

NFPA®

1006

Standard for
Technical Rescue Personnel
Professional Qualifications

2021



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NFPA® 1006

Standard for

Technical Rescue Personnel Professional Qualifications

2021 Edition

This edition of NFPA 1006, *Standard for Technical Rescue Personnel Professional Qualifications*, was prepared by the Technical Committee on Rescue Technician Professional Qualifications, released by the Correlating Committee on Professional Qualifications, and acted on by the NFPA membership during the 2020 NFPA Technical Meeting held June 8–29. It was issued by the Standards Council on August 11, 2020, with an effective date of August 31, 2020, and supersedes all previous editions.

This document has been amended by one or more Tentative Interim Amendments (TIAs) and/or Errata. See “Codes & Standards” at www.nfpa.org for more information.

This edition of NFPA 1006 was approved as an American National Standard on August 31, 2020.

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 *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
- (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 the 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, a 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 were changed from Level I and II to Awareness, Operations, and Technician, which better align with NFPA 1670. JPRs were refined for all the positions within the scope of the standard. Chapters on Floodwater, Animal, Tower, Helicopter, and Watercraft Rescue were added. Definitions were updated and several were added to create consistency with NFPA 1670. In addition, the title of the standard was revised to be inclusive of all personnel associated with technical rescue.

For the 2021 edition, the committee reviewed the entire document to make necessary adjustments to the requirements so that they aligned better with NFPA 1670, as well as with other requirements in the document. The committee expanded on the vehicle rescue discipline by including a new chapter on common passenger vehicles and by renaming the existing *vehicle rescue* to *heavy vehicle rescue* given the vast differences between the two types of vehicles. The committee made numerous changes throughout the document to provide clarity to areas that previously might have been confusing, to strengthen the requirements to be qualified, and to take into account commonly accepted practices and include them in the requirements.

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Standard for

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2021 Edition

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

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.

Δ 1.2.6* Technical rescue personnel shall remain current with the general knowledge, skills, and JPRs addressed for each level or position of qualification.

N 1.2.7* Technical rescue personnel shall remain current with technical rescue practices and applicable standards and shall demonstrate competency on an annual basis.

N 1.2.8 Proficiency in current rescue practices shall be demonstrated by achieving certification and demonstrating skills and proficiencies through private, local, state, provincial, or federal programs providing an acceptable method approved by the AHJ.

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.

N 1.3.5* All the chapters listed in Section 1.3.6 shall be utilized as stand-alone chapters for individual qualifications in specialty areas.

1.3.6 Prior to being qualified, personnel assigned to certain duties shall meet all the requirements of such duties as 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 common passenger vehicle rescue are defined in Chapter 8.
- (6) The duties of heavy vehicle rescue are defined in Chapter 9.
- (7) The duties of animal rescue are defined in Chapter 10.
- (8) The duties of wilderness rescue are defined in Chapter 11.
- (9) The duties of trench rescue are defined in Chapter 12.
- (10) The duties of machinery rescue are defined in Chapter 13.
- (11) The duties of cave rescue are defined in Chapter 14.
- (12) The duties of mine and tunnel rescue are defined in Chapter 15.
- (13) The duties of helicopter rescue are defined in Chapter 16.
- (14) The duties of surface water rescue are defined in Chapter 17.
- (15) The duties of swiftwater rescue are defined in Chapter 18.
- (16) The duties of dive rescue are defined in Chapter 19.
- (17) The duties of ice rescue are defined in Chapter 20.

- (18) The duties of surf rescue are defined in Chapter 21.
- (19) The duties of watercraft rescue are defined in Chapter 22.
- (20) The duties of flood rescue are defined in Chapter 23.

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

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

1.3.9* 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

1.3.10 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.

1.3.11 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.

1.3.12 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.)

Δ 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 respond 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.

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

- (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.

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.

N 1.6.3 The AHJ shall make provisions for implementing search operations at a technical rescue incident to determine the presence of victim(s), their location, and their condition.

