waterborne transportation device and its limitations and follow all manufacturers' recommendations. The operator and crew of the waterborne transportation aid must comply with all regulatory and applicable laws of safe water transportation according to the AHJ.

(B) Requisite Skills. The ability of the operator and crew to enter and exit the waterborne transportation device in a floodwater condition, to correct a capsized waterborne transportation aid, and to assist with safe waterborne transportation operations as members of a floodwater rescue team on a vessel.

22.3 Technician Level. The job performance requirements defined in Sections 16.3, 22.2, and 22.3.1 shall be met prior to technician-level qualification in floodwater rescue.

22.3.1* Perform an entry rescue in the floodwater environment, given an incident scenario, PPE, and floodwater rescue

tool kit, so that rescue is accomplished, and adopted policies and safety procedures are followed.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers and victims, hydrology and characteristics of water, behaviors of waterbound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on water environment and conditions, hazards and limitations of shore-based rescue, local policies/procedures for rescue team activation, information on local water environments, and methods of breaching or defeating structural components of vehicle or structures.

(B) Requisite Skills. Select PPE specific to the water environment, don PPE, identify water hazards (i.e., upstream or downstream, current or tides), identify hazards directly related to the specific rescue, and demonstrate appropriate victim removal techniques.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1 The committee recognizes that emergency services organizations might have to invest considerable resources to provide the equipment and training needed to respond to incidents involving hazardous materials or weapons of mass destruction safely and efficiently. The committee does not mean to imply that organizations with limited resources cannot provide response services, only that the individuals charged with responsibilities are qualified to specific levels according to this standard.

The committee believes that this document specifies the minimum standards for technical rescue personnel. The committee recognizes that emergency services organizations might have to invest considerable resources to provide the equipment and training needed to perform technical rescues in a safe and efficient manner. The committee does not mean to imply that organizations with limited resources cannot provide technical rescue services, only that the individuals charged with performing technical rescues be qualified at the awareness, operations, or technician level according to this standard.

A.1.2.3 Organization and management responsibilities should be addressed by the agency that personnel represent. The AHJ should define the agency requirements for progression to positions of management responsibility.

A.1.2.6 The committee recognizes the importance of formal and continuing education and training programs to ensure technical rescue personnel have maintained and updated the necessary skills and knowledge for the level of qualification. Continuing education and training programs can be developed or administered by local, state, provincial, or federal agencies as well as professional associations and accredited institutions of higher education. The methods of learning would include areas of technology, refresher training, skills practices, and knowledge application to standards. The subject matter should relate directly to the requirements of this standard.

Ongoing training and continuing education are necessary to ensure that technical rescue personnel remain current in the ever-changing field of technical rescue. Attending workshops and seminars, reading professional publications, and participating in refresher training are ways technical rescue personnel can update their knowledge and skills. Proficiency in current rescue practices can be demonstrated by achieving and maintaining certification through a national certifying body.

A.1.3 Table A.1.3 provides an overview of general duties.

A.1.3.1 All technical rescue activities should be carried out in the safest possible manner, including the consideration that all risks taken are to benefit the operation. Technical rescue skills require a high degree of physical activity, coordination, operational planning, and a strong knowledge of all applicable protocols. It is for this reason that entrance requirements are outlined in 1.3.8 and clarified in A.1.3.8.

A.1.3.3 It is recommended, where practical, that evaluators be individuals who were not directly involved as instructors for the requirement being evaluated.

The purpose of Table A.1.3.3 is to help AHJs assess chapter requirements, depending on specific rescue disciplines needed in their areas.

A.1.3.8 The following list elaborates on these requirements:

(1) *Educational Requirements.* Because technical rescue personnel can be required to read and comprehend standards and procedures, prepare written reports, and understand principles of mechanical advantage, structural engineering, and other related disciplines, it is recommended that the technical rescue personnel be at minimum a high school graduate.

(2) *Age Requirements.* The AHJ is empowered to set minimum and maximum age requirements. Due to the fact that technical rescue personnel require a level of maturity inherent to the rescue environment, it is recommended that the minimum age to begin training as technical rescue personnel be set at 18 years. However, some fire

Table A.1.3 General Duties Table

Site Operations	Patient Management	Maintenance	Rope/Rigging
Size-up	Access	Tools and equipment	Tie knots
Establish an incident management system	Triage victims	Vehicle(s)	Construct anchor systems
Mitigate hazards	Stabilize	Communications	Construct simple mechanical advantage
Search location	Package	Personal protective equipment	Operate simple mechanical advantage systems
	Extricate		Construct lowering systems
	Transfer		Operate lowering systems

Table A.1.3.3 Chapter Location of Specific Rescue Disciplines or Rescue Technical Matrix

Discipline	Chapter(s)
High/low angle	5
Surface water	16
Vehicle	8
Confined space	7
Building collapse	6
Trench	11
Mines and tunnels	14
Dive	18
Wilderness	10
Caves	13
Tower	4
Urban	5, 6, 7
Industrial	5, 6, 12
Farm	5, 7, 12
Fireground (rapid intervention)	5, 6
Elevator and escalator	5, 6, 12
Silo	5, 7, 12
Elevated train/subway	5, 7, 12, 14
Wells/cisterns	5, 7
Utility vault/switching station	5, 7
Scaffolding collapse	5, 6
Tram/gondola/ski lift	5, 12
Elevated crane	5, 12
Shipboard	5, 7, 12
Bridges	5, 16
Winery tanks	7
Aircraft	15
Train/light rail	15
Swiftwater	16, 18
Surf	15, 20
Ice	16, 19

and rescue organizations have set requirements to allow participation by individuals under the age of 18.

(3) *Medical Requirements.* The AHJ should establish medical requirements for initiation of training and continued participation as technical rescue personnel. It is recommended that the AHJ adopt NFPA 1582 in whole or in part, as part of their own standard development process.

(4) *Minimum Physical Fitness.* Technical rescue operations involve activities that pose great physical and mental challenges. Technical rescue is an activity requiring the rescuer to perform challenging physical activities in a high-stress environment.

(5) *Emergency Medical Care Training.* Prior to beginning training as technical rescue personnel, a minimum medical training requirement should be met.

(6) *Training.* People having the potential for encountering hazardous materials on an incident scene should be trained to recognize the hazard and to implement exposure and control methods.

A.1.6 To be qualified as a rescue personnel at any level of any specialty, a person must first meet a series of core requirements that the committee considers universal to technical rescue activities.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.4.1 Multiple-Point Anchor System. The subcategories of these systems can be further defined as follows:

(1) Load-distributing anchor systems (also referred to as self-equalizing or self-adjusting) are anchor systems established from two or more anchor points that perform the following functions:

  (a) Maintain near-equal loading on the anchor points despite direction changes on the main line rope.

  (b) Re-establish equal loading on remaining anchor points if any one of them fails. (The system should be configured so as to limit the resulting drop that occurs as the result of an anchor point failure.)

(2) Load-sharing anchor systems are established from two or more anchor points that distribute the load among the anchor points somewhat proportionately but will not adjust the direction changes on the main line rope. The system should be configured so as to limit the resulting drop that occurs as the result of an anchor point failure.

A.3.3.4.2 Single-Point Anchor System. A single point anchor system includes those anchor systems that utilize one or more additional nonloaded anchor points as backup to the primary anchor point.

A.3.3.8 Basic First Aid Kit. See Table A.3.3.8.

A.3.3.9 Belay. This method can be accomplished by a second line in a raise or lowering system or by managing a single line with a friction device in fixed-rope ascent or descent. Belays also protect personnel exposed to the risk of falling who are not otherwise attached to the rope rescue system.

A.3.3.10 Belay System. This includes rope-based and other systems used to provide redundancy to single tensioned rope systems.

A.3.3.16 Bombproof. This term generally refers to an anchor point so structurally significant that failure of this component is likely to cause structural collapse. Examples of bombproof anchor points include large structural steel I-beams and large structural reinforced concrete columns.

A.3.3.27 Community Resource List. A form of agreement or contract negotiated prior to the potential incident with participating concerns will enhance reliability of the resources.

A.3.3.29 Confined Space. A confined space also has one or more of the following characteristics:

(1) Contains or has the potential to contain a hazardous atmosphere
(2) Contains a material that has the potential to contain a hazardous atmosphere
(3) Contains a material that has the potential for engulfing an entrant
(4) 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
(5) Contains any other recognized serious safety or health hazard (including fall, environmental, and equipment hazards)

For purposes of this standard, this definition excludes mines and caves or other natural formations that have to be addressed by other specialized training and equipment.

A.3.3.34 Confined Space Rescue Pre-Plan. See Figure A.3.3.34.

Table A.3.3.8 Basic First Aid Kit

General Category	Specific Information
Assorted bandages	Cravats, ace, self-adhering of various sizes
Assorted dressings	Occlusive, sterile pads, and rolls of various sizes
Assorted splints	Air, vacuum, wire, rigid, soft, traction
Bag valve mask resuscitators	
BP cuff and stethoscope	Adult and pediatric
Cervical collars	Full set adult and pediatric
Oxygen with flow regulator and air adjuncts	D size with 1 mm to 25 mm flow
Portable suction	
Additional items determined by the AHJ	

A.3.3.37 Confined Space Type. Classifying spaces by types can be used to prepare a rescue training plan to include representative spaces for simulated rescue practice. These types focus mainly on the criteria of opening size, configuration, and accessibility. Another important factor to consider is the internal configuration (e.g., congested or noncongested).

A.3.3.38 Construction Type. The construction categories, types, and occupancy usage of various structures might necessitate the utilization of a variety of different techniques and materials. The four construction categories that the rescuer most likely will encounter in collapse situations are light frame, heavy wall, heavy floor, and precast concrete construction. These four categories usually comprise the majority of structures affected by a collapse.

A.3.3.43 Crush Syndrome. This muscle death can lead to myoglobinuria, renal failure, muscle loss, and contractions.

A.3.3.44 Cut Sheet. The cut sheet is utilized by an excavating crew to assist them in completing a job. Usually the competent person or job supervisor will have this document in his or her possession.

A.3.3.50 Dive Supervisor. For more information on the nondiving job performance requirements of technician-level dive rescue, see 18.3.1, 18.3.5, and 18.3.7.

A.3.3.52 Dive Tender. See Section 18.2 through 18.2.8.

A.3.3.53.1 90 Percent Diver. The intent is for this diver to be fully dressed, with the possible exception of fins and facemask, all safety checks performed, and all necessary equipment is on hand to perform the intended mission. The 90 percent diver can be in the water, on the shore, or in a vessel at the entry point.

A.3.3.53.2 Safety Diver. The intent is that this diver is positioned in such a manner that he or she can be deployed to the location of the submerged diver(s) as quickly as possible. This often requires the safety diver to be in the water with all equipment, including facemask, donned and safety checked, neutral buoyancy established, and immediately ready to submerge at the signal to deploy. The diver should be briefed in advance of potential dive-related hazards and the action required in response. In some cases, the diver might need to be aboard a vessel or on the shore.

A.3.3.66 Extinguishing Devices. Many extinguishing mediums can be ineffective if used inappropriately to combat fires involving incompatible materials. The extinguishing medium should be appropriately matched to the class of fire. For instance, use of the wrong type of foam can be completely ineffective based on the type of material being extinguished. The foam should be matched to the specific incident (e.g., polar solvents, nonpolar solvents, pressurized fire, nonpressurized fire).

A.3.3.67 Face(s). Also called *wall*, *side*, or *belly*.

A.3.3.72 General Area. Within the general area, access by people, heavy machinery, and vehicles is limited and strictly controlled.

CONFINED SPACE Pre-Entry Evaluation

1

Location of confined space	Additional descriptor *(Ex; location #, risk assessment #, etc.)*
Description of confined space *(Tank #, manhole, etc.)*	

2

Date issued	Time of entry/issued	Time permit expires *(Max duration = hr)*
Description of work to be done		

3

Initial confined space safe work evaluation. If "Yes" is indicated for any of the questions, entry is not permitted until hazards are identified and mitigated by use of the permit and authorized Entry Supervisor.

If "No" is indicated for every question, work may proceed.

Evaluation signature _____

If any conditions change, work shall stop and the supervisor shall be contacted.

HAZARD IDENTIFICATION	Hazards present or potentially present (indicate "Yes" or "No" in every box)			
	Inherent hazards	Introduced hazards	Adjacent hazards	
Mechanical/electrical (springs, elevated parts, electric >50 volts)				
Physical engulfment by material				
Pneumatic/hydraulic/fluids/gases (lifts, agitators, etc.)				
Chemical/biological/atmospheric				

Atmospheric monitoring should be conducted unless assessment of the space determines no potential hazardous atmosphere hazard.

****Insert parameters and document here***

CONFINED SPACE ENTRY PERMIT

4

ENERGY SOURCES (*examples*)	Hazards present or potentially present (check all that apply)			HAZARD CONTROLLED BY If additional permits are used, indicate here in addition to other controls.
	Inherent hazards	Introduced hazards	Adjacent hazards	
Mechanical (springs, elevated parts, etc.)				
Electrical (motors, agitators, etc.)				
Pneumatic/hydraulic (lifts, agitators, etc.)				
Fluid/gases (CIP lines, nitrogen, steam, etc.)				
OTHER HAZARDS				
Unauthorized entry of personnel				
Noise >85 dB				
Excessive heat or cold				
Falling objects				
Other permits: hot work, line break, LOTO, live electrical work				

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FIGURE A.3.3.34 Sample Pre-Evaluation and Permit Form. [350:Figure B.1]

	ATMOSPHERIC HAZARDS: *(record pre-entry and document continuously at least every two hours until exit)* Bump Test required and completed Yes ❑ Gas tester: type model _____ Serial # _____				Pre-entry required AM/PM:	Time AM/ PM:	Time AM/ PM:	Time AM/ PM:	Time AM/ PM:
	Continuous monitoring required Yes ❑ No ❑								
	Percent of oxygen 19.5% to 22%								
	Lower explosive limit <10% of LEL								
	Carbon monoxide <25 ppm								
	Hydrogen sulfide <5 ppm								
	Other								
	TESTER INITIALS:								
	PERSONAL PROTECTIVE EQUIPMENT REQUIRED: *(for all, either check the box or circle "N/A")* N/A ❑ Respirator — N/A ❑ Safety glasses w/side shields — N/A ❑ Hard hat Type: _____ N/A ❑ Goggles — N/A ❑ Face shield Model: _____ N/A ❑ Ear plugs/muffs — N/A ❑ Boots Cartridge/filter: _____ N/A ❑ Gloves (Type: _____) — N/A ❑ Disposal coveralls ❑ Other (specify: _____)								
5	**COMMUNICATIONS:** Entrant ❑ Verbal (allowed only for line of sight) ❑ Radio Emergency rescue will be requested by:								
6	**RESCUE:** *(for all, either check the box or circle "N/A")* N/A ❑ Full-body harness w/ "D" ring — N/A ❑ Tripod/retrieval system — N/A ❑ Fall-arresting equipment N/A ❑ Lifelines and safety or wrist harness — N/A ❑ Emergency escape retrieval equipment ❑ Emergency response team has been notified of entry, hazards, and duration (still use for alternate procedure, or reclassification) ❑ Incident action plan has been completed and is available								
7	**ENTRANT(S):** I am aware of the hazards and their effects and will take the precautions required. _____ *Print name(s) and initial.*								
8	**ATTENDANT(S):** I am aware of the hazards and their effects. I will arrange for rescue from outside the space, if required. _____ *Print name(s) and initial.*								
9	**ENTRY SUPERVISOR:** I authorize entry into this confined space and verify that the hazards have been evaluated, control measures have been instituted, and the conditions are as indicated on this permit. _____ *Print name, department, and phone. Signature*								
10	**CANCEL PERMIT:** This permit shall be canceled at the completion of the entry, or if hazards change, by placing a large "X" across both sides of the permit.								
11	**RESCUE & EMERGENCY CONTACT** Tel. no.: ( ) —								

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FIGURE A.3.3.34 ***Continued***

A.3.3.77 Hazardous Atmospheres. Hazardous atmosphere can result from one or more of the following:

(1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL).
(2) Airborne combustible dust at a concentration that meets or exceeds its LFL, which can be estimated by observing the density of the concentration. In general, if the concentration of dust obscures vision at a distance of 5 ft (1.5 m) or less, it might be within its flammable range.
(3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.
(4) Atmospheric concentration of any hazardous substance that could result in exposure to personnel in excess of its dose or permissible exposure limit (PEL).
(5) Any other atmospheric condition that is immediately dangerous to life or health (IDLH).

A.3.3.80 Heavy Equipment. Examples include, but are not limited to, excavators, bulldozers, cranes, backhoes, and paving machines.

A.3.3.82 Heavy Vehicle. Incidents involving multiple common passenger vehicles or complex extrication, or that exceed the resources of the AHJ due to other factors, might also fall into this category.

A.3.3.88 Isolation. Some methods of isolation include blanking or blinding of pipes, misaligning or removing sections of pipe lines or ducts, a double block and bleed system, lockout or tagout of all sources of energy, or blocking or disconnecting all mechanical linkages.

A.3.3.89 Isolation System. Examples of isolation devices include concrete or steel pipe, corrugated pipe, concrete vaults, or other pre-engineered structures that sufficiently isolate and protect the victim.

A.3.3.91 Knot. A knot will maintain its integrity. Although more accurately classified as "ties," the term *knot* is commonly used to refer to knots, bends, and hitches.

A.3.3.106 Load Test. A load test is generally performed by multiple personnel to exert force on the system at the load attachment point in the manner of function before life loading.

A.3.3.109 Lowering System. Lowering systems should incorporate a mechanism to prevent the uncontrolled descent of the load during the lowering operation. This mechanism can reduce the need for excessive physical force to control the lowering operation. [**1670,** 2017]

A.3.3.113.2 Simple Rope Mechanical Advantage System. Figure A.3.3.113.2 illustrates such a system.

A.3.3.115 Minimum Primary Reserve Pressure. For the purposes of this document, minimum primary reserve pressure is one third of the entire rated capacity of breathing gas available to the diver. In no case should the established minimum reserve pressure for the primary source of breathing gas be less than 500 psi.

Dive operations involve work in an IDLH environment. To ensure safe dive operations, all divers must plan their dives to maintain an adequate reserve to manage unforeseen circumstances.

The one-third reserve should be calculated in advance for specific sizes of the cylinders used by the team by using the total volume of air, including any redundant air systems, adjusted for the rated working pressure of the cylinders associated with the breathing gas systems. From that calculation, determine the primary system pressure that would leave the diver with approximately one third the total volume in reserve.

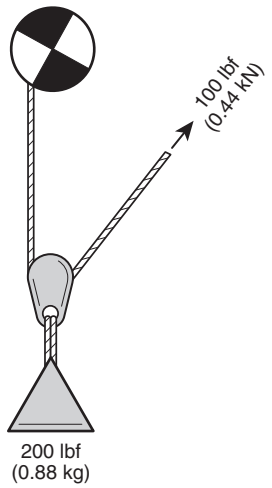

FIGURE A.3.3.113.2 A Simple Rope 2:1 Mechanical Advantage System.

It is not the intent to calculate the reserve pressure based on the actual pressure of the cylinder at the start of the dive but always with the rated working pressure of the cylinder.

A diver equipped with only a standard aluminum cylinder 80 gets 80 ft^3 (2.27 m^3) at 3000 psi. Because there is no redundant air supply (RAS), the entire reserve one-third volume of 26.6 ft^3 (0.74 m^3) must be carried in the primary system.

(26.6 ft^3 × 3000 psi) / 80 ft^3 = 1000 psi

A diver equipped with an 80 ft^3 (2.27 m^3) primary HP Steel and Pony cylinder with a working pressure of 3500 psi and 21 ft^3 (0.59 m^3) redundant air system cylinder has a total of 101 ft^3 (2.86 m^3).The diver needs to be on the surface with approximately 33.6 ft^3 (0.93 m^3) to meet the one third. Subtract the 21 ft^3 (0.59 m^3) provided in the RAS cylinder to leave 12.6 ft^3 (0.34 m^3) in the primary system for the required reserve.

(12.6 ft^3 × 3500 psi) / 80 ft^3 (2.27 m^3) = 472 psi

Even though the calculated minimum surface reserve pressure is 472 psi (214 kg), the minimum permissible breathing gas pressure is 500 psi. In this case the diver's minimum primary reserve pressure is 500 psi.

Ensuring that divers comply with the required minimum reserve pressure is often a challenge to agencies that perform public safety diving. Ensuring that divers get adequate training for using the established limits, including calculating additional air required to perform the ascent and relevant safety stops, is a key element to ensuring compliance. Training should be conducted at depths and under conditions that simulate an actual rescue environment while performing mission-specific work as often as possible so that divers can set proper expectations about air consumption and exertion levels. Instances where divers violate the minimum reserve pressure should be treated as a breach of policy, and the contributing factors

should be documented to prevent recurrence. The AHJ is responsible for holding divers and supervisors accountable for compliance with established limits.

A.3.3.123 Personal Flotation Device (PFD). PFDs are classified by performance criteria into five types with specific limitations on where and under what circumstances each type can be used.

A.3.3.124 Personal Protective Equipment (PPE). Personal protective equipment includes both personal protective clothing and respiratory protection specific to a particular rescue discipline. Adequate personal protective equipment should appropriately protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing.

A.3.3.125 Pneumatic Struts. Also refers to devices (which contain potentially hazardous stored energy) mounted on vehicles or machinery to stabilize or hold open doors or hatches.

A.3.3.127 Pre-Incident Plan. A site-specific pre-plan can also provide useful information for consideration during size-up, including, but not limited to, the following:

(1) Rescue team notification
(2) Acceptable entry conditions for rescue
(3) Hazard analysis
(4) Risk analysis of hazards
(5) Site map
(6) Hazard abatement (including control zones, ventilation, lockout/tagout procedures, etc.)
(7) Use of buddy system (when applicable)
(8) Communications (site, rescue attendant to rescue entrant, etc.)
(9) Command post
(10) Incident management organizational chart
(11) Standard operating guidelines
(12) Safe work practices
(13) Medical assistance
(14) Pre-entry safety briefings
(15) Pre- and post-entry physicals (if indicated)

Guidelines for initial response planning within the quantity and capability of available personnel and equipment should include, but are not limited to, the following:

(1) Response objectives for confined space emergencies
(2) Nonentry rescue options
(3) Entry-type rescue options
(4) Whether rescuer and equipment capabilities are appropriate for available rescue options
(5) Needs analysis and procedures for providing emergency decontamination to victims suspected of being contaminated with a hazardous material

Operational procedures for response implementation should include, but are not limited to, the following:

(1) Scene control, including control zones and communication
(2) Incident management system consistent with the organization's standard operating procedure
(3) Nonentry retrieval
(4) Qualifying entry-type rescues *(see Figure A.3.3.138)*
(5) Emergency decontamination as needed
(6) Technical-level rescue service assistance

A.3.3.128 Protective System. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection. [**1670,** 2017]

A.3.3.131 Rapid Intervention Crew/Company (RIC). Fire departments respond to many incidents that present a high risk to fire fighter safety. Departments in compliance with applicable federal, state, or provincial health and safety regulations of the country of interest must have a minimum of two persons on scene fully equipped when members are operating in an atmosphere immediately dangerous to life or health (IDLH) or a potentially IDLH atmosphere. The primary purpose is the rescue of injured, lost, or trapped fire fighters. Departments utilizing an incident management system in accordance with NFPA 1561 or applicable federal, state, or provincial health and safety regulations of the country of interest, along with a personnel accountability system, have incorporated the RIC into their management system. Many departments have redefined their response plans to include the dispatch of an additional company (e.g., engine, rescue, or truck) to respond to incidents and stand by as the RIC. Incident commanders can assign additional RICs based on the size and complexity of the incident scene. This rule is included as part of special operations incidents in NFPA 1500 *[see sample standard operating procedures (SOPs) in Section 8.8 of NFPA 1500]* for RICs. In some departments, an RIC can also be known as a Rapid Intervention Team.

A.3.3.134 Redundant Air System. This breathing gas system is typically configured with a "pony" cylinder connected to a first- and second-stage regulator, which is then attached to the buoyancy compensator or strapped to the primary cylinder. It is intended to provide a source of air that is independent from any failure in the primary delivery system; as such it is not typically intended to be connected to the primary system by a block or other device unless one of the following occurs:

(1) The device is constructed with a feature that prevents the contents of the reserve cylinder from free flowing out a breach in the primary delivery system, such as a full facemask (FFM).
(2) The device is in addition to a conventional second stage.

A.3.3.135 Registered Professional Engineer. However, a professional engineer registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in the construction of protective systems.

A.3.3.139 Rescue Attendant. A rescue attendant should not enter the space for rescue in most emergencies unless another rescue attendant is immediately available to take his or her place. Duties of rescue attendants include but are not limited to making initial contact with victims, relaying information about the victim's condition to the rescue team, monitoring rescue entrants, maintaining accountability of rescue entrants, monitoring conditions in and around the space, calling for the immediate evacuation of rescue entrants should conditions warrant, and assisting the rescue team in operation of systems for the removal of victims from the space.

A.3.3.140 Rescue Entrant. The rescue entrant meets the following training requirements:

(1) *Confined space.* NFPA 1006 confined space technical search and rescue personnel requirements as appropriate for entries into confined spaces for rescue

(2) *Hazard recognition.* Recognition of the signs and symptoms of exposure to a hazardous material or atmosphere within the space, understanding of consequences of exposure, and knowledge of the mode of transmission for the hazard (e.g., injection, ingestion, inhalation, or absorption)
(3) *Communications.* Method the rescue entrant will use with the rescue attendant on the outside of the space, and a backup method should the primary system fail
(4) *PPE.* Appropriate equipment for the confined space, and training and documentation of training in its use
(5) *Self-rescue.* How the rescue entrant will escape from the space should an emergency occur, including self-actuated methods, such as climbing a ladder or crawling through a portal, as well as those externally applied and operated, such as a mechanical advantage system attached to the rescue entrant and operated by the rescue team

A.3.3.143 Rescue Team. The number of persons required for an effective team is dependent upon variables such as the task(s) to be completed, the abilities of the individual team members, and the individuals' ability to work together efficiently. Although many recommendations exist as to an ideal minimum number of team members, this should be based on the circumstances surrounding the incident and the logistics involved. NFPA 1670 recognizes the need for minimum staffing levels for certain technical rescue incidents and contains guidelines to that effect.

A.3.3.144 Retrieval Equipment (Retrieval System). Retrieval includes the operation of common nonentry retrieval systems. Examples include simple winch and block devices used in conjunction with tripods, quadpods, or other manufactured portable anchor systems or existing structural systems. A nonentry retrieval can simply involve operating the crank on a winch/tripod system where anchors and protection systems are already in place. These systems are required wherever an authorized entrant enters a confined space unless the retrieval system would increase the overall risk of entry or would not contribute to the rescue of the entrant. For confined space rescue operations, these systems should be in place prior to entry (into vertical or horizontal spaces) in such a manner that retrieval of rescue entrants can begin immediately in the event of an emergency. Retrieval systems can also be used to act as fall-arresting devices for rescue personnel.

A.3.3.149.1 Large Animal. It should be noted that the skill sets within this document can be applied to exotic/wild large animals such as tigers, antelope, bears, rhinos, and so forth with appropriate chemical restraint administered by an appropriate person as defined by the AHJ. [**1670,** 2017]

A.3.3.149.3 Lockout. These methods effectively prevent operation of devices that physically prevent the transmission or release of energy, including, but not limited to, the following:

(1) Manually operated electrical circuit breakers
(2) Disconnect switches
(3) Manually operated switches by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently
(4) Line valves (blocks)
(5) Blanks/blinds
(6) Physical separation of pipes
(7) Any similar devices used to block or isolate the energy

Where physical application of lock-type devices is not possible, such as prevention of movement due to gravity, chocking and/or blocking of the mechanism and physical monitoring to prevent removal might be the only effective means of lockout. Push buttons, selector switches, and other control circuit–type devices are not energy-isolating devices.

Sources of dangerous energy include, but are not limited to, mechanical, hydraulic, pneumatic, electrical, and radiological.

It is vitally important for emergency responders to seek guidance and assistance from those with specialized knowledge (i.e., a competent person) in energy isolation methods to assure their safety.

A.3.3.155 Secondary Collapse. Indications of potential for secondary collapse include the following:

(1) Leaning walls
(2) Smoke or water seeping through joints
(3) Unusual sounds (e.g., creaking, groaning)
(4) Recurring aftershocks
(5) Sagging floor or roof assemblies
(6) Missing, strained, or damaged points of connection of structural elements
(7) Excessive loading of structural elements
(8) Sliding plaster and airborne dust
(9) Separating walls
(10) Lack of water runoff
(11) Racked or twisted structure
(12) Building vibration

A.3.3.160 Shield or Shield System. Shields can be permanent structures or can be designed to be portable. They can be either manufactured or job-built. Shields used in trenches are usually referred to as *trench boxes* or *trench shields.*

A.3.3.165 Signaling Device. Examples of signaling devices include, but are not restricted to, flares, strobe lights, mirrors, brightly colored (air) panels, flags, light-emitting devices, smoke pyrotechnics, air horns, and whistles.

A.3.3.167 Sloping System. The angle of incline required to prevent a cave-in varies with the differences in such factors as soil type, environmental conditions of exposure, and application of surcharge loads.

A.3.3.188 System Safety Check. Personnel should review all system components carefully to ensure correct assembly. Personnel should preload the system in a safe manner (e.g., standing away from edges while preloading). A signal is issued by the person performing the system safety check to confirm the completion of the first two steps. The signal should address other rescuers utilizing the system and should be acknowledged by one or more of them.

A.3.3.198 Tool Kit. See Annex J, Technical Rescuer Tool Kit. The tool kits given as examples are not intended to dictate the items necessary for the specific disciplines they address, nor do they prohibit any jurisdiction from exceeding or deviating from the list. These tool boxes are identified to provide guidance or equipment needed to evaluate candidates.

A.3.3.202.1 Intersecting Trench. Common configurations are "L," "X," and "T."

A.3.3.215 Watercraft. Examples include basic paddle boats, powered inflatable boats (I.R.B.), rigid hulled craft, hovercraft,

air boats, and one- and two-person water jet–driven (personal) watercraft.

A.3.3.216 Watercraft Conveyance. Examples include trailers, pickup trucks, forklifts, and davits.

A.4.2.11 The committee recognizes that due to incident complexity, technician-level skills might be required to terminate some incidents. Examples would be complex stabilization issues, multiple concurrent hazards, industrial processes involved, presence of fatalities or multiple injuries, or chemical releases.

A.4.3.2 It is the intent of the committee to emphasize the inherent hazards presented by electromagnetic, radio frequency, and more typical electrical and mechanical energy sources present in a tower environment. Rescuers must positively identify, monitor, and render safe these various forms of energy so that exposure is prevented. As tower operations could involve critical infrastructure, consideration must be given to communicating the intended emergency shutdown of tower systems to relevant entities; however, this factor should not delay the rendering safe of the operational environment.

A.4.3.3 It is the intent of the committee that the distances traveled to demonstrate competency for this JPR be reasonable and not present undue risk to either the candidate or evaluator(s) yet still present a sufficiently challenging obstacle to overcome.

A.5.1.5 It is the intent of this JPR is for the technical rescuers to be familiar with the types of aircraft or helicopter services available to assist in their area, including operational standard operating procedure, equipment carried on the aircraft, safety and onboard aircraft systems and hazards associated with type-specific aircraft, and the ability to communicate via an established radio system with aircrews to complete a task or assignment (e.g., air medical evacuation or search). It is also expected that technical rescuers be aware of and provide for fire suppression in the event of an aircraft mishap while on location. *(See Figure A.7.2.4.)*

A.5.2.2 Technical rescuers should limit their activities in this section to field-level maintenance only. Field-level maintenance generally describes those procedures performed on a given piece of equipment that does not require disassembly, repair, or component replacement except where provided for in manufacturers' user instructions. Where it is recognized that many agencies perform their own maintenance and repair of equipment based on manufacturers' technical training, this capability is beyond that of the technical rescuer and not addressed within the scope of this standard.

A.5.2.3 Rescue equipment should be inspected and maintained in accordance with manufacturers' recommendations, and inspection and maintenance should be recorded in an appropriate recordkeeping system. Technical rescuers should be capable of establishing a schedule of inspection and maintenance requirements for all rescue-specific equipment in their inventory to ensure operational readiness and have these activities documented in an appropriate manner as determined by the AHJ.

A.5.2.4 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.5.2.6(A) For the purposes of this document, the term *static loads* relates to forces applied within a system when the load is not moving. The term *dynamic loads* is intended to address those forces created by moving loads as well as those caused by the sudden cessation of that movement (shock loads).

With reference to the relationship between angles and force within multiple-point anchor systems: When a rope (web) is connected between two anchor points and a load placed in between, an angle is formed. This interior angle acts as a force multiplier. As the angle increases, the force directed along the rope (web) is amplified, increasing the force felt on the anchors. For example, at 120 degrees, the force on each anchor is equivalent to the load. As the angle continues to increase, the force on each anchor rapidly increases *[see Table A.5.2.6(A) and Figure A.5.2.6(A)]*.

In Table A.5.2.6(A), assume a load mass of 200 lb (91 kg) creating a force of approximately 200 lbf (0.89 kN) at the point of attachment.

A.5.2.9 Belay systems are a component of single-tensioned rope systems that apply a tensioned main system on which the entire load is suspended and a nontensioned system with minimal slack (belay) designed, constructed, and operated to arrest a falling load in the event of a main system malfunction or failure. While these traditional systems used for lowering and raising are in common use, two-tensioned rope systems can also be used to suspend the load while maintaining near equal tension on each rope, theoretically reducing the fall distance and shock force in the event of a singular rope failure. To be effective, two-tensioned rope systems must utilize devices that will compensate appropriately for the immediate transfer of additional force associated with such failures.

This document is not intended to limit a rescue team from the use of two-tensioned rope systems that can be utilized anywhere rope-based lowering or mechanical advantage systems are required.

A.5.2.11 The intent of the JPR is to assess the ability of the rescuer to arrest a falling load effectively. This can be accomplished by having a person perform a hard, unexpected jerk on the distal end of the belay system. Testing methods should not include the use of people or persons as live loads.

A.5.2.13 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill, and the operational components of the entire system should be utilized fully (i.e., commands, progress capture, reset mechanisms). For example, an appropriate minimum travel distance for a technical rescuer in the urban/industrial environment for a raising operation might be 10 ft to 20 ft (3.05 m to 6.1 m), while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

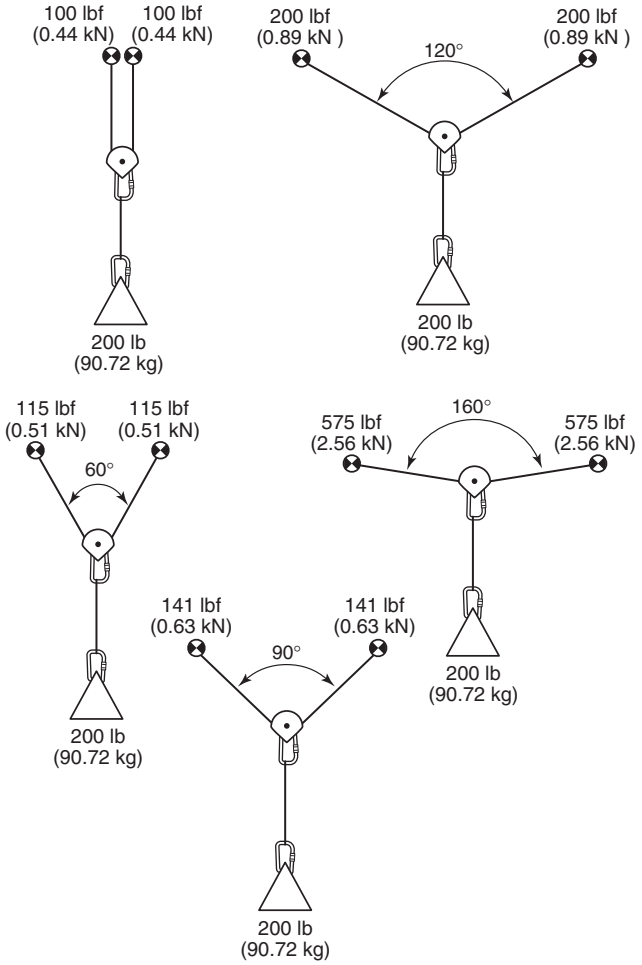

FIGURE A.5.2.6(A) The Effect of Angle Forces on Anchors and Lines: Critical Angles.

Table A.5.2.6(A) Force Conversion Table

	Force at Each Anchor	
Angle	**lbf**	**kN**
0	100	0.44
30	103	0.46
45	108	0.48
60	115	0.51
90	141	0.63
120	200	0.89
160	575	2.56
170	1,147	5.10
179	11,459	50.97

A.5.2.14 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill. For example, an appropriate minimum travel distance for a technical rescuer in the urban/industrial environment for ascending rope might be 10 ft to 20 ft (3.05 m to 6.1 m), while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

A.5.2.17 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill, and the operational components of the entire system should be utilized fully (i.e., commands, progress capture, descent control). For example, an appropriate minimum travel distance for a technical rescuer in the urban/industrial environment for a high-angle raising operation might be 30 ft to 50 ft (9.15 m to 15.25 m), while the minimum for the wilderness/cave environment might be considerably more at 10 ft to 20 ft (3.05 m to 6.1 m).

A.5.2.19 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill, and the operational components of the entire system should be utilized fully (i.e., commands, progress capture, reset mechanisms). For example, an appropriate minimum travel distance for a technical rescuer in the urban/industrial environment for a high-angle raising operation might be 10 ft to 20 ft (3.05 m to 6.1 m), while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

A.5.2.21 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill. For example, an appropriate minimum travel distance for a technical rescuer in the urban/industrial environment for descending a fixed rope system might be 10 ft to 20 ft (3.05 m to 6.1 m), while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

A.5.2.25 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill, and the operational components of the entire system should be utilized fully (i.e., commands, progress capture, reset mechanisms). For example, an appropriate minimum travel distance for a technical rescuer in the urban/industrial environment for a low-angle lowering or raising operation might be 10 ft to 20 ft (3.05 m to 6.1 m), while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

A.5.2.26 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill, and the operational components of the entire system should be utilized fully (i.e., commands, progress capture, descent control). For example, an appropriate minimum travel

distance for a technical rescuer in the urban/industrial environment for a high-angle lowering operation might be 10 ft to 20 ft (3.05 m to 6.1 m), while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

A.5.2.27 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.5.3.2(A) The urgency of performing transfers of patients suspended from fall protection lanyards (pick offs) has received much attention due to increased awareness of the profound effects and rapid onset of suspension induced shock syndrome. Rescuers should recognize the need for rapid removal of persons from these potentially life-threatening situations.

A.5.3.3 This statement is intended to require individual rescuers to perform connections or procedures necessary for completion of a victim transfer while suspended from the rope rescue system in coordination with team operations. The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill, and the operational components of the entire system should be utilized fully (i.e., commands, progress capture, reset mechanisms). For example, an appropriate minimum travel distance for a technical rescuer in the urban/industrial environment for moving a victim with a rope system might be 10 ft to 20 ft (3.05 m to 6.1 m), while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

A.5.3.4 The specified minimum travel distance will vary based on the response area and the discipline-specific application. The distance traveled should depict accurately the typical distance that would be experienced by the person performing the skill, and the operational components of the entire system should be utilized fully (i.e., commands, progress capture, reset mechanisms). For example, an appropriate minimum travel distance for a technical rescuer in the urban/ industrial environment for a high-angle lowering or raising operation might be 10 ft to 20 ft (3.05 m to 6.1 m) while the minimum for the wilderness/cave environment might be considerably more at 30 ft to 50 ft (9.15 m to 15.25 m).

A.5.3.5 This JPR is intended to include, but is not restricted to, systems such as high lines, two-rope offsets, deflection, tracking, and guiding lines. A rope or similar line that is connected directly to the load being raised or lowered (often referred to as a tag line), and effectively managed by a rescuer to pull the load out and away from simple inline projections or obstructions, is not intended to be a technician-level function.

A.5.3.6 This JPR is intended to include, but is not restricted to, systems such as high lines, two-rope offsets, deflection, tracking, and guiding lines. A rope or similar line that is connected directly to the load being raised or lowered (often referred to as a tag line), and effectively managed by a rescuer to pull the load out and away from simple inline projections or obstructions, is not intended to be a technician-level function.

A.5.3.7(A) Equipment of this type can include, but is not limited to, travel limiters, flip lines, buck off straps, climbing lanyards, and lead climb slings.

A.5.3.8 These incidents are most commonly associated with persons who wish to harm themselves or attract attention by jumping, or threatening to jump, from high places. It is recognized that until the subject has an expressed or implied desire to be removed or rescued that these incidents are primarily a law enforcement or public health issue and as such should be managed by agencies that have been identified as having responsibility for these incidents. If the AHJ does not provide these services directly, the AHJ should have a list of resources equipped with the necessary training and expertise to assist with managing people in emotional or psychological crisis. However, the position and location of the subject can make it difficult to determine the state of mind of the subject until a rescuer can access them, placing the rescuer in the position of performing the initial assessment of the mental and emotional state of the subject. All members of the team who might be expected to perform initial contact with the subject should have basic training in recognizing people in crisis and have the necessary skills to protect themselves and, when possible, prevent the situation from degrading.

A.6.2.1 The size-up should include, but not be limited to, the initial and continuous evaluation of the following:

(1) Scope and magnitude of the incident
(2) Risk/benefit analysis
(3) Number and size of structures affected
(4) Integrity and stability of structures affected
(5) Occupancy types (e.g., residential, mercantile, commercial)
(6) Number of known and potential victims
(7) Access to the scene
(8) Environmental factors
(9) Available and necessary resources

A.6.2.6 Emergency shoring operations for urban search and rescue incidents provide a safe and efficient atmosphere while conducting search and rescue operations for trapped victims. The intent is to provide a relatively safe and reduced-risk environment for both the victim and the trained rescue forces. The process includes stabilizing adjacent structures or objects that might have been affected by the initial incident. Figure A.6.2.6(a) through Figure A.6.2.6(j) depict operations-level shores that rescuers working at the operations-level should be able to construct and properly install. They include T shore, double T shore, two-post vertical shore, multiple-post vertical shore, door and window shore, horizontal shore, flying raker shore, split sole raker shore, solid sole raker shore, and box cribbing stacks.

A.6.2.9 Utilization of the victim transfer devices authorized by the AHJ should include horizontal and vertical applications, proper patient securing methods, and rigging attachments.

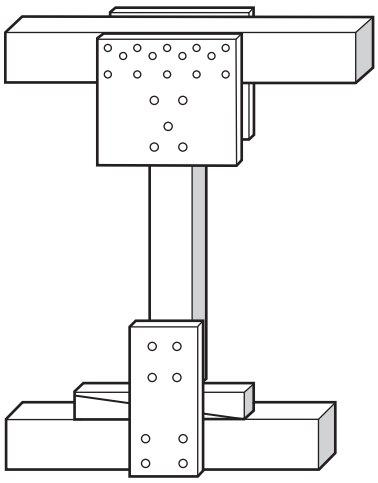

FIGURE A.6.2.6(a) T Shore.

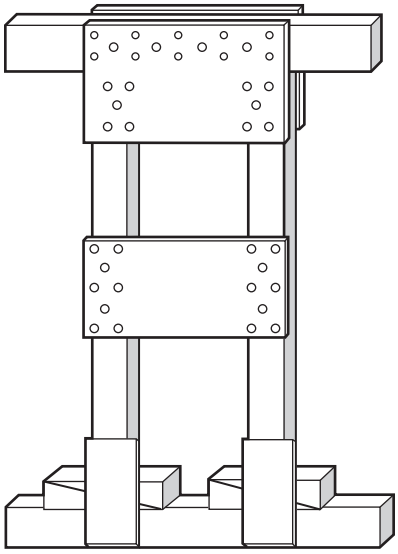

FIGURE A.6.2.6(b) Double T Shore.

A.6.2.10 When lifting a load by utilizing basic hand tools (prybars), jacks, and airbags available in the tool kits, the load should be stabilized during the lifting operation using a recognized cribbing stabilization system so that movement of the load is controlled throughout the lift.

A.6.2.11 The load should be moved utilizing pipes as rollers. This process includes maintaining constant control of the load and its direction of travel and application of any necessary rigging to negotiate existing obstacles.

A.6.2.13 Cribbing systems should consist of the following five basic configurations of cribbing, shown in Figure A.6.2.13:

(1) Two-piece layer crosstie
(2) Three-piece layer crosstie
(3) Platform crosstie
(4) Triangle crosstie
(5) Modified crosstie

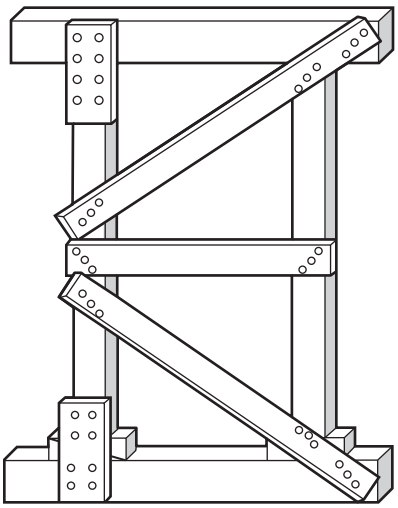

FIGURE A.6.2.6(c) Two-Post Vertical Shore.