N 1.6.4 When multiple victims are present, the AHJ shall make provisions for prioritizing the rescue of victims based on their location, medical condition, and survival profile.

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) National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

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*, 2018 edition.

NFPA 402, *Guide for Aircraft Rescue and Fire-Fighting Operations*, 2019 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, Health, and Wellness Program*, 2018 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 3.3.30, 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 disproportionately.

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 E.)

3.3.24 Collapse Zone. See 3.3.142, 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 access and egress and is not designed for continuous human occupancy. [1500, 2018]

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 F.)

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, infor-

mation 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 3.3.148, 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 postincident meeting designed to assist rescue personnel in dealing with psychological trauma as the result of an emergency.

3.3.41 Critique. A postincident analysis of the effectiveness of the rescue effort.

3.3.42* Compartment 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).

3.3.43 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.

3.3.44* 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, 2018]

N 3.3.61 Emergency Escape Route. A preplanned and understood route that rescuers utilize to move to a safety zone or other low-risk area.

3.3.62 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]

3.3.63 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 3.3.31, *Confined Space Entry*.)

3.3.64 Entry Opening. See 3.3.32, *Confined Space Entry Opening*.

3.3.65 Environmental Controls. See 3.3.22, *Collapse Support Operations*.

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

3.3.67* Extinguishing Devices. Devices used to suppress fire, including, but not limited to, CO₂ extinguishers, dry chemical extinguishers, hose lines, and fire-fighting foam.

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

3.3.69 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]

3.3.70 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.

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

3.3.72 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.

3.3.73* 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.

3.3.74 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]

3.3.75 Harness. See 3.3.96, *Life Safety Harness*.

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

3.3.77 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.

3.3.78* 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]

3.3.79 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.

3.3.80 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 shear wall, unreinforced masonry infill in concrete frame, heavy floor, heavy wall, and precast concrete. (See Annex G.)

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

3.3.82 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.

3.3.83* 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.

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

3.3.85 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.

3.3.86 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]

3.3.87 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.

3.3.88 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.

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

3.3.90* 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).

3.3.91 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]

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

3.3.93 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.

3.3.94 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]

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

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

3.3.97 Life Safety Rope. See 3.3.153.2.

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

3.3.99 Light Frame Construction. Structures that have frame-work made out of wood or other lightweight materials. (See Annex G.)

3.3.100 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.

3.3.101 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.

3.3.102 Lip-In. See 3.3.101, Lip Collapse.

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

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

3.3.105 Load (Mass). That which is being lowered, raised, or otherwise supported by a stabilization or rigging system.

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

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

3.3.108 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.

3.3.109 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]

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

3.3.111 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.

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

3.3.113 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]

3.3.114 Mechanical Advantage System.

3.3.114.1 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).

3.3.114.2* 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.

3.3.115 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.

3.3.116* 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.

3.3.117 Nonintersecting Trench. See 3.3.206.2.

3.3.118 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]

■ **3.3.119 Operator.** An individual trained and responsible for the start-up, operation, and shutdown of the applicable equipment.

3.3.120 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.

3.3.121 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.

3.3.122 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.

3.3.123 Permit-Required Confined Space. See 3.3.33, Confined Space Entry Permit.

3.3.124 Personal Escape. See 3.3.161, Self-Rescue.

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

3.3.126* 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.

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

■ **3.3.128* Preclimb Checklist.** A tool used in tower rescue as part of a rescue preplan that describes the conditions that must be met before rescuers climb the tower to perform a rescue operation and must continue to exist for sustained operation on the tower.

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

3.3.130* 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]

3.3.131* 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]

3.3.132 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]

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

3.3.134* 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.

■ **3.3.135* Rated Capacity.** The working load limit permitted by the manufacturer under nominal working conditions.

3.3.136 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.

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

3.3.138* 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.

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

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

3.3.141 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]

3.3.142 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.

3.3.143* 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.

3.3.144* 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.

3.3.145 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]

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

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

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

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

3.3.150 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.

3.3.151 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.

3.3.152 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]

3.3.153 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 3.3.153.2, *Life Safety Rope*.)

3.3.153.1* 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]

3.3.153.2 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 3.3.153, *Rope*.)

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

3.3.153.4 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.

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

3.3.155 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]

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

3.3.157 SDS. Safety data sheets.

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

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

3.3.160 Security Measures. See 3.3.156, Scene Security.

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

3.3.162 Sheeting and Shoring.

3.3.162.1 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]

3.3.162.2 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]

3.3.163 Sheet piling 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.

3.3.164* 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.

3.3.165 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.

3.3.166 Shoring System. A system that supports unstable surfaces.

3.3.167 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]

3.3.168 Sides. See 3.3.68, Face(s).

3.3.169* 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.

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

3.3.171* 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.

3.3.172 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.

3.3.173 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).

3.3.174 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]

3.3.175 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.

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

3.3.177 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.

3.3.178 Stabilization System. See 3.3.39, Cribbing.

3.3.179 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]

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

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

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

3.3.183 Structural Support System. See 3.3.166, Shoring System.

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

3.3.185 Superimposed Load. See 3.3.187, Surcharge Load.

3.3.186 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]

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

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

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

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

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

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

3.3.193 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]

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

3.3.195 Team. See 3.3.35, Confined Space Rescue Team.

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

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

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

3.3.199 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.

3.3.200 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.

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

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

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

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

3.3.205 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.

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

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

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

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

3.3.208 Trench Floor. The bottom of the trench.

3.3.209 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.

3.3.210 Triage. The sorting of casualties at an emergency according to the nature and severity of their injuries. [402, 2019]

3.3.211 Upright. See 3.3.209, Trench Upright.

3.3.212 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.

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

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

3.3.215 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.

3.3.216 Water Rescue Rope. See 3.3.153.4.

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

3.3.218 Water-bound Victim. A victim who is in the water needing assistance.

3.3.219* 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.

3.3.220* 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.

3.3.221 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]

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

3.3.223 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. Prior to qualification at the awareness level in tower rescue, the individual shall meet the requirements defined in Section 4.1.

N 4.1.1* Perform the rescue of a person from a tower while working from ground ladders, aerial ladders, or other elevated devices employed by the AHJ, given an incident not requiring the rescuer to be solely supported by the tower, so that the patient is transferred from the tower to the elevated device, the agency's protocol for the use of the device is followed, and the risks to the victim and rescuer are minimized.

N (A) Requisite Knowledge. Familiarization with the use of ladders or elevated devices and specific procedures for using them in victim transfer from a tower.

N (B) Requisite Skills. Ability to work from or operate ladders or elevated devices capable of accessing and rescuing the tower victim and providing positive transfer from the tower to the aerial while providing fall protection for the victim and rescue personnel.

N 4.1.2 Size up a tower 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.

N (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 the 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 tower rescue incidents.

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

N 4.1.3 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 4.1.4 Recognize the need for technical rescue resources at an operations- or technical-level incident, given AHJ guidelines, 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.

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

N (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.

N 4.1.5 Support an operations- or technician-level incident, given an incident, an assignment, an 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.

N (A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, scene support requirements.

N (B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

Δ 4.2 Operations Level. The job performance requirements defined in Sections 4.1, 4.2, 5.2, 5.3.9, 5.3.10, and 5.3.11 shall be met prior to or during 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.

Δ (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.

Δ (B) Requisite Skills. The ability to select and use hazard-specific PPE, monitor and test equipment, identify hazards, operate beneficial systems in support of tactical objectives, operate tools and devices for securing and disabling hazards, and 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 ensure any integrated safety systems, such as vertical lifelines (e.g., cable or rail-type structure), are accessible.

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

(B) Requisite Skills. Perform physical inspection of accessible tower components in accordance with a preclimb checklist.