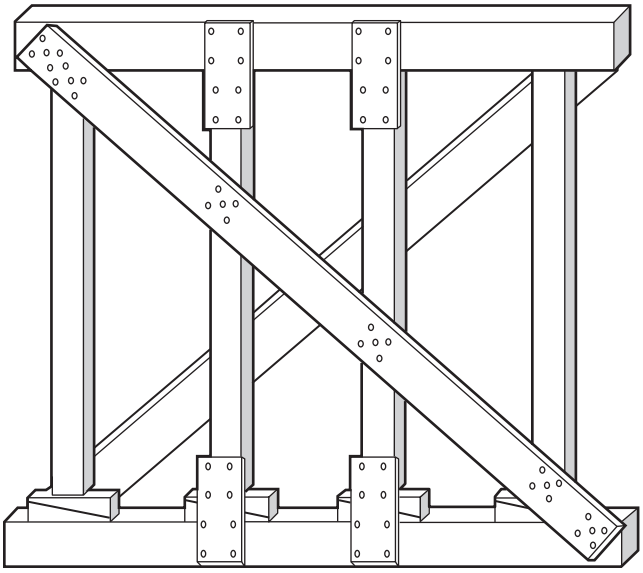

FIGURE A.6.2.6(d) Multi-Post Vertical Shore.

Included in this section are the knowledge of the advantages, disadvantages, and limitations of each type of system.

A.6.2.16 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.6.3.6 Emergency shoring operations for urban search and rescue incidents provide a safe and efficient atmosphere while conducting search and rescue operations for trapped victims.

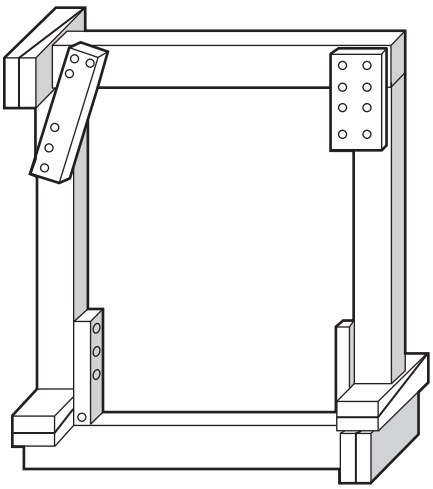

FIGURE A.6.2.6(e) Window Shore.

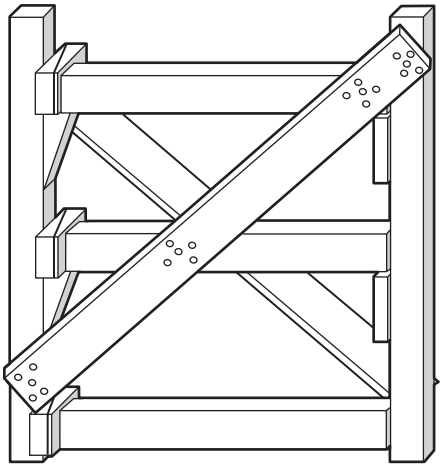

FIGURE A.6.2.6(f) Horizontal Shore.

The intent is to provide a relatively safe and reduced-risk environment for both the victim and the trained rescue force. The process includes stabilizing adjacent structures or objects that might have been affected by the initial incident. Figure A.6.3.6(a) through Figure A.6.3.6(f) depict technician-level shores that rescuers working at the technician level should be able to construct and properly install. They include all operations-level shores as well as laced post shore, plywood laced post shore, sloped floor shores (Type 2 and Type 3), double and triple raker shores, flying shore, and combination shores designed by a structural engineer.

A.6.3.14 Application of the methods, materials, and devices necessary to shore windows, doors, floors/roofs, and walls in heavy construction–type structures should include the usage of the Ellis clamp systems, Ellis post screw jacks, pneumatic/mechanical shores, Lace post shoring systems, horizontal shores, and cross-tied Raker shores (single, double, and triple diagonal).

A.7.1.5 This statement applies to nonentry methods of victim communication only. Awareness-level personnel cannot enter a space for rescue.

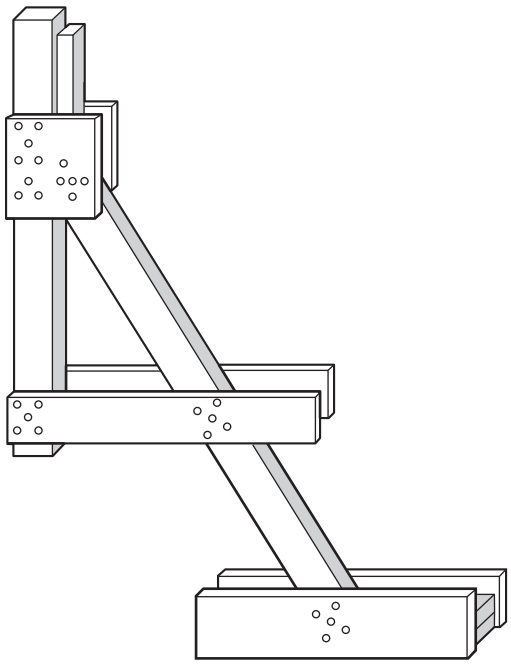

FIGURE A.6.2.6(g) Flying Raker Shore.

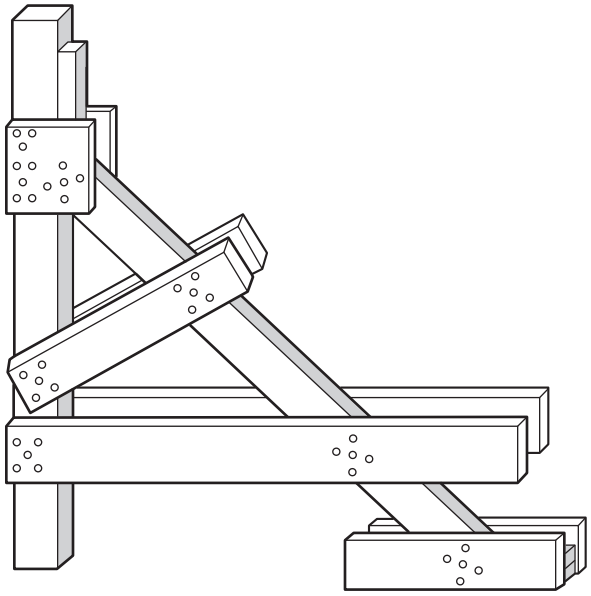

FIGURE A.6.2.6(h) Split Sole Raker Shore.

A.7.2.1 It should be noted that areas immediately adjacent to the confined space entry portal could also be affected by conditions within the space. For example, a vertically oriented space containing atmospheric hazards with a vapor density of less than 1 (lighter than air) could create an atmospheric hazard for personnel outside of the space as well. Personnel at the awareness level should be aware of the potential for these conditions and approach cautiously assuring appropriate assessment, hazard isolation, and personal protective procedures are in place.

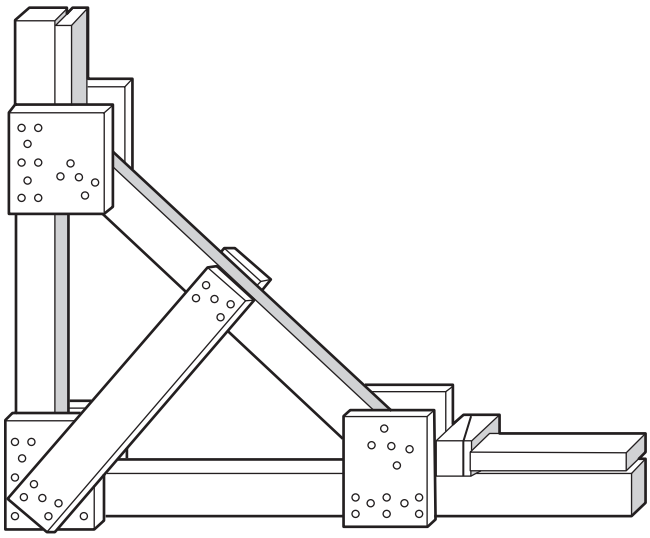

FIGURE A.6.2.6(i) Solid Sole Raker Shore.

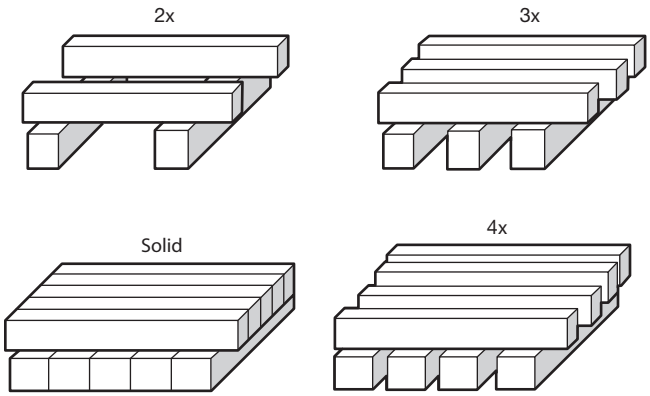

FIGURE A.6.2.6(j) Box Cribbing.

A.7.2.3 Rescue entrants must be cautious to protect themselves from the potential for exposure to atmospheric hazards. During a rescue incident, as a rule of thumb, regardless of monitor readings, if the cause of the incident cannot be proven to be unrelated to the atmosphere, rescuer entrants should wear atmosphere supplying respirators (i.e., self-contained breathing apparatus or supplied air respirators with egress cylinder). This assures that atmospheric hazards related to dead-air space, built-up scale encapsulation of hazardous vapors, and so on will not create an untenable condition for rescue entrants.

Rescuers should evaluate the space interior to assure that they are using appropriate PPE for the given exposure. Atmosphere supplying respirators will protect a rescue entrant from the respiratory and ingestion modes of transmission into the body only. Some contaminants might pose exposure hazards requiring chemical protective clothing to protect from injection and absorption modes of transmission into the body.

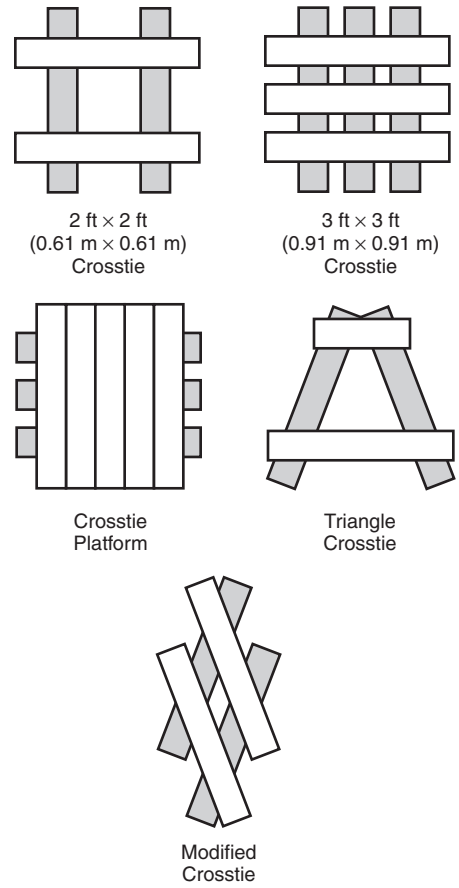

FIGURE A.6.2.13 Five Basic Configurations of Cribbing.

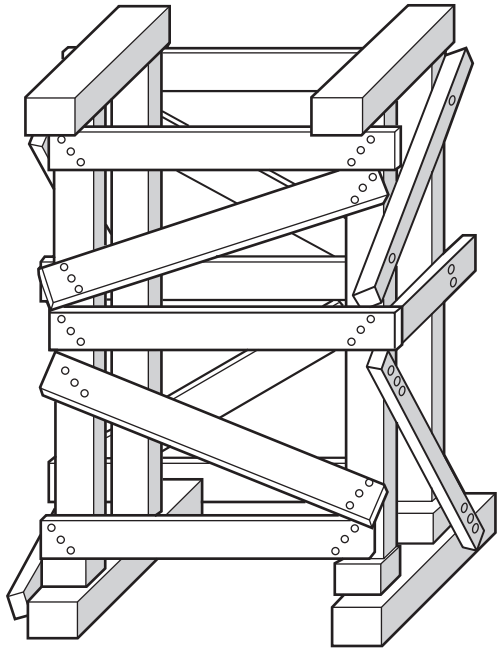

FIGURE A.6.3.6(a) Laced Post Shore.

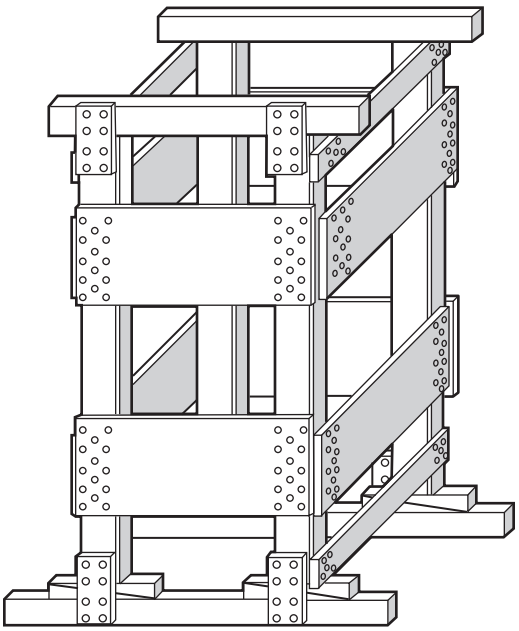

FIGURE A.6.3.6(b) Plywood Laced Post Shore.

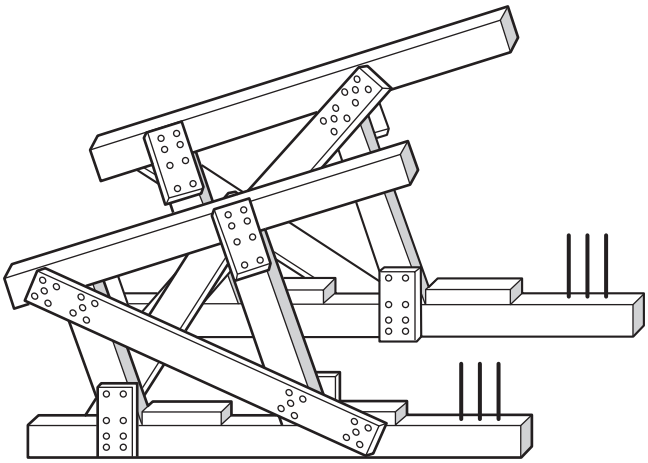

FIGURE A.6.3.6(c) Sloped Floor Shore Type 2.

Assessment of the space should consider all potentially dangerous forms of energy to assure a rescue entrant is appropriately protected before entry. The necessity for assessment and isolation of dangerous forms of energy could include more than the atmosphere.

Some spaces can contain environments that are unacceptable for entry. Acceptable entry conditions for atmospheric hazards within confined spaces are as follows:

(1) Acceptable limits for oxygen concentration in air should be within 19.5 percent and 23.5 percent. An oxygen-enriched atmosphere is considered to be greater than 23.5 percent and poses a flammability hazard. An oxygen-deficient atmosphere is considered to be lower than 19.5 percent and can lead to asphyxiation without fresh air breathing apparatus.

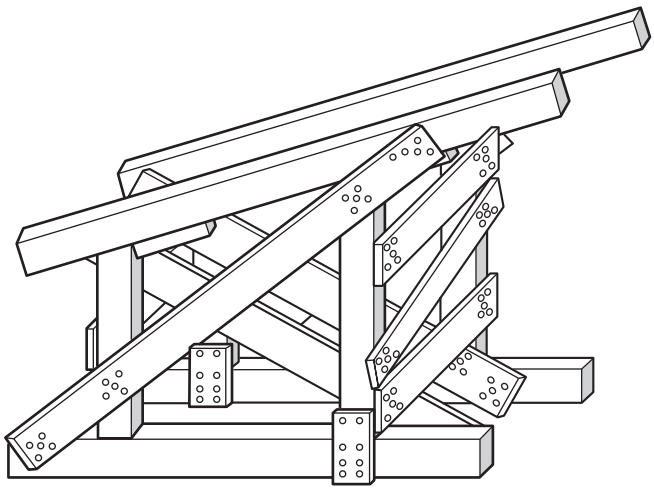

FIGURE A.6.3.6(d) Sloped Floor Shore Type 3.

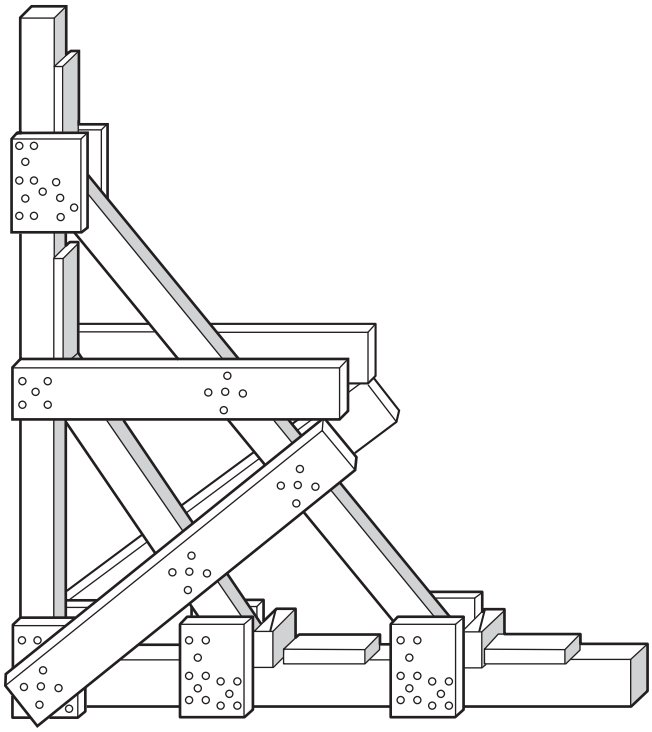

FIGURE A.6.3.6(e) Double Raker Shore.

(2) Flammability is measured as a percentage of a material's lower explosive limit (LEL) or LFL. Rescuers should not enter confined spaces containing atmospheres greater than 10 percent of a material's LEL, regardless of the PPE worn. There is no adequate protection for an explosion within a confined space.

(3) Acceptable toxicity levels are specific to the hazardous material involved, and chemical properties have to be assessed to determine the level of the hazard for a given environment and time frame. The confined space technical rescuer should have available resources capable of understanding the assessment tools necessary for analysis

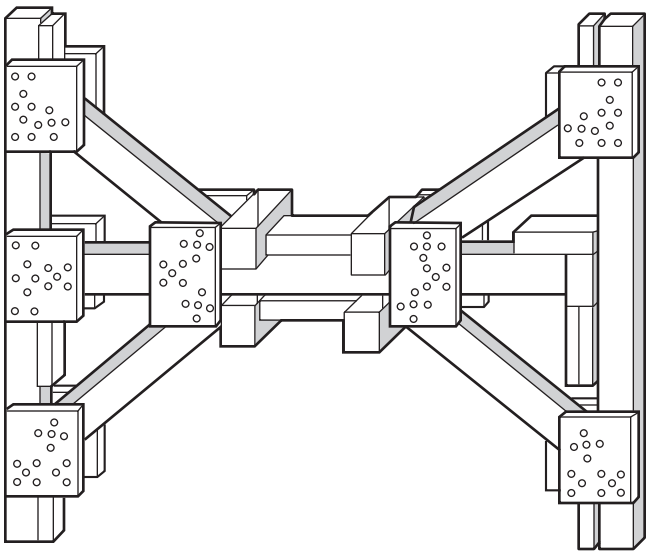

FIGURE A.6.3.6(f) Flying Raker Shore.

and identification of hazardous conditions within confined spaces and interpretation of that data.

This capability should include at least the following steps:

(1) Identification of the hazards found within confined spaces and an understanding of how those hazards influence victim viability and rescue/recovery operations
(2) Selection and use of monitoring equipment to assess the following hazards:
    (a) Oxygen-deficient atmospheres
    (b) Oxygen-enriched atmospheres
    (c) Flammable environments
    (d) Toxic exposures
    (e) Radioactive exposures
    (f) Corrosive exposures

The confined space technical rescuer should understand the limiting factors associated with the selection and use of the atmospheric and chemical monitoring equipment provided by the AHJ for confined space emergencies. This equipment can include, but is not limited to, the following:

(1) Calorimetric tubes
(2) Oxygen concentration monitor (continuous reading, remote sampling)
(3) Combustible gas monitor (continuous reading, remote sampling)
(4) Specific toxicity monitor (continuous reading, remote sampling)
(5) Multigas atmospheric monitors (continuous reading, remote sampling)
(6) Passive dosimeter
(7) pH papers, pH meters, and pH strips
(8) Radiation detection instruments

Skills relating to use of such equipment include, but are not limited to, calibration, proper operation, response time, detection range, relative response, sensitivity, selectivity, inherent safety, environmental conditions, and nature of hazard.

"Limitations of detection and monitoring equipment" *[see 7.2.3(A)]* refers to the extent to which the equipment can provide specific readings and how external factors influence the instrument readings and reliability. For example, the following factors should be considered:

(1) Temperature extremes
(2) Cross-sensitivity
(3) Calibration
(4) Power
(5) Time of sampling period
(6) Location of sample
(7) Condition of instrument sensors

Utilization and evaluation of reference terms and resources should include, but not be limited to, the following:

(1) Lethal concentration-50 (LC_{50})
(2) Lethal dose-50 (LD_{50})
(3) Permissible exposure limit (PEL)
(4) Threshold limit value (TLV)
(5) Threshold limit value — short-term exposure limit (TLVSTEL)
(6) Threshold limit value — time-weighted average (TLVTWA)
(7) IDLH
(8) Chemical information documents (e.g., SDS)
(9) Reference manuals
(10) Computerized reference databases
(11) Technical information centers
(12) Technical information specialists and monitoring equipment

A *confined space rescue on-scene prioritized action plan* is a plan used to mitigate the incident. The components of the plan are as follows:

(1) *Priority 1: Make the scene safe.*
    (a) Hazard assessment: Approach to the space and entrance into the space
    (b) Hazard mitigation: Control or remove the hazard
    (c) De-energize and protect the sources of electricity, fluids, hydraulics, and so forth
(2) *Priority 2: Victim contact by primary responder.*
    (a) Establish victim location
    (b) Primary medical survey (ABCs)
    (c) Determine mode of injury
    (d) Begin psychological first aid
    (e) Determine feasibility of safe retrieval and retrieve if possible
(3) *Priority 3: Size-up.*
    (a) Information gathering
    (b) Resource identification
    (c) Primary responder report
    (d) Brainstorm strategy: risk/reward
    (e) Incident management system (IMS)
    (f) Team member assignments
(4) *Priority 4: Preparation.*
    (a) Rescuer personal protective equipment
    (b) Anchoring and rigging rescue equipment
    (c) Authorized entrant review
(5) *Priority 5: Access patient.*
    (a) Designate access team leader: one team leader for each group of two or more
    (b) Utilize rescuer retrieval (high-point)
    (c) Designate backup personnel

(6) *Priority 6: Stabilize and package patient.*
   (a) First aid to life-threatening injuries
   (b) Secure packaging for rescue transport
(7) *Priority 7: Evacuate.*
   (a) Move victim to a safe location
   (b) Provide medical report to EMS
   (c) Remove rescuers
   (d) Emergency retrievals
(8) *Priority 8: Response termination.*
   (a) Pick up and inventory gear
   (b) Decontaminate (if necessary)
   (c) Rebuild gear packages for the next call
   (d) Field-evaluate rescuer mental state

A.7.2.4 Printed information resources can include, but are not limited to, entry permits, chemical information documents (e.g., SDS), and site plans or drawings.

The size-up should include, but not be limited to, the initial and continuous evaluation of the following:

(1) Scope, magnitude, and nature of the incident
(2) Location, number, and condition of victims
(3) Risk/benefit analysis (body recovery versus rescue)
(4) Access to the scene
(5) Environmental factors
(6) Available and necessary resources
(7) Establishment of a control perimeter

It is the intent of the committee that safety and operational protocols include some form of checklist or "permit" for technical rescue teams operating at a confined space emergency. These checklists should be used to confirm completion of procedures necessary to allow safe entry into a confined space to perform rescue. Hazards can include, but are not limited to, the following:

(1) Atmospheric hazards
(2) Chemical hazards
(3) Temperature extremes
(4) Engulfment and entrapment
(5) Any other recognized safety or health hazard

Some methods of recognition and assessment of hazards associated with confined spaces include, but are not limited to, the following:

(1) Assessment of the perimeter surrounding the confined space incident to determine the presence of, or potential for, a hazardous condition that could pose a risk to rescuers during approach
(2) Recognition of the need for decontamination of a patient or responder who might have been exposed to a hazardous material as per NFPA 472
(3) Recognition of the need for a confined space rescue service or additional resources when nonentry retrieval is not possible
(4) Notification of the designated rescue service and other resources necessary for initiation of confined space rescue
(5) Recognition of hazardous atmospheres or materials through visual assessment and information received from on-site personnel

Specific procedures for mitigating hazards at confined space rescue can include, but are not limited to, consideration of the following:

(1) PPE
(2) Fall protection
(3) Harnesses
(4) Lockout/tagout procedures
(5) Hazard assessment
(6) Scene assessment

Procedures to perform a confined space hazard assessment include, but are not limited to, the following:

(1) Identification of the important industrial documentation, where available, that is useful in hazard assessment, including entry permits, lockout/tagout procedures and checklists, and hot work permits
(2) Selection of all applicable information necessary for emergency responders from chemical information documents (e.g., SDS)
(3) Selection of the proper PPE for the hazard per NFPA 472

Procedures to perform a scene assessment to determine the magnitude of the problem in terms of life safety can include, but are not limited to, the following:

(1) Type, size, access, and internal configuration of the confined space
(2) Information regarding current and potential hazards that threaten victims and rescuers
(3) Risk/benefit analysis concerning the threat to rescuers in relation to the viability of victims

The assessment at this level should include, but not be limited to, the initial and continuous evaluation of the following:

(1) Hazards such as engulfment potential, environmental factors (chemical, atmospheric, temperature, etc.), harmful forms of energy (electrical, mechanical, movement due to gravity, hydraulic, etc.), and configuration hazards (diverging walls, entrapment, obstructions, trip/fall hazards, etc.)
(2) Risk/benefit analysis (body recovery versus rescue)
(3) Available and necessary additional resources
(4) Establishment of control zones
(5) Magnitude of the hazard and isolation procedures
(6) Effectiveness of the nonentry or qualifying entry-type rescue
(7) Overall safety of rescue operations
(8) Level of rescue response (appropriate for the type of rescue being attempted)
(9) Current and projected status of the planned response
(10) Personnel accountability

The AHJ should address the possibility of members of the organization having physical and/or psychological disorders that can impair their ability to perform technical rescue in confined spaces (e.g., physical disabilities, fear of heights, fear of enclosed spaces). Roles, functions, and responsibilities for these team positions should be consistent with the organization's standard operating guidelines for confined space rescue.

Some methods of isolation include blanking or blinding of pipes *(see Figure A.7.2.4)*; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

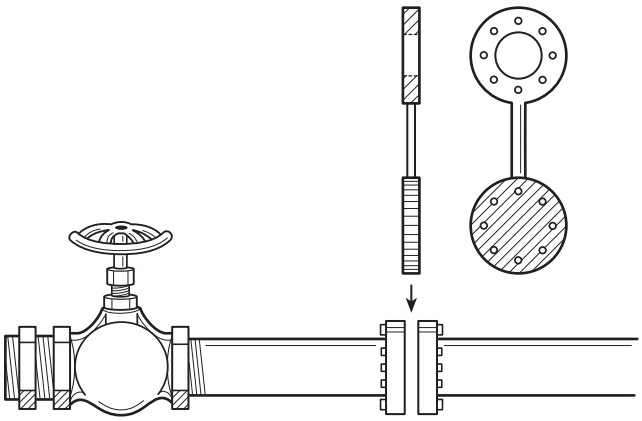

FIGURE A.7.2.4 Blanking or Blinding.

A.7.2.6 While SCBA are specifically addressed within the operations-level section of this chapter, it is recognized that many confined space rescues within the scope of the operations-level might be better suited with the use of supplied-air respirators (SAR) based on the conditions of the space and the incident.

It is not the intent of the committee to exclude the use of SAR at the operations-level but to emphasize the need for skill evaluation regarding SCBA since spaces at the operations-level are generally large enough and configured so that this larger, self-contained unitcan be used effectively.

A.7.2.7 Atmosphere supplying respirators include either SCBA or SAR (Class C airline respirators with an adequate emergency egress cylinder). Self-contained facial bag units or nonentry units designed for rapid egress from a hazardous atmosphere should not be used for victims in confined space emergencies due to their limited air supply.

During confined space rescues requiring placement of breathing air systems on victims, caution must be taken to assure there is no interruption of the breathing air supply, which could cause asphyxiation. Rescue entrants must continuously check air systems for proper application and operation to assure the victim's safety during movement within a space. Failure to recognize an issue could result in the victim's death.

During training exercises, it is recommended that live victims have access to their facepieces so that they can remove the regulator or facepiece should accidental cessation of air supply occur. If a victim cannot access a facepiece due to packaging methods used or other conditions associated with the rescue simulation, it is highly recommended that the facepiece regulator be removed from the facepiece during that segment of the evolution.

A.7.2.8 While many local treatment protocols allow clearance of the victim's spine in certain situations, due to the potential for significant manipulation associated with movement of victims within confined spaces and the potential severity and long-term effects of spinal injuries, it is highly recommended that spinal precautions be instituted aggressively for those victims who have any indicator of the potential for spinal injury. This could be as simple as an unwitnessed fall within a space or any other injury suspected to create enough force to produce spinal pain or injury.

While long spine immobilization is specifically addressed within the operations-level section of this chapter, it is recognized that many confined space rescues within the scope of the operations-level could be better suited with the use of short spine immobilizers based on the conditions of the space and the incident.

It is not the intent of the committee to exclude the use of short spine immobilizers at the operations-level but to emphasize the need for skill evaluation regarding long spine immobilization since spaces at the operations-level are generally large enough and configured so that the larger, full-length devices, can be used effectively.

A.7.2.11 Packaging devices that can be used in confined spaces include, but are not limited to, the following:

(1) Full spine immobilization devices
(2) Short spine immobilization devices
(3) Cervical spine immobilization devices
(4) Litters

A.7.2.15 Packaging devices that can be used in confined spaces include, but are not limited to, the following:

(1) Full spine immobilization devices
(2) Short spine immobilization devices
(3) Cervical spine immobilization devices
(4) Litters

A.7.2.16 It should be noted that situations posing imminent danger to victims should be rapidly but carefully evaluated to assure that they warrant rapid extraction. Rapid extractions place priority on movement of the victim to a clear environment where more definitive care can be provided, regardless of underlying injuries. Making a decision for rapid extraction when it is not appropriate could unnecessarily harm the victim.

A.7.2.18 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.7.3.4 While many local treatment protocols allow clearance of the victim's spine in certain situations, due to the potential for significant manipulation associated with movement of victims within confined spaces and the potential severity and long-term effects of spinal injuries, it is highly recommended that spinal precautions be instituted aggressively for those victims who have any indicator of the potential for spinal injury. This could be as simple as an unwitnessed fall within a space or any other injury suspected to create enough force to produce spinal pain or injury.

Short spine immobilization devices should be considered a temporizing measure, and the victim should be transferred to a full spinal immobilization device as soon as possible. If a victim must be lifted vertically in a short spine immobilizer, manufacturer's recommendations should be followed for procedures associated with attachment to rescue systems and vertical lifts of the specific device.

A.8.2.2 The intent of 8.2.2 is to provide fire control measures and teams at the scene of working rescue incidents. These teams should be in the ready position with a charged hose line of at least 38 mm (1½ in.) diameter or greater (no booster lines) to function as a rapid intervention and extinguishment team. This section implies having an independent water source (i.e., attack pumper) with sufficient extinguishment agent on board to mitigate any unforeseen fires or explosions. Further, it is the intent of this section to have the rapid intervention personnel standing by in donned, self-contained breathing apparatus but not necessarily hooked up/into breathing air. This state of readiness should be maintained until the incident management structure authorizes de-escalation in accordance with AHJ procedures.

A.8.2.3 The five directional movements to be considered during the stabilization process are defined as follows:

(1) *Horizontal Movement.* Vehicle moves forward or rearward on its longitudinal axis or moves horizontally along its lateral axis.
(2) *Vertical Movement.* Vehicle moves up and down in relation to the ground while moving along its vertical axis.
(3) *Roll Movement.* Vehicle rocks side to side while rotating about on its longitudinal axis and remaining horizontal in orientation.
(4) *Pitch Movement.* Vehicle moves up and down about its lateral axis, causing the vehicle's front and rear portions to move left or right in relation to their original position.
(5) *Yaw Movement.* Vehicle twists or turns about its vertical axis, causing the vehicle's front and rear portions to move left or right in relation to their original position.

A.8.2.4 It is the intent of the committee that rescue personnel control hazards by de-energizing where possible vehicle systems that pose hazards to rescuers or victims. These systems can include components such as electrical, fuel, chemical, and pneumatic systems, including fuel pumps, air bags (passive restraint devices), alternative fuel systems, and air suspension systems. Care should be taken in controlling hazards not to eliminate the potential use by rescuers of beneficial systems, such as seat adjustment or positioning controls, restraint retractors, or other powered devices that would enable more efficient operations.

A.8.2.9 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.8.3.1 It is the intent of the committee that the differentiation between Level I and Level II incidents correlate to both the environment in which the rescue is to be conducted as well as the level or degree of entrapment. It is recommended that provider agencies develop clear guidelines for making this determination based on the AHJ's resources and capabilities.

Level I rescue skills are applicable to vehicle events involving common passenger vehicles and involving environments where rescuer intervention does not constitute a high level of risk based upon the environment or other factors.

Level II skills apply to those incidents where commercial or heavy vehicles are involved; complex extrication processes have to be applied; multiple uncommon concurrent hazards are present; or more than digital entrapment of a victim is involved.

This is an example of a standard operating guideline (SOG) dealing with making this determination for transportation incidents:

(1) *Level I Intervention*: Any situation involving rescue of entrapped civilians or personnel that involves common passenger vehicles (autos, light trucks)
(2) *Level II Intervention*: Any situation that exceeds the criteria for a Level I Intervention or meets the following criteria:
    (a) Complex passenger extrications
    (b) Extrications involving other disciplines (hazmat, changes in elevation, etc.)
    (c) Truck, bus, or special vehicle extrications
    (d) Multi-vehicle extrications exceeding AHJ resources

A.8.3.2 See A.8.3.1.

A.9.2.2 Local authority will determine who is qualified to determine if an animal should be euthanized, and who within that jurisdiction is authorized to conduct it, and by what means. Rescuer needs to work through the process of determining if a real rescue, versus humane euthanasia and who can accomplish it in their zone of response.

A.9.2.7 Animal technical rescue often includes marginal SSSF. Rescues as low as 2:1 are not uncommon due to a single component in the system which cannot be mitigated.

A.9.2.8 Animal technical rescue often includes marginal SSSF. Rescues as low as 2:1 are not uncommon due to a single component in the system which cannot be mitigated.

A.9.2.14 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.9.3.1 Any suspension of an animal in excess of 15 minutes requires a full body supporting system. Currently the Anderson Sling is the only system universally recognized for this.

A.9.3.5 A representative helicopter includes an overhead lifting system, including electrical insulation system, cable, and rapid disconnect from the helicopter.

A.10.2.6 It is the intent of the committee that the technical rescuer have enough survival equipment, food, water, and other necessary materials to operate independently for 3 days in the wilderness environment. Wilderness skills and knowledge include the ability to construct improvised shelter, prepare supplied food, purify drinking water, utilize established

primary and emergency communications mediums, select and use layered clothing, and apply land navigation resources.

A.10.2.7 The National Search and Rescue Committee recommends using the georeferencing (coordinate) systems shown in Table A.10.2.7.

A.10.2.9 It is the intent of the committee that a person working in a wilderness environment will be able to manage the long-term medical care of a victim, with *long-term* meaning the time it takes to remove the victim from the wilderness environment and deliver him or her to a medical facility (possibly ranging from 1 hour to 5 days or longer, depending on the environment). The wilderness technician should have at least a thorough knowledge of basic life support, and advanced life support training is recommended so that IV fluids and other advanced life support measures can be utilized.

A.10.2.10 Packaging materials can include spinal care devices, thermal barrier, vapor barrier, and splints. Victim transport devices can include rigid basket-type litters and flexible wrap-around litters.

A.10.2.11 The committee recognizes that due to incident complexity, technician-level skills might be required to terminate some incidents. Examples would be complex stabilization issues, multiple concurrent hazards, industrial processes involved, presence of fatalities or multiple injuries, or chemical releases.

A.10.3.11 A critical element of functioning in the wilderness environment at the technician level is the ability to negotiate the types of terrain where the subject might be located. The terrain could be the cause for the subject's need for search and rescue; he or she could be either trapped or injured by the terrain, for example, "cliffed out," or in a heat or cold stress situation. It is necessary for the responding organization to evaluate the response area and determine the types of terrain that require exceptional skills and specialized equipment to access. In the alpine environment, travel by ski or snowshoes might be required at a minimum. Other environments require the use of technical rock climbing skills and equipment. Desert areas require special equipment for dealing with temperatures and off-road travel. Wetlands require local knowledge for access and travel. The responding organization must determine the type of terrain capabilities to train and equip their personnel or, as an alternative, determine which available resources are capable and equipped to conduct search and rescue operations on the specific terrain.

A.11.1.2 Personnel operating at awareness level need to be able to recognize hazardous situations and rescue problems that are beyond their capabilities. In these situations, awareness-level responders need to know where and how to request operations- or technician-level resources to manage difficult trench collapse rescue events. See Annex H for a full list of hazards and a better understanding of situations that can require an operations- or technician-level response.

Table A.10.2.7 National SAR Committee's Georeferencing Matrix

Georeference system user	U.S. National Grid (USNG)	Latitude/ longitude DD-MM.mm[1]	GARS[2]
Land SAR responder[3]	Primary	Secondary	N/A
Aeronautical SAR responders[4]	Secondary	Primary	As needed
Air space deconfliction[5]	N/A	Primary	N/A
Land SAR responder/ aeronautical SAR responder interface[6]	Primary	Secondary	N/A
Incident Command:			
Air SAR coordination	Secondary	Primary	N/A
Land SAR coordination	Primary	Secondary	N/A
Area organization and accountability[7]	Secondary	Tertiary	Primary

[1]During SAR operations (and to avoid confusion), latitude and longitude should be in one standard format: DD-MM.mm. If required, use up to two digits to the right of the decimal. If required, allow three digits in the degrees field for longitude (i.e., DDD-MM.mm). Do not use leading zeros to the left of the decimal for degrees or minutes that require fewer than the maximum number of possible digits to express their value. The minimum number of digits is always one, even if it is a zero. (Example: Recommended: 9-0.3N 4-2.45W; Not Recommended: 09-00.300N 004-02.45W).

[2]GARS: Global Area Reference System.

[3]Land SAR responders use USNG; however, a good familiarity with latitude and longitude is necessary to ensure effective interface between land and aeronautical SAR responders (note: Land SAR includes SAR on flooded terrain).

[4]Aeronautical SAR responders will use latitude and longitude for SAR response. However, aeronautical SAR responders that work directly with land SAR responders should understand the USNG system for effective land SAR/aeronautical SAR interface.

[5]Air space deconfliction will only be implemented and managed using latitude and longitude.

[6]Aeronautical SAR responders working with land SAR responders have the primary responsibility of coordinating SAR using USNG. However, both groups must become familiar with both georeference systems.

[7]Describes the requirement for providing situational awareness of SAR operations geographically to federal, military, state, local, and tribal leadership, and provides for quick reference to send SAR resources closest to incident.

A.11.1.3 A prebriefing should include, but is not limited to, information regarding the following:

(1) Tactical assignments with explicit instructions
(2) General hazards and safety instructions
(3) Communications protocols, procedures, and details
(4) Anticipated environmental concerns
(5) Time frames for operations
(6) Emergency procedures
(7) Specific equipment needs
(8) Debriefing procedures
(9) Anticipated logistical needs

Documentation for confined space entry operations, as a minimum, should include the following:

(1) Development of some type of representation of incident management system command structure
(2) Time of incident
(3) Total time of operation
(4) Environmental conditions
(5) Location of victim
(6) Creation of a tactical checklist that includes entry times, exit times, personal accountability reports, atmospheric readings, rehabilitation information, injuries sustained, and incident number

An example of a tactical checklist is shown in Figure A.11.1.3.

Rapid, nonentry rescues can include placing a ladder to allow a victim to perform a self-rescue or to allow noninjured workers already in the trench to remove a victim. The ladder can be dropped in quickly at the end(s) of the trench by first responders before ground pads are placed. *(See also Rapid, Nonentry Rescues in Annex H.)*

The general area around a trench or excavation emergency is the entire area within 91.44 m (300 ft) (or more, as established by the incident commander). Making the general area safe includes, but is not necessarily limited to, the following procedures:

(1) Placing ground pads around the lip of the trench to minimize the effect of rescuers' weight on secondary collapse potential.
(2) Controlling or limiting traffic and sources of vibration in the area, including shutting down all vehicles and equipment.
(3) Controlling or limiting access to the area by unnecessary personnel.
(4) Identifying general hazards and affected utilities, and isolating, removing, and/or reducing their impact; also refer to General Hazards in Annex H, for more detailed information on general and other hazard types.
(5) Controlling of the utilities in and around a trench or excavation emergency to ensure the safety of responding personnel and victims; the AHJ should have available to rescuers or local public works employees training in the control of these services in order to provide a safe environment in which to operate and to ensure the safety of victims. The following utilities should be considered when providing training:
    (a) Electrical services (primary and secondary)
    (b) Gas, propane, fuel oil, or other alternative energy sources (primary systems)
    (c) Water/steam
    (d) Sanitary systems
    (e) Communications
    (f) Secondary service systems (such as compressed, medical, or industrial gases)

An RIC, as specified in Section 8.8 of NFPA 1500, should consist of rescuers at or above the capability level at which the incident is operating.

A.11.1.4 Support operations can include, but are not limited to, the following functional sectors in the incident management system:

(1) *Ventilation Sector.* Monitors and ventilates personnel
(2) *Extrication Sector.* Prepares for extrication methods and tactics
(3) *EMS Sector.* Plans for ongoing patient care, transfer, and transport in coordination with the incident commander and receiving hospital
(4) *Support Sector.* Can handle lighting, power, and environmental management
(5) *Cut Station.* Handles construction and fabrication of shoring materials

A.11.2.1 It is the intent of the committee to define the outcomes desired for each job performance requirement. The methods and equipment used to reach that outcome, in this case the shoring of a "nonintersecting" trench, should be those that best suit the particular needs and resource availability of the AHJ.

When considering stabilization tactics, it is critical to recognize logistical needs in terms of space required to remove the victim(s) from the trench. A forest of wales and struts placed without regard to the location of the victim can demonstrate technical abilities but will do nothing for victim survival. The survivability time frame, depth and width of the trench, soil conditions, and type of injuries sustained are only a few examples of the variables that need to be addressed. This process will involve thinking ahead and looking at all options available to shore in an approved manner, in acceptable time frames, while placed in locations that will enhance ease and safety of victim(s) removal.

A.11.2.2 Trench rescue by nature is a time-consuming endeavor. The time can be minimized by careful planning and division of the tasks that need to be performed simultaneously. The rescuers in the trench should identify the tools needed to disentangle the victim. These tools can be limited to shovels to remove entrapping soil or can include exothermic torches, air bags, and cribbing, depending on the nature of the entrapment. There should be rescuers assigned topside to assemble, prepare, and deploy whatever resources are necessary to complete disentanglement (i.e., an extrication sector). Any unwarranted delay can severely affect the survivability of the victim. In addition, an EMS sector should be assigned so that information on victim injuries and stabilization equipment can be processed so that treatment can be initiated and maintained. The treatment of crush syndrome must begin *before* the victim is released from the offending compressive weight, or the victim will quickly succumb to the effects of the toxins released into the bloodstream.

TRENCH RESCUE TACTICAL WORKSHEET

Location of incident: _____ Date: _____

_____ Time: _____

SITE ASSESSMENT/INCIDENT INFORMATION

❑ Knowledgeable contact person: _____

❑ Cut sheet ❑ Tabulated data ❑ Other documentation

❑ # and condition of victims: Total burial _____ Partial burial _____ Not trapped _____

❑ Determine mode of operation: ❑ Rescue mode ❑ Recovery mode

❑ Size and area of collapse: Width _____ Length _____ Depth _____

❑ Soil type: A B C Typing method used: ❑ Visual ❑ Manual ❑ Mechanical device

HAZARD ASSESSMENT

❑ Utilities
❑ Secondary collapse
❑ Water in trench
❑ Atmospheric hazards
❑ Ground-level hazards
❑ Tripping hazards
❑ Surface encumbrances
❑ Building instability
❑ Heavy equipment
❑ Blasting
❑ Road traffic
❑ Railroads
❑ Other vibration sources

RESOURCE ASSESSMENT/REQUEST

❑ Trench rescue staffing
❑ Trench rescue equipment
❑ EMS
❑ Police department
❑ Hazardous materials resources
❑ Utility companies
❑ Heavy equipment
❑ Other resources

HAZARD CONTROL

❑ Secure perimeter
❑ Establish an entry control point
❑ Stage incoming apparatus
❑ Atmospheric monitoring
❑ Ventilation
❑ Control vibrations
❑ Remove tripping hazards
❑ Control trench lip (ground pads)
❑ Install ladder in trench
❑ Control utility leaks
❑ Support utilities
❑ Move spoil pile as needed
❑ Install shoring

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FIGURE A.11.1.3 Sample Trench Rescue Tactical Worksheet.