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, including but not limited to fall protection, helmet, and gloves as appropriate, and use 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 climb and maneuver 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 the removal of a victim from a preplanned tower environment, given an incident, a rescue preplan, and a prescribed means of removal of the victim to the objective, so that risks to victims and rescuers are minimized, all the elements of the preplan are complied with, and the objective is achieved.

(A) Requisite Knowledge. Tactics identified in the rescue preplan for the removal of a victim on a tower.

(B) Requisite Skills. Employ tactics identified in the rescue preplan for the removal of a victim on a tower.

4.2.9 Direct a team in removal of a victim from a preplanned tower environment, given an incident, a rescue preplan, and a prescribed means of removal of the victim to the objective, so that risks to victims and rescuers are minimized, all the elements of the preplan are complied with, and the objective is achieved.

(A) Requisite Knowledge. Tactics identified in the rescue preplan for the removal of a victim on a tower.

(B) Requisite Skills. Direct the employment of tactics identified in the rescue preplan for the removal of a victim on a tower.

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. AHJ policies and procedures, risk versus benefit analysis application, site safety and hazard control techniques, and pre-incident rescue action planning.

Δ (B) Requisite Skills. Apply policies and protocols, risk versus benefit analysis information, and pre-incident planning data, risk management, and site safety control techniques.

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, and postincident analysis techniques.

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

Δ 4.3 Technician Level. The job performance requirements defined in Sections 4.2 and 4.3 shall be met prior to or during technician-level qualification in tower rescue.

Δ 4.3.1 Direct a tower rescue team, given a tower rescue 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.

Δ 4.3.2* Develop an incident action plan for a tower rescue incident on a structure whose size, shape, or configuration would accommodate only one rescuer, given a tower rescue scenario, so that a climbing path plan is established, 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 action 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.

Δ 4.3.3* Ascend a simulated or actual tower to conduct a rescue, given an incident action plan and a preclimb checklist, so that the preclimb checklist and hazard control measures are implemented; fall protection systems are utilized; and the rescuer moves both horizontally and vertically between structural elements of the tower, with or without the benefit of climbing pegs, ladders, or vertical lifelines, to achieve the objectives of the incident action plan.

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

△ (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.

△ 4.3.4 Perform a ground-based tower rescue requiring the rescue of a suspended victim from an elevated position, given an incident action plan, climbing plan, hazard-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 the rescue environment.

△ (A) **Requisite Knowledge.** Incident action plan, 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.** 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 rescue requiring the rescue of a victim suspended from a tower at a height beyond the scope of a ground-based rope rescue system, given an incident action plan, climbing plan, hazard-specific PPE, and resources from the tower rescue tool kit, so that the victim is transferred to the rescue system and is moved both horizontally and vertically a distance representative of the rescue environment.

△ (A) **Requisite Knowledge.** Incident action plan, 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.** 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.

N 4.3.6 Perform a lowering operation of a victim from a tower or elevated structure where the travel path or height of the objective requires establishment of multiple sets of sequential rope systems, given a tower rescue scenario and a tower rescue tool kit, so that the victim is protected from a fall, rope movement is managed without entanglement, and the objective is achieved.

N (A) **Requisite Knowledge.** Incident action plan, 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.

N (B) **Requisite Skills.** Scene assessment, hazard control techniques, PPE use and application, fall protection system operation, horizontal and vertical climbing and movement techniques, and multi-pitch tower-based rescue techniques.

Chapter 5 Rope Rescue

5.1 **Awareness Level.** Prior to qualification at the awareness level in rope rescue, the individual shall meet the requirements defined in Section 5.1.

5.1.1 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.

• N 5.1.2 Size up a rope 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for rope rescue incidents.

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

N 5.1.3 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) **Requisite Skills.** The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 5.1.4 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

5.1.5 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

5.2 Operations Level. The job performance requirements defined in Sections 5.1 and 5.2 shall be met prior to or during operations-level qualification in rope rescue.

5.2.1 Perform size up of 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* Maintain hazard-specific PPE, given clothing or equipment for the protection of the rescuers, inspection procedures, 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 record-keeping 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* Maintain rescue equipment, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, inspection procedures, 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 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.