TRENCH RESCUE TACTICAL WORKSHEET *(continued)*

MANAGEMENT & COORDINATION

- ❑ Scene control
- ❑ Hazard control
- ❑ Team briefing
- ❑ Establish tool/equipment area
- ❑ Assign panel and shore install teams
- ❑ EMS care from outside of trench
- ❑ Plan extrication
- ❑ Prepare patient packaging materials
- ❑ Prepare patient removal rigging
- ❑ EMS interface with patient after trench is shored
- ❑ Removal and transport of patient
- ❑ Rehab of personnel
- ❑ Termination operations
- ❑ Documentation

FUNCTIONS

- ❑ Incident Commander
- ❑ Logistics
- ❑ Rescue Group Supervisor
- ❑ Panel Installation Crew
- ❑ Safety
- ❑ Shore Installation Crew

NOTES

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FIGURE A.11.1.3 ***Continued***

A.11.2.3 It is imperative that the route of transfer be identified and the ambulance to the nearest hospital or trauma center be positioned to transport as soon as a victim is removed. An advanced life support–equipped and staffed medical unit is the preferred level of care and transport. The receiving hospital should already be aware of the condition of the patient and the estimated time of arrival. The rescuers should always be cognizant of the hazards and utilize universal precautions in the rescue area.

A.11.2.4 Disassembly of trench support systems is often the most dangerous portion of a rescue operation. The victim has been removed and transported, the tension and adrenaline have subsided, and it is a setting for potential catastrophe. Rescuers must maintain their attentiveness and safety policies until all equipment and shoring material is removed from the trench. The trench entrants must be vigilant about staying within the "safe zone" while removing struts in the reverse order that they were placed. They must leave the trench completely before pulling the last shores out with ropes. Arrangements should be made to have physical barriers placed to minimize further opportunities for an accident and to turn control of the incident site over to the AHJ or jobsite contractor. Equipment should be cleaned thoroughly and maintained to the manufacturers' recommendations. Damaged and lost equipment should be documented, and reports should be completed for recordkeeping and review. The rescue team should have a postbriefing to discuss effectiveness of strategies, tactics, equipment, and personnel. Signs of critical incident stress syndrome should be monitored and addressed.

A.11.2.5 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.11.3.1 Different types of intersecting trenches can include an "L," "T," or "X" configuration. In most cases, a trench is backfilled as the intended installation continues. There are times, however, when an exposure to an unprotected intersecting trench will present itself. Protecting the victim and quickly stabilizing the inside corners are priorities in this type of trench collapse. Use of a shield system or trench box located on site and rated for the trench in question can be a "quick and dirty" way to protect the victim if a competent heavy equipment operator is present. Where shoring with timber, hydraulics, or pneumatic struts, it is recommended that both sides of an inside corner are stabilized simultaneously to prevent the possible "blow out" of the unsupported corner. Shoring the inside corners and the unopposed floating panels necessitates additional skills, equipment, and training. In any case, the shoring of intersecting trenches should be done in a well-thought-out manner with an awareness of the particular vulnerability to collapse of an inside corner.

A.11.3.2 Lateral pressures and potential for collapse increase as the depth of the trench increases. For that reason, supplemental shoring that extends below the initial sheeting and shoring is most critical to the stability of the entire system. The dirt should be excavated over a wide enough area to uncover the victim completely while allowing enough room for placing supplemental shoring and facilitating safety, treatment, and removal. This approach will maintain the integrity of the protective system and provide competent patient management.

A.11.3.3 Cribbing systems in the trench rescue environment have a multitude of applications. Such applications can include, but are not limited to, the following:

(1) Stabilizing or securing a heavy load
(2) Providing a base for lifting entrapping loads (heavy reinforced concrete pipes or boulders) from within the trench or from the top of the trench
(3) Maintaining lift by cribbing under the load as it is lifted

Examples of available curricula that outline various lifting and rigging principle areas are as follows:

(1) Rescue Systems 1
(2) Rescue Systems 2
(3) FEMA Rescue Specialist

Lifting and stabilization topics that are detailed include the following:

(1) Gravity and mechanics, general principles
(2) Load stabilization utilizing mechanical principles
(3) Using power with an advantage (classes of levers, inclined planes, hydraulic or pneumatic presses, etc.)
(4) Overcoming friction
(5) Estimating load weights
(6) Mechanics of lifting
(7) Lifting and rigging

A.11.3.4 See A.11.3.3.

A.11.3.5 Deciding the mode of operation (rescue vs. recovery) and conducting a risk/benefit analysis should guide the selection of strategy in the possible use of heavy equipment. Strong consideration has to be given to the great surcharge loads and vibration created by using heavy equipment in the area of the collapse and the ultimate effect these factors have on the continued safety and condition of the victim and rescuers at the incident. It is strongly recommended to use heavy equipment only in support or recovery operations. Where possible, the job site supervisor or another competent excavating professional should be kept at the command post to assist in problem solving. Ultimately, however, the decision to utilize heavy equipment at a trench collapse incident should be made on a case-by-case basis. Operational support tasks for heavy equipment can include the following:

(1) Placing a trench box or isolation system
(2) Excavating around an existing protective reinforced or engineered structure for access
(3) Sloping or benching operations in recovery operations, or where an existing trench collapse, due to running, saturated, or extremely unstable soil conditions, cannot be safely shored or protected
(4) Lifting or moving a heavy load, where other options are not feasible
(5) Utilization as a high-point anchor for rope rescue systems (carefully monitored)

The suitability of the operator to complete a rescue operational objective is based, subjectively at times, on his/her experience, training, recommendation by peers, familiarity to

rescuers, and a calm, professional demeanor in an often emotionally charged situation. The incident commander should maintain control of the scene.

A.11.3.6 Trench rescue by nature is a time-consuming endeavor. The time can be minimized by careful planning and division of the tasks that need to be performed simultaneously. The rescuers in the trench should identify the tools needed to disentangle the victim. These tools can be limited to shovels to remove entrapping soil or can include exothermic torches, air bags, and cribbing, depending on the nature of the entrapment. There should be rescuers assigned topside to assemble, prepare, and deploy whatever resources are necessary to complete disentanglement (i.e., extrication sector).

Any unwarranted delay can severely affect the survivability of the victim. In addition, an EMS resource should be assigned so that information on victim injuries and stabilization equipment can be processed and so that treatment can be initiated and maintained. The treatment of crush syndrome must begin *before* the victim is released from the offending compressive weight, or the victim will quickly succumb to the effects of the toxins released into the bloodstream.

A.12.2.1 To ensure a safe disentanglement or extrication operation, the AHJ should provide training on the following topics as part of the planning process:

(1) Weight estimation
(2) Construction and materials of small machinery
(3) Identification of tension and compression forces
(4) Pneumatic high-, medium-, and low-pressure lifting bags
(5) Categories of mechanical injury
(6) Various ground-based stabilization techniques
(7) Center of gravity and its relationship to rollover
(8) Use of cribbing, chocks, and box cribbing
(9) Proper use of shackles and slings (including wire rope, chain, and synthetic rope of various types and styles)
(10) Types and examples of levers for mechanical advantage
(11) Proper and effective use of hand tools, including a hammer, wrenches, sockets, screwdrivers, pry bars, saws, a cable cutter, jacks, and a come-along
(12) Disentanglement through primary access points
(13) Patient packaging prior to removal from a machine
(14) Protection of the victim during extrication or disentanglement operations
(15) Proper and effective use of power tools, such as hydraulic, pneumatic, and electrical spreading, cutting, lifting, and ram-type tools
(16) Lockout/tagout of machinery
(17) Identification and use of various sling configurations
(18) Steps to lift and/or move an object

A.12.2.2 The intent of 12.2.2 is to establish working zones in, around, or near a working incident. It is expected that the established zones function with the AHJ incident management systems currently in place.

A.12.2.3 The intent of 12.2.3 is to provide fire control measures and teams at the scene of working rescue incidents. The type and scope of these measures will vary depending on the incident as well as any potential rescue tools and tactics used in the extrication effort. In all cases, an independent entity (such as a team, a company, or an individual) should be dedicated to identifying potential sources of explosion, fire, or thermal hazard and be equipped and positioned to immediately extinguish or mitigate the hazard.

A.12.2.4 In this case, "stabilization" is meant to imply stabilization from unintended or unwanted movement; uncontrolled movement of machinery components can cause extremely hazardous and potentially fatal situations. Responding personnel should be familiar with, and trained in, techniques for stabilizing and removing the potential for movement of machinery components. The five directional movements to be considered during the stabilization process are defined as follows:

(1) *Horizontal Movement.* Machine moves forward or rearward on its longitudinal axis or moves horizontally along its lateral axis.
(2) *Vertical Movement.* Machine moves up and down in relation to the ground while moving along its vertical axis.
(3) *Roll Movement.* Machine rocks side to side while rotating about on its longitudinal axis and remaining horizontal in orientation.
(4) *Pitch Movement.* Machine moves up and down about its lateral axis, causing the object's front and rear portions to move left or right in relation to their original position.
(5) *Yaw Movement.* Machine twists or turns about its vertical axis, causing the object's front and rear portions to move left or right in relation to their original position.

For Level I, stabilization would include basic techniques such as cribbing, blocking, and wedging components against unwanted movement.

A.12.2.5 It is the intent of the committee that rescue personnel control hazards by de-energizing or controlling, where possible, machinery power and stored energy systems that pose hazards to rescuers or victims. These systems can include components such as electrical, fuel, chemical, hydraulic, mechanical, and pneumatic systems. When controlling hazards, care should be taken not to eliminate the potential use by rescuers of beneficial systems, such as ventilation, machinery movement and positioning controls, restraint retractors, or other devices that would enable more efficient operations. These hazards include the following:

(1) *Utilities.* Control of the utilities in and around a machinery search and rescue incident is critical to ensure the safety of responding personnel and victims. The AHJ should provide its members with training in the control of these services to provide a safe environment in which to operate and to ensure the safety of victims. The following utilities should be considered when providing training:
    (a) Electrical services (primary and secondary)
    (b) Gas, propane, fuel oil, or other alternative energy sources (primary systems)
    (c) Water
    (d) Sanitary systems
    (e) Communications
    (f) Secondary service systems (such as compressed, medical, or industrial gases)
(2) *Hazardous Materials.* Machinery rescue incidents might include various materials that, when released during an incident, could pose a hazard to victims and responders. The AHJ should provide members with training in the recognition of potential hazardous material releases, the determination of an existing hazard, and the methods used to contain, confine, or divert hazardous materials to conduct operations safely and effectively.

(3) *Release of High-Pressure Systems.* Machinery often includes high-pressure systems (e.g., hydraulic, pneumatic) that can fail without warning. Such failure can cause extremely hazardous conditions, injury, and death of victims and responders. The AHJ should provide members with training in the recognition of potential high-pressure system hazards, the determination of an existing hazard, and the methods used to contain, confine, or divert such hazards to conduct operations safely and effectively.
(4) *Personal Hazards.* At the site of any machinery search and rescue incident, many dangers exist that pose personal injury hazards to the responders. The AHJ should train members to recognize the personal hazards they encounter and to use the methods needed to mitigate these hazards to help ensure member safety. Every member should be made aware of hazards such as trips, falls, blows, cuts, abrasions, punctures, and impalement.

A.12.2.11 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.12.3.1 It is the intent of the committee that the differentiation between Level I and Level II incidents correlate to both the environment in which the rescue is to be conducted as well as the level or degree of entrapment. It is recommended that provider agencies develop clear guidelines for making this determination based on the AHJ's resources and capabilities.

Level I rescue skills are applicable to vehicle or machinery events that involve simple or small machinery, that are limited to digital entrapment of the victim, and that involve environments where rescuer intervention does not constitute a high level of risk to either the victim or rescuers, based on the environment or other factors.

Level II skills apply to those incidents that involve heavy machinery; the application of complex extrication processes; the presence of multiple uncommon concurrent hazards; or situations including more than digital entrapment of a victim.

A.12.3.2 Stabilization of large, heavy, or complex machines requires more advanced techniques and specialized resources, including the following:

(1) Use of commercial heavy wreckers or crane services to assist at incidents involving large machinery
(2) Use, care, and maintenance of power winches
(3) Establishment of an anchor over the responde's head
(4) Shoring

A.13.1.2 Personnel operating at awareness level need to be able to recognize hazardous situations and rescue problems that are beyond their capabilities. In these situations, awareness-level responders need to know where and how to request operations- or technician-level resources to manage difficult mine and tunnel rescue incidents. See Annex H for a full list of hazards and a better understanding of situations that can require an operations- or technician-level response.

Size-up conditions in a cave incident have to be evaluated beyond the normal emergency response since many will occur far below the surface. Critical background information has to, at a minimum, include the following:

(1) Schematic drawings of the spaces
(2) Known or potential hazards from the space as well as the equipment working within the space
(3) Number of workers and their potential positions based on job type
(4) Access/egress problems
(5) Environmental problems either naturally occurring or man-made
(6) Special rescue resource availability
(7) Risk/benefit analysis based on information that has been gathered

A.13.1.3 A prebriefing should include, but is not limited to, information regarding the following:

(1) Tactical assignments with explicit instructions
(2) General hazards and safety instructions
(3) Communications protocols, procedures, and details
(4) Anticipated environmental concerns
(5) Time frames for operations
(6) Emergency procedures
(7) Specific equipment needs
(8) Debriefing procedures
(9) Anticipated logistical needs

Documentation for entry operations, as a minimum, should include the following:

(1) Development of some type of representation of IMS command structure
(2) Time of incident
(3) Total time of operation
(4) Environmental conditions
(5) Location of victim
(6) Creation of a tactical checklist that includes entry times, exit times, personal accountability reports, atmospheric readings, rehabilitation information, injuries sustained, and incident number

A.13.1.4 Support operations can include, but are not limited to, the following functional sectors in the incident management system:

(1) *Ventilation Group.* Monitors and ventilates personnel
(2) *Extrication Group.* Prepares for extrication methods and tactics
(3) *EMS Group.* Plans for ongoing patient care, transfer, and transport in coordination with the incident commander and receiving hospital
(4) *Support Group.* Can handle lighting, power, and environmental management
(5) *Cut Station.* Handles construction and fabrication of shoring materials

A.13.2.5 Maneuvering in a cave rescue environment involves extreme physical fitness and preparation. The obstacles found in the cave environment might differ depending on regional location, but nearly all caves include movement in three dimensions.

Crawling, bouldering, and chimneying are commonplace ways to move through spaces and voids. The use of helmet-mountable lighting is essential, and utilizing kneepads and elbow pads will help during extended operations.

Chances of being injured are reduced by danger awareness and by knowledge of equipment and techniques. Statistically, caving accidents are mostly attributed to poor judgment, little or no caving experience, or falls. The most common causes of caving accidents include falling, being struck by falling objects, and hypothermia, detailed as follows:

(1) *Falling:* To reduce the risk of falling, one should avoid jumping and uncontrolled sliding down slopes, wear proper footwear, check and discard any faulty or worn vertical equipment, and obtain proper training.
(2) *Falling Objects:* Injury caused by falling objects is best avoided by always wearing a helmet, staying clear of the base of drops and climbs, and securing all items of equipment so that they will not drop on cavers below.
(3) *Hypothermia:* If the temperature drops more than a few degrees, the body can no longer function properly. Extra clothing, a blanket, or other protection against the cold should be carried.
(4) *Other Hazards:* Not all caving problems involve injuries. A few people do get lost in caves, become stuck, or are unable to climb up a ledge or rope to get out of the cave. Exhaustion and a lack of light (or light failure) can cause someone to become lost who might otherwise have found their way out of the cave.

The committee recommends the following web sites for more information: http://www.caves.org/pub/aca/ and http://www.caves.org/safety/.

A.13.2.7 The role of an initial response team is to respond to a subject at a known location and to bring the highest level of medical assistance currently available to the subject(s); provide hypothermia protection; carry to the subject the initial equipment and materials required for subject evacuation, including equipment for raises and lowers if necessary; mark the trail to the subject for subsequent responders; sketch and note obstacles to the evacuation; advise command of findings; and begin evacuation of the subject.

A.13.2.8 The role of this communications task force is to develop a system of in-cave communications from the entrance to the subject, with appropriate communications stations along the way that will ensure effective communications between the various operational teams and command, ensure the safety of the rescuers, and provide information on the status of the subject and the rescuers.

A.13.2.9 The role of a search task force is to look for, preserve, record, and recover clues that will lead to finding the missing person or persons.

A.13.2.11 The role of the underground medical officer, or the medical task force, is to upgrade the level of care following the initial response, to continuously monitor and treat the physical condition of the subject during the evacuation and until transferred to hospital-based providers, to monitor the condition of the rescuers, and to notify command of findings. This resource is only deployed if the medical credentials or experience of the resource(s) are greater than those of the initial responders.

A.13.2.13 The role of rigging task forces is to develop a system of rappel and climbing lines. Rope rescue equipment used in the cave rescue environment typically falls under the requirements outlined in NFPA 1983.

A.13.2.14 The role of the patient evacuation team is to safely move the subject. This includes bringing the litter to the subject, if a litter is necessary for subject evacuation and this task has not already been performed; assisting the subject to walk out, or carrying the subject in the litter; rigging the litter, or the subject, for raises, lowers, and belays; monitoring subject packaging; ensuring good route finding; and ensuring that enough personnel remain in front of the subject to assure safe movement.

A.13.2.15 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.13.3.1 Considerations should be given for the need to manage a prolonged cave rescue operation in a primitive setting. Considerations can include relief crews, rehabilitation of rescuers, and provisions for waste management during long-term operations.

Although some consideration should be given to the assessment of potentially hazardous gaseous atmospheres, the rescuer should note the following when considering the need for ventilation:

(1) Caves typically self ventilate. Mechanical ventilation might be impossible, impractical, or even increase the risk to the rescuers.
(2) Atmospheric monitoring might be needed in a few regional caves. Contact local caving organizations for reports of bad air caves in the area.
(3) Bad atmosphere could be created by the rescuers themselves in special circumstances.

A.13.3.3 Assessment information used to formulate the incident action plan includes the following:

(1) Scope, magnitude, and nature of incident
(2) Location, number, and condition of victims
(3) Rescue versus recovery decision
(4) Access and egress points for the cave
(5) Environmental factors
(6) Resource requirements and availability
(7) Hazards and hazard control requirements
(8) Availability of accurate information

Incident action plans include measurable strategic objectives, tactical assignments to accomplish strategic goals, benchmark plans, safety plans, communications plans, and alternative tactical consideration. The use of outside experts should be incorporated into the incident action plan. Nearly all of cave, cliff, land search, or wilderness incidents involve one or more of the following tasks:

(1) Responding to the needs of a subject whose location is known

(2) Sharing information about the status of the mission, the rescuers, and the subject
(3) Evacuating injured persons
(4) Providing a system of rappel and climbing lines and raising and lower systems for the safe removal of the injured person or persons
(5) Searching for persons who are lost or overdue in a cave or surface environment
(6) Transferring equipment from the staging area to the rescue scene

The Incident Commander, or Operations Section Chief if one has been appointed, should assign and brief one or more of the following teams to manage these tasks:

(1) Initial response *(see A.13.2.7)*
(2) Search *(see A.13.2.9)*
(3) Communications underground *(see A.13.2.8)*
(4) Rigging *(see A.13.2.13)*
(5) Evacuation *(see A.13.2.14)*

Medical considerations can be addressed by operations either through a team *(see 13.2.11)* or using single resources. Equipment can be moved to the rescue site through the use of a team or teams *(see A.13.2.14)*.

A.14.1.2 Personnel operating at awareness level need to be able to recognize hazardous situations and rescue problems that are beyond their capabilities. In these situations, awareness-level responders need to know where and how to request operations- or technician-level resources to manage difficult mine and tunnel rescue incidents. See Annex H for a full list of hazards and a better understanding of situations that can require an operations- or technician-level response.

Size-up conditions in a mine or tunnel incident have to be evaluated beyond the normal emergency response since many will occur far below the surface. Critical background information has to, at a minimum, include the following:

(1) Schematic drawings of the spaces
(2) Known or potential hazards from the space as well as the equipment working within the space
(3) Number of workers and their potential positions based on job type
(4) Access/egress problems
(5) Environmental problems either naturally occurring or man-made
(6) Special rescue resource availability
(7) Risk/benefit analysis based on information that has been gathered

A.14.1.3 A prebriefing should include, but is not limited to, information regarding the following:

(1) Tactical assignments with explicit instructions
(2) General hazards and safety instructions
(3) Communications protocols, procedures, and details
(4) Anticipated environmental concerns
(5) Time frames for operations
(6) Emergency procedures
(7) Specific equipment needs
(8) Debriefing procedures
(9) Anticipated logistical needs

Documentation for entry operations, as a minimum, should include the following:

(1) Development of some type of representation of IMS command structure
(2) Time of incident
(3) Total time of operation
(4) Environmental conditions
(5) Location of victim
(6) Creation of a tactical checklist that includes entry times, exit times, personal accountability reports, atmospheric readings, rehabilitation information, injuries sustained, and incident number

A.14.1.4 Support operations can include, but are not limited to, the following functional sectors in the IMS:

(1) *Ventilation Group.* Monitors and ventilates personnel
(2) *Extrication Group.* Prepares for extrication methods and tactics
(3) *EMS Group.* Plans for ongoing patient care, transfer, and transport in coordination with the incident commander and receiving hospital
(4) *Support Group.* Can handle lighting, power, and environmental management
(5) *Cut Station.* Handles construction and fabrication of shoring materials

A.14.2.1 Size-up conditions in a mine and tunnel incident have to be evaluated beyond the normal emergency response since many will occur far below the surface. Critical background information has to, as a minimum, include the following:

(1) Schematic drawings of the spaces
(2) Known or potential hazards from the space as well as the equipment working within the space
(3) Number of workers and their potential positions based on job type
(4) Access/egress problems
(5) Environmental problems either naturally occurring or man-made
(6) Special rescue resource availability
(7) Risk/benefit analysis based on information that has been gathered

A.14.2.2 Scene safety zones will be established based on the involved area and the projected resources needed to control the incident. These should be easily identified work areas, regardless of the incident size or type, and should share some of the same characteristics, as follows:

(1) Well marked and easy to access
(2) Large enough to contain the equipment and personnel operating in the area
(3) Secure from media, general public, and non-essential personnel access
(4) With personnel accountability entry and exit points

A.14.2.3 Fire protection requirements for these incidents can be specialized and quite substantial. Pre-incident surveys by members who could be potentially operating in these environments are essential and should include some of the following factors:

(1) Built-in fire protection system might be available in certain applications. Personnel should be familiar with the type and activation mechanism for these systems.

(2) Logistics of equipment/personnel access should be evaluated and contingency plans established for additional entry points.
(3) Hazard recognition of existing and potential ignition sources.
(4) Ability to de-water a space during fire-fighting operations.

A.14.2.4 The intent of 14.2.4 is for the rescuer to anticipate additional atmospheric hazards during the rescue operation. Atmospheric monitoring information can be derived from several sources at the time of the incident. Rescuers should be in contact with the responsible person at the incident to determine what atmospheric records have been kept during the normal operation periods so they have a basis to determine the projected hazard levels.

A.14.2.5 Each space will have specific airflow needs based on size, air hazards, and air change requirements. Rescuers need to be familiar with the methods and procedures to support, maintain, or re-establish air movement within the space(s) utilizing in-place air movement systems. Rescuers also need to be familiar with the types, uses, applications, and limitations of auxiliary air movement equipment used in these spaces.

A.14.2.6 Tunnels under construction and former mines pose unique hazards and challenging working conditions that could be unfamiliar to potential rescuers. Skills, tools, and capabilities to manage the risks posed by this environment can be highly specialized and are not commonly found in most operations-level or even technician-level technical rescue tool kits for other disciplines. Since teams with access to these expanded capabilities are more unique, they often have longer reflex and response times, even beyond those associated with technician-level resources in other disciplines. This potential for delay in service could either expose rescuers at the scene to additional risk by attempting to perform a rescue without fully comprehending the hazards or by increasing the risk to the victim or the public by deferring any action until arrival of technician-level resources. While this is a problem common to many technical rescue disciplines, the gap is even more pronounced in the tunnel and mine environment. To help reduce the risks to the responders at this level while enabling a designated scope of service delivery under specific conditions, a comprehensive survey and pre-rescue plan needs to be present and physically exercised prior to deploying resources at this level. The pre-rescue plan clearly establishes conditions for entry for rescue at the operations-level and the specific methods to be employed. These conditions for entry will ultimately be established by the AHJ, but typically operations-level resources are limited to responding to emergencies in the space that can be definitively determined as not caused by, or otherwise affecting, the environment in the space. Resources at this level can conduct entry only if they can determine with a reasonable degree of certainty that there are no atmospheric hazards, fire, and collapse and that the rescue operations will not unintentionally introduce those hazards. Because each tunnel and space is unique, the elements of the pre-rescue plan must specifically identify how those conditions are established and outline the definitive criteria to allow entry. The operations-level resources shall then practice the pre-rescue plan and each member who might be required to enter the space shall be familiar with the actual work environment by physically being present in the space.

A.14.2.7 Individuals operating at the operations-level would not be expected to make entry into a tunnel or mine where an atmospheric hazard is known to exist. However, an entry team could be deployed and a subsequent hazard or condition might develop or be detected that would require immediate evacuation. In such cases the size of the space or length of tunnel might prevent safe egress before the individual is overcome by exposure of the toxic or oxygen-deficient atmosphere. Mining and tunneling regulations typically require all workers to have access to self rescuers or self-contained self rescuers for use in an evacuation. In some cases emergency response agencies that do not have access to such devices have used conventional open circuit SCBA, requiring entrants to carry them with them and don them in the event of an emergency. Care must be taken to ensure that the service life of the SCBA exceeds the potential time it might take to make egress or reach an area of refuge under emergency conditions.

A.14.2.8 The technician should have thorough knowledge of the components necessary to assemble an incident action plan (IAP) for the incident. Working under the Incident Commander (IC) or Planning Section Chief, the rescuer must assemble the information that is available from the size-up and anticipate additional needs of the incident.

A.14.2.11 Many state and federal regulations require teams performing tunnel and mine rescue operations to meet certain specific criteria including, but not limited to, the following:

(1) Use of SCBA with a minimum service life of 2 hours for entry into hazardous atmospheres, with entrants trained in the donning, care, and use of SCBA
(2) Access to egress-only respiratory protection devices by all entrants into the space
(3) Secured means of access and egress

It is the intent of this section that the Level I rescuer have the skills to make entry into a mine or tunnel with a very low hazard profile, typically excluding any entries where the hazards are unknown or where they are directly related to the space or environment.

A.14.2.15 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.14.3.1 The intent of this requirement is to ensure that Level II technicians have evaluated and selected proper personal protective equipment (PPE) that includes, but is not limited to, long-duration closed circuit breathing apparatus (CCBA) and other specialized respiratory protective equipment. In addition to the use of PPE, additional concerns must be addressed, such as the physiological impact of long work cycles while using PPE and protracted exposure to the tunnel and mine environment.

A.14.3.2 The intent of 14.3.2 is for the technician to be able to coordinate resources from fire, rescue, EMS, and private sector in support of the IAP and maintain accountability, scene safety, and rescue activities. The technician should have strong command and control skills as well as the ongoing ability to forecast problems, develop contingency plans, maintain

personnel safety, and maintain an adequate resource level for the operation.

A.14.3.5 The technician is required to have the knowledge, skills, and abilities to utilize various systems for moving a heavy load. The distance for evaluations is 10 ft (30 m) . The technician should be aware of the mechanical advantage systems that could be available at the rescue scene.

A.14.3.7 The intent of 14.3.7 is for the rescuer to operate as a team member in the construction of shoring systems to stabilize the collapsed area of a mine or tunnel. The team member should have the following skills:

(1) Hazard recognition and escape procedures
(2) Common and specialty tool knowledge and application
(3) Shoring construction methods
(4) Load limitations for shoring systems
(5) Ability to work with specialized resources and personnel

A.14.3.9 Because of the limited work area in these situations and the unique vehicles that can be found in these environments, the technician needs to be familiar with specific support procedures used in these incidents and how they differ from the similar types of abovegrade rescues.

A.15.2.7 The committee recognizes that due to incident complexity, technician-level skills might be required to terminate some incidents. Examples would be complex stabilization issues, multiple concurrent hazards, industrial processes involved, presence of fatalities or multiple injuries, or chemical releases.

A.16.1 This section is for rescue situations with water moving less than 1 knot. Awareness-level water rescue skills are applicable only to survival swimming skills and support of water rescue operations.

A.16.2 This section is for rescue situations with water moving less than 1 knot. Operations-level water rescue skills are applicable only to basic swimming and support of technician-level water rescue.

A.16.2.1 Water environments can include, but are not limited to, swiftwater, still water, ice-covered water, and tidal water. Rescuers should demonstrate the requisite knowledge of each water environment anticipated within the geographical confines of the AHJ and their associated tactical and safety considerations as part of this competency.

A.16.2.2 Temperature extremes include both hypo- and hyperthermia. Personal protective equipment users have to be aware of the potential for either condition to develop strategies for avoidance and recognition. Adequate flotation is dependent upon the mode of operation. As an example, for surface rescue, positive buoyancy is desired, whereas for underwater operations, neutral buoyancy should be maintained. Proper fit of personal protective equipment is determined by the manufacturers' specifications and related documentation; the primary intent is that the safety and efficiency of the rescuer is not impaired or the garments' capabilities exceeded.

The AHJ should utilize personal protective equipment appropriate to the conditions present in its response area, as well as based on the scope of its operations. In considering personal protective equipment selection, the following factors should be addressed:

(1) Flotation (buoyancy)
(2) Insulation from cold water exposure
(3) Protection from physical hazards (e.g., abrasion, cuts, tears, punctures)
(4) Visibility
(5) Garment form, fit, and mobility
(6) Limited chemical and biological protection (e.g., from bloodborne pathogens) *(see FEMA document FA 136, Protective Clothing and Equipment for Emergency Responders for Urban Search and Rescue Missions)*
(7) Provision of "low-profile" helmets (i.e., helmets without a brim on the back) utilized in the water rescue environment to avoid possible cervical spine hyperextension or hyperflexion injuries, as well as to provide protection from blunt force trauma

A.16.2.2(B) Selection of water rescue personal protective equipment, so that the rescuer will be protected from temperature extremes and blunt trauma, the rescuer will have flotation for tasks to be performed, swimming ability will be maximized during rescue activities, self-rescue needs have been evaluated and provided for has been established, and a means of summoning help has been provided.

A.16.2.3 *Active Search Measures*: Of primary and immediate importance is locating the point last seen (PLS) of the missing subject. Sometimes the reporting person (RP) will have no direct knowledge of what happened. For example, the RP might be a family member reporting a group of canoeists overdue at a takeout. At other times the RP will have witnessed a river accident such as a raft overturning or a fisherman being swept away, and will be able to give a description of the victims, and a fairly exact PLS. RPs should be interrogated for all information they might have about the victim, to include physical description, clothing, destination, experience, time the incident occurred, and any other details that might help the search (e.g., the type of shoes, in order to aid the trackers).

Passive Search Measures: The searches at this point are detailed, formal searches, not hasty ones. It is better to have small, trained groups of searchers thoroughly search an area repeatedly than to search with large groups of untrained people, since these frequently trample more evidence than they find. As the search progresses, the incident commander should debrief team leaders frequently and revise the search plan as necessary.

A.16.2.6 Both throw-rope deployments should be conducted sequentially, to the same victim, within a span of approximately 40 seconds to a victim 12.19 m (40 ft) away from the rescuer.

A.16.2.7 See A.16.2.6.

A.16.2.8 The committee's intent is for the candidate to know what procedures are used when using watercraft in their jurisdiction, or at least basic watercraft deployment and recovery techniques, even if the AHJ does not have its own watercraft. This includes the rescuer's role on the boat, nomenclature, and use of emergency/safety equipment (fire extinguishers, flares, flotation devices, etc.). The committee understands that not all water rescue teams have boats and not all boat operators are knowledgeable about deploying rescuers. In this case, the technician should be able to act as a liaison between the team and the boat operator.

A.16.2.9 While helicopters are not universally available to water rescuers and there are many restrictions on the use of aircraft for rescue, they are nonetheless frequently drafted for improvised rescues during times of crisis. Therefore, water rescue teams and the supporting helicopter services should plan for the use of helicopters that can be called upon during these crises to identify capabilities and limitations of the team and the helicopter service, to train in those procedures that all parties agree are within their collective skill levels and for which they are equipped, and to draft protocols that will define exactly what procedures the helicopter service will be called upon to perform and the criteria for that decision.

A.16.2.10 It is the intent of the committee that the watercraft operator be required to perform a range of skills that demonstrate the operator's ability to control the craft in challenging or adverse conditions, to recover from a loss of power or primary means of propulsion, to right an overturned craft, to cast and recover rescuers and victims, to dock with fixed points and other watercraft, and to tow a disabled watercraft to safety. The specific evolutions required to demonstrate this level of proficiency should be defined by the AHJ.

All personnel (including the operator) should be competent in the use of self-rescue practices and procedures applicable to the scope of operation, including, but not limited to, drown-proofing, swiftwater self-rescue, current considerations (rip current, etc.), and basic swimming skills as identified by the AHJ.

These requirements should be applied in the same manner that apparatus operators must meet specific knowledge and skill requirements based on the type of apparatus being operated *(see NFPA 1002)*.

A.16.2.14 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.16.3 This section is for rescue situations with water moving less than 1 knot. Operations-level water rescue skills are applicable only to basic swimming and support of technician-level water rescue.

A.16.3.1 A realistic evaluation of the rescuer's water survival skills should be conducted by the AHJ to meet this requirement. It is recommended that the AHJ use an annual swim test that meets or exceeds the IADRS Annual Watermanship Test. Example: Swim 91.4 m (100 yards) unassisted with any stroke, no time limit, and tread water for 10 minutes.

A.16.3.2 The committee includes the IADRS Annual Watermanship Test *(see Annex K)* as an example of a method of evaluating swimming surface rescue as it applies to this standard but recommends that rescue swimmers conduct the "tow" exercise with the appropriate PPE used for surface water rescue, not SCUBA.

A.17.2.4 A hazard and risk analysis is needed when operating as a rescuer when applying shore-based rescue techniques. The rescuer might need to enter the hot zone (i.e., moving or standing water) to assist a distressed victim for removal purposes. Without proper consideration of the water's edge topography, water conditions, depth, current flow, and the ability of the rescuer to swim, there is potential for the rescuer to become a victim. Not every shore-based rescue will be mitigated from land-based operational zones.

A.17.2.5 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.18.2.2 Resources should include the consideration of high-tech electronics such as sonar, underwater video, ROV units, and the use of canine teams.

A.18.2.3 The committee's intent is for the candidate to know the procedures for using watercraft in the AHJ's jurisdiction, or at least basic watercraft deployment and recovery techniques, even if the AHJ does not have its own watercraft. This includes the diver's role on the boat, nomenclature, and use of emergency/safety equipment (fire extinguishers, flares, flotation devices, etc.). The committee understands that not all dive teams have boats and not all boat operators are knowledgeable about deploying divers. In this case, the technician should be able to act as a liaison between the team and the boat operator.

A.18.2.5 Drowned victims can be treated as potential homicides until proven otherwise. Therefore, the search area should be treated as a potential crime scene and appropriate evidence secured and documented *(see Figure A.18.2.5)* according to AHJ protocol.

A.18.2.7 The committee's intent is that this JPR should measure the technical rescuer's ability to assist (or rescue) other divers, including his/her buddy, on the surface. Surfaced divers, because of the nature of their injuries or the equipment they are using, can require specialized assistance.

A.18.2.8 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

DIVE SITE DIAGRAM

Department Name:

Incident location: **Date:**

GPS coordinates: **Lat:** **Long:**

Access locations:

Type of access: **What was found/recovered:**

Conditions

- ❑ Weather _____
- ❑ Surface _____
- ❑ Current _____
- ❑ Visibility _____
- ❑ Water temp. _____
- ❑ Thermocline _____
- ❑ Surf _____
- ❑ High tide _____
- ❑ Low tide _____
- ❑ Depth where evidence was found _____

Witness name and phone

- ❑ 1 _____
- ❑ 2 _____
- ❑ 3 _____
- ❑ 4 _____

Scene diagram

Number indicates witness location.
Letter indicates evidence location.

Not to scale

Completed by:

FIGURE A.18.2.5 Sample Form for Dive Site Diagram.

A.18.3 The committee is of the opinion that Advanced Open Water certification provided by most nationally recognized certifying agencies (agencies associated with the Recreational SCUBA Training Council) build an acceptable foundation for the basic SCUBA skills required for dive technical rescuer. These courses do not, however, offer all of the skills required to meet these standards, and further training and experience in special hazards expected to be encountered in the AHJ's territory should be sought.

Candidates should have experience diving in various environments by taking additional specialties. Examples of specialties include ice, current, hazardous materials, dry suit, and lifting operations. Annual confirmation of these skills should be performed to ensure continued competency.

Candidates should demonstrate leadership skills similar to that of a "Divemaster" as defined by the Recreational SCUBA Training Council. The dive technical rescuer should have documented substantial dive experience in varied environments and have the ability to supervise and lead others. These personnel should also be able to employ checklists to identify pre- and post-dive needs.

Examples of specialty diving include dry suit, full face mask, underwater communications, deep diving, night and limited visibility, current, polluted water, leadership, lifting, cave, surface supplied, and ice.

A.18.3.2 Examples of personal protective equipment utilized in dive rescue are buoyancy control devices, masks, fins, snorkels, regulator sets (including first and second stages), redundant air systems, consoles (with submersible pressure gauge, depth gauge, dive timer), thermal protection, and lighting systems. Figure A.18.3.2 is an illustration of a pre-dive safety checklist.

A.18.3.3 The committee recommends the diver perform these skills in a blacked-out mask to test ability to perform in a low-visibility environment. The reason this is being done in a pool or confined water environment is so that the student can be observed for problems prior to being exposed to the actual low-visibility environment. These skills involve locating and utilizing personal emergency equipment (not limited to cutting devices, secondary air system, communications equipment, etc.) positioned according to AHJ protocols. PPE should include the use of dry suits.

A.18.3.4 The understanding of the committee is that candidates for this specialty should have obtained prior SCUBA certification and, as a result, have met basic watermanship requirements. The committee's opinion is that candidates should have the ability to swim a designated watercourse similar to the conditions that will be encountered in the AHJ's territory in order to determine the candidate's ability to perform self-rescue. The committee recommends that the skills involved in this test be more strenuous than what is expected for civilians to perform for enrolling in an open water SCUBA course.

An example of a Divemaster-level watercourse for watermanship would be a concurrent 365.76 m (400 yard) swim, 15-minute water tread or "drownproofing," 731.52 m (800 yard) swim using mask, fins, and snorkel, and a 91.44 m (100 yard) inert diver tow. At no point should the diver utilize flotation aids to assist in the swim. The inert diver is not permitted to assist in propulsion, but the task is not to be a "rescue" skill. See Figure A.18.3.4.

A.18.3.6 Examples of personal protective equipment utilized in dive rescue are buoyancy control devices, masks, fins, snorkels, regulator sets (including first and second stages), redundant air systems, consoles (with submersible pressure gauge, depth gauge, dive timer), thermal protection, and lighting systems.

A.18.3.8 The committee's intent is that this JPR should measure the technical rescuer's ability to assist (or rescue) other divers, including his/her buddy, at depth. Because of the nature of their injuries or the equipment they are using, some divers might require specialized assistance. Rescue divers must be cognizant of buoyancy and barotrauma issues in relation to the ascent of the diver they are trying to assist.

A.18.3.9 The committee's intent is that skills for this JPR should be performed in a controlled situation that replicates the worst conditions expected to be encountered in the AHJ's territory. The intent is to determine the candidate's ability to perform assigned tasks and to effect self-rescue. The skills involved in this test should be at least as strenuous as those expected to be demonstrated by civilians for Divemaster certification.

A.19.2.4 The committee recognizes that due to incident complexity, technician-level skills might be required to terminate some incidents. Examples would be complex stabilization issues, multiple concurrent hazards, industrial processes involved, presence of fatalities or multiple injuries, or chemical releases.

A.20.2.2 Surf (wave) heights are defined by the distance on the face, or front, of a wave from the trough (bottom) to the crest (top) just before the wave breaks. Low surf should be defined as surf that is found to be normal for the environment found in the AHJ. High surf can be described as being greater than normal for the environment found in the AHJ.

A.20.2.3 The term *nonmotorized watercraft* refers to items such as kayaks, surfboards, rafts, or boats.

A.20.2.4 Motorized watercraft includes items such as motorboats, Jet Skis, and other motorized personal watercraft.

A.20.2.5 The committee recognizes that due to incident complexity, technician-level skills might be required to terminate some incidents. Examples would be complex stabilization issues, multiple concurrent hazards, industrial processes involved, presence of fatalities or multiple injuries, or chemical releases.

A.21.1 This chapter outlines the requirement for use of both powered and nonpowered watercraft to perform rescue operations. The AHJ shall ensure its members that meet the requirements of this section do so in conditions representative of the waters and weather typical to the jurisdiction.

For the purposes of this chapter, a rescue watercraft includes powered and nonpowered vessels and craft that are intended to carry rescuers and victims. It is not intended to include rescue devices such as swim aids, paddle boards, and rescue boards that might accommodate a victim but are typically not classified as vessels or watercraft.

PRE-DIVE SAFETY CHECKLIST

Position	Name
Incident commander	
Safety officer	
Rescue group supervisor	
Line tender	
Diver	
Safety diver	

Buddy Checklist

- ❑ Buddy equipment check
- ❑ Hand signals
- ❑ Lost buddy/communications procedure
- ❑ Emergency ascent procedure
- ❑ Line signals
- ❑ Procedure for diver in need of assistance

Conditions

- ❑ Weather _____
- ❑ Surface _____
- ❑ Current _____
- ❑ Visibility _____
- ❑ Water temp. _____
- ❑ Thermocline _____
- ❑ Surf _____
- ❑ High tide _____
- ❑ Low tide _____

Safety Procedures

- ❑ Max. depth _____
- ❑ Max. bottom time _____
- ❑ Min. PSI to surfacing _____
- ❑ Direction _____
- ❑ Compass heading _____

Search

- ❑ **RESCUE VS. RECOVERY**
- ❑ Search pattern _____
- ❑ Review procedure for found object

Equipment Recommendations

- ❑ Tank size _____
- ❑ Suit _____
- ❑ Hood & gloves _____
- ❑ Mask/fins/snorkel/booties
- ❑ Weight belt
- ❑ BCD
- ❑ Regulator & alternate
- ❑ Depth gauge & pressure gauge
- ❑ Compass
- ❑ Communications device _____
- ❑ 2 cutting devices _____
- ❑ Other equipment: _____

_____

_____

Backup Diver Information

- ❑ Has recommended equipment
- ❑ Weight _____
- ❑ Pressure group start _____
- ❑ PSI start _____
- ❑ Safety diver ready _____
- ❑ PSI ending _____
- ❑ Pressure group ending _____

Primary Diver Information

- ❑ Has recommended equipment
- ❑ Weight _____
- ❑ Pressure group start _____
- ❑ PSI start _____
- ❑ Time on air _____
- ❑ PSI ending _____
- ❑ Pressure group ending _____

FIGURE A.18.3.2 Sample Pre-Dive Safety Checklist. (Courtesy of Dive Rescue International)

I.A.D.R.S. ANNUAL WATERMANSHIP TEST

Evaluation Parameters

There are five exercises that evaluate stamina and comfort in the water, each rated by points.
The diver must successfully complete all stations and score a minimum of 12 points to pass the test.
The test should be completed with not more than 15 minutes between exercises.

Exercise 1: 500 Yard Swim

The diver must swim 500 yards without stopping using a forward stroke and without using any swim aids such as a dive mask, fins, snorkel, or flotation device. Stopping or standing up in the shallow end of the pool at any point during this exercise will constitute a failure of this evaluation station.

Time to Complete	Points Awarded
Under 10 minutes	5
10–13 minutes	4
13–16 minutes	3
16–19 minutes	2
More than 19 minutes	1
Stopped or incomplete	Incomplete

Exercise 2: 15 Minute Tread

Using no swim aids and wearing only a swimsuit the diver will stay afloat by treading water, drown proofing, bobbing or floating for 15 minutes with hands only out of the water for the last 2 minutes.

Performance Criteria	Points Awarded
Performed satisfactorily	5
Stayed afloat, hands not out of water for 2 minutes	3
Used side or bottom for support at any time	1
Used side or bottom for support >twice	Incomplete

Exercise 3: 800 Yard Snorkel Swim

Using a dive mask, fins, snorkel, and a swimsuit (no BCD or other flotation aid) and swimming the entire time with the face in the water, the diver must swim non stop for 800 yards. The diver must not use arms to swim at any time.

Performance Criteria	Points Awarded
Under 15 minutes	5
15–17 minutes	4
17–19 minutes	3
19–21 minutes	2
More than 21 minutes	1
Stopped at any time	Incomplete

Exercise 4: 100 Yard Inert Rescue Tow

The swimmer must push or tow an inert victim wearing appropriate PPE on the surface 100 yards non stop and without assistance.

Performance Criteria	Points Awarded
Under 2 minutes	5
2–3 minutes	4
3–4 minutes	3
4–5 minutes	2
More than 5 minutes	1
Stopped at any time	Incomplete

Exercise 5: Free Dive to a depth of nine feet and retrieve an object

Performance Criteria	Points Awarded
Performed satisfactorily	Pass
Stopped or incomplete	Incomplete

Additional copies available at no charge via the International Association of Dive Rescue Specialists webpage. Visit www.IADRS.org

FIGURE A.18.3.4 Sample Divemaster-Level Watermanship Test. *(Courtesy of Dive Rescue International)*

This section is for rescue situations with water moving less than 1 knot. Awareness-level water rescue skills are applicable only to survival swimming skills and support of water rescue operations.

A.21.1.5 Technical rescuers should be familiar with the types of aircraft or helicopter services available to assist in their area, including operational standard operating procedure, equipment carried on the aircraft, safety and onboard aircraft systems and hazards associated with type-specific aircraft, and the ability to communicate via an established radio system with aircrews to complete a task or assignment (e.g., air medical evacuation or search). It is also expected that technical rescuers be aware of and provide for fire suppression in the event of an aircraft mishap while on location. *(See Figure A.7.2.4.)*

A.21.2 This section is for rescue situations with water moving less than 1 knot. Operations-level water rescue skills are applicable only to basic swimming and support of technician-level water rescue.

A.21.2.18 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner in which resources are transitioned out of an event require careful analysis to ensure that scene and rescuer safety are not compromised. Risk management strategies can include both active and nonintervention strategies, such as not removing (abandoning in place) equipment, denying entry to a site, and so forth. A large number of catastrophic events have occurred during the end or termination stages of such events when personnel are fatigued and resources are in a state of transition from active event participation to a return to service.

A.21.3 This section is for rescue situations with water moving less than 1 knot. Operations-level water rescue skills are applicable only to basic swimming and support of technician-level water rescue.

A.22.2 Rescuers performing functions in or around structures or vehicles should have appropriate training in the related disciplines. Although not all floodwater events have swiftwater conditions, many do, and the presence of moving water should always be considered.

A.22.2.2 Moving water has an impact on the human body both in its mechanical effects and accelerated heat transfer properties. The ability to gauge its speed is a key factor in determining the risks moving water poses to both the rescuer and victims. The contours of the terrain under the water can give indicators as to the best means of access as well as areas that might pose increased risks to the responder. The resources available to the rescuer for obtaining this necessary information include topo maps, charts, weather forecasts, local irrigation data, and flood control information.

Methods of flow calculations include putting markers in the water and measuring distance traveled over time. A list of basic calculations is shown in Table A.22.2.2.

A.22.2.6 Floodwaters typically contain human or animal sewage, dead or decomposing animal matter, and other biological factors and pathogens. Populated areas can also have household, agricultural, or industrial chemicals present in the water.

Table A.22.2.2 Basic Calculations for a Marker Float Traveling 100 ft Down Current

	Speed		
Time (sec)	**ft per sec**	**mph**	**knots**
5	20	13.6	12
10	10	6.8	6
15	6.7	4.5	4
20	5	3.4	3
25	4	2.7	2.4
50	2	1.4	1.2
100	1	0.7	0.6

While working in the floodwater environment, rescuers should limit their exposure to potentially contaminated water and practice good housekeeping methods to limit the potential for skin contact or ingestion.

All rescuers who work in or around floodwaters should follow basic hand- and face-washing protocols after completion of their duties prior to entering living, sleeping, or eating areas.

It is the intent of this chapter that, when engaged in protracted operations in floodwater rescue operations, the AHJ engage local hazardous materials teams or health departments to assess contamination hazards and provide decontamination services.

A.22.2.7 As structures flood, occupants instinctively seek higher elevations, often ending up in attics or upper stories with no way to exit the structure. They might also seek refuge under or on highway overpasses, trees, towers, power poles, roofs, or vehicles. Victims could also find themselves trapped inside vehicles that become partially submerged or float.

A.22.2.8 Differential pressure can build up as water is drawn or forced through confined spaces such as manholes, storm sewers, and drainage pipes. These situations might create conditions that cause rapid water movement and a suction effect that can trap rescuers. A good example of differential pressure is a typical bathtub drain.

Mechanical hazards might include signs, fences, vehicles, energy sources, and utilities that can continue to function even while submerged.

Local wildlife and domestic animals that might not normally pose a hazard to rescuers might pose a risk when displaced by the floodwaters. This could include poisonous snakes, alligators, or crocodiles.

Normally occupied flooded areas might pose challenges with respect to the security and safety of the rescuers from individuals with criminal or harmful intent. Making provisions for the security of the team using law enforcement or military assets should be considered.

A.22.2.9 Floodwater incidents often eradicate, displace or cover landmarks such as buildings, roads, and signs typically used to provide orientation to search teams and to document the progress of the search. Rescuers might need to rely on improvised means of determining their location and marking their progress. Conventionally available GPS devices can be very useful tools in accomplishing these objectives. Teams can also use improvised markers such as posts or poles inserted into the ground or use what local features are still present, such as trees or power poles.

Rescuers might also need to adopt specialized techniques, such as using a pole to determine the location of submerged features, including curbs, holes, vehicles, and such.

A.22.3.1 Entry type rescue in this context might include rescuers entering the water to remove a victim or entering a structure to perform a search.

Rescuers should be cognizant of the potential requirement to breach and/or search inside flooded structures. Basic search techniques can be utilized, including the use of accountability systems, oriented searches, or search ropes. Rescuers should also be aware of the potential need for backup or rapid intervention crews.

Annex B Explanation of the Professional Qualifications Standards and Concepts of JPRs

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Explanation of the Professional Qualifications Standards and Concepts of Job Performance Requirements (JPRs). The primary benefit of establishing national professional qualifications standards is to provide both public and private sectors with a framework of the job requirements for emergency services personnel. Other benefits include enhancement of the profession, individual as well as organizational growth and development, and standardization of practices.

NFPA professional qualifications standards identify the minimum job performance requirements (JPRs) for specific emergency services levels and positions. The standards can be used for training design and evaluation; certification; measuring and critiquing on-the-job performance; defining hiring practices; job descriptions; and setting organizational policies, procedures, and goals.

Professional qualifications standards for specific jobs are organized by major areas of responsibility defined as "duties." For example, the fire fighter's duties might include fire department communications, fireground operations, and preparedness and maintenance, whereas the fire and life safety educator's duties might include education and implementation, planning and development, and evaluation. Duties are major functional areas of responsibility within a specific job.

The professional qualifications standards are written as JPRs. JPRs describe the performance required for a specific joband are grouped according to the duties of the job. The complete list of JPRs for each duty defines what an individual must be able to do in order to perform and achieve that duty.

B.2 The Parts of a JPR.

B.2.1 Critical Components. The JPR comprises three critical components, which are as follows:

(1) Task to be performed, partial description using an action verb
(2) Tools, equipment, or materials that are to be provided to complete the task
(3) Evaluation parameters and performance outcomes

Table B.2.1 gives an example of the critical components of a JPR.

B.2.1.1 The Task to Be Performed. The first component is a concise statement of what the person is required to do. A significant aspect of that phrase is the use of an action verb, which sets the expectation for what is to be accomplished.

B.2.1.2 Tools, Equipment, or Materials That Must Be Provided for Successful Completion of the Task. This component ensures that all individuals completing the task are given the same tools, equipment, or materials when they are being evaluated. Both the individual and the evaluator will know what will be provided in order for the individual to complete the task.

B.2.1.3 Evaluation Parameters and Performance Outcomes. This component defines — for both the performer and the evaluator— how well the individual should perform each task. The JPR guides performance toward successful completion by identifying evaluation parameters and performance outcomes. This portion of the JPR promotes consistency in evaluation by reducing the variables used to gauge performance.

B.2.2 Requisite Knowledge and Skills. In addition to these three components, the JPR describes requisite knowledge and skills. As the term *requisite* suggests, these are the necessary knowledge and skills the individual should have prior to being able to perform the task. Requisite knowledge and skills are the foundation for task performance.

B.2.3 Examples. With the components and requisites combined, a JPR might read similar to the following two examples.

B.2.3.1 Example: Fire Fighter I. Perform overhaul at a fire scene, given approved PPE, attack line, hand tools, flashlight, and an assignment, so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.

Table B.2.1 Example of a JPR

(1) Task to be performed	(1) Perform overhaul at a fire scene,
(2) Tools, equipment, or materials	(2) given approved PPE, attack line, hand tools, flashlight, and an assignment,
(3) Evaluation parameters and performance outcomes	(3) so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.

(A) Requisite Knowledge. Knowledge of types of fire attack lines and water application devices for overhaul, water application methods for extinguishment that limit water damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, signs of area of origin or signs of arson, and reasons for protection of fire scene.

(B) Requisite Skills. The ability to deploy and operate an attack line; remove flooring, ceiling, and wall components to expose void spaces without compromising structural integrity; apply water for maximum effectiveness; expose and extinguish hidden fires in walls, ceilings, and subfloor spaces; recognize and preserve signs of area of origin and arson; and evaluate for complete extinguishment.

B.2.3.2 Example: Fire and Life Safety Educator II. Prepare a written budget proposal for a specific program or activity, given budgetary guidelines, program needs, and delivery expense projections, so that all guidelines are followed and the budget identifies all program needs.

(A) Requisite Knowledge. Knowledge of budgetary process; governmental accounting procedures; federal, tribal, state, and local laws; organizational bidding process; and organization purchase requests.

(B) Requisite Skills. The ability to estimate project costs; complete budget forms; requisition/purchase orders; collect, organize, and format budgetary information; complete program budget proposal; and complete purchase requests.

B.3 Potential Uses for JPRs.

B.3.1 Certification. JPRs can be used to establish the evaluation criteria for certification at a specific job level. When used for certification, evaluation should be based on the successful completion of the JPRs.

The evaluator would verify the attainment of requisite knowledge and skills prior to JPRs evaluation. Verification could be through documentation review or testing.

The individual seeking certification would be evaluated on completion of the JPRs. The individual would perform the task and be evaluated based on the evaluation parameters and performance outcomes. This performance-based evaluation is based on practical exercises for psychomotor skills and written examinations for cognitive skills.

Psychomotor skills are those physical skills that can be demonstrated or observed. Cognitive skills cannot be observed but rather are evaluated on how an individual completes the task (process-oriented) or on the task outcome (product-oriented).

Performance evaluation requires that individuals be given the tools, equipment, or materials listed in the JPR in order to complete the task.

B.3.2 Curriculum Development and Training Design and Evaluation. The statements contained in this document that refer to job performance were designed and written as JPRs. Although a resemblance to instructional objectives might be present, these statements should not be used in a teaching situation until after they have been modified for instructional use.

JPRs state the behaviors required to perform specific skills on the job, as opposed to a learning situation. These statements should be converted into instructional objectives with behaviors, conditions, and degree to be measured within the educational environment.

While the differences between JPRs and instructional objectives are subtle in appearance, their purposes differ. JPRs state what is necessary to perform the job in practical and actual experience. Instructional objectives, on the other hand, are used to identify what students must do at the end of a training session and are stated in behavioral terms that are measurable in the training environment.

By converting JPRs into instructional objectives, instructors would be able to clarify performance expectations and avoid confusion caused by the use of statements designed for purposes other than teaching. Instructors would be able to add jurisdictional elements of performance into the learning objectives as intended by the developers.

Requisite skills and knowledge could be converted into enabling objectives, which would help to define the course content. The course content would include each item of the requisite knowledge and skills ensuring that the course content supports the terminal objective.

B.3.2.1 Example: Converting a Fire Fighter I JPR into an Instructional Objective. The instructional objectives are just two of several instructional objectives that would be written to support the terminal objective based on the JPR.

JPR: Perform overhaul at a fire scene, given approved PPE, attack line, hand tools, flashlight, and an assignment, so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.

Instructional Objective (Cognitive): The Fire Fighter I will identify and describe five safety considerations associated with structural integrity compromise during overhaul as part of a written examination.

Instructional Objective (Psychomotor): The Fire Fighter I will demonstrate the designed use of tools and equipment during overhaul to locate and extinguish hidden fires without compromising structural integrity.

B.3.2.2 Example: Converting a Fire and Life Safety Educator II JPR into an Instructional Objective. The instructional objectives are just two of several instructional objectives that would be written to support the terminal objective based on the JPR.

JPR: Prepare a written budget proposal for a specific program or activity, given budgetary guidelines, program needs, and delivery expense projections, so that all guidelines are followed and the budget identifies all program needs.

Instructional Objective (Cognitive): The Fire and Life Safety Educator II will list and describe the bidding process for the purchase of a published program using budgetary guidelines, program needs, and the guidelines established by local organizational procedures as part of a written examination.

Instructional Objective (Psychomotor): The Fire and Life Safety Educator II will lead in the purchase of a specific fire and life safety educational program by following the bidding process to completion, using local organizational guidelines, including budgetary procedures, program needs, and delivery expense projections.

B.4 Other Uses for JPRs. While the professional qualifications standards are used to establish minimum JPRs for qualification, they have been recognized as guides for the development of training and certification programs, as well as a number of other potential uses

These areas might include the following:

(1) *Employee Evaluation/Performance Critiquing.* The professional qualifications standards can be used as a guide by both the supervisor and the employee during an evaluation. The JPRs for a specific job define tasks that are essential to perform on the job, as well as the evaluation criteria to measure completion of the tasks.

(2) *Establishing Hiring Criteria.* The professional qualifications standards can be helpful in a number of ways to further the establishment of hiring criteria. The authority having jurisdiction (AHJ) could simply require certification at a specific job level, for example, Fire Fighter I. The JPRs could also be used as the basis for pre-employment screening to establish essential minimal tasks and the related evaluation criteria. An added benefit is that individuals interested in employment can work toward the minimal hiring criteria at local colleges.

(3) *Employee Development.* The professional qualifications standards can be practical for both the employee and the employer in developing a plan for the employee's growth within the organization. The JPRs and the associated requisite knowledge and skills can be used as a guide to determine additional training and education required for the employee to master the job or profession.

(4) *Succession Planning.* Succession planning addresses the efficient placement of individuals into jobs in response to current needs and anticipated future needs. A career development path can be established for targeted employees to prepare them for growth within the organization. The JPRs and requisite knowledge and skills could then be used to develop an educational path to aid in the employee's advancement within the organization or profession.

(5) *Establishing Organizational Policies, Procedures, and Goals.* The professional qualifications standards can be functional for incorporating policies, procedures, and goals into the organization or agency.

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Annex C An Overview of JPRs for Technical Rescue Personnel

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Technical Rescue Personnel. The matrices shown in Table C.1 are included to provide the user of the standard with an overview of the JPRs and the progression of the various levels found in the document. They are intended to assist the user of the document with the implementation of the requirements and the development of training programs using the JPRs.