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 most appropriate anchor points are 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 the force will be distributed — proportionally or disproportionally — 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, protect personnel from falls while working near edges, secure edge protection, and secure ropes or webbing in a specific location.

5.2.9* Construct a system intended to provide belay within a single- or two-tensioned rope 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 belay operator, the belay operator 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 devices used to provide belay, 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 hazard-specific PPE, and perform a system safety check.

Δ **5.2.10** Operate a system intended to provide belay within a single- or two-tensioned rope 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 system, and a load, so that the potential fall factor is minimized, the belay is not actuated during normal lowering and raising operations, the belay system is prepared for actuation at all times during the operation, the belay operator is attentive at all times during the operation, the load's position is continually monitored, and the belay operator moves rope through the belay device as designed.

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

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

Δ **5.2.11*** Belay a falling load in a high-angle environment, given a belay and a failed line creating 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 belay operator utilizes the belay device as designed, and the belay operator 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 hazard-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 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.

5.2.14* 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.

5.2.15 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.

5.2.16* 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.

5.2.17 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.

5.2.18* 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.

Δ (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 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.

5.2.19 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.

Δ **5.2.20** Prepare for transfer of victims, given diagnostic and packaging equipment and an actual or simulated EMS agency, so that rescuers and victims are protected from hazards, victim injuries or illnesses are managed, and victims are delivered to the EMS provider with information regarding the history of the rescue activity and victim conditions.

(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.

5.2.21 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 low-angle litter operation, and perform a system safety check.

5.2.22* 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.

5.2.23* 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 high-angle environment, identify safety concerns in a high-angle environment, and perform a system safety check.

5.2.24* 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.

(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.

Δ 5.3 Technician Level. The job performance requirements defined in Sections 5.2 and 5.3 shall be met prior to or during 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.

Δ 5.3.3* While suspended from a rope rescue system, perform the transfer 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 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.

5.3.9* 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 harnesses 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.

5.3.10* 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 harnesses, 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.

5.3.11 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 harnesses, 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.

Chapter 6 Structural Collapse Rescue

6.1 Awareness Level. Prior to qualification at the awareness level in structural collapse rescue, the individual shall meet the requirements defined in Section 6.1.

6.1.1 Identify incident hazards, given a specific type of collapse incident, so that construction type is determined, all associated hazards are identified, 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.

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

6.1.2 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.

6.1.3 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.

Δ (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.

• 6.1.4 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.

N 6.1.5 Perform collapse support operations at a rescue incident, given an assignment and available resources, so that scene lighting is provided for the tasks to be undertaken, environmental concerns are addressed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.

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

N (B) Requisite Skills. The ability to access resources, setup lights, initiate environmental controls, and setup rehabilitation for rescuers.

N 6.1.6 Size up a structural 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 the victims is established, witnesses and reporting parties are identified and interviewed, resource needs are assessed, primary search parameters are identified, and the information required to develop an initial incident action plan is obtained.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for structural collapse rescue incidents.

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

N 6.1.7 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

Δ 6.2 Operations Level. The job performance requirements defined in Sections 6.1 and 6.2 shall be met prior to or during 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 G.)

(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; hazard-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** 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 compartment syndrome due to crush injuries, 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; compartment 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 compartment syndrome indicators, and complete risk/benefit assessments for selected methods of rescue and time constraints.

6.2.8* 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 compartment syndrome due to crush injuries, 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 compartment syndrome due to crush injuries 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.

6.2.9* 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.

6.2.10* 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.

6.2.11 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.

6.2.12* 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.

6.2.13 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, inspection procedures, 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 record-keeping 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.

6.2.14 Maintain rescue equipment, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, inspection procedures, 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 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.

6.2.15* 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, postincident analysis techniques.

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

Δ 6.3 Technician Level. The job performance requirements defined in Sections 6.2 and 6.3 shall be met prior to or during 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 E, G, and F 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 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.