Table C.1 Overview of JPRs for Technical Rescue Personnel

Rescue Section	Awareness	Operations	Technician
Tower Rescue	**4.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**4.2.1** Participate in a prerescue survey given a tower rescue preplan, the specific tower targeted in the preplan, an operations-level tower rescue tool kit, and a tower rescue team, so that the targeted elevation in the tower is attained using the tools and techniques designated for use during a rescue operations, all elements of the rescue plan are implemented, and the full scope of the plan is exercised.	**4.3.1** Direct a tower rescue team, given a tower rescue technician-level scenario, incident action plan, preincident plan data, and resources from the tower rescue tool kit, so that resources are deployed to best advantage, the incident action plan is supported, and objectives are attained.
	4.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**4.2.2** Isolate and manage exposure to potentially harmful energy sources found in erected structures, including power systems such as mechanical, radio frequency (RF), and electrical hazards, given lock-out tag-out (LOTO) equipment and construction materials and PPE, so that all hazards are identified, systems are managed, beneficial system use is evaluated, and hazards to rescue personnel and victims are minimized.	**4.3.2** Develop an incident action plan for a technician-level tower rescue incident on a structure that might accommodate only one rescuer, given an unfamiliar (not preplanned) tower rescue scenario, so that a climbing path plan is established in the absence of an integrated ladder, climbing pegs, or an integrated vertical lifeline, hazardous energy sources are identified and managed, fall protection is maintained throughout the event, anchor points are identified and utilized to best advantage, and the incident application plan objectives are met.
	4.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**4.2.3** Assess the integrity of the tower structure and related components, given an incident, a preclimb checklist, and an unobstructed climb path so that safe access to the victim is assured, and determine any integrated safety systems such as vertical lifelines (cable or rail type structure) are accessible.	**4.3.3** Ascend a simulated or actual tower to conduct a technician-level rescue, given an incident action and site safety plan, so that a pre-climb checklist is used, fall protection systems are utilized, horizontal lifelines are utilized, the rescuer transitions between structural elements of the tower and the rescue system, and the objectives of the incident action plan attained in a safe and expedient manner.
	4.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**4.2.4** Recognize, identify, and utilize typical fall protection and work positioning equipment used by climbers, given a specific tower structure, so that the victim can be transferred to the rescue system.	**4.3.4** Perform a technician-level ground-based tower rescue requiring the release of an entrapped victim from an elevated position, given an incident action plan, climbing plan, task-specific PPE, and resources from the tower rescue tool kit, so that the victim is released/transferred from an existing fall arrest system to one created by the rescuer, and the victim moved both horizontally and vertically a distance representative of demonstrating competency.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		4.2.5 Perform an ascent using proper PPE and safe climbing technique equipment, given an incident, so that access to the level of the victim is achieved.	**4.3.5** Perform a technician-level tower-based rescue requiring the release of an entrapped victim from an elevated position in excess or a height allowing for ground-based rescue, given an incident action plan, climbing plan, task-specific PPE, and resources from the tower rescue tool kit, so that the victim is released/transferred from an existing fall arrest system to one created by the rescuer and the victim is moved both horizontally and vertically a distance representative of demonstrating competency.
		4.2.6 Perform transfer between the ladder or climbing peg safety system, given an incident so that tie off is maintained, equipment is utilized, and procedures are followed as part of identified rescue plan. **4.2.7** Access a victim in a tower environment according to the rescue preplan, given an incident so that the risks from a fall are minimized or eliminated, the patient is accessed, and the objective is achieved **4.2.8** Perform removal of a victim suspended from rope, webbing, or integrated safety system in a tower environment, given an incident, methods requiring up to a 15-degree deviation from plumb and can be performed with a tag line and a rescue preplan, so that there is a means of removal of the victim to the ground, risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the elements of the preplan are maintained, and the objective is achieved. **4.2.9** Direct a team in removal of a victim suspended from rope, webbing, or integrated safety system in a tower environment given an incident, methods requiring up to a 15-degree deviation from plumb and can be performed with a tag line, a rescue preplan, a means of removal of the victim to the ground or other safe area, so that risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the elements of the preplan are maintained, and the objective is achieved. **4.2.10** Develop and adhere to contingency plans for when inclement weather or other factors make operations-level response ineffective or dangerous to rescuers, given an incident so that a risk/benefit decision can be made.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		4.2.11 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	
Rope Rescue	**5.1.1** Recognize the need for support resources, given a specific type of rescue incident, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operation facilitates rescue operational objectives.	**5.2.1** Perform size-up a rescue incident, given background information and applicable reference materials, so that the type of rescue is determined, the number of victims is identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**5.3.1** Direct a team in the operation of a rope rescue system to remove a victim stranded on or clinging to a natural or manmade feature in a high-angle environment, given a victim stranded on or clinging to a feature and a means of removal of the victim to the ground or other safe area, so that risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the victim is removed and is brought to a safe area for transfer to EMS.
	5.1.2 Recognize incident hazards and initiate isolation procedures, given scene control barriers, personal protective equipment (PPE), requisite equipment, and available specialized resources, so that all hazards are identified, resource application fits the operational requirements, hazard isolation is considered, risks to rescuers and victims are minimized, and rescue time constraints are taken into account.	**5.2.2** Inspect and maintain hazard-specific PPE, given clothing or equipment for the protection of the rescuers, cleaning and sanitation supplies, maintenance logs or records, and such tools and resources as are indicated by the manufacturer's guidelines for assembly or disassembly of components during repair or maintenance, so that damage, defects, and wear are identified and reported or repaired, equipment functions as designed, and preventive maintenance has been performed and documented consistent with the manufacturer's recommendations.	**5.3.2** Direct a team in the operation of a rope rescue system to remove a victim suspended from rope or webbing in a high-angle environment, given a victim suspended by a harness attached to anchored rope or webbing, systems for removal of the victim from the rope or webbing, and a means of removal of the victim to the ground or other safe area, so that risks to victims and rescuers are minimized, injury to the victim is minimized, the means of attachment to the rope rescue system is maintained, the victim is removed from the rope or webbing, and the victim is brought to a safe area for transfer to EMS.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	5.1.3 Recognize needed resources for a rescue incident, given incident information, a means of communication, resources, tactical worksheets, personnel accountability protocol, applicable references, and standard operating procedures, so that references are utilized, personnel are accounted for, necessary resources are deployed to achieve desired objectives, incident actions are documented, rescue efforts are coordinated, the command structure is established, task assignments are communicated and monitored, and actions are consistent with applicable regulations.	**5.2.3** Inspect and maintain rescue equipment, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, equipment replacement protocol, and organizational standard operating procedure, so that the operational status of equipment is verified and documented, all components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement protocol are correctly disposed of and changed.	**5.3.3**While suspended from a rope rescue system, perform the transfer and movement of a victim suspended from rope or webbing in a high-angle environment to a separate rope rescue lowering or mechanical advantage system, given a rope rescue system, a specified minimum travel distance for the victim, victim transfer systems, and specialized equipment necessary for the environment, so that risks to victims and rescuers are minimized; undesirable victim movement during the transfer is minimized; the means of attachment to the rope rescue system is maintained; the victim is removed from the static line and lowered or raised to a stable surface; victim positioning is managed to reduce adverse effects associated with suspension-induced injuries; selected specialized equipment facilitates efficient victim movement; and the victim can be transported to the local EMS provider.
	5.1.4 Initiate a discipline-specific search, given hazard-specific PPE, equipment pertinent to search mission, an incident location, and victim investigative information, so that search parameters are established; the victim profile is established; the entry and exit of all people either involved in the search or already within the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims are located as quickly as possible; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.	**5.2.4** Demonstrate knots, bends, and hitches, given ropes, webbing, and a list of knots used by the agency, so that the knots are dressed, recognizable, and backed up as required.	**5.3.4** Perform the activities of a litter tender in a high-angle lowering or raising operation, given a rope rescue system, a specified minimum travel distance for the litter tender, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to victims and rescuers are minimized; the means of attachment to the rope rescue system is secure; and the travel path is negotiated while minimizing risks to equipment or persons.
	5.1.5 Perform ground support operations for helicopter activities, given a rescue scenario/incident, helicopter, operational plans, PPE, requisite equipment, and available specialized resources, so that rescue personnel are aware of the operational characteristics of the aircraft and demonstrate operational proficiency in establishing and securing landing zones and communicating with aircraft personnel until the assignment is complete.	**5.2.5** Construct a single-point anchor system, given life safety rope and other auxiliary rope rescue equipment, so that the chosen anchor system fits the incident needs, meets or exceeds the expected load, and does not interfere with rescue operations, an efficient anchor point is chosen, the need for redundant anchor points is assessed and used as required, the anchor system is inspected and loaded prior to being placed into service, and the integrity of the system is maintained throughout the operation.	**5.3.5** Participate as a member of a team in the construction of a rope rescue system intended to move a suspended rescue load along a horizontal path to avoid an obstacle, given rescue personnel, life safety rope, rope rescue equipment, and a suitable anchor capable of supporting the load, so that personnel assignments are made and clearly communicated; the system constructed can accommodate the load; tension applied within the system will not exceed the rated capacity of any of its components' parts; a system safety check is performed; movement on the load is efficient; and loads can be held in place or moved with minimal effort over the required distance.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	5.1.6 Initiate triage of victims, given triage tags and local protocol, so that rescue versus recovery factors are assessed, triage decisions reflect resource capabilities, severity of injuries is determined, and victim care and rescue priorities are established in accordance with local protocol.	**5.2.6** Construct a multiple-point anchor system, given life safety rope and other auxiliary rope rescue equipment, so that the chosen anchor system fits the incident needs, the system strength meets or exceeds the expected load and does not interfere with rescue operations, equipment is visually inspected prior to being put in service, the nearest anchor point that will support the load is chosen, the anchor system is system safety checked prior to being placed into service, the integrity of the system is maintained throughout the operation, and weight will be distributed between more than one anchor point.	**5.3.6** Direct a team in the operation of a rope system to move a suspended rescue load along a horizontal path, given rescue personnel, an established system, a target for the load, a load to be moved, and PPE, so that the movement is controlled; the load is held in place when needed; operating methods do not stress the system to the point of failure; personnel assignments are made; tasks are communicated; and potential problems are identified, communicated and managed.
	5.1.7 Assist a team in operation of the haul line of a rope mechanical advantage system raising operation, given rescue personnel, an established rope rescue system, a load to be moved, and an anchor system, so that the movement is controlled; a reset is accomplished; the load can be held in place when needed; commands are followed in direction of the operation; and potential problems are identified, communicated, and managed.	**5.2.7** Conduct a system safety check, given a rope rescue system and rescue personnel, so that a physical/visual check of the system is made to ensure proper rigging, a load test is performed prior to life-loading the system, and verbal confirmation of these actions is announced and acknowledged before life-loading the rope rescue system.	**5.3.7** Climb, ascend, descend, and traverse natural features or man-made structures that require the use of climbing aids, positioning equipment, or fall protection systems to prevent the fall or unwanted movement of the rescuer, given the equipment used by the agency, and a task that reflects the anticipated rescue environment so that the objective is achieved, the rescuer can perform the required task, and fall protection is maintained.
		5.2.8 Place edge protection, given life safety rope or webbing traversing a sharp or abrasive edge, edge protection, and other auxiliary rope rescue equipment, so that the rope or webbing is protected from abrasion or cutting, the rescuer is safe from falling while placing the edge protection, the edge protection is secure, and the rope or webbing is securely placed on the edge protection.	**5.3.8** Interact with a person at height who is in an emotional or psychological crisis given an environment consistent with the mission of the agency, the policies and procedures of the organization, and a person in a crisis scenario so that the condition is recognized and communicated to the team, the rescuer is prevented from harm, and the actions of the rescuer do not escalate the incident.
		5.2.9 Construct a belay system, given life safety rope, anchor systems, PPE, and rope rescue equipment, so that the system is capable of arresting a fall, a fall will not result in system failure, the system is not loaded unless actuated, actuation of the system will not injure or otherwise incapacitate the belayer, the belayer is not rigged into the equipment components of the system, and the system is suitable to the site and is connected to an anchor system and the load. **5.2.10** Operate a belay system during a lowering or raising operation, given an operating lowering or mechanical advantage system, a specified minimum travel distance for the load, a belay system, and a load, so that the potential fall actor is minimized, the belay device system is not actuated during operation of the primary rope rescue system, the belay system is prepared for actuation at all times during the operation, the belayer is attentive at all times during the operation, the load's position is continually monitored, and the belayer moves rope through the belay device as designed.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		5.2.11 Belay a falling load in a high-angle environment, given a belay system and a dropped load, so that the belay line is not taut until the load is falling, the belay device is actuated when the load falls, the fall is arrested in a manner that minimizes the force transmitted to the load, the belayer utilizes the belay system as designed, and the belayer is not injured or otherwise incapacitated during actuation of the belay system. **5.2.12** Construct a fixed rope system, given an anchor system, a life safety rope, and rope rescue equipment, so that the system constructed can accommodate the load, is efficient, and is connected to an anchor system and the load, and a system safety check is performed and the results meet the incident requirements for descending or ascending operations. **5.2.13** Ascend a fixed rope in a high-angle environment, given an anchored fixed rope system, a specified minimum distance for the rescuer, a system to allow ascent of a fixed rope, a structure, a belay system, a life safety harness worn by the person ascending, and PPE, so that the person ascending is secured to the fixed rope in a manner that will not allow him or her to fall; the person ascending is attached to the rope by means of an ascent control device(s) with at least two points of contact; injury to the person ascending is minimized; the person ascending can stop at any point on the fixed rope and rest suspended by his or her harness; the system will not be stressed to the point of failure; the person ascending can convert his or her ascending system to a descending system; obstacles are negotiated; the system is suitable for the site; and the objective is reached. **5.2.14** Descend a fixed rope in a high-angle environment, given an anchored fixed-rope system, a specified minimum travel distance for the rescuer, a system to allow descent of a fixed rope, a belay system, a life safety harness worn by the person descending, and PPE, so that the person descending is attached to the fixed rope in a manner that will not allow him or her to fall; the person descending is attached to the rope by means of a descent control device; the speed of descent is controlled; injury to the person descending is minimized; the person descending can stop at any point on the fixed rope and rest suspended by his or her harness; the system will not be stressed to the point of failure; the system is suitable for the site; and the objective is reached.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		5.2.15 Demonstrate the ability to escape from a jammed or malfunctioning device during a fixed rope descent in a high-angle environment, given an anchored fixed-rope system with a simulated malfunctioning descent control device, a system to allow escape from the malfunctioning device, a belay system, a life safety harness worn by the person descending, and PPE, so that the person descending is attached to the fixed rope in a manner that will not allow him or her to fall; the person descending is attached to the rope by means of a descent control device; the means for escape will allow the rescuer to escape either upward or downward from the malfunctioning descent control device; injury potential to the rescuer is minimized; the system will not be stressed to the point of failure; the system is suitable for the site; and the objective is reached. **5.2.16** Construct a lowering system, given an anchor system, life safety rope(s), descent control device, and auxiliary rope rescue equipment, so that the system can accommodate the load, is efficient, is capable of controlling the descent, is capable of holding the load in place or lowering with minimal effort over the required distance, and is connected to an anchor system and the load. **5.2.17** Direct a lowering operation in a high-angle environment, given rescue personnel, an established lowering system, a specified minimum travel distance for the load, and a load to be moved, so that the movement is controlled, the load can be held in place when needed, operating methods do not stress the system to the point of failure, rope commands are used to direct the operation, and potential problems are identified, communicated, and managed. **5.2.18** Construct a simple rope mechanical advantage system, given life safety rope, carabiners, pulleys, rope grab devices, and auxiliary rope rescue equipment, so that the system constructed can accommodate the load, is efficient, and is connected to an anchor system and the load. **5.2.19** Direct a team in the operation of a simple rope mechanical advantage system in a high-angle raising operation, given rescue personnel, an established rope rescue system incorporating a simple rope mechanical advantage system, a specified minimum travel distance for the load, a load to be moved, and an anchor system, so that the movement is controlled, a reset is accomplished, the load can be held in place when needed, operating methods do not stress the system to the point of failure, commands are used to direct the operation, and potential problems are identified, communicated, and managed.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		5.2.20 Construct a compound rope mechanical advantage system, given a load, an anchor system, life safety rope, carabiners, pulleys, rope grab devices, and rope rescue equipment, so that the system constructed accommodates the load and reduces the force required to lift the load, operational interference is factored and minimized, the system is efficient, a system safety check is completed, and the system is connected to an anchor system and the load. **5.2.21** Direct the operation of a compound rope mechanical advantage system in a high-angle environment, given a rope rescue system incorporating a compound rope mechanical advantage system and a load to be moved, and a specified minimum travel distance for the load, so that a system safety check is performed; a reset is accomplished, and the movement is controlled; the load can be held in place when needed; operating methods do not stress the system to the point of failure; operational commands are clearly communicated; and potential problems are identified, communicated, and managed. **5.2.22** Negotiate an edge while attached to a rope rescue system during a high-angle lowering and raising operation, given a rope rescue system, a specified minimum travel distance for the rescuer, life safety harnesses, an edge to negotiate during the lower and haul, and specialized equipment necessary for the environment, so that risk to the rescuer is minimized; the means of attachment to the rope rescue system is secure; and all projections and edges are negotiated while minimizing risks to the rescuer or equipment. **5.2.23** Access, assess, stabilize, package, and transfer victims, given diagnostic and packaging equipment and an actual or simulated EMS agency, so that rescuers and victim are protected from hazards, the victim's injuries or illnesses are managed, and the victim is delivered to the appropriate EMS provider with information regarding the history of the rescue activity and victim's condition. **5.2.24** Direct a litter lowering and litter-raising operation in a low-angle environment, given rescue personnel, litter tender(s), an established lowering /mechanical advantage system, a specified minimum travel distance for the load and a victim packaged in a litter to be moved, so that the litter is attached to the lowering/raising and belay systems, movement is controlled; litter tender(s) are used to manage the litter during the lower and haul, the litter can be held in place when needed; operating methods do not stress the system to the point of failure; rope commands are used to direct the operation; and potential problems are identified, communicated, and managed.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		5.2.25 Operate as a litter tender in a low-angle lowering or raising operation, given a rope rescue system, a specified minimum travel distance for the litter tender, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to victims and rescuers are minimized; the means of attachment to the rope rescue system is secure; and the terrain is negotiated while minimizing risks to equipment or persons. **5.2.26** Direct a litter lowering or litter-raising operation in a high-angle environment, given rescue personnel, an established lowering/mechanical advantage system, a specified minimum travel distance for the load, a victim packaged in a litter to be moved and a means for negotiating edges and projections along the travel path, so that the litter is attached to the lowering/raising and belay systems, an edge is negotiated during a lower and raise; tag lines are used to manage the litter during the lower and haul, the litter can be held in place when needed; operating methods do not stress the system to the point of failure; rope commands are used to direct the operation; and potential problems are identified, communicated, and managed. **5.2.27** Terminate a technical rescue operation, given an incident scenario, assigned resources, and site safety data, so that rescuer risk and site safety are managed, scene security is maintained and custody transferred to a responsible party, personnel and resources are returned to a state of readiness, record keeping and documentation occur, and post event analysis is conducted.	
Structural Collapse Rescue	**6.1.1** Identify the need for structural collapse rescue, given a specific type of collapse incident, so that resource needs are identified and the emergency response system for structural collapse is initiated.	**6.2.1** Conduct a size-up of a light frame or unreinforced masonry (URM) collapsed structure, given an incident and specific incident information, so that existing and potential conditions within the structure and the immediate periphery are evaluated, needed resources are defined, hazards are identified, construction and occupancy types are determined, collapse type is identified if possible, the need for rescue is assessed, a scene security perimeter is established, and the size-up is conducted within the scope of the incident management system.	**6.3.1** Conduct a size-up of a collapsed heavy construction–type structure, given an incident and specific incident information, so that existing and potential conditions within the structure and the immediate periphery are evaluated, needed resources are defined, hazards are identified, construction and occupancy types are determined, collapse type is identified if possible, the need for rescue is assessed, a scene security perimeter is established, and the size-up is conducted within the scope of the incident management system.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	6.1.2 Size-up a collapse rescue incident, given background information and applicable reference materials, so that the scope of the rescue is determined, the number of victims is identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed and primary search parameters are identified, and information required to develop an initial incident action plan is obtained.	**6.2.2** Determine potential victim locations in light frame and URM construction collapse incidents, given size-up information, a structural collapse tool kit, the type of construction and occupancy, time of day, and collapse pattern, so that search areas are established and victims can be located.	**6.3.2** Determine potential victim locations in a heavy construction–type incident, given size-up information, a structural collapse tool kit, the type of construction and occupancy, time of day, and collapse pattern, so that search areas are established and victims can be located.
	6.1.3 Initiate the incident management system given a structural collapse incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, the incident action plan is developed.	**6.2.3** Develop a collapse rescue incident action plan, given size-up information and a light frame and URM construction collapsed structure, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.	**6.3.3** Develop a collapse rescue incident action plan, given size-up information and a heavy collapsed structure, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.
	6.1.4 Identify incident hazards, given scene control barriers, PPE, requisite safety equipment, and available specialized resources, so that construction type is determined, all associated hazards are identified, safety perimeter is established, hazard isolation is initiated,	**6.2.4** Implement a collapse rescue incident action plan, given an action plan and a light frame and URM construction collapsed structure, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.	**6.3.4** Implement a collapse rescue incident action plan, given an action plan and a heavy construction–type collapsed structure, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.
	6.1.5 Initiate a search, given PPE, an incident location, and victim investigative information, so that search parameters are established and include surface and non-entry void search, the information found is updated and relayed to command; the personnel assignments match their expertise; all victims are located as quickly as possible; risks to searchers are minimized; and accountability is achieved.	**6.2.5** Search a light frame and URM construction collapsed structure, given PPE, the structural collapse tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained. *(See also Annex E.)*	**6.3.5** Search a heavy construction–type collapsed structure, given PPE, the structural collapse tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	6.1.6 Apply the building marking system given a structural collapse incident, so that the search phase of the floor or structure is marked, victim locations and condition are applied to the area, hazards are noted on the structure, and the access and egress points are marked.	**6.2.6** Stabilize a collapsed light frame and URM construction structure as a member of a team, given size-up information, a specific pattern of collapse, a basic structural collapse tool kit, and an assignment, so that strategies to effectively minimize the movement of structural components are identified and implemented; hazard warning systems are established and understood by participating personnel; incident-specific PPE is identified, provided, and utilized; physical hazards are identified; confinement, containment, and avoidance measures are discussed; and a rapid intervention team is established and staged.	**6.3.6** Stabilize a collapsed heavy construction–type structure as a member of a team, given size-up information, a specific pattern of collapse, a basic structural collapse tool kit, and an assignment, so that strategies to effectively minimize the movement of structural components are identified and implemented; hazard warning systems are established and understood by participating personnel; incident-specific PPE is identified, provided, and utilized; physical hazards are identified; confinement, containment, and avoidance measures are discussed; and a rapid intervention team is established and staged.
	6.1.7 Perform triage of victims, given triage tags and local protocol, so that rescue versus recovery factors are assessed, triage decisions reflect resource capabilities, severity of injuries is determined, and victim care and rescue priorities are established in accordance with local protocol.	**6.2.7** Implement collapse support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.	**6.3.7** Implement collapse support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.
	6.1.8 Move a victim, given victim transport equipment, litters, other specialized equipment, and victim removal systems specific to the rescue environment, so that the victim is moved without further injuries, risks to rescuers are minimized, the victim is secured to the transfer device, and the victim is removed from the hazard.	**6.2.8** Release a victim from entrapment by components of a light frame and URM construction collapsed structure, given PPE and resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating the offending structural component, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.	**6.3.8** Release a victim from entrapment by components of a heavy construction–type collapsed structure, given PPE and resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating the offending structural component, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.
		6.2.9 Remove a victim from a light frame and URM construction collapse incident, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required, victim is evaluated for signs of crush syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.	**6.3.9** Remove a victim from a heavy construction–type collapse incident, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required, victim is evaluated for signs of crush syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.
		6.2.10 Lift a heavy load as a team member, given a structural collapse tool kit and a load to be lifted, so that the load is lifted; control and stabilization are maintained before, during, and after the lift; and access can be gained.	**6.3.10** Lift a heavy load as a team member, given a structural collapse tool kit and a load to be lifted, so that the load is lifted; control and stabilization are maintained before, during, and after the lift; and access can be gained.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		6.2.11 Move a heavy load as a team member, given a structural collapse tool kit, so that the load is moved the required distance to gain access and so that control is constantly maintained.	**6.3.11** Move a heavy load as a team member, given a structural collapse tool kit, so that the load is moved the required distance to gain access and so that control is constantly maintained.
		6.2.12 Breach light frame and URM construction structural components, given an assignment, PPE, various types of construction materials, and a structural collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.	**6.3.12** Breach heavy structural components, given an assignment, PPE, various types of construction materials, and a structural collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.
		6.2.13 Construct cribbing systems, given an assignment, PPE, a structural collapse tool kit, various lengths and dimensions of lumber, wedges, and shims, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.	**6.3.13** Construct cribbing systems, given an assignment, PPE, a structural collapse tool kit, various lengths and dimensions of lumber, wedges, and shims, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.
		6.2.14 Inspect and maintain hazard-specific PPE, given clothing or equipment for the protection of the rescuers, including respiratory protection, cleaning and sanitation supplies, maintenance logs or records, and such tools and resources as are indicated by the manufacturer's guidelines for assembly or disassembly of components during repair or maintenance, so that damage, defects, and wear are identified and reported or repaired, equipment functions as designed, and preventive maintenance has been performed and documented consistent with the manufacturer's recommendations.	**6.3.14** Stabilize a collapsed heavy construction–type structure as a member of a team, given size-up information, hazard-specific PPE, an assignment, a specific pattern of collapse, a structural collapse tool kit, specialized equipment necessary to complete the task, and engineering resources if needed, so that hazard warning systems are established and understanding by team members is verified, all unstable structural components that can impact the work and egress routes are identified, alternative egress routes are established when possible, expert resource needs are determined and communicated to command, load estimates are calculated for support system requirements, all shoring systems meet or exceed load-bearing demands, shoring systems are monitored continuously for integrity, safety protocols are followed, a rapid intervention crew (RIC) is established and staged to aid search and rescue personnel in the event of entrapment, an accountability system is established, atmospheric monitoring is ongoing, and progress is communicated as required.
		6.2.15 Inspect and maintain rescue equipment, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, equipment replacement protocol, and organizational standard operating procedure, so that the operational status of equipment is verified and documented, all components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement are correctly disposed of and changed out.	**6.3.15** Cut through structural steel, given a structural collapse tool kit, PPE, and an assignment, so that the steel is efficiently cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		6.2.16 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	**6.3.16** Coordinate the use of heavy equipment, given PPE, means of communication, equipment and operator, and an assignment, so that common communications are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.
Confined Space Rescue	**7.1.1** Recognize the need for confined space support resources, given a specific type of rescue incident, so that the confined space is recognized, a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operation facilitates rescue operational objectives.	**7.2.1** Initiate a search inside a confined space in those areas immediately visible from the confined space entry portal, given hazard-specific PPE, equipment pertinent to search mission, a confined space, and victim investigative information, so that search parameters are established; the victim profile is established; the people in or around the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims inside the space that are immediately visible from outside the portal are located and identified quickly; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.	**7.3.1** Initiate a search inside a confined space in those areas not immediately visible from the confined space entry portal, given hazard-specific PPE, confined space rescue entrant(s) to perform the search, equipment pertinent to search mission, a confined space, and victim investigative information, so that search parameters are established; the victim profile is established; search result information is acquired and relayed to command; the personnel assignments match their expertise; all victims inside the space are located and identified quickly; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.
	7.1.2 Recognize incident hazards and initiate isolation procedures, given scene control barriers, PPE, requisite equipment, and available specialized resources, so that all hazards are identified, resource application fits the operational requirements, hazard isolation is considered, risks to rescuers and victims are minimized, and rescue time constraints are taken into account.	**7.2.2** Perform size-up of a confined space rescue incident, given background information and applicable reference materials, so that the type of rescue is determined, the number of victims is identified, the last reported location of all victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**7.3.2** Preplan a confined space incident, given applicable guidelines and regulations and a preplan form, so that a standard approach is used during a confined space rescue emergency, hazards are recognized and documented, isolation methods are identified and documented, all accesses to the location of the confined space entry opening are identified and documented, all types of confined space entry openings are identified and documented, and internal configurations and special resource needs are documented for future rescuer use.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	7.1.3 Recognize the need for technical rescue resources at an incident, given incident information, a means of communication, resources, tactical worksheets, personnel accountability protocol, applicable references, and standard operating procedures, so that references are utilized, personnel are accounted for, necessary resources are deployed to achieve desired objectives, incident actions are documented, rescue efforts are coordinated, the command structure is established, task assignments are communicated and monitored, and actions are consistent with applicable regulations	**7.2.3** Conduct monitoring of the environment, given monitoring equipment reference material, PPE, accurately calibrated detection and monitoring equipment, and size-up information, so that a representative sample of the space is obtained, accurate readings are made, readings are documented, and effects of ventilation in determining atmospheric conditions and the conditions of the space have been determined for exposures to existing or potential environmental hazards.	**7.3.3** Apply and use supplied-air respirators (SAR) as a rescue entrant, given a confined space incident requiring respiratory protection, a rescue assignment, a means of entry into and exit from the space, a rescue attendant outside the space, personnel to manage air lines outside of the space, a SAR, a breathing air supply system with air lines to supply the SAR, breathing apparatus cylinders, personnel to monitor and maintain the air supply system and a confined space with the following characteristics: (1) the internal configuration of the space will not create entanglement hazards when using air lines, (2) the victim cannot be seen from the outside of the space's primary access opening, (3) the portal size and configuration will not allow a rescuer to pass through the access/egress opening(s) using SCBA when worn in the manner recommended by the manufacturer, and (4) all hazards in and around the confined space have been identified and may be mitigated by using respiratory protection; so that the rescue entrant passes through the portal without removal of the SAR and the assigned rescue duty is performed.
	7.1.4 Initiate a search in areas immediately adjacent to the space, given hazard-specific PPE, equipment pertinent to search mission, a confined space incident location, and victim investigative information, so that search parameters are established; the victim profile is established; the entry and exit of all people either involved in the search or already within the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims in the adjacent areas to the space are located as quickly as possible; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.	**7.2.4** Assess the incident, given size-up information, information from technical resources, monitoring equipment, and PPE required to perform the assessment, so that general area and space-specific hazards are identified, bystanders and victims are interviewed, immediate and ongoing monitoring of the space is performed, the victims' conditions and location are determined, a risk/benefit analysis is performed, methods of ingress and egress for rescuer and victims are identified, rescue systems for victim removal are determined, and an emergency means of retrieval for rescue entrants is established.	**7.3.4** Perform short spinal immobilization of a victim inside a confined space, given a confined space incident requiring spinal precautions, a stable victim, a short spinal immobilization device, a second rescuer to assist and a confined space with the following characteristics: (1) the portal size or internal configuration will not allow the application of a full spine immobilization device, and (2) all hazards in and around the confined space have been identified and might be mitigated by using respiratory protection; so that the victim's cervical spine is manually maintained in a neutral position immediately upon contact and maintained until the short immobilization device is completely applied and secure, victim movement onto the spinal immobilization device creates minimal manipulation of the spine, void spaces between the victim and immobilization device are padded as appropriate, victim securement to the immobilization device will reduce spinal manipulation during movement, applicable local treatment protocols are followed.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		7.2.5 Control hazards, given PPE and a confined space tool kit, so that the rescue area is established; access to the incident scene is controlled; rescuers are protected from exposure to hazardous materials and atmospheres, all forms of harmful energy releases, and physical hazards; and victims are protected from further harm.	**7.3.5** Prepare for entry into the confined space with a hazardous atmosphere, given a confined space with a hazardous atmosphere, atmosphere-supplied respirators, a confined space rescue tool kit, and a confined space that contains one or more of the following characteristics: (1) the internal configuration of the space could create entanglement hazards and retrieval might not be effective, (2) the victim cannot be seen from the outside of the space's primary access opening, (3) the portal size and configuration will not allow a rescuer to pass through the access/egress opening(s) using SCBA when worn in the manner recommended by the manufacturer, and (4) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that continuous atmospheric monitoring is initiated, the atmosphere is assessed to be manageable with atmosphere supplying respirators, victim communication is established when possible, atmosphere supplying respirators are used by rescue entrants while within the space, atmosphere supplying respirators are rapidly applied to the victim, rescuer readiness is verified, rescuers' limitations are identified and evaluated, rescuers unsuitable to entry operations are reassigned and replaced, route and methods of confined space entry are determined, and rescuer evacuation is planned.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		7.2.6 Apply and use self-contained breathing apparatus (SCBA) as a rescue entrant, given a confined space incident requiring respiratory protection, a rescue assignment, a means of entry into and exit from the space, a rescue attendant outside the space, SCBA, breathing apparatus cylinders and a confined space with the following characteristics: (1) the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, (2) the victim can be easily seen from the outside of the space's primary access opening, (3) rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer, (4) the space can accommodate two or more rescuers in addition to the victim, and (5) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that the rescue entrant passes through the portal without removal of the SCBA, the assigned rescue duty is performed, the rescue entrant frequently assesses the level of air remaining in the cylinder and communicates this level to rescuers outside of the space, and the rescue entrant exits the space prior to activation of the low-pressure alarm on the SCBA. **7.2.7** Apply an atmosphere supplying respirator to a victim, given a confined space incident requiring respiratory protection, a live victim, an atmosphere supplying respirator and associated equipment, and a confined space with the following characteristics: (1) the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, (2) the victim can be easily seen from the outside of the space's primary access opening, (3) rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer, (4) the space can accommodate two or more rescuers in addition to the victim, and (5) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that the apparatus face piece is applied rapidly, positioned properly on the face and without air leakage; application of the face piece can be performed simultaneously with spinal precautions; the breathing apparatus unit is securely placed during victim movement, the face piece will not be pulled from the victim's face during movement; the level of air remaining in the victim's breathing apparatus is frequently accessed and communicated, and the victim is removed from the space without interruption of the air supply.	**7.3.6** Enter a confined space with atmospheric hazards, given hazard specific PPE; safety, communication, and operational protocols; a confined space with a hazardous atmosphere, a confined space rescue tool kit so that the victim is contacted, and a confined space that contains one or more of the following characteristics: (1) the internal configuration of the space could create entanglement hazards and retrieval might not be effective, (2) the victim cannot be seen from the outside of the space's primary access opening, (3) the portal size and configuration will not allow a rescuer to pass through the access/egress opening(s) using SCBA when worn in the manner recommended by the manufacturer, and (4) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that a controlled confined space entry is established and maintained, the atmosphere is continuously monitored, the rescuers and patient(s) are protected from the hazards, the victim's mental and physical conditions are further assessed, patient care is initiated, the patient is packaged to restrictions of the space, and patient removal can be initiated.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		7.2.8 Perform full spinal immobilization of a victim inside a confined space, given a confined space incident requiring spinal precautions, a victim, full spinal immobilization equipment, a second rescuer to assist and a confined space with the following characteristics: (1) the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, (2) the victim can be easily seen from the outside of the space's primary access opening, (3) rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer, (4) the space can accommodate two or more rescuers in addition to the victim, and (5) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that the victim's cervical spine is manually maintained in a neutral position immediately upon contact and maintained until the body and head are completely immobilized and secure, victim movement onto the spinal immobilization device creates minimal manipulation of the spine, void spaces between the victim and immobilization device are padded as appropriate, victim securement to the immobilization device will prevent spinal manipulation during movement, applicable local treatment protocols are followed. **7.2.9** Prepare for entry into horizontally-oriented confined space; given a confined space rescue tool kit and a confined space with the following characteristics: (1) the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, (2) the victim can be easily seen from the outside of the space's primary access opening, (3) rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer, (4) the space can accommodate two or more rescuers in addition to the victim, and (5) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that victim communication is established when possible, continuous atmospheric monitoring is initiated, rescuer readiness is verified, rescuers' limitations are identified and evaluated, rescuers unsuitable to confined space entry operations are reassigned and replaced, route and methods of entry are determined, and rescuer evacuation is planned.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		7.2.10 Enter a horizontally-oriented confined space for rescue, given PPE; safety, communication, and operational protocols; portable lighting; and a confined space rescue tool kit, a retrieval system, and a confined space with the following characteristics: (1) the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, (2) the victim can be easily seen from the outside of the space's primary access opening, (3) rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer, (4) the space can accommodate two or more rescuers in addition to the victim, and (5) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that the victim is contacted, controlled confined space entry is established and maintained, atmosphere is monitored continuously, the victim's mental and physical conditions are further assessed, the rescue entrant is aided by portable lighting, rescue entrants are attached to retrieval lines at all times, patient care is initiated, the patient is packaged to restrictions of the space, and patient removal can be initiated. **7.2.11** Package the victim in a litter for removal from a horizontally-oriented confined space, given a confined space rescue tool kit, a litter and associated rigging equipment, a space that provides enough internal and external clearance to maneuver a litter in and around the space, so that the victim is secured to the litter, the litter is secured to the rescue system if needed, the litter will pass through the portal, the victim is protected during the extraction, and further harm to the victim is minimized. **7.2.12** Assemble a portable anchor system for application of a high point of attachment to a confined space rescue system given a portable anchor device, additional rescuers to assist in the assembly, and a vertically oriented space with a portal above which to set the portable anchor, so that the portable anchor is assembled in accordance with the manufacturer's recommendations, rescue systems are attached and secured to the anchor device and the portable anchor provides enough clearance above the portal to fully extract a victim packaged in a vertically-oriented litter.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		7.2.13 Prepare for entry into vertically-oriented confined space; given a confined space rescue tool kit and a confined space with the following characteristics: (1) the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, (2) the victim can be easily seen from the outside of the space's primary access opening, (3) rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer, (4) the space can accommodate two or more rescuers in addition to the victim, and (5) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that victim communication is established when possible, continuous atmospheric monitoring is initiated, rescuer readiness is verified, rescuers' limitations are identified and evaluated, rescuers unsuitable to confined space entry operations are reassigned and replaced, route and methods of entry are determined, and rescuer evacuation is planned. **7.2.14** Enter a vertically-oriented confined space for rescue, given PPE; safety, communication, operational protocols; a confined space rescue tool kit; and a confined space with the following characteristics: (1) the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, (2) the victim can be easily seen from the outside of the space's primary access opening, (3) rescuers can pass easily through the access/egress opening(s) with room to spare when PPE is worn in the manner recommended by the manufacturer, (4) the space can accommodate two or more rescuers in addition to the victim, and (5) all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; so that the victim is contacted, controlled confined space entry is established and maintained, atmosphere is continuously monitored, the victim's mental and physical conditions are further assessed, patient care is initiated, the patient is packaged to restrictions of the space, and patient removal can be initiated. **7.2.15** Package the victim in a litter for removal from a vertically-oriented confined space, given a confined space rescue tool kit, a vertically-oriented litter and associated rigging equipment, a work area that provides enough vertical clearance to extract a vertically-oriented litter and a victim, so that the victim is secured to the litter, the litter is secured to the rescue system in a vertically-configuration, the litter will pass through the portal, the litter can be raised high enough to clear the portal, the victim is protected during the extraction, and further harm to the victim is minimized.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		7.2.16 Access and rapidly remove a victim from a vertically-oriented confined space, given a confined space rescue tool kit, victim harnesses and rigging, a victim who has been discovered to be in respiratory arrest, and conditions inside the space requiring immediate extraction to prevent imminent death of the victim, so that the victim is rapidly secured in an extraction harness, the harness is secured to the rescue system, and the victim is removed from the space. **7.2.17** Remove all entrants from a confined space, given PPE, rope and related rescue and retrieval systems, personnel to operate rescue and retrieval systems, and a confined space rescue tool kit, so that internal obstacles and hazards are negotiated, all persons are extricated from a space in the selected transfer device, the victim and rescuers are decontaminated as necessary, and the victim is delivered to the EMS provider. **7.2.18** Terminate a technical rescue operation, given an incident scenario, assigned resources, and site safety data, so that rescuer risk and site safety are managed, scene security is maintained and custody transferred to a responsible party, personnel and resources are returned to a state of readiness, record keeping and documentation occur, and post event analysis is conducted	
Vehicle Rescue	**8.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**8.2.1** Create an incident action plan for a vehicle incident, and conduct an initial and ongoing size-up, given agency guidelines, planning forms, and an operations-level vehicle incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; vehicle stabilization needs are evaluated; and resource needs are identified and documented for future use.	**8.3.1** Create an incident action plan for a commercial or heavy vehicle incident, and conduct initial and ongoing size-up, given agency guidelines, planning forms, and an operations-level vehicle incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; vehicle stabilization needs are evaluated; and resource needs are identified and documented for future use.
	8.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and PPE, so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**8.2.2** Establish fire protection, given an extrication incident and fire control support, so that fire and explosion potential is managed and fire hazards and rescue objectives are communicated to the fire support team.	**8.3.2** Stabilize commercial/heavy vehicles, given a vehicle and machinery tool kit and PPE, so that the vehicle is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise vehicle stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	8.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**8.2.3** Stabilize a common passenger vehicle, given a vehicle tool kit and PPE, so that the vehicle is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise vehicle stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.	**8.3.3** Determine the heavy vehicle access and egress points, given the structural and damage characteristics and potential victim location(s), so that the victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, the victim(s), and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise vehicle stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced.
	8.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**8.2.4** Isolate and manage potentially harmful energy sources, including propulsion power, restraint systems, and construction materials, given passenger vehicle, vehicle tool kit, and PPE, so that all hazards are identified; systems are managed; beneficial system use is evaluated; and hazards to rescue personnel and victims are minimized.	**8.3.4** Create access and egress openings for rescue from a heavy vehicle, given vehicle tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and vehicle stability is maintained.
		8.2.5 Determine the common passenger vehicle access and egress points, given the structural and damage characteristics and potential victim location(s), so that the victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, victim, and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise vehicle stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced.	**8.3.5** Disentangle victim(s), given an extrication incident, a vehicle tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.
		8.2.6 Create access and egress openings for rescue from a common passenger vehicle, given a vehicle tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and vehicle stability is maintained. **8.2.7** Disentangle victim(s), given an operations-level extrication incident, a vehicle tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.	**8.3.6** Isolate and manage potentially harmful energy sources, including propulsion power, restraint systems, and construction materials, given heavy vehicle, vehicle tool kit, and PPE, so that all hazards are identified; systems are managed; beneficial system use is evaluated; and hazards to rescue personnel and victims are minimized.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		8.2.8 Remove a packaged victim to a designated safe area, as a member of a team, given a victim transfer device, a designated egress route, and PPE, so that the team effort is coordinated; the designated egress route is used; the victim is removed without compromising victim packaging; undue injury is prevented; and stabilization is maintained. **8.2.9** Terminate a vehicle incident, given PPE specific to the incident, isolation barriers, and an extrication tool kit, so that rescuers and bystanders are protected during termination operations; the party responsible for the operation, maintenance, or removal of the affected vehicle is notified of any modification or damage created during the extrication process; scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; and command is terminated.	
Animal Technical Rescue	**9.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**9.2.1** Assess and stabilize a representative victim, given a first aid kit, and an actual or simulated EMS agency, so that rescuers and a representative victim are protected from hazards, the representative victim's injuries or illnesses are managed, and the representative victim is delivered to the appropriate EMS provider with information regarding the history of the rescue activity and the representative victim's condition with the assistance of local policy determined personnel, when available.	**9.3.1** Move a representative victim load in an extended duration high-angle environment, as a member of a team, given animal transport equipment, litters, and animal removal systems specific to the rescue environment, so that the a representative victim is moved without further injuries, risks to rescuers are minimized from both the hazard and the a representative victim, the integrity of the a representative victim 's securement within the transfer device is established and maintained, the means of attachment to the rope rescue system is maintained, and the representative victim is removed from the hazard.
	9.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and PPE, so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**9.2.2** Perform basic level triage, given triage tags and AHJ protocols, so that determination between rescue and recovery modes are made, triage decisions reflect resource capabilities, severity of injuries are determined, and animal care and rescue priorities are established in accordance with local protocol.	**9.3.2** Direct a team in the removal of a representative victim, in a high-angle environment using a means of transporting the representative victim to the ground or other safe area, given an incident, a representative victim load, high-angle rope system when raising or lowering animals, an assignment, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to animals and rescuers are minimized, injury to the animal is minimized, the means of attachment to the rope rescue system is maintained, and a representative victim is brought to a safe area for transfer to appropriate authorities.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	9.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**9.2.3** Construct an improvised restraint device, given an available rope or accessory cord, so that the device includes a long enough standing end to ensure rescuer control and that the representative victim is able to be led to a safe area.	**9.3.3** Complete an assignment while suspended from a rope rescue system in a high-angle environment, given an independent rescuer rope rescue system, a representative victim and an independent animal rope rescue system, when raising or lowering animals in excess of 300 lbs (136 kgs), an assignment, life safety harnesses, litters, bridles, and specialized equipment necessary for the environment, so that risks to animals and rescuers are minimized; the means of attachment to the rope rescue system is secure; selected specialized equipment facilitates efficient rescuer movement; and specialized equipment does not unduly increase risks to rescuers or animals.
	9.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**9.2.4** Move a representative victim, in a low-angle environment, as a member of a team, given an incident action plan, basic animal transport equipment, so that hazards are identified, the representative victim is moved without further injury, risks to rescuers are managed, the representative victim securement is maintained, and the objective attained. **9.2.5** Move a representative victim in a low-angle environment, as a member of a team, given animal transport equipment, litters, and animal removal systems specific to the rescue environment, so that the a representative victim is moved without further injuries, risks to rescuers are minimized from both the hazard and the representative victim, the integrity of the a representative victim's securement within the transfer device is established and maintained, the means of attachment to the rope rescue system is maintained, and the a representative victim is removed from the hazard. **9.2.6** Inspect and maintain rescue equipment, given maintenance logs and records, tools, resources, manufacturer's guidelines, organizational standard operating procedures, which should include keeping the large animal technical rescue cache subjected to greater than 600 lb (272 kg) loads, separate from the regular cache, so that the operational status of equipment is verified and documented, components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement protocol are correctly disposed of and changed.	**9.3.4** Direct a team in the operation of a rope system to move a suspended representative victim load along a horizontal path, given rescue personnel, an established system, a target for the load, a load to be moved, and personal protective equipment, so that the movement is controlled; the load is held in place when needed; the weight of the rescuer and a representative victim, or a representative victim being moved alone is under 600 lbs (272 kgs); operating methods do not stress the system to the point of failure; personnel assignments are made; tasks are communicated; and potential problems are identified, communicated and managed.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		9.2.7 Construct a simple rope mechanical advantage system, given an incident, representative victim load, an anchor system, life safety rope, carabiners, pulleys, rope grab devices, and rope rescue equipment, so that the system constructed accommodates the load and reduces the force required to lift the load, operational interference is factored and minimized, the system is efficient, a system safety check is completed, and the system is connected to an anchor system and the load, with recognition a sub optimal SSSF might be required to accomplish the rescue.	
		9.2.8 Construct a compound rope mechanical advantage system, given an incident, a representative victim load, an anchor system, life safety rope, carabiners, pulleys, rope grab devices, and rope rescue equipment, so that the system constructed accommodates the load and reduces the force required to lift the load, operational interference is factored and minimized, the system is efficient, a system safety check is completed, and the system is connected to an anchor system and the load, with recognition a sub optimal SSSF might be required to accomplish the rescue.	
		9.2.9 Construct and operate a portable highpoint anchor and multiple compound rope mechanical advantage system in a high-angle environment, as a member of a team, given an incident, multiple rope rescue systems incorporating a compound rope mechanical advantage system, a representative victim load to be moved, and a specified minimum travel distance for the load, so that a system safety check is performed; a reset is accomplished, and the movement is controlled; the load can be held in place when needed; operating methods do not stress the system to the point of failure; operational commands are clearly communicated; and potential problems are identified, communicated, and managed.	**9.3.5** Conduct an animal helicopter rescue, as a member of a team, given a representative helicopter system, size-up information and a representative victim needing rescue, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions are included, specialized resource needs are identified, work parameters are determined, associated hazards are identified, incident objectives are established, and scene security and safety measures are addressed.
		9.2.10 Move a representative victim load in a high-angle environment, as a member of a team, given animal transport equipment, litters, other specialized equipment, and animal removal systems specific to the rescue environment, so that the representative victim is moved without further injury, risks to rescuers are minimized from both the hazard and the a representative victim, the integrity of the representative victim s securement within the transfer device is established and maintained, the means of attachment to the rescue system is maintained, and the representative victim is removed from the hazard.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		9.2.11 Release a representative victim from soil entrapment, as a member of a team, given an incident, a representative victim load, personal protective equipment, a mud rescue tool kit, and specialized equipment, so that hazards to rescue personnel and a representative victim are minimized, considerations are given to animal hypothermia, dehydration and other injuries, techniques are used to enhance animal survivability, tasks are accomplished within projected time frames. **9.2.12** Develop a plan for an animal transport vehicle incident, given an incident, agency guidelines, planning forms, so that size-up is conducted and continued throughout the incident, a standard approach is used during training and operational scenarios; hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; vehicle stabilization needs are evaluated; and resource needs including veterinary personnel are identified. **9.2.13** Remove a packaged representative victim to a designated safe area, as a member of a team, given an animal transfer device, a designated egress route, and personal protective equipment, so that effort is coordinated; the designated egress routes are used; a representative victim is removed without compromising animal packaging; injury is prevented; and stabilization is maintained. **9.2.14** Terminate an incident, given personal protective equipment specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	
Wilderness Rescue	**10.1.1** Identify the environment, type of terrain, and associated hazards involved in a wilderness incident given the environment, terrain, hazards involved in the incident so that the personnel and equipment matches the environment and terrain.	**10.2.1** Identify specific environments and conditions in their area in which operations-level search and rescue incidents are permitted as well as exceeded. **10.2.2** Preplan and size-up existing and potential conditions where wilderness search and rescue will be performed. **10.2.3** Request and interface with wilderness search and rescue resources.	**10.3.1** Identify specific environments and conditions in their area in which technician-level and rescue incidents are permitted as well as exceeded. **10.3.2** Identify how certain factors affect preparing, choosing, and using equipment in the AHJ's wilderness area. **10.3.3** Develop profile(s) for the subject(s) in a wilderness environment, given subject information and collected evidence, so that a search plan can be developed and implemented.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	10.1.2 Recognize the need for technical search and rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**10.2.4** Interview reporting party(ies), given interview recording forms, so that available information in regard to the potential locationof the subject and other factors affecting the incident are documented.	**10.3.4** Collect and purify water, given a natural source of water in the wilderness environment, so that the rescuer can have potable water.
	10.1.3 Establish scene hazard zones, given an incident, scene barriers, and incident location, incident information, PPE, so that hazard zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to Incident Command, and only authorized personnel are allowed access to the scene.	**10.2.5** Collect, interpret, and document evidence to determine subject's potential location, given various items of evidence, collection and documentation equipment and wilderness tool kit, so that the scene (area) is searched and evidence is protected, documented, cataloged, and collected.	**10.3.5** Develop a wilderness search and rescue incident action plan, given an incident, size-up information, and local weather forecasts and current conditions, so that theIMS is utilized, communication needs are addressed, existing and potential conditions are identified, the search area is designated, operational periods are identified, safety plans are developed, and objectives are established.
			10.3.6 Develop a search plan given standard search tactics, the lost person profile, lost person behavior statistics, reporting party interviews and available resources, and revise the search plan based on clues identified by search teams so that resources can be deployed.
			10.3.7 Navigate in the wilderness to a specified location, given navigation equipment, topographical maps of the area to be navigated, and communication equipment, so that the specified location is identified and reached, search patterns are conducted, teams are guided to the desired location, and all clues relative to the location of the subject are identified and communicated to the incident commander.
	10.1.4 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**10.2.6** Prepare to work in a wilderness environment for an 8-hour period of time, given personal support equipment, so that the rescuer can be self-sustaining in the wilderness environment.	**10.3.8** Manage and direct a team at a wilderness search and search and rescue incident, given rescue personnel, capabilities and limitations of search and rescue members, and incident and site information, so that an IMS is established, needed support resources are identified, the incident action plan is communicated, tasks are communicated, resources are allocated, the incident is stabilized, personnel assignments are made, potential problems are identified and managed, and accountability is provided.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	10.1.5 Size up a given incident; obtain background information and applicable reference materials; so that the operational mode is defined; determine resource availability and response time; determine potential types of searches and; rescues; identify the number of subjects; establish the last reported location of all subjects; identify interview, and retain for further information witnesses and reporting parties; assess resource needs; identify search parameters; and obtain information required to develop an incident action plan.	**10.2.7** Navigate to a given location with directions from reporting parties, on nontechnical terrain, given maps and trail guides so that local recreational areas are known. **10.2.8** Establish the need for specialized resources in wilderness search and rescue operations, given aircraft, watercraft, or specialized vehicles and trained operators, given operational protocols and specialized vehicle resources, so that resources are allocated and utilized during the operation to locate and/or remove the subject. **10.2.9** Manage a subject in a wilderness environment, given basic life support equipment and wilderness tool kit, so that the basic medical care of the subject is managed during transport, and the potential for further injury is minimized. **10.2.10** Move a subject in a wilderness environment a minimum of 0.25 mi (0.4 km), given subject transport equipment, litters, other specialized equipment, and subject removal systems specific to the search and rescue environment, so that the subject is moved without further injuries, risks to rescuers are minimized, the integrity of the subject's packaging within the transfer device is established and maintained, and the subject is removed from the hazard.	**10.3.9** Locate a subject in a wilderness environment, given a lost person profile, established search area, navigation equipment, topographical maps, and communication equipment, so that the subject's location is determined. **10.3.10** Construct an emergency shelter in a wilderness environment, given supplies in the search and rescue response pack, so that the rescuer is protected from the elements. **10.3.11** Negotiate technical terrain typical of the response area, given the technical wilderness travel equipment used by the responders, so that technical terrain access skills can be assessed.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		10.2.11 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated. **10.2.12** Travel through a wilderness environment by foot given off-road on a trail or on nontechnical terrain typical of the response area of the AHJ so that the rescuer maintains personal safety and has the ability to reach the subject.	
Trench Rescue	**11.1.1** Identify the need for trench and excavation collapse rescue, given a specific type of collapse incident, so that resource needs are identified and the emergency response system for trench and excavation collapse is initiated. **11.1.2** Conduct a size-up of a collapsed trench, given an incident and background information and applicable reference material, so that the size-up is conducted within the scope of the incident management system; the existing and potential conditions are evaluated within the trench and the rescue area; general hazards are identified; a witness or "competent person" is secured; the probability of victim existence, number, condition, and location is determined; potential for rapid, non-entry rescues or victim self-rescue is recognized; needed personnel, supply, and equipment resources are evaluated; and utility involvement and location are determined.	**11.2.1** Support a nonintersecting straight wall trench of 8 ft (2.4 m) or less in depth as a member of a team, given size-up information, an action plan, a trench tool kit, and an assignment, so that strategies to minimize the further movement of soil are implemented effectively; trench walls, lip, and spoil pile are monitored continuously; rescue entry team(s) remains in a safe zone; any slough-in and wall shears are mitigated; emergency procedures and warning systems are established and understood by participating personnel; incident-specific PPE is utilized; physical hazards are identified and managed; victim and rescuer protection is maximized; victim extrication methods are considered; and a rapid intervention team is staged. **11.2.2** Release a victim from soil entrapment by components of a nonintersecting collapsed trench of 8 ft (2.4 m) or less in depth, given personal protective equipment, a trench rescue tool kit, and specialized equipment, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome and other injuries, techniques are used to enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing trench shoring system.	**11.3.1** Support an intersecting trench as a member of a team, given size-up information and an action plan, a trench tool kit, and an assignment, so that strategies to minimize the further movement of soil are implemented effectively; trench walls, lip, and spoil pile are monitored continuously; rescue entry team(s) in the trench remains in a safe zone; any slough-in and wall shears are mitigated; emergency procedures and warning systems are established and understood by participating personnel; incident-specific PPE is utilized; physical hazards are identified and managed; victim protection is maximized; victim extrication methods are considered; and a rapid intervention team is staged. **11.3.2** Install supplemental sheeting and shoring for each 2 ft (0.61 m) of depth dug below an existing approved shoring system, given size-up information, an action plan, and a trench tool kit, so that the movement of soil is minimized effectively, initial trench support strategies are facilitated, rescue entry team safe zones are maintained, excavation of entrapping soil is continued, victim protection is maximized, victim extrication methods are considered, and a rapid intervention team is staged.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	11.1.3 Implement a trench emergency action plan, given size-up information and a trench incident, so that initial size-up information is utilized; pre-briefing is given to rescuers; documentation is ongoing; the collapse zone is established; a risk/benefit analysis is conducted; rapid, non-entry rescues or victim self-rescues are performed; the rescue area and general area are made safe; strategy and tactics are confirmed and initiated for existing and potential conditions; rapid intervention team and operational tasks are assigned; other hazards are mitigated; rescue resources are staged; and a protective system is being utilized.	**11.2.3** Remove a victim from a trench, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required, the victim is evaluated for signs of crush syndrome, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.	**11.3.3** Construct load stabilization systems, given an assignment, personal protective equipment, and a trench tool kit, so that the stabilization system will support the load safely, the system is stable, and the assignment is completed.
	11.1.4 Implement support operations at trench emergencies, given an assignment, and equipment and other resources, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, a cut station is established, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, operations proceed without interruption, extrication methods are in place, and the support operations facilitate rescue operational objectives.	**11.2.4** Disassemble support systems at a trench emergency incident, given personal protective equipment, trench tool kit, and removal of victim(s), so that soil movement is minimized, all rescue equipment is removed from the trench, sheeting and shoring are removed in the reverse order of their placement, emergency protocols and safe zones in the trench are adhered to, rescue personnel are removed from the trench, the last supporting shores are pulled free with ropes, equipment is cleaned and serviced, reports are completed, and a post briefing is performed.	**11.3.4** Lift a load, given a trench tool kit, so that the load is lifted the required distance to gain access; settling or dropping of the load is prevented; control and stabilization are maintained before, during, and after the lift; and operational objectives are attained.
	11.1.5 Initiate the incident management system given a trench or excavation collapse incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, the incident action plan is developed.	**11.2.5** Terminate a technical rescue operation, given an incident scenario, assigned resources, and site safety data, so that rescuer risk and site safety are managed; scene security is maintained and custody transferred to a responsible party; personnel and resources are returned to a state of readiness; recordkeeping and documentation occur; and post-event analysis is conducted.	**11.3.5** Coordinate the use of heavy equipment, given personal protective equipment, means of communication, equipment and operator, and an assignment, so that operator capabilities and limitations for task are evaluated, common communications are maintained, equipment usage supports the operational objectives, and hazards are avoided.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
			11.3.6 Release a victim from entrapment by components of a collapsed trench, given personal protective equipment, a trench rescue tool kit, and specialized equipment, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome and other injuries, techniques are used to enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing trench shoring system.
Machinery Rescue	**12.1.1** Recognize the need for technical rescue resources at a machinery incident, given AHJ guidelines, an operations or technician level machinery incident or simulation, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational/incident action plan.	**12.2.1** Plan for a machinery incident, and conduct an initial and ongoing size-up, given agency guidelines, planning forms, and an operations level machinery incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; machinery stabilization needs are evaluated; and resource needs are identified and documented for future use.	**12.3.1** Plan for a large machinery incident, and conduct initial and ongoing size-up, given agency guidelines, planning forms, and operations-level machinery incident or simulation, so that a standard approach is used during training and operational scenarios; emergency situation hazards are identified; isolation methods and scene security measures are considered; fire suppression and safety measures are identified; machinery stabilization needs are evaluated; and resource needs are identified and documented for future use.
	12.1.2 Establish scene safety zones, given pre-arrival instructions from operations or technician level resources, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that action hot, warm, and cold safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the rescue scene.	**12.2.2** Establish "scene" safety zones, given scene security barriers, incident location, incident information, and PPE, so that hot, warm, and cold safety zones are designated; zone perimeters are consistent with incident requirements; perimeter markings can be recognized and understood by others; zone boundaries are communicated to incident command; and only authorized personnel are allowed access to the rescue scene.	**12.3.2** Stabilize large machinery, given a machinery tool kit and PPE, so that the machinery is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise machinery stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.
	12.1.3 Identify the needed support resources, given a specific type of rescue incident, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operation facilitates rescue operational objectives.	**12.2.3** Establish fire protection, given an extrication incident and fire control support, so that fire and explosion potential is managed and fire hazards and rescue objectives are communicated to the fire support team.	**12.3.3** Determine large machinery access and egress points, given the structural and damage characteristics and potential victim location(s), so that victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, victim(s), and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise machinery stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	12.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**12.2.4** Stabilize a small or simple machine, given a machinery tool kit and PPE, so that the machinery is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise machinery stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.	**12.3.4** Create access and egress openings for rescue from large machinery, given a machinery tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and stability is maintained.
		12.2.5 Isolate potentially harmful energy sources, given machinery tool kit and PPE, so that all hazards are identified; systems are managed; beneficial system use is evaluated; and hazards to rescue personnel and victims are minimized. **12.2.6** Determine small machinery access and egress points, given the structural and damage characteristics and potential victim location(s), so that victim location(s) is identified; entry and exit points for victims, rescuers, and equipment are designated; flows of personnel, victims(s), and equipment are identified; existing entry points are used; time constraints are factored; selected entry and egress points do not compromise stability; chosen points can be protected; equipment and victim stabilization are initiated; and AHJ safety and emergency procedures are enforced. **12.2.7** Create access and egress openings for rescue from a small or simple machine, given a machinery tool kit, specialized tools and equipment, PPE, and an assignment, so that the movement of rescuers and equipment complements victim care and removal; an emergency escape route is provided; the technique chosen is expedient; victim and rescuer protection is afforded; and stability is maintained. **12.2.8** Disentangle victim(s), given an extrication involving a small or simple machine, a machinery tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.	**12.3.5** Disentangle victim(s), given an extrication incident, a machinery tool kit, PPE, and specialized equipment, so that undue victim injury is prevented; victim protection is provided; and stabilization is maintained.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		12.2.9 Identify potential emergency events in buildings where mechanical equipment exists, such as elevators. Determine entry and egress points, given the structural and damage characteristics and potential victim location(s), so that victim location(s) is identified; designate entry and exit points for victim(s)s and rescuer(s); chosen points can be protected; determine the need for a specialized elevator technician; stabilize and isolate all machinery involved, given an elevator tool kit and PPE; control the hazards presented by the release of fluids or mechanical release devices; determine elevator position to optimize the removal of victim(s); secure all elevators and weight systems in common hoistways so that chosen points do not compromise the removal of a victim or rescuer; equipment and victim stabilization are initiated; package and remove victim(s) so that undue injury is prevented; and AHJ safety points are enforced. **12.2.10** Remove a packaged victim to a designated safe area, as a member of a team, given a victim transfer device, a designated egress route, and PPE, so that the team effort is coordinated; the designated egress route is used; the victim is removed without compromising victim packaging; undue injury is prevented; and stabilization is maintained. **12.2.11** Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	
Cave Rescue	**13.1.1** Identify the need for cave rescue, given a cave incident, so that resource needs are identified and the emergency response system for cave rescue incident is initiated.	**13.2.1** Establish and maintain entrance control, given perimeter markings that can be recognized and understood by others, perimeter boundaries are communicated to incident command, and only authorized personnel are allowed access to the rescue scene, so that all known entrances are identified and secured.	**13.3.1** Conduct a size-up of a cave rescue incident, given an incident and background information, maps, charts, diagrams, forms, information from technical resources and on-site personnel, and PPE necessary to perform the assessment, so that existing and potential conditions within the cave and the rescue area are evaluated, general and site-specific hazards are identified, witnesses are identified, the total number and probable locations of victims are determined, a risk/benefit analysis is performed, entry and egress are identified, and specialized resource needs are identified.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	13.1.2 Conduct a size-up of a cave incident, given an incident and background information, site maps, charts, diagrams, blueprints, forms, information from technical resources and on-site personnel, monitoring equipment, and personal protective equipment (PPE) necessary to perform the assessment, so that existing and potential conditions within the cave and the rescue area are evaluated, general and site-specific hazards are identified, witnesses are interviewed, the total number and probability of victim existence, number, condition, and location is determined, a risk/benefit analysis is performed, potential for rapid, non-entry rescues or victim self-rescue is recognized; ventilation requirements are determined, entry and egress points are identified, and specialized resource needs are identified.	**13.2.2** Implement cave rescue support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.	**13.3.2** Develop a probability of area plan, given witnesses, local information statements, and scene assessments, so that intelligence is developed and correlated; last known location, activity, and direction of travel of the victim(s) are determined; procedures to recontact the witnesses are established; references are utilized; and an initial direction or pattern of search is determined.
	13.1.3 Implement an emergency action plan, given size-up information and a incident, so that initial size-up information is utilized; pre-briefing is given to rescuers; documentation is ongoing; the Hazard zone is established; a risk/benefit analysis is conducted; rapid, non-entry rescues or victim self-rescues are performed; the rescue area and general area are made safe; strategy and tactics are confirmed and initiated for existing and potential conditions; rapid intervention team and operational tasks are assigned; other hazards are mitigated; rescue resources are staged; and a protective system is being utilized.	**13.2.3** Select PPE and provisions for extended cave rescue search, recovery, and extraction operations, given lights, food, water, batteries, hypothermic protection, self-rescue equipment, personal medical kit, and a low-profile durable carrying container, so that the rescuer can be self-sufficient for a minimum of 24 hours.	**13.3.3** Develop a cave rescue incident action plan, given an incident, size-up information, probability of detection report, and reports from reporting persons or witnesses, so that size-up information and the incident management system are utilized, safety requirements and communication needs are addressed, existing and potential conditions in the cave space are identified, and incident objectives are established and followed.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	13.1.4 Implement support operations at cave emergencies, given an assignment, and equipment and other resources, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, a cut station is established, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, operations proceed without interruption, extrication methods are in place, and the support operations facilitate rescue operational objectives.	**13.2.4** Select PPE for use in a cave rescue environment that includes water hazards, given a cave/water rescue assignment and assorted items of personal protective and life-support equipment, so that rescuer is protected from temperature extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are in compliance, and self-rescue needs have been evaluated and met.	**13.3.4** Coordinate the use of specialized resources, given a cave rescue scenario outside of the scope of training for a cave technical rescuer, so that specialized resources are considered with respect to the incident management system; specialized resource usage supports incident objectives; hazards are identified, avoided, monitored, and controlled; and rescuer and resource safety is maintained.
	13.1.5 Initiate the IMS given a cave rescue incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, the incident action plan is developed.	**13.2.5** Maneuver in the cave rescue environment, given PPE, established routes, cave rescue tool kit (cache), size-up information, and cave map, so that obstacles specific to the cave environment are negotiated and situational awareness is maintained. **13.2.6** Use single rope techniques to ascend a minimum of 100 ft (30.5 m) in free space, given an anchored fixed rope system, so that the rescuer is secured to the rope with an ascending system that utilizes at least two gripping points of attachment at or above the waist and a quick attachment safety device, the person ascending can stop at any point on the fixed rope and rest suspended by his or her harness, the rescuer can convert the ascending system to a descent system at any time, and a rescuer demonstrates a level of proficiency and fitness that allows the rescuer to continue assigned operations immediately following the ascent. **13.2.7** Respond as a member of an initial response team given a known patient location so that access routes are established and marked, patient care is initiated, patient packaging considerations are communicated to the medical team, and obstacles to evacuation are identified and communicated to the rigging team. **13.2.8** Establish communications in a cave rescue environment as a member of a communications team, given size-up information and established routes, so that communications are established and maintained between the incident commander and the initial response team, search team, medical in-cave team, rigging teams, evacuation teams, communication teams, and patient transport teams.	**13.3.5** Terminate the cave rescue incident, given isolation barriers, documentation forms, and a cave rescue tool kit, so that all personnel are accounted for and removed from the space, injuries are avoided, further entry into the space is denied, and the scene is secured.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		13.2.9 Conduct a search in a cave environment as a member of a search team, given a specific area identified by the probability of area plan, PPE, the cave rescue tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained. **13.2.10** Extract a victim from both vertical and horizontal crack and crevice entrapments, working as a member of a team, given extraction tools, stemples, airbags, and a medical kit, so that the victim is extracted without creating further harm, and the rescuers are not exposed to undue risk. **13.2.11** Manage a victim in a cave environment as part of a medical in-cave team, given a victim and basic life support kits and extended patient care plan, so that the basic support medical care of the victim is managed during transport and the potential for further injury is minimized. **13.2.12** Package the victim for removal from a cave, given a cave tool kit (cache) and patient transfer devices, so that design limitations are not exceeded, the victim is given the best profile for removal, methods and packaging devices selected are compatible with the intended routes of transfer, and further harm to the victim is minimized. **13.2.13** Construct and use rope rescue systems as a member of a cave rescue rigging team, given rope rescue equipment designed for the cave rescue environment, so that natural anchor points are identified; anchoring hardware compatible with available anchor points is selected; load factors are considered; an anchor system is constructed; and ascent, descent, lifting, and lowering systems are attached and utilized as required. **13.2.14** Remove all victims from a cave as a member of a patient evacuation team, given PPE, rope and related rescue equipment, personnel to operate rescue systems, and a cave rescue tool kit, so that internal obstacles and hazards are negotiated, victims are extricated from the cave in the selected transfer device, and victims are delivered to the EMS provider. **13.2.15** Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
Mine and Tunnel Rescue	**14.1.1** Identify the need for mine and tunnel rescue, given a mine and tunnel incident, so that resource needs are identified and the emergency response system for mine and tunnel rescue incident is initiated.	**14.2.1** Conduct a size-up of a mine and tunnel rescue incident, given an incident and background information, site maps, charts, diagrams, blueprints, forms, information from technical resources and on-site personnel, monitoring equipment, and PPE necessary to perform the assessment, so that existing and potential conditions within the mine and tunnel and the rescue area are evaluated, general and site-specific hazards are identified, witnesses are interviewed, the total number and probable locations of victims are determined, a risk/benefit analysis is performed, ventilation requirements are determined, entry and egress points are identified, and specialized resource needs are identified.	**14.3.1** Select and use specialized PPE and life-support equipment, consistent with the size, shape, and length of the tunnel or mine, so that the rescuer is protected from atmospheric hazards, temperature extremes, and environmental hazards; self-rescue needs have been evaluated and provided for; and pre-entry safety checks have been conducted.
	14.1.2 Conduct a size-up of a mine and tunnel rescue incident, given an incident and background information, site maps, charts, diagrams, blueprints, forms, information from technical resources and on-site personnel, monitoring equipment, and personal protective equipment (PPE) necessary to perform the assessment, so that existing and potential conditions within the mine and tunnel and the rescue area are evaluated, general and site-specific hazards are identified, witnesses are interviewed, the total number and probability of victim existence, number, condition, and location is determined, a risk/benefit analysis is performed, potential for rapid, non-entry rescues or victim self-rescue is recognized; ventilation requirements are determined, entry and egress points are identified, and specialized resource needs are identified.	**14.2.2** Establish scene safety zones, given a mine and tunnel incident, scene security barriers, incident location, incident information, and PPE, so that action hot, warm, and cold safety zones are designated; zone perimeters are consistent with incident requirements; perimeter markings can be recognized and understood by others; zone boundaries are communicated to incident command; and personnel access to the rescue scene is managed.	**14.3.2** Coordinate the use of specialized resources at a mine and tunnel rescue incident, given PPE, communications equipment, size-up information, specialized resources, and an incident action plan, so that specialized resources usage supports incident objectives; hazards are identified, avoided, monitored, or controlled; and rescuer and resource safety is maintained.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	14.1.3 Implement a emergency action plan, given size-up information and a incident, so that initial size-up information is utilized; pre-briefing is given to rescuers; documentation is ongoing; the hazard zone is established; a risk/benefit analysis is conducted; rapid, non-entry rescues or victim self-rescues are performed; the rescue area and general area are made safe; strategy and tactics are confirmed and initiated for existing and potential conditions; rapid intervention team and operational tasks are assigned; other hazards are mitigated; rescue resources are staged; and a protective system is being utilized.	**14.2.3** Establish fire protection, given a mine and tunnel rescue incident and fire control support, so that fire and explosion potential is determined, identified hazards are mitigated or isolated, and rescue objectives are communicated to the fire support team.	**14.3.3** Breach debris components, given an assignment, PPE, various types of construction materials, and a mine and tunnel collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, and debris stability is maintained.
	14.1.4 Implement support operations at mine/tunnel emergencies, given an assignment, and equipment and other resources, so that a resource cache is managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, a cut station is established, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, operations proceed without interruption, extrication methods are in place, and the support operations facilitate rescue operational objectives.	**14.2.4** Conduct atmospheric monitoring of the mine and tunnel environment, given PPE, atmospheric monitoring equipment, and reference material, so that atmospheric readings are continually assessed, readings are documented, and changes in the involved area are tracked and communicated to the incident command post (ICP).	**14.3.4** Cut through steel components, given a mine and tunnel rescue tool kit, and PPE, so that the steel is cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.
	14.1.5 Initiate the incident management system given a trench or excavation collapse incident, so that scene management is initiated, initial command structure is identified, resource tracking and accountability is established, the incident action plan is developed.	**14.2.5** Establish mine and tunnel ventilation, given size-up information and atmospheric monitoring results, so that airflow needs are determined, the required airflow is established and maintained, required air changes are accomplished, and atmospheric hazards are monitored and controlled.	**14.3.5** Move a heavy load as a team member, given a mine and tunnel rescue tool kit, so that the load is moved the required distance to gain access and control is constantly maintained.
		14.2.6 Establish dewatering operations, given a mine and tunnel collapse incident, dewatering pumps, hose, and appliances, so that water is removed and directed away from the affected area, atmospheric conditions are not affected by the pumping equipment, and there are no power or flow interruptions during the operation.	**14.3.6** Coordinate the use of heavy equipment, given PPE, means of communication, equipment and operator, and an assignment, so that common communications are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		14.2.7 Implement support operations at mine and tunnel rescue scene given an assignment, equipment, and other resources, so that a resource staging area is established and managed, scene lighting is provided for the tasks to be undertaken, environmental concerns are managed, supplemental power is provided for all equipment, atmospheric monitoring and ventilation are implemented, personnel rehab is facilitated, provisions for extended patient care and prolonged search and recovery are established, and the support operations facilitate operational objectives.	**14.3.7** Stabilize a collapsed mine and tunnel as a member of a team, given size-up information, PPE, a collapse assignment, a mine and tunnel rescue tool kit, engineering resources if needed, and specialized equipment necessary to complete the task, so that hazards are identified and acknowledged by team members, all unstable structural components are identified, egress routes are established, expert resource needs are determined and requested from command, load estimates are calculated for support system requirements, cribbing and shoring systems are constructed and monitored continuously for integrity, safety protocols are followed, RIC is staged, an accountability system is established, and progress is communicated as required.
		14.2.8 Develop a mine and tunnel rescue incident action plan, given a mine and tunnel collapse incident and size-up information, so that size-up information and the incident management system are utilized; safety requirements and communication needs are addressed; existing and potential conditions in the mine and tunnel space are identified; and incident objectives are established and resources are managed.	**14.3.8** Conduct a search in a mine and tunnel collapse environment, given PPE, the mine and tunnel rescue tool kit, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.
		14.2.9 Prepare for entry into a mine and tunnel space, given size-up information, mine/tunnel classification, site map, and a mine and tunnel rescue tool kit, so that PPE is checked for readiness; specific routes for rescue are identified; accountability is maintained; the rapid intervention crew (RIC) is standing by; entry team readiness is confirmed; communications systems are in place; continuous atmospheric monitoring capabilities are used; lighting is established; and safe access and egress control points are identified and managed.	**14.3.9** Stabilize a vehicle or machine in a mine and tunnel environment, given a basic extrication tool kit and PPE, so that the vehicle or machinery is locked/tagged out during the rescue operation, vehicle or machinery is supported, rescue activities will not compromise vehicle or machinery stability, stabilization equipment can be monitored, and the risk to rescuers is minimized.
		14.2.10 Enter a mine and tunnel for rescue as a member of a team, given PPE, identified access and egress routes, a mine and tunnel rescue tool kit, and a pre-entry briefing, so that identified routes are followed; specific mine/tunnel environmental obstacles are negotiated; victims are located; patient respiratory protection is initiated; disentanglement is accomplished; atmospheric monitoring is maintained; hazard assessment continues; and secondary collapse potential is assessed.	**14.3.10** Disentangle victim(s), given a mine and tunnel incident involving vehicles or machinery, a mine and tunnel tool kit, PPE, and specialized equipment as needed, so that victim injury is prevented, victim protection is provided, and stabilization is maintained.
		14.2.11 Determine potential victim locations, given size-up information, witness reports, a mine and tunnel rescue tool kit, and the type and area of the collapse, so that search areas are established and victims can be located.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		14.2.12 Package the victim for removal from a mine and tunnel, given a mine and tunnel tool kit and patient transfer devices, so that design limitations are not exceeded; the victim is given the best profile for removal; and further harm to the victim is minimized. **14.2.13** Evacuate all personnel from a mine and tunnel incident, given PPE, rope and related rescue equipment, support personnel to operate rescue systems, and a mine/tunnel rescue tool kit, so that internal obstacles and hazards are negotiated; all rescuers and victims are removed from the area; the rescuers and victims are decontaminated as necessary; and the victims are delivered to the EMS provider. **14.2.14** Terminate the mine and tunnel rescue incident, given isolation barriers, documentation forms, and a mine and tunnel rescue tool kit, so that all personnel are accounted for and removed from the space; injuries are avoided; further entry into the space is denied; and the scene is secured. **14.2.15** Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	
Helicopter Rescue	**15.1.1** Recognize the need for technical search and rescue resources at an incident, given AHJ guidelines and an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**15.2.1** Operate as part of a flight crew, ground support, or other assignment in or attached to the aircraft, given an assignment, task specific PPE, and an incident, so that situational awareness is maintained, safety issues are identified and communicated, and the assignment is completed.	**15.3.1** Construct and manage a human and nonhuman external load to the aircraft, given an airframe, an assignment, and a load, so that all attachment points are connected, the load is lifted in a controlled manner, and the task completed.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	15.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**15.2.2** Select and use task specific PPE, given an air transport assignment, and an incident, so that hazards are identified and proactively managed, the search and rescuer and the patient are briefed on the identified hazards and PPE use, and the tasks is completed.	**15.3.2** Demonstrate hoisting techniques, as a member of a flight/ rescue crew, given an airframe, assignment and a packaged load, and incident, so that the load is moved in a controlled and safe manner, hoist activities are coordinated with flight operations, the airframe operational envelope is not exceeded, and the task completed.
	15.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**15.2.3** Select air operations resources, given an assignment and incident, and a list of flight/ rescue operations resources, so that the type of aircraft and air crew selected match the assignment and operational parameters, and resources meet intended tasking.	**15.3.3** Demonstrate the ability to devise and implement, given a rescue incident, so that pre-incident planning, primary and secondary operational rescue plans, and the selection of a properly trained, equipped, and adequately staffed rescue crew for the environment and operational conditions to be encountered is accomplished.
	15.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**15.2.4** Demonstrate airframe specific emergency procedures, while operating as a member of a flight/rescue crew, ground support, or others in or attached to the aircraft, given an assignment and airframe, so that pre and post emergency operations are completed, airframe safety systems are engaged, and the aircraft is egressed within established time frames.	**15.3.4** Demonstrate, given a helicopter search and rescue mission, so that passengers are restrained, the patient is packaged, cargo is secured for flight operations in accordance with the AHJ.
	15.1.5 Identify potential landing zones (LZs) and helispots, given a search and/or rescue incident, so that the rescuer may begin the mitigation of the general hazards, and the use of PPE, providing for the safety of rescuers, victims, and others within the operational area.	**15.2.5** Demonstrate search observer skills, while operating as a member of a flight/rescue crew, given a search assignment, so that a pre-flight briefing is conducted, tasks and assignments are communicated, the search mode and protocols are defined, and the task completed.	**15.3.5** Perform weight and balance calculations for a specific airframe and task, given an assignment, reference materials, weather forecast, and airframe specific operational parameters, so that the total weight of occupants, as well as the flight crew, fuel, external loads and equipment, are incorporated into the weight and balance calculations, the load does not exceed airframe operational parameters, and the task is completed.
		15.2.6 Demonstrate landing zone management, as a member of a ground crew, given an already established landing zone, and an assignment, so that the area is secured, hazards are identified and controlled, movement in and around the LZ are positively controlled, and the task is completed.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		15.2.7 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that search and rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	
Surface Water Rescue	**16.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**16.2.1** Develop a site survey for an existing water hazard, given historical data, specific PPE for conducting site inspections, flood insurance rate maps, tide tables, and meteorological projections, so that life safety hazards are anticipated, risk/benefit analysis is included, site inspections are completed, water conditions are projected, site-specific hazards are identified, routes of access and egress are identified, boat ramps (put-in and take-out points) are identified, method of entrapment is considered, and areas with high probability for victim location are determined.	**16.3.1** Swim a designated water course, given a course designated by the AHJ as demonstrating the capabilities necessary to operate in the anticipated rescue environment, water rescue PPE, and swim aids as required, so that the specified objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuer has been staged for deployment.
	16.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to Incident Command, and only authorized personnel are allowed access to the scene.	**16.2.2** Select water rescue PPE, given a water rescue assignment and assorted items of personal protective and life-support equipment, so that rescuer is protected from temperature extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, and pre-operation safety checks have been conducted.	**16.3.2** Perform a swimming surface water rescue, given a simulated victim, water rescue PPE, conditions representative of the anticipated rescue environment, swim aids as required, flotation aids for victims, and reach/extension devices, so that victim contact is maintained, the rescuer maintains control of the victim, the rescuer and the victim reach safety at a predetermined area, and medical conditions and treatment options are considered.
	16.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**16.2.3** Define search parameters for a water rescue incident, given topographical maps of a search area, descriptions of all missing persons and incident history, hydrologic data including speed and direction of current or tides, so that areas with high probability of detection are differentiated from other areas, witnesses are interviewed, critical interview information is recorded, passive and active search tactics are implemented, personnel resources are considered and used, and search parameters are communicated.	**16.3.3** Demonstrate defensive tactics in the water rescue environment, given a waterbound victim in a stressed or panicked situation so that the rescuer can maintain separation from the victim to create or maintain personal safety, and can perform self-defense techniques to prevent rescuer submersion if direct contact is made between a panicked victim and the rescuer.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	16.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**16.2.4** Develop an action plan for a shore-based rescue of a single or multiple waterbound victim(s), given an operational plan and a water rescue tool kit, so that all information is factored, risk/benefit analysis is conducted, protocols are followed, hazards are identified and minimized, personnel and equipment resources will not be exceeded, assignments are defined, consideration is given to evaluating changing conditions, and the selected strategy and tactics fit the conditions. **16.2.5** Conduct a witness interview, given witnesses and checklists, so that witnesses are secured, information is gathered, last seen point can be determined, last known activity can be determined, procedures to re-contact the witnesses are established, and reference objects can be utilized. **16.2.6** Deploy a water rescue reach device to a waterbound victim, given required equipment and PPE so that the deployed equipment reaches the victim(s), the rescue equipment does not slip through the rescuer's hands, the victim is moved to the rescuer's shoreline, the victim is not pulled beneath the surface by rescuer efforts, the rescuer is not pulled into the water by the victim, and neither the rescuer nor the victim is tied to or entangled in the device. **16.2.7** Deploy a water rescue rope to a waterbound victim, given a water rescue rope in a throw bag, a coiled water rescue rope 50 ft to 75 ft (15.24 m to 22.86 m) in length, and PPE, so that the deployed rope lands within reach of the victim, the rescue rope does not slip through the rescuer's hands, the victim is moved to the rescuer's shoreline, the victim is not pulled beneath the surface by rescuer efforts, the rescuer is not pulled into the water by the victim, and neither the rescuer nor the victim is tied to or entangled in the throw line. **16.2.8** Develop and implement an action plan for the use of watercraft to support the rescue of a single or multiple waterbound victims, given watercraft, trained operator(s), and policies and procedures used by the AHJ, so that watercraft predeployment checks are completed, watercraft launch or recovery is achieved, rescuers are deployed and recovered, both on-board and rescue operations conform with watercraft operational protocols and capabilities, communications are clear and concise, and the candidate is familiar with watercraft nomenclature, operational protocols, design limitations, and launch/recovery site issues.	**16.3.4** Supervise, coordinate, and lead rescue teams during operations, given incident checklists, maps, topographic surveys, and charts, so that teams are managed, personnel are supervised, hazards are assessed and identified, safety and health of team is ensured, qualifications and abilities of rescuers are verified, pre-entry briefing is conducted, and debriefing is performed.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		16.2.9 Define procedures to provide support for helicopter water rescue operations within the area of responsibility for the AHJ, given a helicopter service, operational protocols, helicopter capabilities and limitations, water rescue procedures, and risk factors influencing helicopter operations, so that air-to-ground communications are established and maintained, applications are within the capabilities and skill levels of the helicopter service, the applications facilitate victim extraction from water hazards that are representative of the bodies of water existing or anticipated within the geographic confines of the AHJ, air crew and ground personnel safety are not compromised, landing zones are designated and secured, and fire suppression resources are available at the landing zone. **16.2.10** Implement procedures for performing watercraft-based rescue of an incapacitated waterbound victim, as a member of a team, given a water hazard that is representative of the anticipated rescue environment watercraft that is available to the team (if applicable), designated victim packaging and management equipment, and water rescue PPE, so that the control and stability of the watercraft is maintained, risks to the victim and rescuers are minimized, and the victim is removed from the hazard. **16.2.11** Demonstrate fundamental survival swimming and self-rescue skills, given safety equipment, props, and a controlled setting representative of the anticipated rescue environment, so that the risk of injury is minimized, flotation is maintained, available PPE is utilized, and egress is accomplished. **16.2.12** Identify procedures for operation of rope systems particular to the water rescue needs of the AHJ, given rescue personnel, an established rope system, a load to be moved, and PPE, so that the movement is controlled, the load is held in place when needed, and operating methods do not stress the system. **16.2.13** Support operations, given a designated mission, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, correct buoyancy control is maintained, and emergency procedures are demonstrated.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		16.2.14 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	
Swiftwater Rescue	**17.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**17.2.1** Construct rope systems particular to the swiftwater rescue needs of the AHJ, given rescue personnel, rope equipment, a load to be moved, and PPE, so that the movement is controlled, the load is held in place when needed, and operating methods do not stress the system.	**17.3.1** Perform an entry rescue in the swiftwater/flooding environment, given an incident scenario, PPE, and swiftwater rescue tool kit, so that rescue is accomplished, and adopted policies and safety procedures are followed.
	17.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**17.2.2** Support operations, given a designated mission, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, and emergency procedures are demonstrated.	**17.3.2** Negotiate a designated swiftwater course, given a course that is representative of the bodies of swiftwater existing or anticipated within the geographic confines of the AHJ, water rescue PPE, and swim aids as required, so that the specified objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuer has been staged for deployment.
	17.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**17.2.3** Assess moving water conditions, characteristics, and features in terms of hazards to the rescuer and victims, given an incident scenario and swiftwater tool kit, so that flow and conditions are estimated accurately, mechanisms of entrapment are considered, hazards are assessed, depth and surrounding terrain are evaluated, and findings are documented.	**17.3.3** Perform a swiftwater rescue from a rescue platform; such as a vessel, boat, watercraft or other water born transportation aid while negotiating a designated swiftwater course, given a course that is representative of the bodies of swiftwater existing or anticipated within the geographical confines of the AHJ, water rescue PPE, and swim aids as required, so that the specific objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuers has been staged for deployment.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	17.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported locations of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**17.2.4** Perform a nonentry rescue in the swiftwater/flooding environment, given an incident scenario, PPE, and swiftwater rescue tool kit, so that rescue is accomplished, and adopted policies and safety procedures are followed. **17.2.5** Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, and scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	
Dive Rescue	**18.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan. **18.1.2** Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**18.2.1** Define search parameters for a dive rescue incident, given topographical maps of a search area, descriptions of all missing persons and incident history, and hydrologic data, including speed and direction of current or tides, so that areas likely to contain the subject are differentiated from other areas, witnesses are interviewed, critical interview information is recorded, passive (indirect) and active (direct) search tactics are implemented, personnel resources are considered and used, and search parameters are communicated.	**18.3.1** Develop a dive plan, including the projected dive profile, given a pre-dive checklist, dive tables, and a subsurface mission so that elements of the plan, including maximum bottom time, depth limit, minimum reserve breathing air pressure, risk/benefit analysis, hazard-specific equipment, access/egress routes, type of search to be performed, and communication methods, are defined. **18.3.2** Select and use PPE, given a subsurface mission and personal protective and life-support equipment, so that rescuer is protected from temperature extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, pre-dive safety checks have been conducted, and the diver returns to the surface with no less than the minimum specified reserveprimary air supply pressure.