6.3.6* 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; hazard-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 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 compartment syndrome due to crush injuries, 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; compartment 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 compartment syndrome signs and symptoms, and complete risk/benefit assessments for selected methods of rescue and time constraints.

6.3.8 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 compartment 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.

Δ (B) Requisite Skills. Selection, use, and care of PPE; basic prehospital care of soft-tissue injuries; fracture stabilization;

airway maintenance techniques and cardiopulmonary resuscitation; signs and symptoms of compartment syndrome; and selection and use of patient packaging equipment.

6.3.9 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.

6.3.10 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.

6.3.11 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.

6.3.12 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.

6.3.13* 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.

6.3.14 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.

6.3.15 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. Prior to qualification at the awareness level in confined space rescue, the individual shall meet the requirements defined in Section 7.1.

7.1.1 Initiate isolation procedures for a specific confined space incident, given scene control barriers, personal protective equipment (PPE), requisite equipment, and available specialized resources, so that all hazards are identified; unauthorized entry to the confined space and adjacent areas are controlled; resource application fits the operational requirements; hazard isolation is considered; risks to rescuers, bystanders, and victims are minimized; and rescue time constraints are taken into account.

(A) Requisite Knowledge. Resource capabilities and limitations, hazard recognition, isolation methods and terminology, methods for controlling access to the scene, and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify potential hazards to rescuers and bystanders, identify potential paths for entry to the confined space and its adjacent areas, utilize scene entry control methods, place scene control barriers, and operate control and mitigation equipment.

7.1.2 Initiate a search in areas immediately adjacent to the confined 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 survival profile is established, the access and egress 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 confined 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.

7.1.3* 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.

7.1.4 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.

N 7.1.5 Size up a confined space 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for confined space rescue incidents.

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

N 7.1.6 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

N 7.1.7 Support an operations- or technician-level incident, given an incident, an assignment, an 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.

N (A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, and scene support requirements.

N (B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

• **7.2 Operations Level.** The job performance requirements defined in Sections 5.2, 7.1, and 7.2 shall be met prior to or during 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.

Δ **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, so that the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, the victim can be seen easily from the outside of the space's primary access opening, 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, the space can accommodate two or more rescuers in addition to the victim, all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection, 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, so that the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement; the victim can be easily seen from the outside of the space's primary access opening; 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; the space can accommodate two or more rescuers in addition to the victim; all hazards in and around the confined space have been identified and can be mitigated by using respiratory protection; 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 so 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, so that the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, the victim can be easily seen from the outside of the space's primary access opening, 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, the space can accommodate two or more rescuers in addition to the victim, 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 spine immobilization device.

▲ **7.2.9** Prepare for entry into horizontally oriented confined space, given a confined space rescue tool kit and a confined space, so that the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, the victim can be easily seen from the outside of the space's primary access opening, 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, the space can accommodate two or more rescuers in addition to the victim, 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, so that the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, the victim can be easily seen from the outside of the space's primary access opening, 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, the space can accommodate two or more rescuers in addition to the victim, 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, so that the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, the victim can be easily seen from the outside of the space's primary access opening 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, the space can accommodate two or more rescuers in addition to the victim, 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, so that the internal configuration of the space is clear and unobstructed so retrieval systems can be utilized for rescuers without possibility of entanglement, the victim can be easily seen from the outside of the space's primary access opening, 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, the space can accommodate two or more rescuers in addition to the victim, 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* 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, record-keeping 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 Sections 7.2 and 7.3 shall be met prior to or during 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, so that the internal configuration of the space will not create entanglement hazards when using air lines, the victim cannot be seen from the outside of the space's primary access opening, 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, 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, so that the portal size or internal configuration will not allow the application of a full spine immobilization device, 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, and a confined

space tool kit, so that entry can be made into a confined space that contains one or more of the following characteristics: the internal configuration of the space could create entanglement hazards and retrieval might not be effective, the victim cannot be seen from the outside of the space's primary access opening, 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, 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, so that the internal configuration of the space could create entanglement hazards and retrieval might not be effective, the victim cannot be seen from the outside of the space's primary access opening, 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, 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 medi-

cal equipment specific to confined space victim needs; and reassess and confirm mode of operation.