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
	18.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**18.2.2** Implement an action plan for a dive operation, given an operational plan and a dive rescue tool kit, so that all information is factored, risk/benefit analysis is conducted, protocols are followed, hazards are identified and minimized, personnel and equipment resources will not be exceeded, assignments are defined, consideration is given to evaluating changing conditions, and the selected strategy and tactics fit the conditions.	**18.3.3** Select and use a standard or full-face mask, given a subsurface mission and personal protective and life-support equipment, so that rescuer is protected from temperature extremes and environmental hazards, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, and pre-dive safety checks have been conducted.
	18.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**18.2.3**Implement procedures for use of watercraft in dive operations, given watercraft used by the AHJ, trained operator(s), and the agency's procedures so that watercraft pre-deployment checks are completed, watercraft launch or recovery is achieved as stipulated by AHJ operational protocols, divers are deployed recovered, and protected from harm; both onboard and dive rescue operations conform with watercraft operational protocols and capabilities, communications are clear and concise, and the candidate is familiar with watercraft nomenclature, operational protocols, design limitations, and launch/recovery site issues.	**18.3.4** Negotiate a SCUBA water course, given a SCUBA-dive designated course, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, correct buoyancy control is maintained, and emergency procedures are demonstrated.
		18.2.4 Support entry-level dive rescue operations, given a designated mission, a dive plan, safety equipment, props, and conditions consistent with the anticipated rescue environment, so that communication is maintained with divers while they are on the surface and submerged; status of divers' bottom time, location, repetitive dive status, and the progress of subsurface search operations is tracked and documented; skills are demonstrated in a controlled environment; performance parameters are achieved; hazards are continually assessed; and emergency procedures are demonstrated. **18.2.5** Secure the area as a potential crime scene and generate an accurate record of possible evidence and its environment, given paper and pencil, evidence tube or container, marker float, GPS, and last seen point, so that items are secured; possible evidence is preserved by taking notes on, documenting, making sketches of, photographing, or retrieving evidence; chain of custody and evidentiary nature is maintained; and information is passed to law enforcement.	**18.3.5** Supervise, coordinate, and lead dive teams during operations, given incident checklists, dive checklists, maps, topographic surveys, charts, and pre-dive/post-dive medical evaluation checklist, so that teams are managed, personnel are supervised, hazards are assessed and identified, safety and health of team is ensured, qualifications/abilities of divers are verified, pre-dive briefing is conducted, and post-dive medical evaluation and briefing are performed. **18.3.6** Select and use dive rescue equipment, given a dive rescue assignment and assorted items of personal protective and life-support equipment, so that rescuer is protected from temperature extremes, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, pre-dive safety checks have been conducted, and the diver returns to the surface with no less than the minimum specified reserve primary air supply pressure.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		18.2.6 Select and assemble PPE to assist rescue divers, given a subsurface mission and personal protective and life-support equipment, so that rescuer is protected from temperature extremes, correct buoyancy is maintained, AHJ protocols are complied with, swimming ability is maximized, routine and emergency communications are established between components of the team, self-rescue needs have been evaluated and provided for, and pre-dive safety checks have been conducted, to include complete encapsulation, including dry suit with attached hood, boots, and gloves and full face-mask.	**18.3.7** Manage physiological and psychological stressors in the aquatic environment for the diver and surface support personnel, given a simulated life-threatening situation, so that problems are recognized; corrective actions are initiated; and the situation is stabilized.
		18.2.7 Assist a surfaced diver in distress, given safety equipment; PPE; water hazard; and a tired, entrapped, or stressed diver, so that the diver is rescued or assisted, and the victim is extricated from the environment.	**18.3.8** Assist a submerged diver in distress, given safety equipment; PPE; and an entrapped, tired, or distressed diver, so that the diver is rescued or assisted, and the victim is extricated from the environment.
		18.2.8 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	**18.3.9** Escape from simulated life-threatening situations including out-of-air emergencies, entanglements, malfunction of primary air supply source, loss of buoyancy control and disorientation, given safety equipment, a pool or controlled water environment, SCUBA equipment, and props, so that hazards are recognized, emergency procedures are performed, diver escapes from situation to safety, and problems can be identified prior to work in a high-stress environment. **18.3.10** Perform environment-specific search of the water body, given search parameters for a dive rescue incident, hydrologic data (including speed and direction of current or tides), descriptions of missing persons and incident history, checklists, conditions affecting overlap, pattern selection, water body representative of the AHJ, and safety and SCUBA equipment, so that areas with high probability of detection are differentiated from other areas, witnesses are interviewed, critical interview information is recorded, personnel resources are considered, search parameters are communicated, search is performed, and object is found.

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Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
Ice Rescue	**19.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**19.2.1** Support Level II operations, given a designated mission, safety equipment, props, and water body, so that skills are demonstrated in a controlled environment, performance parameters are achieved, hazards are continually assessed, and emergency procedures are demonstrated.	**19.3.1** Demonstrate techniques for movement on ice, given an ice formation that is representative of the bodies of water and ice existing or anticipated within the geographic confines of the AHJ, ice rescue PPE, and swim aids as required, so that the specified objective is reached, all performance parameters are achieved, movement is controlled, hazards are continually assessed, distress signals are communicated, and rapid intervention for the rescuer has been staged for deployment.
	19.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**19.2.2** Assess ice and water conditions, characteristics, and features in terms of hazards to the rescuer and victims, given an incident scenario and ice rescue tool kit, so that conditions are estimated accurately, mechanisms of entrapment are considered, hazards are assessed, depth and surrounding terrain are evaluated, and findings are documented.	**19.3.2** Perform an entry rescue in the ice rescue environment, given an incident scenario, PPE, and ice rescue tool kit, so that independent positive buoyancy is established for the victim, rescue is accomplished, and adopted policies and safety procedures are followed.
	19.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**19.2.3** Perform a nonentry rescue in the ice rescue environment, given an incident scenario, PPE, and ice rescue tool kit, so that rescue is accomplished and adopted policies and safety procedures are followed.	
	19.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**19.2.4** Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
Surf Rescue	**20.1.1** Recognize the need for technical rescue resources at an incident, given AHJ guidelines, an operations- or technician-level incident, so that the need for additional resources is identified, the response system is initiated, the scene is secured and rendered safe until additional resources arrive, and awareness-level personnel are incorporated into the operational plan.	**20.2.1** Develop a site survey for an existing surf site, given historical data, PPE for conducting site inspections, rescue equipment for effecting surf rescues, tide tables, currents, and wave heights and meteorological projections, so that life safety hazards are anticipated, risk/benefit analyses are included, site inspections are completed, ocean conditions are projected, site-specific hazards are identified, routes of access and egress are identified, boat ramps are identified, entry and exit points to surf sites are identified, methods of entrapment are considered, and areas with high probability for victim location are determined.	**20.3.1** Demonstrate advanced swimming skills in the surf environment, given safety equipment and a water body with high surf, so that advanced skills are demonstrated in an environment representative of conditions experienced in the jurisdiction, performance parameters and objectives are achieved, and problems can be identified prior to working in a high surf environment.
	20.1.2 Establish scene safety zones, given an incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that safety zones are designated, zone perimeters are consistent with incident requirements, perimeter markings can be recognized and understood by others, zone boundaries are communicated to incident command, and only authorized personnel are allowed access to the scene.	**20.2.2** Demonstrate survival swimming skills in low-surf environment, given safety equipment and a water body with low surf, so that basic survival skills are demonstrated in a representative environment as found in the jurisdiction, performance parameters are achieved, and problems can be identified prior to working in a low-surf environment.	**20.3.2** Perform a swimming rescue for a waterbound surf victim, given PPE, including a pair of swimming fins and a surf rescue tube with a shoulder strap, safety equipment, and a water body with high surf representative of the jurisdiction's conditions, so that the victim is secured within the surf rescue tube and towed out of the surf impact zone to shore or to a surf-free zone for pickup by a watercraft, boat, or helicopter.
	20.1.3 Identify and support an operations- or technician-level incident, given an incident, an assignment, incident action plan, and resources from the tool kit, so that the assignment is carried out, progress is reported to command, environmental concerns are managed, personnel rehabilitation is facilitated, and the incident action plan is supported.	**20.2.3** Deploy a nonmotorized watercraft and rescue a water-bound surf victim, given watercraft used by the AHJ, so that watercraft predeployment checks are completed, watercraft launch or recovery is achieved as stipulated by AHJ operational protocols, both onboard and surf rescue operations conform with watercraft operational protocols and capabilities, communications are clear and concise, and the candidate is familiar with watercraft nomenclature, operational protocols, design limitations, and launch/recovery site issues.	**20.3.3** Perform a subsurface retrieval of a submerged victim in a surf environment, given PPE; swimming fins, mask, and snorkel; and a water body with high surf representative of the jurisdiction's conditions, so that the victim is located and brought to the surface, removed out of the surf impact zone to shore or to a surf-free zone for pickup by a watercraft, boat, or helicopter.
	20.1.4 Size up an incident, given an incident, background information and applicable reference materials, so that the operational mode is defined, resource availability and response time, types of rescues are determined, the number of victims are identified, the last reported location of all victims are established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, search parameters are identified, and information required to develop an incident action plan is obtained.	**20.2.4** Define procedures to provide support for surf rescue operations within the area of responsibility for the AHJ, given motorized watercraft used by the AHJ, protocols and procedures, boat-to-shore communication, extraction issues, and safety procedures, so that communications are clear and concise, and the candidate is familiar with boat nomenclature, operational protocols, and design limitations.	

(continues)

Table C.1 *Continued*

Rescue Section	Awareness	Operations	Technician
		20.2.5 Terminate an incident, given PPE specific to the incident, isolation barriers, and tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modification or damage created during the operational period; documentation of loss or material use is accounted for, scene documentation is performed, scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing and post-incident analysis and critique are considered, and command is terminated.	

Annex D Collapse Types

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 Collapse Patterns. Collapse patterns and potential victim locations include the following:

(1) *Lean-To.* A lean-to is formed when one or more of the supporting walls or floor joists breaks or separates at one end, causing one end of the floor(s) to rest on the lower floor(s) or collapse debris. Potential areas where victims might be located are under the suspended floor and on top of the floor at the lowest level. *[See Figure D.1(a).]*

(2) *"V" Shape.* A "V" is formed when heavy loads cause the floor(s) to collapse near the center. Potential areas where victims might be located are under the two suspended floor pieces and on top of the floor in the middle of the V. *[See Figure D.1(b).]*

(3) *Pancake.* A pancake is formed when the bearing wall(s) or column(s) fails completely and an upper floor(s) drops onto a lower floor(s), causing it to collapse in a similar manner. Potential areas where victims might be located are under the floors and in voids formed by building contents and debris wedged between the floors. *[See Figure D.1(c).]*

(4) *Cantilever.* A cantilever is formed when one end of the floor(s) hangs free because one or more walls have failed and the other end of the floor(s) is still attached to the wall(s). Potential areas where victims might be located are on top of or under the floors. *[See Figure D.1(d).]*

(5) *A-Frame.* An A-frame collapse occurs when flooring separates from the exterior bearing walls but still is supported by one or more interior bearing walls or nonbearing partitions. The highest survival rate for trapped victims will be near these interior partitions. Other victims will be located in the debris near both exterior walls. *[See Figure D.1(e).]*

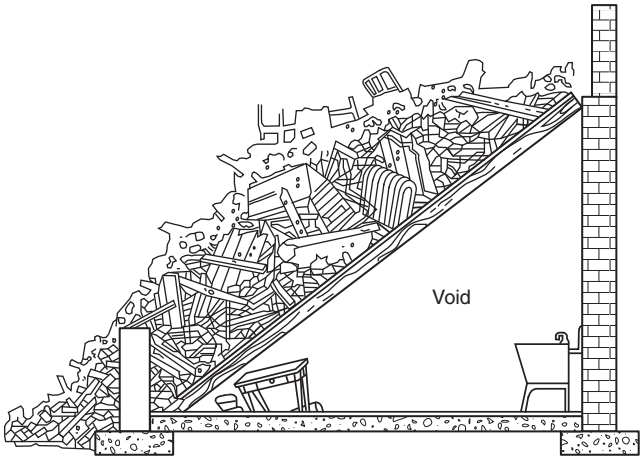

FIGURE D.1(a) Lean-To Floor Collapse. ***[Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense]***

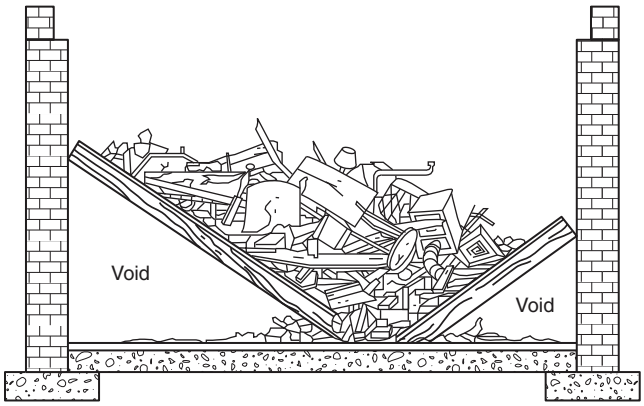

FIGURE D.1(b) V-Shape Floor Collapse. ***[Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense)]***

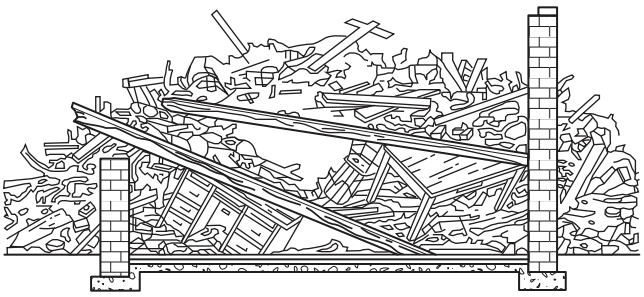

FIGURE D.1(c) Pancake Floor Collapse. *[Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense)]*

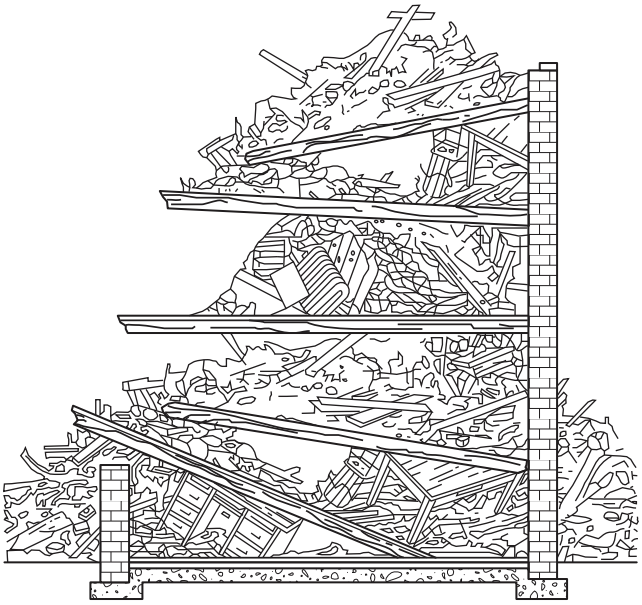

FIGURE D.1(d) Cantilever Floor Collapse. *[Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense)]*

D.2 Earthquake Collapse Patterns. Earthquake motion causes forces to be generated in all types of structures. In general, the forces are proportional to the weight of the structure. However, with careful attention to the design, using ductility and redundancy, many structures are earthquake resistant. The destructive forces affect the lateral resistance of the structure, such as shear-walls, moment frames, and X-bracing. Once the resistance of these elements has been overcome, gravity will cause the structure to move toward the ground. The following are collapse patterns that have been observed:

(1) **Offset Collapse Pattern — Light Frame Construction.** This pattern develops due to the unique nature of light frame construction. The lateral load–resisting walls for these structures can be characterized as "skin and bones" construction, where lateral resistance to racking is provided by the sheathing (skin), but the vertical load is supported by studs and posts (bones). Therefore, when earthquake motion causes the sheathing to fail (usually in the first story), the story (or stories) will start to lean over (rack). The vertical load capacity of the studs and posts is still intact, so the structure will progressively lean over until it has offset about as much as the height of the story (or stories) that have failed sheathing. *[See Figure D.2(a).]*

(2) **Wall-Fall Collapse Pattern — Heavy Wall Construction, Unreinforced Masonry (URM), and Tilt-Up.** This pattern develops when earthquake motion causes high forces to be developed in the heavy walls that overcome the connections between the walls and the floors/roof. The walls can then fall outward, leaving the floors/roof partially unsupported. The pattern is somewhat different for URM and tilt-up construction.

(a) **Wall-Fall URM.** Since the walls are relatively weak, and earthquake motion causes forces to be greatest at the top of the wall and decrease with height, the parapets and upper story walls are most likely to fall. The fall zone is normally much less than the wall height. Because many URM buildings have residential occupancies with interior partitions, the light, interior wood frame construction will remain uncollapsed and supported on interior bearing and nonbearing walls. In extreme cases the full height of the URM wall will fall, and then collapse of interior spaces is more likely. It should be noted that URM construction in California has been the

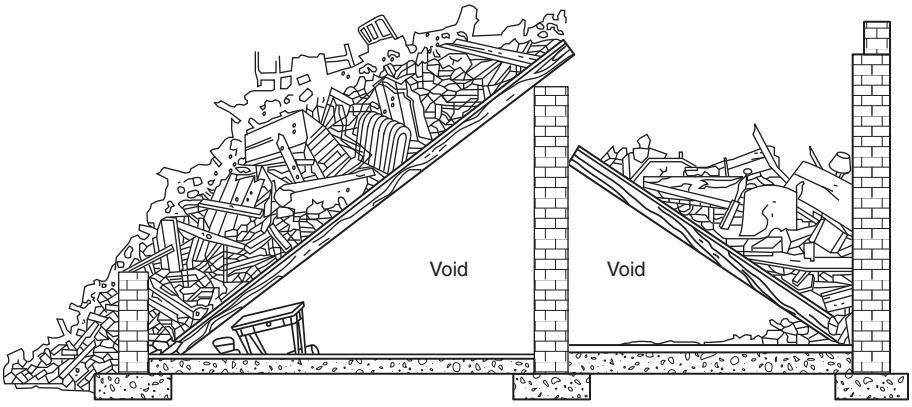

FIGURE D.1(e) A-Frame Floor Collapse. *[Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense)]*

subject of statewide ordinances that require upgrade modifications that greatly reduce the chance of this type of collapse. There are many vulnerable URM buildings in the earthquake regions in the central and eastern United States. *[See Figure D.2(b).]*

(b) **Wall-Fall Tilt-Up.** The 0.15 m to 0.20 m (6 in. to 8 in.) reinforced concrete walls for these structures will, in almost all cases, collapse as a unit. The fall zone in this case will be at least the height of the wall. Since this type of construction most commonly has warehouse occupancy with few partitions and fairly long roof spans, it is most likely that the end of the roof formerly supported by the wall will collapse to the ground. At that point, one would observe a lean-to roof collapse, unless a more extensive roof collapse was generated. *[See Figure D.2(c).]*

(3) **Pancake Collapse Pattern — Heavy Floor Construction.** This pattern develops when earthquake motion causes the columns to fail, commonly at their connection with the floors. The heavy floors are then driven down on top of each other by gravity. This type of collapse has been minimized in more modern structures (post 1975 in the western U.S.) that have been designed and built with greater ductility. *[See Figure D.2(d).]*

(4) **Overturn Collapse Pattern — Heavy Floor or Heavy Steel Construction.** This pattern develops when earthquake motion causes high tension and/or compression forces in the exterior columns of taller, slender buildings that have inadequate ductility in their designs. In the case of heavy floor buildings, the columns normally fail in tension at a spliced connection. In heavy steel buildings, the columns fail in compression by buckling. *[See Figure D.2(e).]*

(5) **Soft First Story Collapse Pattern — Heavy Floor.** This pattern develops in a building that has occupancy in the first story, which does not permit many shear-resisting walls, and with upper stories, which have many shear walls. Earthquake motion becomes concentrated in the soft story as the minimal amount of shear resistance is overcome and the story collapses. *[See Figure D.2(f).]*

(6) **Random Parts Collapse Pattern — Precast Concrete Construction.** This pattern develops when earthquake motion causes forces in the connections between the precast elements. When the connections fail, the affected parts fall and a progressive collapse can be triggered that can involve most of the structure. This type of collapse most often occurs in "economically engineered" precast structures, such as parking garages throughout the United States, as well as other occupancies in the central and eastern United States. Once the collapse starts, it is hard to predict how many parts will be involved, but gravity will bring those parts directly to the ground below. *[See Figure D.2(g).]*

(7) **Wind Collapse.** Depending on its speed, wind can cause many detrimental effects to structures and parts of structures. Light, projecting parts can be lifted away and deposited at great distances. In very severe tornado winds, light structures are shredded and torn apart. A common collapse pattern that has been observed for partially remaining structures is the roof lift-off collapse pattern, which occurs in light frame and heavy wall construction. This pattern develops when the roof is lifted off, either due to aerodynamic lift or the wind penetrating the structure. Once the lateral transfer bracing provided by the roof has been removed from the walls, the walls are vulnerable to falling out (or in). The wall-fall can be limited at corners or if there are other elements that can provide lateral support. *[See Figure D.2(h).]*

(8) **Blast Collapse.** Blasts produce very high, but short-duration, pressures on surfaces in all directions from the ignition point. Light structures will be completely blown away, in no particular pattern. The effect of blast is very different from that of earthquake. In the case of blast, the pressure is exerted equally in all directions from the origin. A common collapse pattern is the lift and drop collapse pattern. This pattern develops when a blast originates within or immediately adjacent to a structure. The pressure wave radiates out in all directions, but the most detrimental effect is upward pressures on concrete slabs that have been designed for only gravity forces. If the reinforcing steel has been provided to resist only downward, gravity forces, the concrete has only its weight to resist the upward blast pressure. Since concrete is weak in tension, the slabs are lifted, destabilizing adjacent columns, and a significant part of the structure falls to the ground (or basement). Part of the damaged slabs can end up precariously hanging from the remaining structure. Figure D.2(i) shows a three-step, probable collapse sequence based on the Murrah Federal Office Building, Oklahoma City, 1995.

(9) **Fire Collapse.** Depending on the type of construction, there are many collapse patterns due to fire. In the case of light frame construction, the entire structure might be consumed. There are a few cases where a heavy floor or heavy, fireproofed steel has collapsed. Figure D.2(j) shows a common type of collapse pattern caused by fire. This pattern develops when the wood floor and the roof, which provide the lateral, transfer bracing for the walls, have burned out. This leaves the unbraced walls standing without adequate lateral support, and they could collapse in high winds.

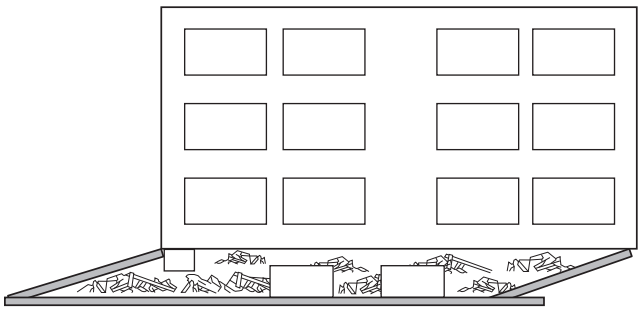

FIGURE D.2(a) Offset Collapse Pattern — Light Frame Construction.

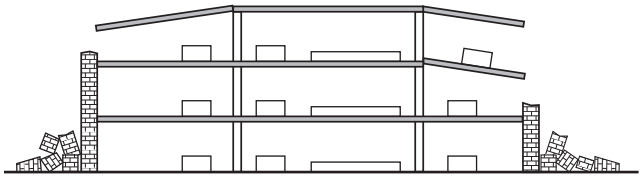

FIGURE D.2(b) Wall-Fall Collapse Pattern — Heavy Wall — URM Construction.

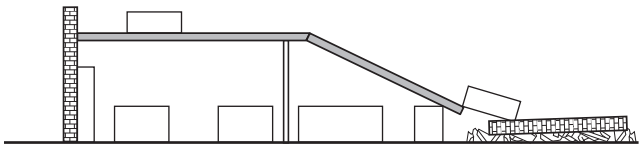

FIGURE D.2(c) Wall-Fall Collapse Pattern — Heavy Wall — Tilt-Up Construction.

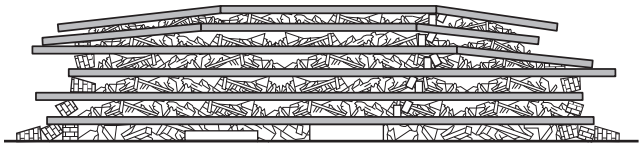

FIGURE D.2(d) Pancake Collapse Pattern — Heavy Floor Construction.

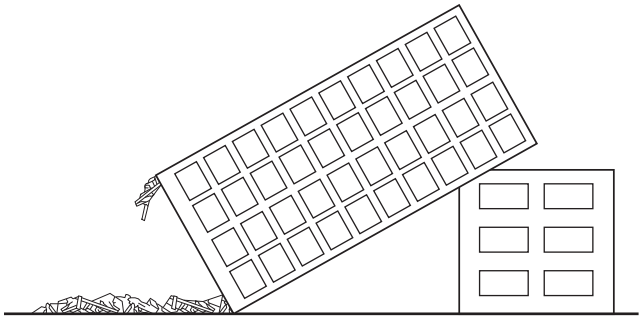

FIGURE D.2(e) Overturn Collapse Pattern — Heavy Floor or Heavy Steel Construction.

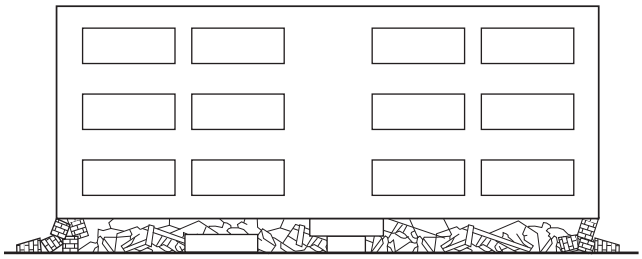

FIGURE D.2(f) Soft First Story Collapse Pattern — Heavy Floor Construction.

Annex E Confined Space Entry Permit

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

E.1 Confined Space Sample Forms. In certain industries, U.S. federal law does not require a permit system even though spaces that meet the characteristics of confined spaces, as defined within this standard, can be present. In these cases, as well as cases of unauthorized or nonregulated entry into confined spaces, a permit might not be available for reference by the rescue team. The space must be assessed completely before entry can be made safely. U.S. federal law does not require rescuers to have a permit to rescue, although it is advisable for the rescue team to follow similar procedures to ensure safety. *[See Figure E.1(a) through Figure E.1(d).]*

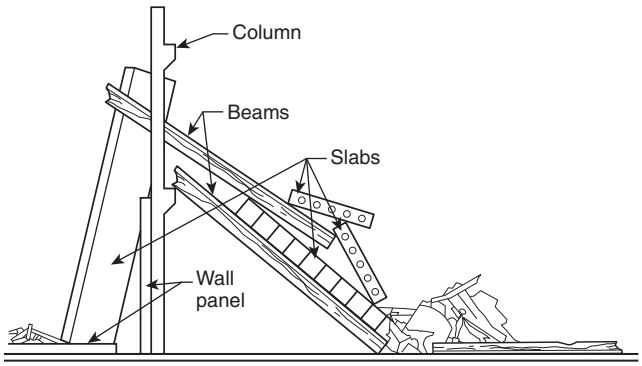

FIGURE D.2(g) Random Fall Collapse Pattern — Precast Concrete Construction.

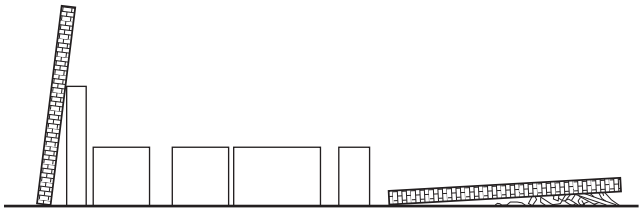

FIGURE D.2(h) Wind Lift Collapse — Roof Off, Walls Collapse.

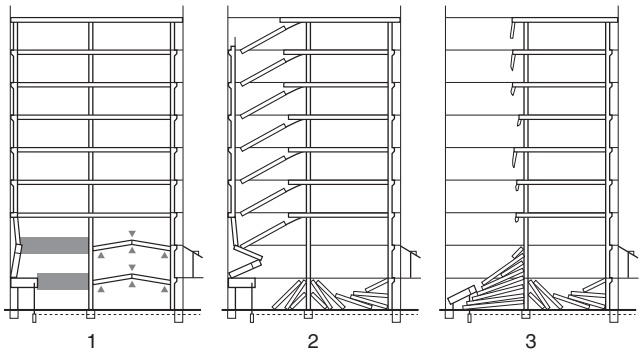

FIGURE D.2(i) Lift and Drop Collapse Pattern — Concrete Heavy Floor Construction.

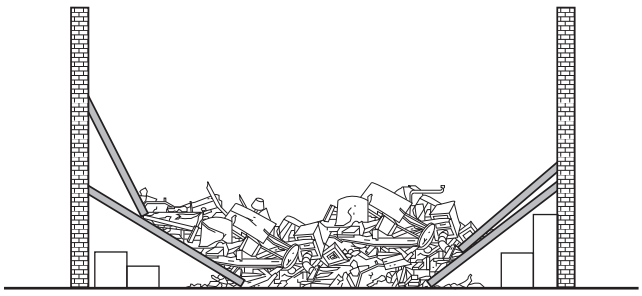

FIGURE D.2(j) Fire Burn-Out Collapse Pattern — Roof/Floor Burn-Out — Heavy Wall Construction — URM or Tilt-Up.

ENTRY PERMIT

Address: _____

RP name: _____ Title: _____

RP or witness account of incident: _____

_____

If no witness, clues available at the site: _____

_____

Space type: Tank: _____ Pipe: _____ Silo: _____ Evacuation: _____

Confined Space Permit obtained? ❑ Yes ❑ No

Product involved: _____

Product hazards: LEL _____ % TLV _____ ppm IDLH _____ ppm

Explosive? ❑ Yes ❑ No

Establishment of zones? ❑ Yes ❑ No Isolation of area: _____ hr(s)

Lockout completed: _____ hr(s)

Number of victims: _____ Time victims trapped: _____ (24-hr clock)

Victim status: _____

_____

Victim #	Age	Name	Medical HX
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

Victim #	Location	Priority
1.	_____	1 2 3 4
2.	_____	1 2 3 4
3.	_____	1 2 3 4
4.	_____	1 2 3 4

Communications established with victims? ❑ Yes ❑ No

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FIGURE E.1(a) Sample Entry Permit Form.

ENTRY PERMIT

Access points	Location	Entry accessible		Ventilation point	
1.	_____	Yes	No	Yes	No
2.	_____	Yes	No	Yes	No
3.	_____	Yes	No	Yes	No
4.	_____	Yes	No	Yes	No

Is there an adequate number of trained personnel on the scene to perform the tasks associated with the rescue? (minimum of eight required) ❑ Yes ❑ No

Is the proper equipment present at the scene to complete the operation?

	Yes	No
Atmosphere monitoring equipment	❑	❑
Explosionproof lighting	❑	❑
Explosionproof communications	❑	❑
Supplied-air breathing apparatus or remote aid	❑	❑
Cascade system	❑	❑
Victim removal systems/equipment	❑	❑
Ventilation equipment with CFM of 4000 – 5000 and necessary duct work	❑	❑

Request for hazmat and/or rescue units: _____hr(s)

Diagram of confined space (including entry and egress locations):

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FIGURE E.1(a) ***Continued***

CONFINED SPACE ENTRY TEAM CHECKLIST

Entry Team member's name: _____

Filled out by: _____

- ❑ Confined space atmosphere evaluated
- ❑ Medical checkout by ALS unit
- ❑ Jump suit donned
- ❑ 2.2 cylinders on remote air topped off
- ❑ Escape bottle topped off
- ❑ Remote air tested and operational
- ❑ Communications check
- ❑ Life line attached
- ❑ Atmosphere monitors attached and on
- ❑ Helmet on
- ❑ Gloves on

ENTRY TEAM MEDICAL CHECKLIST

Entry time: _____ BP ____ / ____ Pulse _____ Resp. _____ Skin _____

Notes: _____

Exit time: _____ BP ____ / ____ Pulse _____ Resp. _____ Skin _____

Notes: _____

FIGURE E.1(b) Sample Confined Space Entry Team Checklist.

ATMOSPHERE MONITORING LOG

Unit	Time	LEL	O_2	Action
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	
		%	%	

FIGURE E.1(c) Sample Atmosphere Monitoring Log.

AGREEMENT TO PROVIDE RESCUE RESPONSE

This is to confirm that (*rescue service*) has agreed to provide permit-required confined space rescue response to (*employer's facility*), hereafter referred to as (*employer*).

(*Employer*) understands that in order for (*rescue service*) to provide such response, (*employer*) is required and agrees to:

1) Inform (*rescue service*) of the hazards and/or potential hazards present in the confined spaces.
2) Provide access prior to entry to all permit spaces from which (*rescue service*) may be required to perform rescue.
3) Provide MSDS for each substance to which there may be potential exposure in the confined space.
4) Notify (*rescue service*) prior to commencing entry and verify that (*rescue service*) is available to respond. (It is recommended that the rescue service require the employer to fax a copy of the entry permit to the rescue service prior to entry.)
5) Evacuate all confined spaces after entry has begun if notified by (*rescue service*) that (*rescue service*) is not available to respond.
6) (*Rescue service*) has the full authority to make the determination whether entry will be made for rescue given the current existing conditions.

(*Rescue service*) agrees to:

1) Perform rescue preplans of all confined spaces for which (*rescue service*) is responsible for rescue response prior to entry.
2) Provide a list of rescue equipment needed for each entry into such spaces for listing on the permit as required.
3) Notify (*employer*) immediately if the rescue service becomes unavailable for immediate response for any reason.

Name	*Name*
Employer	*Rescue Service*
Date	*Date*

Note: At this point, the rescue service should address any additional considerations for response. For example, if the rescue service is a municipal service, the service should address anticipated difficulties in response, such as being unavailable due to response to accident, fires, etc., that could result in extended periods of unavailability. Also consider language qualifying the extent of availability. This would include such things as stating that response cannot be guaranteed due to, for instance, two separate instances occurring simultaneously when there is only one response unit/team. Although the rescue service would be responsible under this agreement for notifying the host employer when the service is not available due to another response, it is possible that the incidents can occur simultaneously, in which case neither employer would have been notified. Also consider language agreeing to how such a response decision will be handled, that is, triage, closest response, etc.

FIGURE E.1(d) Sample Agreement to Provide Rescue Response.

Annex F Structural Types

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

F.1 Materials and Construction Types. Table F.1 and Figure F.1(a) through Figure F.1(n) can be used to clarify material on structural types found in the body of the document.

Table F.1 Combinations of Materials in Structural Types (after ATC, 1987)

Structural Type Identifier	General Description
W	Wood buildings of all types
S1	Steel moment-resisting frames
S2	Braced steel frames
S3	Light metal buildings
S4	Steel frames with cast-in-place concrete shearwalls
C1	Concrete moment-resisting frames
C2	Concrete shearwall buildings
C3/C5	Concrete or steel frame buildings with unreinforced masonry in-fill walls
TU	Tilt-up buildings
PC2	Precast concrete frame buildings
RM	Reinforced masonry
URM	Unreinforced masonry

[**1670:** Table C.1]

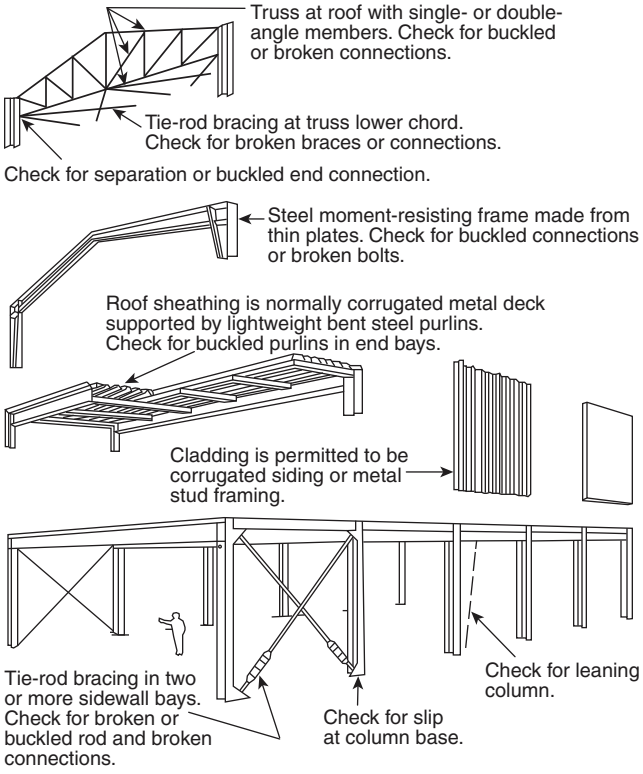


FIGURE F.1(a) Light Metal Building.

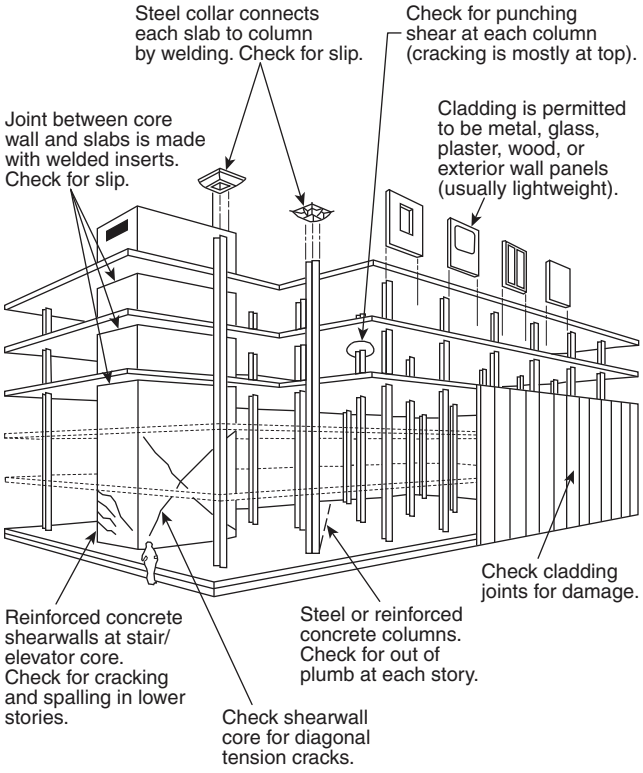
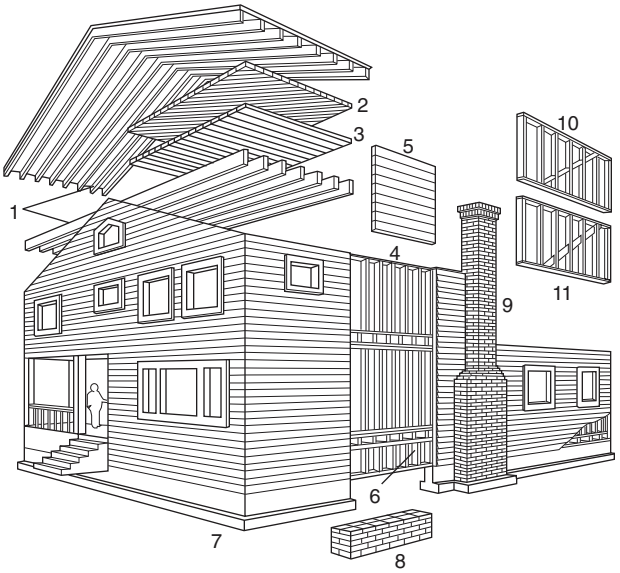


FIGURE F.1(b) Post-Tensioned Lift Slab Building.

Roof/floor span systems:
1. Wood joist and rafter
2. Diagonal sheathing
3. Straight sheathing

Wall systems:
4. Stud wall (platform or balloon framed)
5. Horizontal siding



Foundation/connections:
6. Unbraced cripple wall
7. Concrete foundation
8. Brick foundation

Bracing and details:
9. Unreinforced brick chimney
10. Diagonal blocking
11. Let-in brace (only in later vintages)

FIGURE F.1(c) Wood Stud Frame Construction.

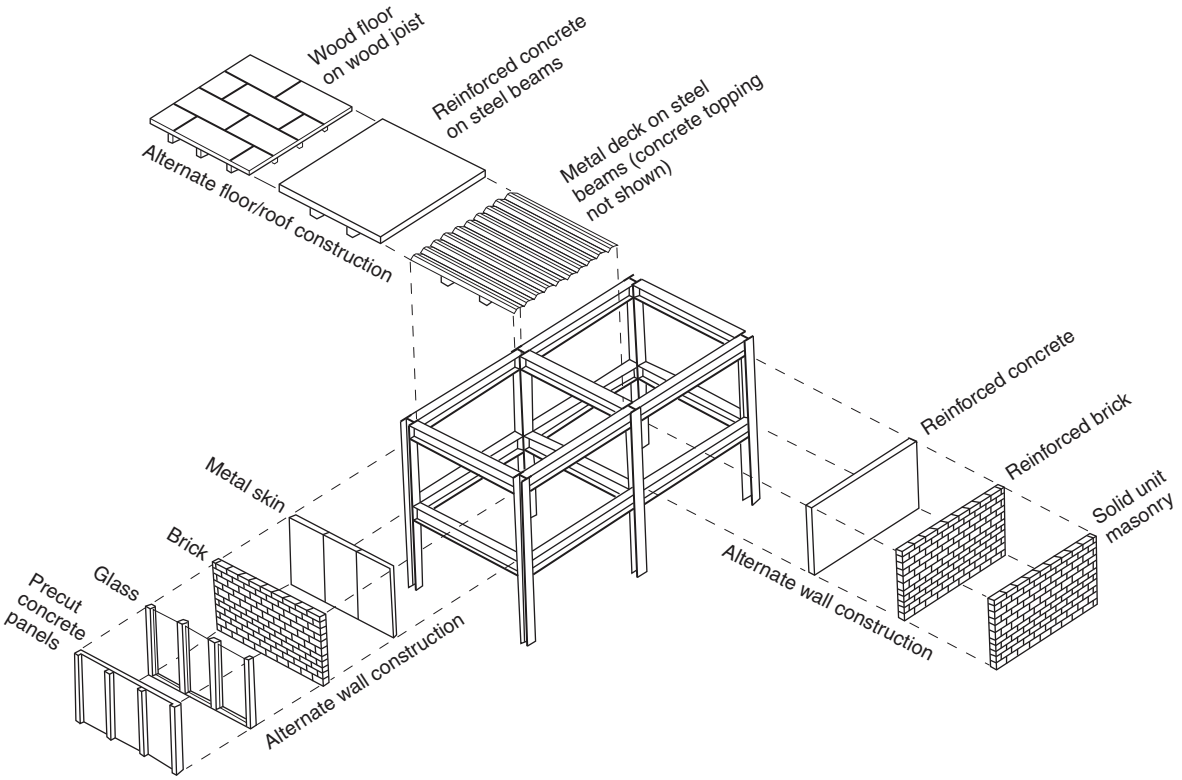


FIGURE F.1(d) Steel Moment-Resisting Frame.

F.2 Light Frame Construction. Materials used for light frame construction are generally lightweight and provide a high degree of structural flexibility in response to forces such as earthquakes, hurricanes, tornadoes, and so forth.

These structures typically are constructed with skeletal structural frame systems of wood or light-gauge steel components that provide support to the floor and roof assemblies.

Examples of this construction type include wood frame structures used for residential, multiple low-rise, and light commercial occupancies up to four stories in height. Light-gauge steel frame buildings include commercial, business, and light manufacturing occupancies and facilities.

F.3 Heavy Construction.

F.3.1 Heavy Wall Construction. Materials used for heavy wall construction are generally heavy and utilize an interdependent structural or monolithic system. These types of materials and their assemblies tend to produce a structural system that is inherently rigid.

This construction type usually is built without a skeletal structural frame. It utilizes a heavy wall support and assembly system that provides support for the floors and roof areas.

Occupancies utilizing tilt-up concrete construction are typically one to three stories in height and consist of multiple, monolithic concrete wall panel assemblies. They also use an interdependent girder, column, and beam system for providing lateral wall support of floor and roof assemblies. Such occupancies typically include commercial, mercantile, and industrial

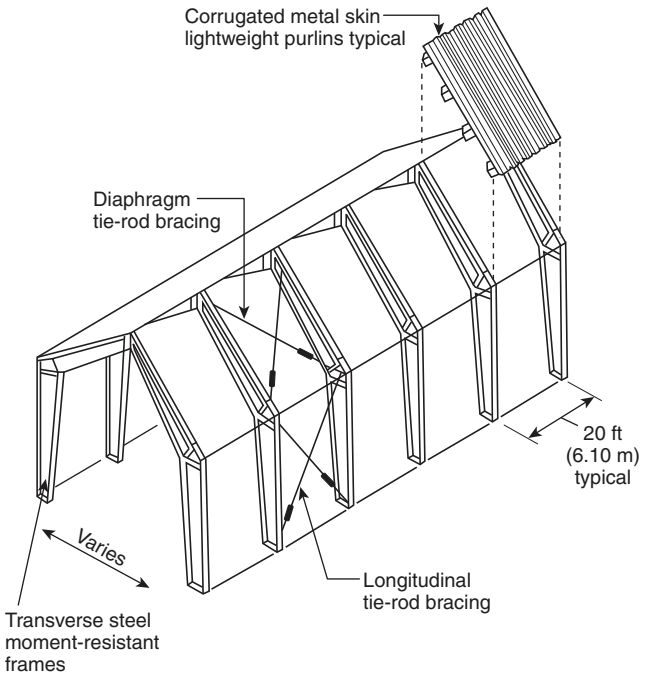


FIGURE F.1(e) Light Metal Construction.

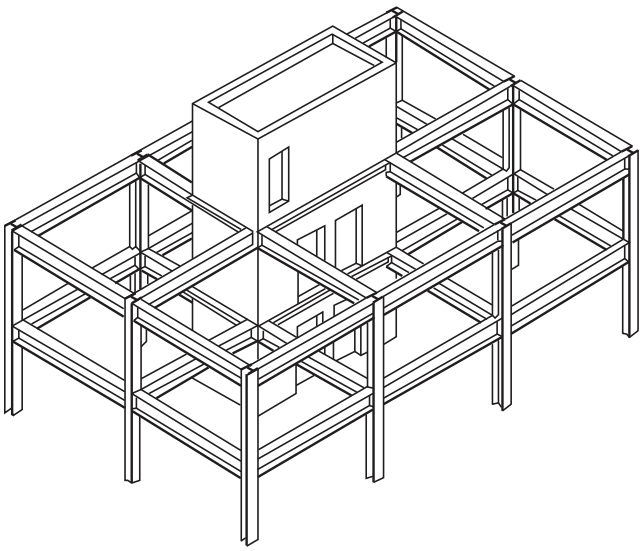
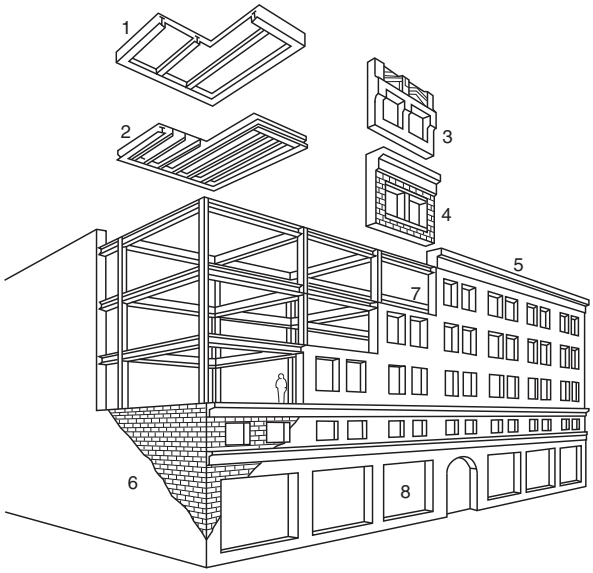


FIGURE F.1(f) Steel Frame with Shearwall.

Roof/floor span systems:
1. Steel framing with concrete cover
2. Wood floor joist and diaphragm (diagonal and straight)

Wall systems:
3. Non-load-bearing concrete wall
4. Non-load-bearing unreinforced masonry cover wall



Details:
5. Unreinforced and unbraced parapet and cornice
6. Solid party walls

Openings and wall penetrations:
7. Window-penetrated front facade
8. Large openings of street-level shops

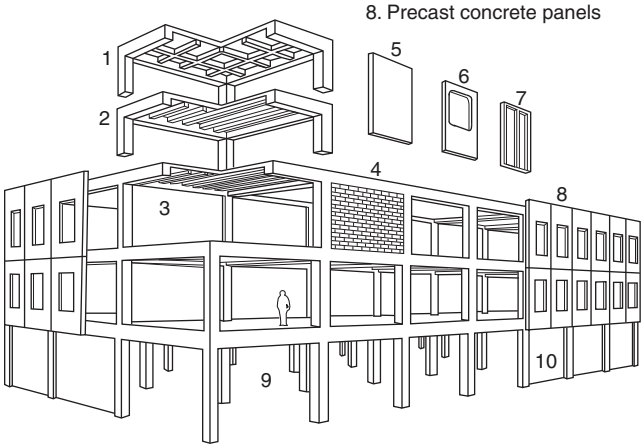
FIGURE F.1(g) Steel Frame with Unreinforced Masonry (URM) In-Fill.

usage. Materials other than concrete now are being utilized in tilt-up construction.

Examples of this type of construction include reinforced and unreinforced masonry buildings typically of low-rise construction, one to six stories in height, and of any occupancy type.

Roof/floor diaphragms:
1. Concrete waffle slab
2. Concrete joist and slab
3. Steel decking with concrete topping

Curtain wall/nonstructural infill:
4. Masonry infill walls
5. Stone panels
6. Metal skin panels
7. Glass panels
8. Precast concrete panels



Structural system:
9. Distributed concrete frame

Details:
10. Typical tall first floor (soft story)

FIGURE F.1(h) Concrete Moment-Resisting Frame.

Roof/floor span systems:
1. Heavy timber rafter roof
2. Concrete joist and slab
3. Concrete flat slab

Wall system:
4. Interior and exterior concrete bearing walls
5. Large window penetrations of school and hospital buildings

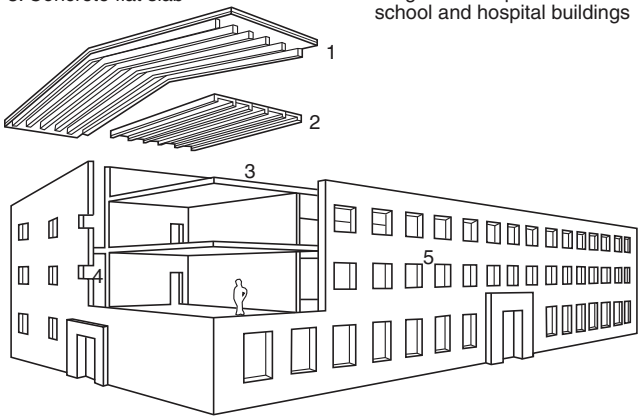


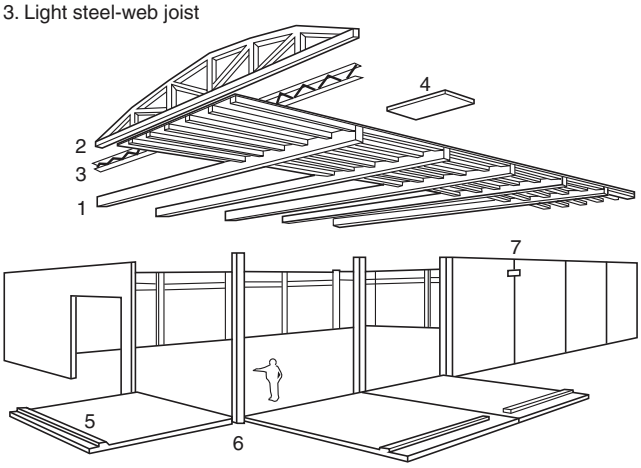
FIGURE F.1(i) Concrete Shearwall.

F.3.2 Heavy Floor Construction. Structures of heavy floor construction are built utilizing cast-in-place concrete construction consisting of flat slab panel, waffle, or two-way concrete slab assemblies. Pretensioned or posttensioned reinforcing steel rebar or cable systems are common components used for structural integrity. The vertical structural supports include integrated concrete columns, concrete enclosed steel frame, or steel frame, which carry the load of all floor and roof assemblies. This type of structure includes heavy timber construction that might use steel rods for reinforcement.

The reinforcing steel, along with the varying thicknesses of concrete structural slab and girder supports utilized in this construction assembly, poses significant concerns with respect to breaching and void penetration.

Roof/floor span systems:
1. Glue-laminated beam and joist
2. Wood truss
3. Light steel-web joist

Roof/floor diaphragms:
4. Plywood sheathing



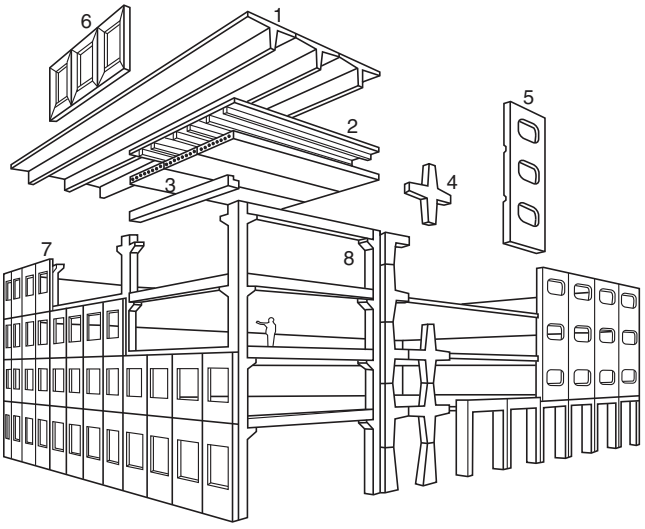
Details:
5. Anchor-bolted wooden ledger for roof/floor support

Wall systems:
6. Cast-in-place columns — square, T-shape, and H-shape
7. Welded steel plate–type panel connection

FIGURE F.1(j) Tilt-Up Construction Typical of Western United States; Tilt-Up Construction in Eastern United States Can Incorporate Steel Frame.

Roof/floor span systems:
1. Structural concrete T sections
2. Structural double-T sections
3. Hollow-core concrete slab

Wall systems:
4. Load-bearing frame components (cross)
5. Multistory load-bearing panels



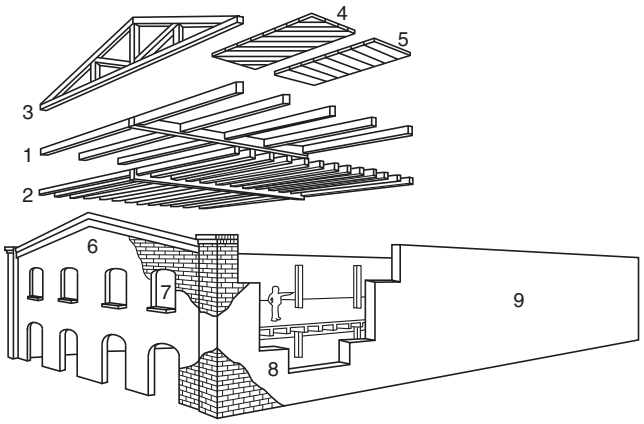
Curtain wall system:
6. Precast concrete panels
7. Metal, glass, or stone panels

Structural system:
8. Precast column and beams

FIGURE F.1(k) Precast Concrete Frame.

Roof/floor span systems:
1. Wood post and beam (heavy timber)
2. Wood post, beam, and joist (mill construction)
3. Wood truss-pitch and curve

Roof/floor diaphragms:
4. Diagonal sheathing
5. Straight sheathing



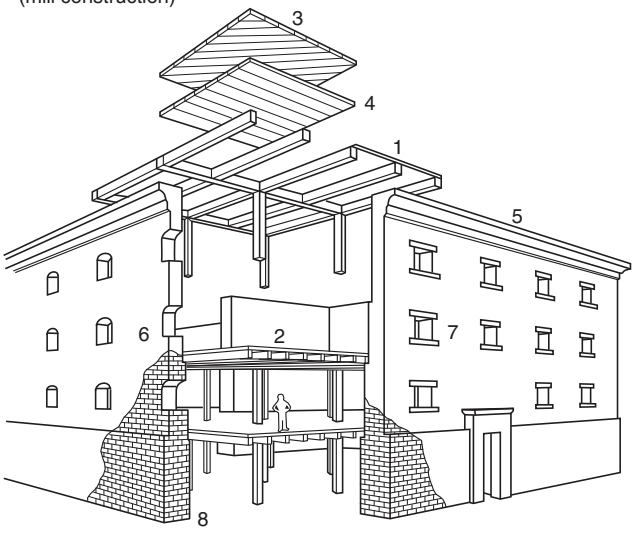
Details:
6. Typical unbraced parapet and cornice
7. Flat arch window openings

Wall systems:
8. Bearing wall — four or more wythes of brick
9. Typical long solid party wall

FIGURE F.1(l) Unreinforced Masonry Bearing Wall, Example 1 of 3.

Roof/floor span systems:
1. Wood post and beam (heavy timber)
2. Wood post, beam, and joist (mill construction)

Roof/floor diaphragms:
3. Diagonal sheathing
4. Straight sheathing



Details:
5. Typical unbraced parapet and cornice
6. Flat arch window openings
7. Small window penetrations (if building is originally a warehouse)

Wall systems:
8. Bearing wall — four to eight wythes of brick

FIGURE F.1(m) Unreinforced Masonry Bearing Wall, Example 2 of 3.

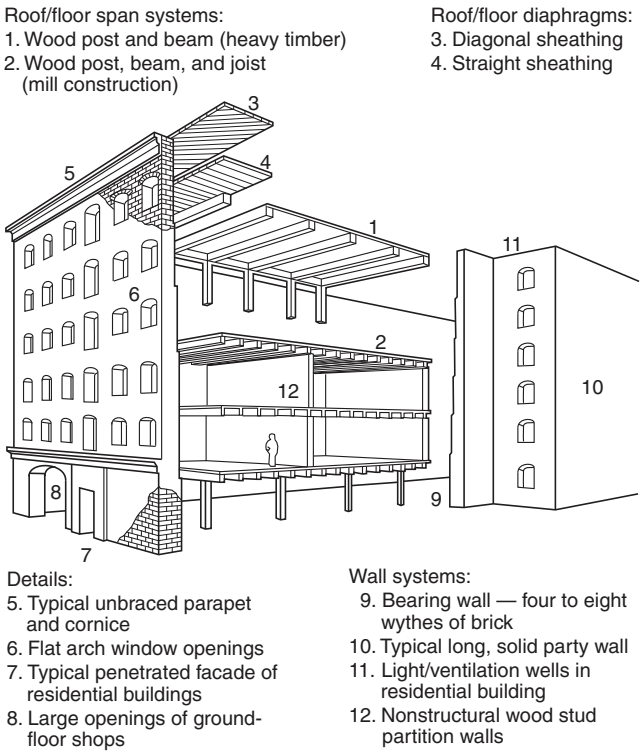


FIGURE F.1(n) Unreinforced Masonry Bearing Wall, Example 3 of 3.

The loss of reinforcement capability and the integrity of structural loading capacity of the floor and wall assemblies creates significant safety and operational considerations during collapse operations.

Structural steel frame construction utilizes a skeletal framing system consisting of large-load-carrying girders, beams, and columns for structural support. These components represent a substantial weight factor for individual and assembly components. Floor systems consist of cast-in-place concrete slabs of varying thicknesses poured onto metal pans or structural metal floor decks and also might include precast and posttensioned concrete plank systems. These concrete/metal pan floor assemblies are supported by the structural steel framing system.

The exterior construction might consist of metal or masonry veneer, curtain wall, or composite material panel systems. Additionally, precast concrete or stone-clad panel systems might be present.

Multiple assembly or component failures might be present in a collapse situation where isolated or multiple collapse conditions or collapse configurations exist.

Examples of this type of construction include offices, schools, apartments, hospitals, parking structures, and multipurpose facilities. Heights vary from single-story to high-rise structures.

F.3.3 Precast Construction. Structures of precast construction are built utilizing modular precast concrete components that include floors, walls, columns, and other subcomponents that are field-connected at the site.

Individual concrete components utilize imbedded steel reinforcing rods and welded wire mesh for structural integrity and might utilize either steel beam and column or concrete framing systems for the overall structural assembly and building enclosure.

These structures rely on single or multipoint connections for floor and wall enclosure assembly and are a safety and operational concern during collapse operations.

Examples of this type of construction include commercial, mercantile, office, and multiuse or multifunction structures, including parking structures and large occupancy facilities.

Annex G Structural Marking Systems

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Annex G is extracted from the Army Corps of Engineers.

G.1 General. One of the initial strategic concerns for personnel is the need to analyze the structure(s) involved in any collapse situation. This is especially true where there is more than one structure involved, as in cases of devastating earthquakes, hurricanes, or other natural or man-made disasters. The determination of the condition of the structure, hazards, and occupancy prior to the event will affect the overall search and rescue strategy.

A uniform building marking system has been developed by the FEMA National US&R Response System. There are four categories of FEMA US&R Markings:

(1) Structure Identification Marking
(2) Structure/Hazards Evaluation Marking
(3) Search Assessment Marking
(4) Victim Location Marking

The building marking system was established to ensure:

(1) Differentiation of structures within a geographic area.
(2) The structural condition and status of rescue operations within the structure are communicated.

Identification markings on structures may be made with International Orange spray paint (or construction crayon), placed on the building surface. In the case of hurricanes where many structures are involved, a system using a "Stick-on Label" should be used. Markings should be placed on normal address side of the structure.

G.2 Structure Identification Marking Within a Geographic Area. Structure identification within a geographic area is used to differentiate buildings by groups, such as by block(s) or jurisdictional area. It is imperative that personnel clearly identify each structure within a geographic area. This identification will assist both in the specific ongoing search and rescue effort and the long-term, post disaster identification of the site.

International orange spray paint or construction crayon is used to mark buildings with their street number so that personnel can differentiate one building from another. Existing numbers should be used to fill in any unknown numbers. If all numbers are unknown, arbitrary numbers can be used (odd and even used on opposite sides of the street). The primary method of identification should include the existing street

name, hundred block, and building number. Such identification is not always possible due to post-disaster conditions. *[See Figure G.2(a).]*

If at all possible, the existing street name and building number will be used. If some numbers have been obliterated, an attempt should be made to reestablish the numbering based on nearby structures. If no numbers are identifiable on a given block, rescue personnel will assign and identify the street name and numbers based on other structures in the proximity. The structures should then be numbered to differentiate them (using paint or crayon).

It is also important to identify locations within a single structure. The address side of the building is side A. Other sides of the structure are assigned alphabetically in a clockwise manner from side A around the building. *[See Figure G.2(b).]*

The interior of the structure can be divided into quadrants. The quadrants are identified alphabetically in a clockwise manner starting from where the side A and side B perimeter meet. The center core, where all four quadrants meet is identified as quadrant E (i.e., central core lobby, etc.). *[See Figure G.2(c).]*

Multistory buildings must have each floor clearly identified. If not clearly discernable, the floors should be numbers as referenced from the exterior. The grade (or street) level floor is designated floor 1, and moving upward, the second floor would be floor 2, etc. Conversely, the first floor below grade (or street) level would be B-1, the second B-2, etc. For buildings where the street slopes, all at the incident must be informed as to which level will be called the first floor. *[See Figure G.2(d).]*

If a structure contains a grid of structural columns, they should be marked with 2 foot high, orange letters/numbers to further identify enclosed areas. If plans are available, use the existing numbering system. If plans are not available, letter the columns across the long side (side A in the example) starting from the left, and number the columns along the short side (side B in this example) starting from the front, side A. The story level should be added to each marked column, and be placed below the column locator mark. Example: "FL-2" = Floor 2. *[See Figure G.2(e).]*

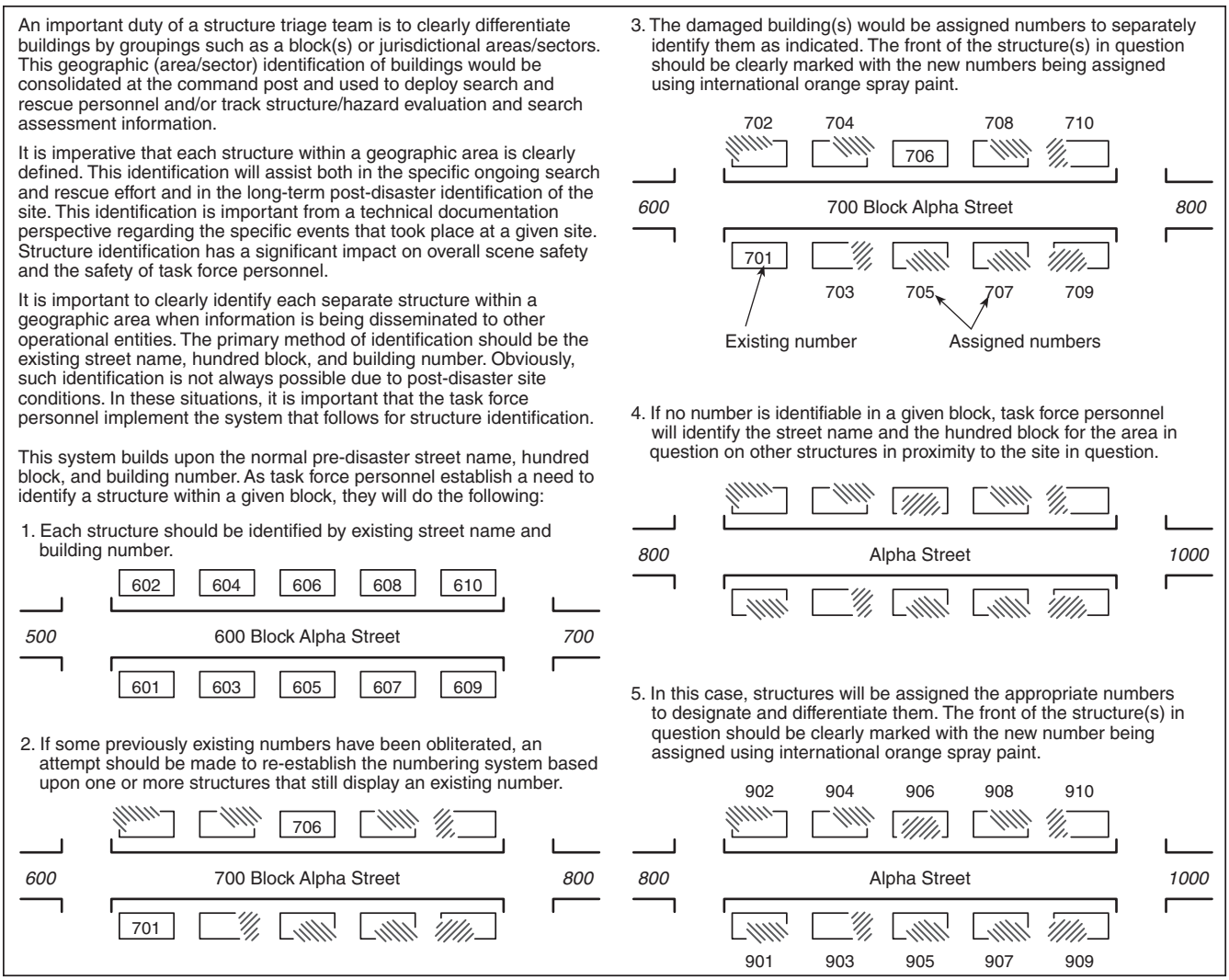


FIGURE G.2(a) Structure Identification Marking System Within a Geographic Area.

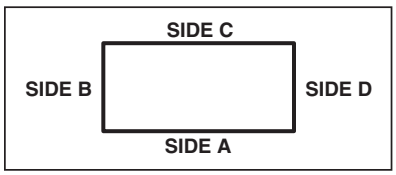


FIGURE G.2(b) Structure Identification Marking System Within a Geographic Area — Sides of a Single Structure.

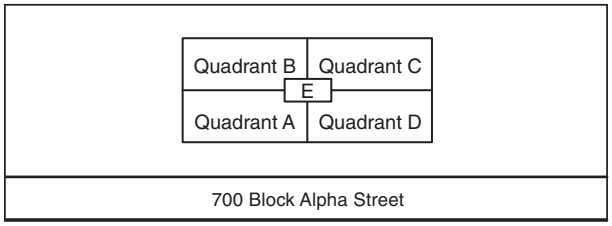


FIGURE G.2(c) Structure Identification Marking System Within a Geographic Area — Quadrants of a Single Structure.

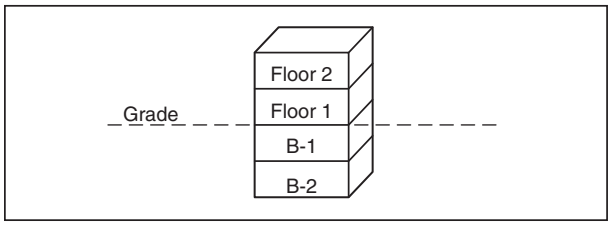


FIGURE G.2(d) Structure Identification Marking System Within a Geographic Area — Floors in a Single Structure.

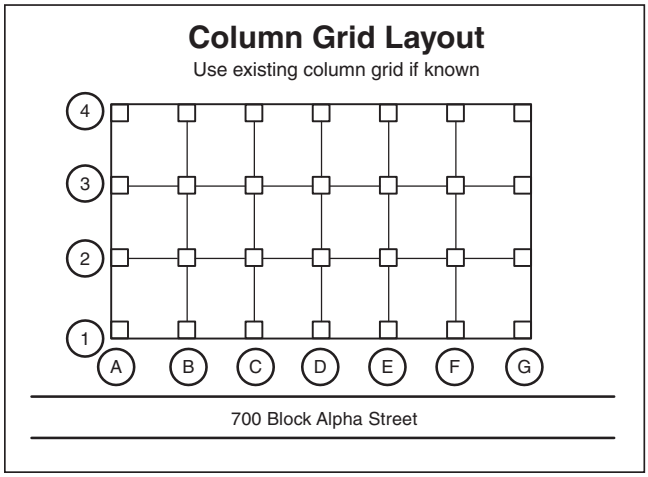


FIGURE G.2(e) Structure Identification Marking System Within a Geographic Area — Column Grid Layout.

G.3 Structure/Hazards Evaluation Marking. This system is designed to identify specific hazards associated with any collapsed structure. Personnel should be cognizant of the nationally accepted marking system and should be proficient in the use of the system.

After performing a building hazard identification, the responder makes a 2 ft × 2 ft (0.6 m × 0.6 m) square box on the building adjacent to the most accessible point of entry into any compromised structure. Paint sticks, lumber crayons or international orange aerosol spray paint can be used for this marking system. Peel and stick labels or stiff paper placards may be used to avoid paint damage. It is important that an effort is made to mark all normal entry points (side A if possible) to a building under evaluation to ensure that rescue personnel approaching the building can identify that it has been evaluated.

Materials and methods used for marking should be coordinated with the AHJ in order to avoid confusion with search and other marking.

The specific markings will be made inside the box to indicate the condition of the structure at the time of the assessment. Any identified hazards will be indicated, outside of the box, on the right side. Placards have space below the box for comments on hazards.

Normally the marking (or placards) would, also, be made immediately adjacent to the entry point identified as lowest risk. An arrow will be placed next to the box indicating the direction of the lowest risk entrance if the structure/hazard evaluation marking must be made somewhat remote from this entrance.

All rescue personnel must be aware of the possibility of, and look for other structure/hazards evaluation marking must be made somewhat remote from this entrance.

As each subsequent assessment is performed throughout the course of the mission, a new time, date, and unit (task force) ID entry will be made below the previous entry, or a completely new marking made if the original information is now incorrect.

The depiction of the various markings is as follows *[see Figure G.3(a)]*:

The time, date, and unit ID, are noted outside the box at the right-hand side. This info is made with paint stick or lumber crayon. The paper (or cardboard), stick-on placards may need to be attached using duct tape to assure their positioning. *[See Figure G.3(b)* .]

This example is for a medium risk building, and the arrow indicates the direction to the lowest risk entry (possibly a window, upper floor, etc.). Assessment was made on July 15, 1991, at 1:10 PM. There is an indication of natural gas in the structure. The evaluation was made by the #1 TF from the State of Oregon.

It should be understood that this building would not be entered until the hazmat (natural gas) has been mitigated. When that mitigation is performed, this mark should be altered by placing a line through the HM and adding the time and unit who performed the mitigation. An entirely new mark could also be added when the mitigation is done, or after any change in conditions such as an aftershock. To indicate changed conditions when using labels or placards, one may cross out the hazard if mitigated or just replace the label/placard if appropriate.

Marking boxes may also be placed in each of the specific areas within the structure (i.e., rooms, hallways, stairwells, etc.) to denote hazardous conditions in separate parts of the building.

Low Risk for US&R Operations with a low probability of further collapse. Victims could be trapped by contents, building could be completely pancaked, or first story could be soft.

Medium Risk for US&R Ops, and structure is significantly damaged. Might need shoring, bracing, removal, and/or monitoring of hazards. The structure might be partly collapsed.

High Risk for US&R Ops, and the building might be subject to sudden collapse. Remote search operations can proceed at significant risk. If rescue operations are undertaken, significant and time-consuming mitigation should be done.

An arrow located next to a marking box indicates the direction to the lowest-risk entrance to the structure, if the marking box should need to be made remote from the indicated entrance.

HM

Indicates that a hazardous material condition exists in or adjacent to the structure. Personnel could be in jeopardy. Consideration for operations should be made in conjunction with the hazardous materials specialist. The type of hazard can also be noted.

FIGURE G.3(a) Structure and Hazards Evaluation Marking.

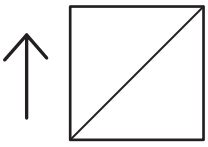


FIGURE G.3(b) Marking Detail.

It should also be noted that the structure/hazards mark might not be made in many situations, such as structures in which rescuers are present at all times during the incident and after hurricanes for very simple structures.

G.3.1 Structure/Hazards Placard. This placard should be printed on adhesive-backed, 8.5 inch × 11 inch heavy white paper, Rite in the Rain® (or equivalent) paper, or light cardboard. Cut in half to obtain two placards. *(See Figure G.3.1.)*

White color was selected to avoid being confused with the Green-Yellow-Red Placards that are placed during safety evaluation of structures by non-US&R engineers.

G.4 Search Assessment Marking. A separate and distinct marking system is necessary to denote information relating to the victim location determinations in the areas searched. This separate search assessment marking system is designed to be used in conjunction with the structure and hazards evaluation marking system. The canine search specialist, technical search specialists, and/or search team manager (or any other search and rescue team member performing the search function) will draw and "X" that is 2 ft x 2 ft (0.6 m × 0.6 m) in size with international orange paint stick, lumber crayon or color spray paint (note that K9 may be adversely effected by the fumes from the spray paint). This X will be constructed in two operations—one slash drawn upon entry into the structure (or room, hallway, etc.) and a second crossing slash drawn upon exit. *[See Figure G.4(a)].*

Distinct markings will be made inside the remaining quadrants of the X to clarify denote the search status and findings at the time of this assessment. The marks will be made with carpenter chalk or lumber crayon. The following illustrations define the search assessment marks *[see Figure G.4(b)]*:

In most cases, extemporaneous information will not be conveyed using the marking system. This type of communication will usually take place as a result of face-to-face meetings between search, rescue, and other components of the search and rescue team.

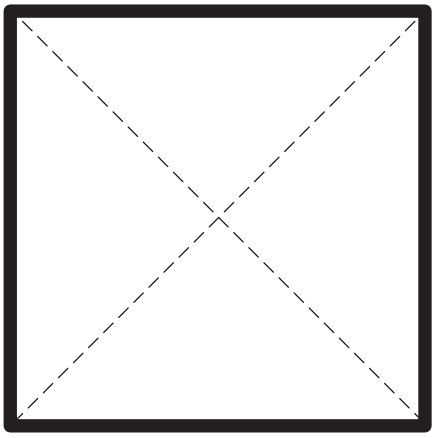
Search markings should be made at each area within a structure, such as rooms, voids, etc., but only information related to the results of the search will be marked upon exiting each space (no time or unit designation).

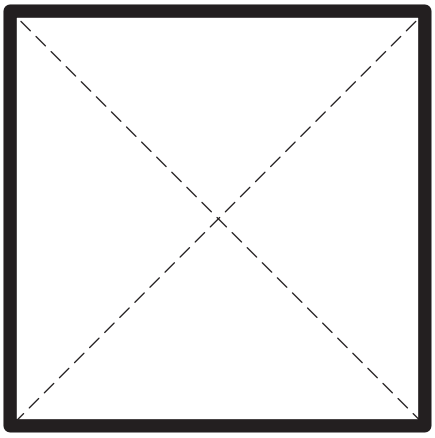
G.5 Victim Location Marking. During the search function, it is often necessary to identify the location of potential and known victims because debris in the area could completely cover, obstruct, or hide the location of any victims. When a known or potential victim is located and not removed immediately, victim location marking symbols are made by the search team or others aiding the search and rescue operation. These symbols should be made with orange spray paint or orange crayon.

Figure G.5 illustrates the marking system.

G.6 The United Nations International Search and Rescue Advisory Group (INSARAG). The search marking system used by the United Nations includes the following:

(1) Structural marking should be applied on collapsed structures assessed by USAR teams.
   (a) The marking should be placed near the point of entry on the exterior of the collapsed structure that offers the best visibility.
   (b) All assessment results are to be reported to the OSOCC immediately.
(2) The marking consists of a 3.3 ft × 3.3 ft (1 m × 1 m) square box.
(3) Inside the box, mark the following:
   (a) "Go" if deemed safe to enter
   (b) "No Go" if deemed unsafe to enter
   (c) Team identification
   (d) Date and time start
   (e) Date and time finish
(4) Outside the box, mark the following:
   (a) Hazard information (top)
   (b) Missing persons (bottom)
   (c) Live victims extricated (left)
   (d) Dead victims removed (right)
(5) Additional information
   (a) When the USAR team has completed work on the structure to its capacity, a circle is drawn around the entire marking.
   (b) After all work on the structure has been completed and it is confirmed there are no more victims, a horizontal line is drawn through the entire marking. *(See Figure G.6).*





Structural / Hazard Evaluation

DATE	TIME	TF

HAZARDS:

☐ **LR**	⊘ **MR**	☒ **XR**
Low Risk for US&R Ops. Low probability of further collapse. Victims could be trapped by contents, or building could be completely pancaked or soft 1st story	**Medium Risk** for US&R Ops. Structure is significantly damaged. May need shoring, bracing, removal, and/or monitoring of hazards. The structure may be partly collapsed	**High Risk** for US&R Ops. May be subject to sudden collapse. Remote search operations may proceed at significant risk. If Rescue Ops are undertaken, significant and time-consuming mitigation should be done

Should the marking box need to be made remote from the indicated entrance, place an arrow next to the box to indicate the direction to the lowest risk entrance to structure.

Structural / Hazard Evaluation

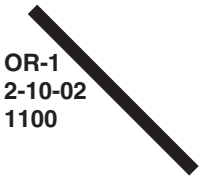
DATE	TIME	TF

HAZARDS:

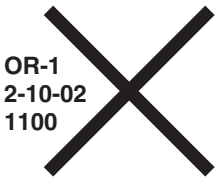
☐ **LR**	⊘ **MR**	☒ **XR**
Low Risk for US&R Ops. Low probability of further collapse. Victims could be trapped by contents, or building could be completely pancaked or soft 1st story	**Medium Risk** for US&R Ops. Structure is significantly damaged. May need shoring, bracing, removal, and/or monitoring of hazards. The structure may be partly collapsed	**High Risk** for US&R Ops. May be subject to sudden collapse. Remote search operations may proceed at significant risk. If Rescue Ops are undertaken, significant and time-consuming mitigation should be done

Should the marking box need to be made remote from the indicated entrance, place an arrow next to the box to indicate the direction to the lowest risk entrance to structure.

FIGURE G.3.1 Structure/Hazards Placard.



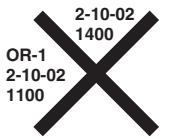
A single slash drawn upon entry into a structure or area indicates search operations are in progress. When entering a building or wing of a large building, add the search team identifier, date, and time of entry next to main entry.



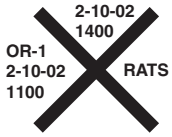
Note: OR-1 is used instead of OR-TF1 to save time. "1100" is an abbreviation of "1100 hrs."

A crossing slash is drawn when personnel exit from the structure or area.

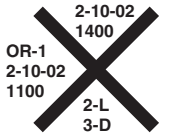
FIGURE G.4(a) Search Assessment Marking.



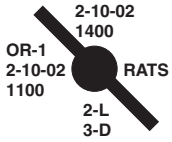
After exiting and drawing the second slash, add the following information:
Top Quadrant: Time and date the Search Team left the structure.



Right Quadrant: Personal hazards.



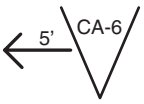
Bottom Quadrant: Number of live and dead victims still inside the structure ("0" = no victims).



F = Floors
Q = Quadrants
or
No Entry

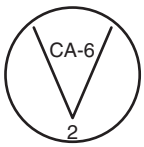
When the Recon Team leaves a structure without completing the search (due to aftershock, end of shift, etc.) then the second slash will not be made. A solid circle is drawn at the mid-length of the first slash. Date/time of exit, personal hazards, and victim information will be filled in. Also the number of quadrants or floors completed should be added in a box below the X. If the building has not been entered (e.g., during a hurricane), mark **No Entry** in the box.

FIGURE G.4(b) Marking Detail.



Paint a large (2 ft × 2 ft) (0.6 m × 0.6 m) "V" in orange near the location of a known or **potential** victim. Mark the name of the search team as shown.

An arrow might need to be painted next to the V, pointing toward the victim's location, not immediately near where the V is painted. Show distance on arrow.



Paint a circle around the V when a potential victim has been **confirmed alive** visually, vocally, or by hearing sounds that would indicate a high probability of a live victim. If there is more than one confirmed live victim, mark total number under the V.

Paint a horizontal line through the middle of the V when a **confirmed** victim is determined to be **deceased**. If there is more than one confirmed deceased victim, mark the total number under the V. Use both live and deceased victim marking symbols when a combination of live and deceased victims are determined to be in the same location.

Paint an "X" through the **confirmed** victim symbol after **all victims** have been removed from the specific location identified by the marking.

Paint new victim symbols next to additional victims that are later located near where the original victim(s) were discovered and removed, assuming original symbol has been Xed out.

FIGURE G.5 Victim Location Marking System.

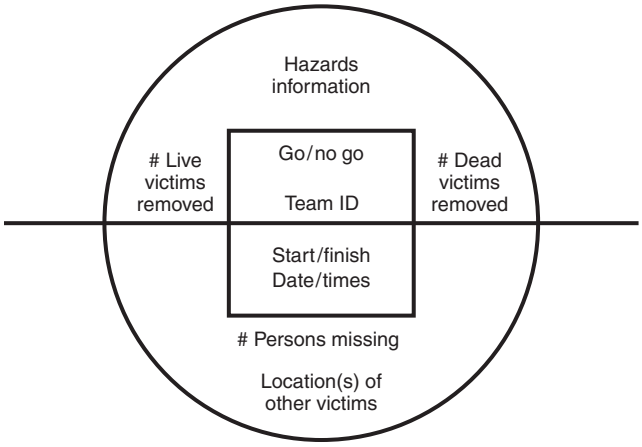


FIGURE G.6 INSARAG Marking System.

Annex H Trench and Excavation Rescue Incidents

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

H.1 Trench Types and Considerations. In all types of trench and excavation rescue incidents, the potential exists for extenuating circumstances and conditions that would require expertise beyond the normal capability of the organization in order to operate safely. Examples of these situations can include, but are not limited to, very deep trenches [more than 15 ft (4.57 m) deep], unusually shaped excavations, multiple complications (e.g., deep excavation and fluid soil), involvement of hazardous or toxic substances, completely buried subjects, or severe environmental conditions. Severe environmental conditions include frozen soil, running soil (e.g., gravel, sand, liquid), severe weather (e.g., heavy rain, snow, wind, or flooding), or night (dark) operations. These conditions should be evaluated during the initial size-up and risk assessment made on an incident-by-incident basis.

The types of collapse normally encountered at an excavation or trench incident include the following:

(1) Spoil pile collapse (spoil-in), where the excavated earth piled on the side of the trench slides into the trench.
(2) Lip collapse (lip-in), where a portion of the trench lip fails and falls into the trench. Lip collapse is usually secondary to surcharge or significant impact forces from the excavating bucket weakening the cohesive properties of the soil in the defined lip area.
(3) Shearwall collapse (shear-in), where the side(s) of the trench shears away from the wall of the trench. Possible indicators for an impending shearwall collapse are slough-ins on lower trench walls and/or stress cracks visible from the trench lip back to (a distance equal to) the depth of the trench.
(4) Slough collapse (slough-in), where a below-grade section collapses, leaving the potential for the collapse of an overhanging ledge.

H.2 Collapse. The reasons for and indicators of initial and secondary collapse of trenches and excavations are usually related to one or more of the following site characteristics:

(1) Soil composition
(2) Passage of time
(3) Unprotected trench (lack of protection systems)

(4) Surface encumbrances
(5) Surcharge or superimposed loads
(6) Standing water or water seeping into trench (saturated)
(7) Intersecting trenches
(8) Previously disturbed soil
(9) Vibrations (vehicles, nearby roads, airports, etc.)
(10) Exterior cracking of trench walls or collapse zone (fissures/stress cracks)

H.3 Soil Types. The following is excerpted from 29 CFR 1926.651, "Specific Excavation Requirements," and specifies soil types.

"Cemented soil" means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

"Cohesive soil" means clay (fine grained soil) or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sides, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silt clay, clay, and organic clay.

"Dry soil" means soil that does not exhibit visible signs of moisture content.

"Fissured" means a soil material that has a tendency to break along definite planes of fracture with little resistance or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

"Granular soil" means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

"Layered system" means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

"Moist soil" means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

"Plastic" means a property of a soil that allows the soil to be deformed or molded without cracking or appreciable volume change.

"Saturated soil" means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

"Soil classification system" means, for the purpose of this Subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure.

"Stable rock" means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

"Submerged soil" means soil that is underwater or is free seeping.

"Type A" means cohesive soils with an unconfined, compressive strength of 1.5 tons per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are clay, silty clay, sandy clay, clay loam, and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if any of the following situations exist:

(1) The soil is fissured.
(2) The soil is subject to vibration from heavy traffic, pile driving, or similar effects.
(3) The soil has been previously disturbed.
(4) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater.
(5) The material is subject to other factors that would require it to be classified as a less stable material.

"Type B" means cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa) or one of the following:

(1) Granular cohesionless soils, including angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam
(2) Previously disturbed soils except those that would otherwise be classed as Type C soil
(3) Soil that meets the unconfined compressive strength or cementation requirements for Type A but is fissured or subject to vibration
(4) Dry rock that is not stable
(5) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V) but only if the material would otherwise be classified as Type B

"Type C" means cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less or one of the following:

(1) Granular soils including gravel, sand, and loamy sand
(2) Submerged soil or soil from which water is freely seeping
(3) Submerged rock that is not stable
(4) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper

"Unconfined compressive strength" means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing or estimated in the field using a pocket penetrometer, by thumb penetration tests, and by other methods.

"Wet soil" means soil that contains significantly more moisture than moist soil but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

The classification of soil should be made based on the results of at least one visual and at least one manual analysis. Such analyses should be conducted by a competent person using tests described in 29 CFR 1926, Subpart P, Appendix A, "Soil Classification," or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials or the U.S. Department of Agriculture textural classification system.

The visual and manual analyses, such as those specified in 29 CFR 1926, Subpart P, Appendix A, "Soil Classification," should be designed and conducted to provide sufficient quantitative and qualitative information as can be necessary to identify properly the properties, factors, and conditions affecting the classification of the soil.

H.4 General Hazards. General hazards associated with search and rescue operations at trench and excavation collapses can present the AHJ with uniquely challenging situations. The AHJ should consider the following potential hazards when providing training to its members:

(1) *Utilities.* In many parts of the United States, a "one-call" underground utility location service is available to contractors and residents who are preparing to excavate. By making one telephone call (usually a toll-free number), excavators can find the location of all underground utility installations in the area of the planned excavation. This service quickly notifies all possible utility providers in the area who, in turn, either indicate that there is no utility in the area or have someone go to the site to mark the utilities. Such a service can be invaluable to emergency responders at the site of a trench or excavation emergency incident. Where no "one-call" system exists, all utility companies that might have underground equipment at or near the excavation site must be notified so they can have a representative respond to mark underground utility locations.

(2) *Hazardous Materials.* Excavations might include various materials unique to a site that, when released during a collapse, could pose a hazard to victims and responders. The AHJ should provide members with training in the recognition of potential hazardous materials releases, the determination of an existing hazard, and the methods used to contain, confine, or divert hazardous materials in order to conduct operations safely and effectively.

(3) *Personal Hazards.* At the site of any trench or excavation collapse, there are many dangers that pose personal injury hazards to the responders. The AHJ should train members to recognize the personal hazards they encounter and to use the methods needed to mitigate these hazards in order to help ensure their safety. Every member should be made aware of hazards such as trips, falls, blows, punctures, impalement, and so forth.

(4) *Confined Space.* All trench collapses, and many excavation collapses, necessitate a confined space rescue. Responding personnel should be familiar with and trained in confined space rescue requirements and techniques. The AHJ should determine the applicable laws and standards related to confined space rescue and should provide training to members in confined space rescue.

(5) *Other Hazards.* There are numerous other hazards associated with trench and excavation collapses. The AHJ should make every effort to identify the hazards that might be encountered within the jurisdiction and should provide members with training and awareness of these other hazards in order to perform rescue operations safely and effectively.

H.5 Competent Person. A competent person can be invaluable for quickly gathering information about the trench, will have possession of the "cut sheet," and will know the number and location of workers involved in the incident. He or she should also have knowledge regarding general hazards and nearby available resources for the size-up and subsequent action plan.

H.6 Victim Locations. Procedures to identify probable victim locations include the following:

(1) Visualization of the victim
(2) Presence of drink cups or food containers, work tools, laser targets, buckets, grade poles, grease and brush, engineers hubs, or anything that can indicate the victim's last probable physical location
(3) Information from bystanders
(4) End of pipe string
(5) Sounds in pipes or presence of recently installed pipes
(6) "Cat" or tire tracks

H.7 Rapid, Nonentry Rescues. A quick look in the trench from an end can show that a victim might require only a ladder to leave the trench or a shovel lowered to him/her to dig out a trapped foot. This can mitigate the incident quickly before complication by secondary collapse or other hazards. A ladder or engineered ramp can be required for entry or egress from a trench. For instance, 29 CFR 1926.651 (c)(1)(v) requires, "A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees."

H.8 Personnel/Equipment Resources. A trench or excavation collapse often requires resources that the AHJ is unable to provide. A community resource list with supporting standard operating procedures should include activation of and contact numbers for mutual-aid contracts, public works and private contractor response agreements, rental and construction supply house agreements, and utility one-call services.

Annex I Sloping and Benching

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

I.1 General. The material in this annex describes and defines sloping and benching as used in this standard and is excerpted from Appendix B (Excavations, Sloping and Benching) of 29 CFR 1926, Subpart P.

(1) *Scope and application.* This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in 1926.652(b)(2).

(2) *Definitions.*

(a) *Actual slope* means the slope to which an excavation face is excavated.

(b) *Distress* means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, e.g., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excava-

tion and trickling or rolling down into the excavation.

(c) *Maximum allowable slope* means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

(d) *Short term exposure* means a period of time less than or equal to 24 hours that an excavation is open.

(3) *Requirements*

(a) *Soil Classification.* Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

(b) *Maximum Allowable Slope.* The maximum allowable slope for a soil or rock deposit shall be determined from Table I.1 of this appendix.

(c) *Actual Slope.*

i. The actual slope shall not be steeper than the maximum allowable slope.

ii. The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least ½ horizontal to one vertical (½ H:1V) less steep than the maximum allowable slope.

iii. When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with 1926.651(i).

(d) *Configurations.* Configurations of sloping and benching systems shall be in accordance with Figure I.1.1.1(a) through Figure I.1.1.3(c).

I.1.1 Excavations Made in Type A Soil.

I.1.1.1 All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of ¾:1. *[See Figure I.1.1.1(a).]*

Table I.1 Maximum Allowable Slopes

Soil or Rock Type	Maximum Allowable Slopes (H:V)[1] for Excavations Less Than 6.1 m (20 ft) Deep[2]
Stable rock	Vertical (90 degrees)
Type A[3]	¾:1 (53 degrees)
Type B	1:1 (45 degrees)
Type C	1½:1 (34 degrees)

[1]Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

[2]Sloping or benching for excavations greater than 6.1 m (20 ft) deep shall be designed by a registered professional engineer.

[3]A short-term maximum allowable slope of ½H:1V (63 degrees) is allowed in excavations in Type A soil that are 3.67 m (12 ft) or less in depth. Short-term maximum allowable slopes for excavations greater than 3.67 m (12 ft) in depth shall be ¾H:1V (53 degrees).

Source: 29 CFR 1926, Subpart P, Appendix B, Table B-1.

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of ½:1. [See Figure I.1.1.1(b).]

I.1.1.2 All benched excavations 20 feet or less in depth shall have a maximum allowable slope of ¾ to 1 and maximum bench dimensions as follows: *[See Figure I.1.1.2(a) and Figure I.1.1.2(b).]*

I.1.1.3 All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3½ feet. *[See Figure I.1.1.3(a).]*

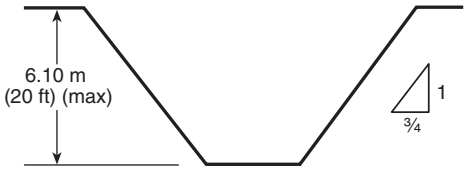


FIGURE I.1.1.1(a) Simple Slope — General. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.1.1(a)]***

FIGURE I.1.1.1(b) Figure B.1.1.1(b) Simple Slope — Short Term. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.1.1(b)]***

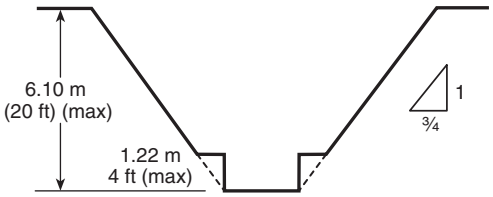


FIGURE I.1.1.2(a) Simple Bench. [Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.1.1(c)]

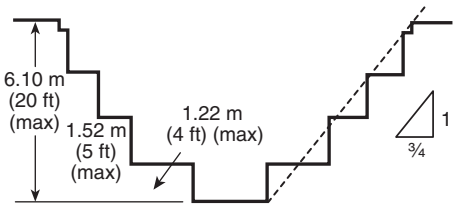


FIGURE I.1.1.2(b) Multiple Bench. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.1.2(d)]***

All excavations more than 8 feet but not more than 12 feet in depth with unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3½ feet. *[See Figure I.1.1.3(b).]*

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of ¾:1. The support or shield system must extend at least 18 inches above the top of the vertical side. *[See Figure I.1.1.3(c).]*

I.1.1.4 All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under 1926.652(b).

I.1.2 Excavations Made in Type B Soil.

I.1.2.1 All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1. *[See Figure I.1.2.1.]*

I.1.2.2 All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows: *[See Figure I.1.2.2(a) and Figure I.1.2.2(b).]*

I.1.2.3 All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1. *(See Figure I.1.2.3.)*

I.1.2.4 All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

I.1.3 Excavations Made in Type C Soil.

I.1.3.1 All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1. *(See Figure I.1.3.1.)*

I.1.3.2 All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1½:1. *(See Figure I.1.3.2.)*

I.1.3.3 All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

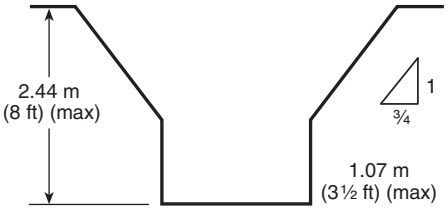


FIGURE I.1.1.3(a) Unsupported Vertically Sided Lower Portion — Maximum 8 Feet in Depth. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.1.3(e)]***

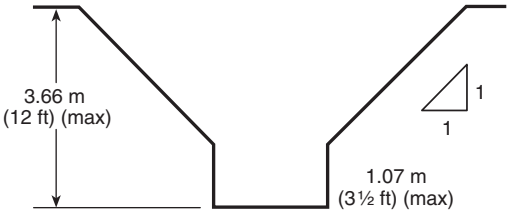


FIGURE I.1.1.3(b) Unsupported Vertically Sided Lower Portion — Maximum 12 Feet in Depth. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.1.3(f)]***

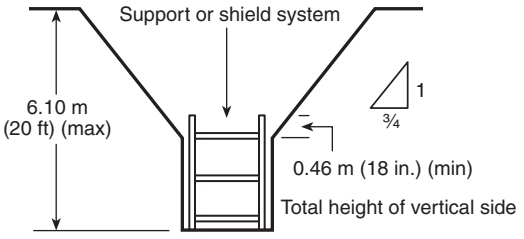


FIGURE I.1.1.3(c) Supported or Shielded Vertically Sided Lower Portion. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.1.3(g)]***

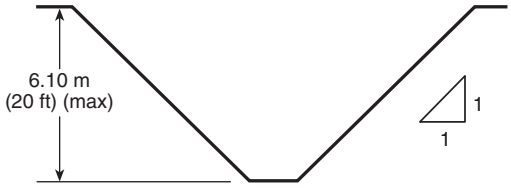


FIGURE I.1.2.1 Simple Slope. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.2.1]***

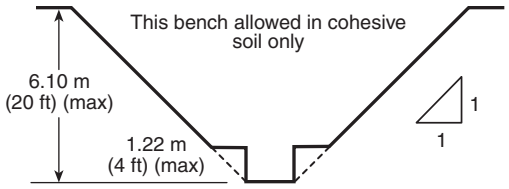


FIGURE I.1.2.2(a) Single Bench. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.2.2(a)]***

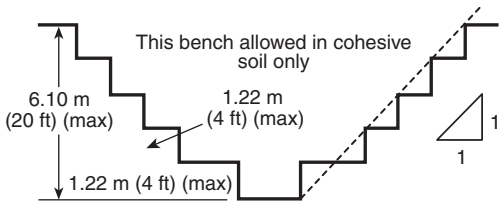


FIGURE I.1.2.2(b) Multiple Bench. ***[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.2.2(b)]***

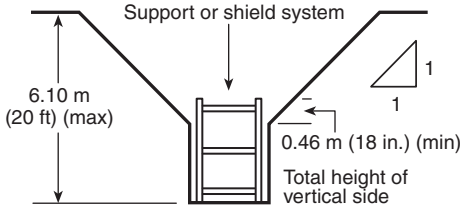


FIGURE I.1.2.3 Vertically Sided Lower Portion. ***(Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.2.3)***

I.1.4 Excavations Made in Layered Soils.

I.1.4.1 All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below. *[See Figure I.1.4.1(a) through Figure I.1.4.1(f).]*

I.1.4.2 All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

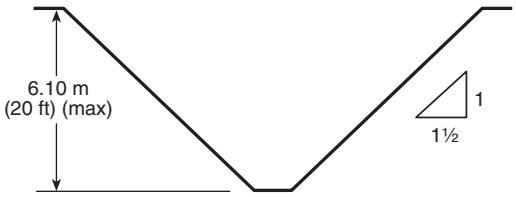


FIGURE I.1.3.1 Simple Slope. *(Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.3.1)*

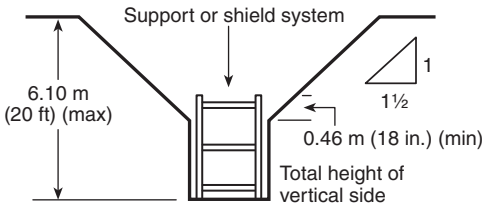


FIGURE I.1.3.2 Vertical Sided Lower Portion. *(Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.3.2)*

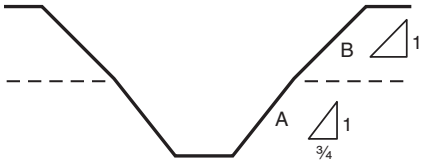


FIGURE I.1.4.1(a) B over A. *[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.4.1(a)]*

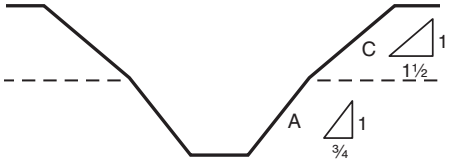


FIGURE I.1.4.1(b) C over A. *[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.4.1(b)]*

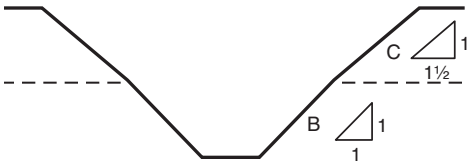


FIGURE I.1.4.1(c) C over B. *[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.4.1(c)]*

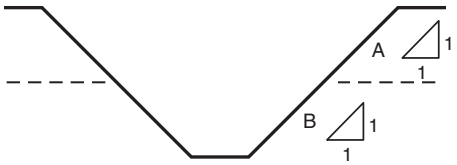


FIGURE I.1.4.1(d) A over B. *[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.4.1(d)]*

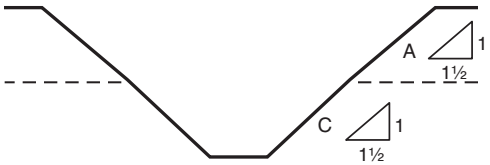


FIGURE I.1.4.1(e) A over C. *[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.4.1(e)]*

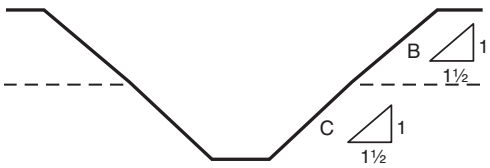


FIGURE I.1.4.1(f) B over C. *[Source: 29 CFR 1926, Subpart P, Appendix B, Figure B-1.4.1(f)]*

Annex J Technical Rescuer Tool Kit

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

J.1 Sample Tool Kit Contents. Table J.1 contains a list of sample tool kits that can be used with the various rescue specialties. The table is not intended to imply a minimum or all-inclusive listing of equipment necessary to perform a rescue. These tool boxes are identified to provide guidance on equipment needed to evaluate candidates.

Table J.1 Tool Kit Contents

Discipline	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Air-monitoring equipment																			
Anemometer																			
Animal lifting bridle system																			
Animal mud adhesion reduction system																			
Animal packaging devices																			
Animal restraint devices																			
Assorted cribbing																			
Assorted wedges																			
Audiovisual signaling device																			
Axe																			
Binoculars																			
Buoyancy control devices																			
Camera																			
Carabiners, locking																			
Chain saw, electric or gas																			
Chain slings																			
Charged fire hose line																			
Chisels																			
Clamp, “Ellis”																			
Class B foam application supplies																			
Come-along																			
Communication devices																			
Community resource lists																			
Cutting torch																			
DECON equipment																			
Descent control/ascending devices																			
Dewatering pumps																			
Dive weights																			
Duct-type ventilation																			
Edge protection																			
Energy detection equipment (e.g., electromechanical radiation)																			
Energy isolation equipment (lockout/tagout)																			
Extension cords																			
Fall protection/restraint equipment																			

(continues)

Table J.1 *Continued*

Discipline	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Fins, swim																			
Fire extinguisher																			
First aid and oxygen kits																			
Flexible and/or rigid litter devices																			
Flotation aid																			
Food, packable																			
Generator																			
Gloves																			
Halligan bar																			
Hammer, demolition																			
Hammer, rotary																			
Hand tools																			
Harness, animal																			
Harness, rescue																			
Harness, tunneller																			
Harness, victim																			
Heavy excavating equipment resources																			
Helmets																			
Hose inflator																			
Hydration systems (personnel)																			
Hydraulic cutters																			
Hydraulic rams																			
Hydraulic spreaders																			
Jacks																			
Junction box, electrical																			
Knife, rescue																			
Lanyards, climbing/fall arrest (100% tie-off)																			
Lanyards, work positioning																			
Lighting, flood																			
Lighting, hand and/or helmet (Factory Mutual approved)																			
Line gun																			
Lumber and timber (assorted)																			
Marking kit; paint, chalk, crayon, pencil																			
Navigational instruments — compass, GPS																			
Packs																			

(continues)

Table J.1 *Continued*

Discipline	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Passports																			
Pens/pencils																			
Perimeter or scene-marking devices																			
Personal alarm device																			
Personal flotation devices (PFDs)																			
Personal toiletry items																			
Personnel accountability system																			
Pickets																			
Plastic bags																			
Pneumatic bags																			
Pneumatic soil knife																			
Pneumatic soil vacuum (hand and/or truck)																			
Portable anchor device																			
PPE — boots																			
PPE — boots, climbing																			
PPE — boots, dive																			
PPE — gloves																			
PPE — HazMat, Levels B and C																			
PPE — helmet water rescue																			
PPE — knee and/or elbow pads																			
PPE — SCBA																			
PPE — SCUBA																			
PPE — suit, dry																			
PPE — suit, wet																			
PPE — supplied-air respirators with egress cylinder																			
PPE — turnout gear																			
PPE — respiratory escape packs																			
Preplans/maps																			
Pulleys																			
Quick release mechanism																			
Reach extension devices																			
Rope — life safety																			
Rope — utility																			
Rope — water rescue																			
Rope grab devices																			

(continues)

Table J.1 *Continued*

Discipline	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Safety glasses and hearing protection																			
Saw, circular, carbide tip, metal cutting, and continuous rim diamond blades																			
Saw, reciprocating with wood and metal blades																			
Seismic/acoustic life detector system (e.g., DELSAR)																			
Sheeting																			
Shoring																			
Sleeping material/bag																			
Spinal immobilization devices, short and long																			
Spring-loaded center punch																			
Tactical worksheets																			
Tarps																			
Thermal imaging cameras (TICs)																			
Throw bags																			
Torpedo buoy, ring buoy, or equivalent																			
Traffic control devices																			
Trench box, shield																			
Victim protective coverings																			
Watercraft — manual or motorized																			
Webbing																			
Winches																			

Annex K IADRS Annual Watermanship Test

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

K.1 Evaluation Parameters. There are five exercises that evaluate stamina and comfort in the water, each rated by points. The swimmer must successfully complete all stations and score a minimum of 12 points to pass the test. These scores are recorded on the Annual Watermanship Evaluation Form.

K.2 Stamina Exercise 1: 500-Yard Swim. The diver must swim 500 yards without stopping using a forward stroke and without using any swim aids such as dive mask, fins, snorkel, or flotation device. Stopping or standing up in the shallow end of the pool at any point during this exercise will constitute a failure of this evaluation station.

Time to Complete and Points Awarded:

(1) Under 10 minutes: 5
(2) 10 to 13 minutes: 4
(3) 13 to 16 minutes: 3
(4) 16 to 19 minutes: 2
(5) More than 19 minutes: 1
(6) Stopped or incomplete: Incomplete

K.3 Stamina Exercise 2: 15-Minute Tread. Using no swim aids and wearing only a swimsuit, the diver will stay afloat by treading water, drownproofing, bobbing, or floating for 15 minutes, with hands only out of the water for the last 2 minutes.

Performance Criteria and Points Awarded:

(1) Performed satisfactorily: 5
(2) Stayed afloat, hands not out of water for 2 minutes: 3
(3) Used side or bottom for support at any time: 1
(4) Used side or bottom for support > twice: Incomplete

K.4 Stamina Exercise 3: 800-Yard Snorkel Swim. Using a dive mask, fins, snorkel, and swimsuit (no BCD or other floatation aid) and swimming the entire time with the face in the water, the diver must swim nonstop for 800 yards. The diver must not use arms to swim at any time.

Performance Criteria and Points Awarded:

(1) Under 15 minutes: 5
(2) 15 to 17 minutes: 4
(3) 17 to 19 minutes: 3
(4) 19 to 21 minutes: 2
(5) More than 21 minutes: 1
(6) Stopped at any time: Incomplete

K.5 Stamina Exercise 4: 100-Yard Inert Rescue Tow. The swimmer must push or tow an inert victim on the surface 100 yards nonstop without assistance.

Performance Criteria and Points Awarded:

(1) Under 2 minutes: 5
(2) 2 to 3 minutes: 4
(3) 3 to 4 minutes: 3
(4) 4 to 5 minutes: 2
(5) More than 5 minutes: 1
(6) Stopped at any time: Incomplete

K.6 Surface Dive Exercise 5: Free Dive to a Depth of 9 ft (2.7 m) and Retrieve an Object. Performance Criteria and Points Awarded:

(1) Performed satisfactorily: Pass
(2) Stopped or incomplete: Incomplete

Annex L National Fallen Firefighters Foundation

Annex L is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

L.1 16 Firefighter Life Safety Initiatives The National Fallen Firefighters Foundation sponsored a symposium in 2004 in Tampa, FL. At this milestone event more than 200 fire service leaders assembled and discussed the nation's fire problem and how to drastically reduce the number of fire fighter line of duty deaths. This event was the birth of the 16 Firefighter Life Safety Initiatives which should be the catalyst for fire service training and education, and the foundation for strategic level policies and procedures.

(1) Define and advocate the need for a cultural change within the fire service relating to safety; incorporating leadership, management, supervision, accountability and personal responsibility.
(2) Enhance the personal and organizational accountability for health and safety throughout the fire service.
(3) Focus greater attention on the integration of risk management with incident management at all levels, including strategic, tactical, and planning responsibilities.
(4) All fire fighters must be empowered to stop unsafe practices.
(5) Develop and implement national standards for training, qualifications, and certification (including regular recertification) that are equally applicable to all fire fighters based on the duties they are expected to perform.
(6) Develop and implement national medical and physical fitness standards that are equally applicable to all fire fighters, based on the duties they are expected to perform.
(7) Create a national research agenda and data collection system that relates to the initiatives.
(8) Utilize available technology wherever it can produce higher levels of health and safety.
(9) Thoroughly investigate all fire fighter fatalities, injuries, and near misses.
(10) Grant programs should support the implementation of safe practices and/or mandate safe practices as an eligibility requirement.
(11) National standards for emergency response policies and procedures should be developed and championed.
(12) National protocols for response to violent incidents should be developed and championed.
(13) Fire fighters and their families must have access to counseling and psychological support.
(14) Public education must receive more resources and be championed as a critical fire and life safety program.
(15) Advocacy must be strengthened for the enforcement of codes and the installation of home fire sprinklers.
(16) Safety must be a primary consideration in the design of apparatus and equipment.

L.2 Specific Firefighter Life Safety Initiatives for Technical Rescue Personnel are as follows:

(1) Define and advocate the need for a cultural change within the fire service relating to safety; incorporating leadership, management, supervision, accountability and personal responsibility.
(2) Enhance the personal and organizational accountability for health and safety throughout the fire service.
(3) Focus greater attention on the integration of risk management with incident management at all levels, including strategic, tactical, and planning responsibilities.
(4) All fire fighters must be empowered to stop unsafe practices.
(5) Develop and implement national medical and physical fitness standards that are equally applicable to all fire fighters, based on the duties they are expected to perform.
(6) Utilize available technology wherever it can produce higher levels of health and safety.
(7) Thoroughly investigate all fire fighter fatalities, injuries, and near misses.
(8) National standards for emergency response policies and procedures should be developed and championed.

Annex M Informational References

M.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

M.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, 2013 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2017 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2013 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2014 edition.

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, 2013 edition.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*, 2017 edition.

NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services*, 2017 edition.

M.1.2 Other Publications.

M.1.2.1 FEMA Publications. Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472.

FA 136, *Protective Clothing and Equipment for Emergency Responders for Urban Search and Rescue Missions.*

FEMA Urban Search and Rescue (US&R) Response System, 7th edition, second printing, November 2012.

M.1.2.2 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 29, Code of Federal Regulations, Part 1910.120, "Regulation on Hazardous Waste."

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M.1.2.3 Additional Publications. Annett, John, and Neville E. Stanton. 2001. *Task Analysis.* London and New York: Taylor and Francis.

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Koester, R. J., Lost Person Behavior: A Search and Rescue Guide on Where to Look – for Land, Air and Water, dbS Productions, Charlottesville, VA, 2008.

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Taylor, A., and Cooper, D. C., Fundamentals of mantracking: The step-by-step method. 3rd edition, Skyhorse Publishers, New York, NY, 2014.

Zemke, Ron, and Thomas Kramlinger. 1982. *Figuring Things Out: A Trainer's Guide to Task, Needs, and Organizational Analysis.* New York, NY: Perseus Press.

M.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

M.2.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2013 edition.

NFPA 1035, *Standard on Fire and Life Safety Educator, Public Information Officer, Youth Firesetter Intervention Specialist, and Youth Firesetter Program Manager Professional Qualifications*, 2015 edition.

M.2.2 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title III SARA, 1986. P.L. 99-499, the Emergency Planning and Community Right to Know Act (EPCRA, also known as SARA, Title III) of 1986.

M.2.3 Other Resource Material.

Confined Space and Structural Rope Rescue, Roop, Vines & Wright, Mosby Lifeline Publications.

Confined Space Entry and Rescue Protocol, AIHA Publications (American Industrial Hygiene Association).

Decontamination for Hazardous Materials Emergency, Timothy V. Henry, Delmar Publishers, 3 Columbia Circle, Box 15015 Albany, NY 12212-5015, 1998.

Rescue Systems 1, USFA/NFA-RSI-SM, Federal Emergency Management Agency, United States Fire Administration, National Fire Academy, 1993.

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Swiftwater Rescue; A Manual for the Rescue Professional, Slim Ray, CFS Press, 1997.

Swiftwater Technical Rescuer I, Jim Segerstrom, Mike Croslin, and Barry Edwards, Rescue International, 1995.

Training for Hazardous Materials Response: Confined Space Rescue for First Responders, International Association of Fire Fighters, 1750 New York Ave., N.W., Washington, DC 20006, 1995.

M.3 References for Extracts in Informational Sections.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*, 2017 edition.

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Sequence of Events for the Standards Development Process

Once the current edition is published, a Standard is opened for Public Input.

Step 1 – Input Stage

- Input accepted from the public or other committees for consideration to develop the First Draft
- Technical Committee holds First Draft Meeting to revise Standard (23 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Technical Committee ballots on First Draft (12 weeks); Technical Committee(s) with Correlating Committee (11 weeks)
- Correlating Committee First Draft Meeting (9 weeks)
- Correlating Committee ballots on First Draft (5 weeks)
- First Draft Report posted on the document information page

Step 2 – Comment Stage

- Public Comments accepted on First Draft (10 weeks) following posting of First Draft Report
- If Standard does not receive Public Comments and the Technical Committee chooses not to hold a Second Draft meeting, the Standard becomes a Consent Standard and is sent directly to the Standards Council for issuance (see Step 4) or
- Technical Committee holds Second Draft Meeting (21 weeks); Technical Committee(s) with Correlating Committee (7 weeks)
- Technical Committee ballots on Second Draft (11 weeks); Technical Committee(s) with Correlating Committee (10 weeks)
- Correlating Committee Second Draft Meeting (9 weeks)
- Correlating Committee ballots on Second Draft (8 weeks)
- Second Draft Report posted on the document information page

Step 3 – NFPA Technical Meeting

- Notice of Intent to Make a Motion (NITMAM) accepted (5 weeks) following the posting of Second Draft Report
- NITMAMs are reviewed and valid motions are certified by the Motions Committee for presentation at the NFPA Technical Meeting
- NFPA membership meets each June at the NFPA Technical Meeting to act on Standards with "Certified Amending Motions" (certified NITMAMs)
- Committee(s) vote on any successful amendments to the Technical Committee Reports made by the NFPA membership at the NFPA Technical Meeting

Step 4 – Council Appeals and Issuance of Standard

- Notification of intent to file an appeal to the Standards Council on Technical Meeting action must be filed within 20 days of the NFPA Technical Meeting
- Standards Council decides, based on all evidence, whether to issue the standard or to take other action

Notes:

1. Time periods are approximate; refer to published schedules for actual dates.
2. Annual revision cycle documents with certified amending motions take approximately 101 weeks to complete.
3. Fall revision cycle documents receiving certified amending motions take approximately 141 weeks to complete.

Committee Membership Classifications[1,2,3,4]

The following classifications apply to Committee members and represent their principal interest in the activity of the Committee.

1. M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.
2. U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.
3. IM *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.
4. L *Labor:* A labor representative or employee concerned with safety in the workplace.
5. RT *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.
6. E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.
7. I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.
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9. SE *Special Expert:* A person not representing (1) through (8) and who has special expertise in the scope of the standard or portion thereof.

NOTE 1: "Standard" connotes code, standard, recommended practice, or guide.

NOTE 2: A representative includes an employee.

NOTE 3: While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of member or unique interests need representation in order to foster the best possible Committee deliberations on any project. In this connection, the Standards Council may make such appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.

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Once the First Draft Report becomes available there is a Public Comment period during which anyone may submit a Public Comment on the First Draft. Any objections or further related changes to the content of the First Draft must be submitted at the Comment stage.

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I. Applicable Regulations. The primary rules governing the processing of NFPA standards (codes, standards, recommended practices, and guides) are the NFPA *Regulations Governing the Development of NFPA Standards (Regs)*. Other applicable rules include NFPA *Bylaws*, NFPA *Technical Meeting Convention Rules*, NFPA *Guide for the Conduct of Participants in the NFPA Standards Development Process*, and the NFPA *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council*. Most of these rules and regulations are contained in the *NFPA Standards Directory*. For copies of the *Directory*, contact Codes and Standards Administration at NFPA Headquarters; all these documents are also available on the NFPA website at "www.nfpa.org."

The following is general information on the NFPA process. All participants, however, should refer to the actual rules and regulations for a full understanding of this process and for the criteria that govern participation.

II. Technical Committee Report. The Technical Committee Report is defined as "the Report of the responsible Committee(s), in accordance with the Regulations, in preparation of a new or revised NFPA Standard." The Technical Committee Report is in two parts and consists of the First Draft Report and the Second Draft Report. (See *Regs* at Section 1.4.)

III. Step 1: First Draft Report. The First Draft Report is defined as "Part one of the Technical Committee Report, which documents the Input Stage." The First Draft Report consists of the First Draft, Public Input, Committee Input, Committee and Correlating Committee Statements, Correlating Notes, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.3.) Any objection to an action in the First Draft Report must be raised through the filing of an appropriate Comment for consideration in the Second Draft Report or the objection will be considered resolved. [See *Regs* at 4.3.1(b).]

IV. Step 2: Second Draft Report. The Second Draft Report is defined as "Part two of the Technical Committee Report, which documents the Comment Stage." The Second Draft Report consists of the Second Draft, Public Comments with corresponding Committee Actions and Committee Statements, Correlating Notes and their respective Committee Statements, Committee Comments, Correlating Revisions, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.4.) The First Draft Report and the Second Draft Report together constitute the Technical Committee Report. Any outstanding objection following the Second Draft Report must be raised through an appropriate Amending Motion at the NFPA Technical Meeting or the objection will be considered resolved. [See *Regs* at 4.4.1(b).]

V. Step 3a: Action at NFPA Technical Meeting. Following the publication of the Second Draft Report, there is a period during which those wishing to make proper Amending Motions on the Technical Committee Reports must signal their intention by submitting a Notice of Intent to Make a Motion (NITMAM). (See *Regs* at 4.5.2.) Standards that receive notice of proper Amending Motions (Certified Amending Motions) will be presented for action at the annual June NFPA Technical Meeting. At the meeting, the NFPA membership can consider and act on these Certified Amending Motions as well as Follow-up Amending Motions, that is, motions that become necessary as a result of a previous successful Amending Motion. (See 4.5.3.2 through 4.5.3.6 and Table 1, Columns 1-3 of *Regs* for a summary of the available Amending Motions and who may make them.) Any outstanding objection following action at an NFPA Technical Meeting (and any further Technical Committee consideration following successful Amending Motions, see *Regs* at 4.5.3.7 through 4.6.5.3) must be raised through an appeal to the Standards Council or it will be considered to be resolved.

VI. Step 3b: Documents Forwarded Directly to the Council. Where no NITMAM is received and certified in accordance with the Technical Meeting Convention Rules, the standard is forwarded directly to the Standards Council for action on issuance. Objections are deemed to be resolved for these documents. (See *Regs* at 4.5.2.5.)

VII. Step 4a: Council Appeals. Anyone can appeal to the Standards Council concerning procedural or substantive matters related to the development, content, or issuance of any document of the NFPA or on matters within the purview of the authority of the Council, as established by the Bylaws and as determined by the Board of Directors. Such appeals must be in written form and filed with the Secretary of the Standards Council (see *Regs* at Section 1.6). Time constraints for filing an appeal must be in accordance with 1.6.2 of the *Regs*. Objections are deemed to be resolved if not pursued at this level.

VIII. Step 4b: Document Issuance. The Standards Council is the issuer of all documents (see Article 8 of *Bylaws*). The Council acts on the issuance of a document presented for action at an NFPA Technical Meeting within 75 days from the date of the recommendation from the NFPA Technical Meeting, unless this period is extended by the Council (see *Regs* at 4.7.2). For documents forwarded directly to the Standards Council, the Council acts on the issuance of the document at its next scheduled meeting, or at such other meeting as the Council may determine (see *Regs* at 4.5.2.5 and 4.7.4).

IX. Petitions to the Board of Directors. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the codes and standards development process and to protect the interests of the NFPA. The rules for petitioning the Board of Directors can be found in the *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council* and in Section 1.7 of the *Regs*.

X. For More Information. The program for the NFPA Technical Meeting (as well as the NFPA website as information becomes available) should be consulted for the date on which each report scheduled for consideration at the meeting will be presented. To view the First Draft Report and Second Draft Report as well as information on NFPA rules and for up-to-date information on schedules and deadlines for processing NFPA documents, check the NFPA website (www.nfpa.org/docinfo) or contact NFPA Codes & Standards Administration at (617) 984-7246.