Chapter 8 Common Passenger Vehicle Rescue

8.1 Awareness Level. Prior to qualification at the awareness level in common passenger vehicle rescue, the individual shall meet the requirements defined in Section 8.1.

8.1.1 Establish scene safety zones, given a common passenger vehicle incident, scene security barriers, incident location, incident information, and personal protective equipment (PPE), so that the scene and responders are visible to approaching common passenger vehicles, 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 traffic flow is controlled.

(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 maintain personal safety techniques.

8.1.2 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.

8.1.3 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, bystanders, 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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Knowledge. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

8.1.4 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

8.1.5 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

8.2 Operations Level. The job performance requirements defined in Sections 8.1 and 8.2 shall be met prior to or during operations-level qualification in common passenger vehicle rescue.

8.2.1 Create an incident action plan for a common passenger vehicle incident, given agency guidelines, planning forms, and an operations-level common passenger 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, common passenger 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 common passenger vehicles within the AHJ boundaries, common passenger vehicle hazards, incident support operations and resources, common passenger 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 common passenger vehicles, identify and evaluate various types of common passenger vehicles within the AHJ boundaries, request support and resources, identify common passenger 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 that has come to rest on its wheels on the road surface or similar flat stable environment, given a common passenger vehicle tool kit and PPE, so that the common passenger vehicle is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise common passenger vehicle stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

(A) Requisite Knowledge. Types and rated capacities 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 select, operate, and monitor stabilization devices.

8.2.4* Manage potentially harmful energy sources, including propulsion power, restraint systems, and construction materials, given a common passenger vehicle, common passenger vehicle tool kit, and PPE, so that all hazards are identified and isolated, 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 hazard-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; access and egress 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, access and egress points, routes and hazards operating systems, AHJ standard operating procedure, and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify access and egress 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 on its wheels, 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 access and egress 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.

Δ (A) Requisite Knowledge. Patient handling techniques; types of immobilization, packaging, and transfer devices; types of immobilization techniques; signs and symptoms of compartment syndrome as a result of crush injuries; 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.

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

Δ 8.3 Technician Level. The job performance requirements defined in Sections 8.2 and 8.3 shall be met prior to or during technician-level qualification in common passenger vehicle rescue.

8.3.1 Create an incident action plan for an incident where a common passenger vehicle has come to rest on its roof, 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 common passenger vehicles within the AHJ boundaries, vehicle hazards, incident support operations and resources, vehicle anatomy, and fire suppression and safety measures.

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

8.3.2 Stabilize a common passenger vehicle that has come to rest on its roof, given a common passenger vehicle, a technician-level common passenger vehicle incident or simulation, given a common passenger vehicle tool kit and PPE, so that the common passenger vehicle is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise common passenger vehicle stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

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

(B) Requisite Skills. The ability to select, operate, and monitor stabilization devices.

8.3.3 Create access and egress openings for rescue from a common passenger vehicle that has come to rest on its roof, given a technician-level common passenger vehicle incident or simulation, a common passenger 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 common passenger vehicle stability is maintained.

(A) Requisite Knowledge. Common passenger vehicle construction and features; electrical, mechanical, hydraulic, and pneumatic systems; alternative access and egress 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.

N 8.3.4 Create an incident action plan for an incident where a common passenger vehicle has come to rest on its side, given agency guidelines, planning forms, and a technician-level common passenger 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 crew and safety measures are identified, common passenger vehicle stabilization needs are evaluated, and resource needs are identified and documented for future use.

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

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

N 8.3.5 Stabilize a common passenger vehicle that has come to rest on its side, given a common passenger vehicle tool kit and PPE, so that the common passenger vehicle is prevented from moving during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise common passenger vehicle stability; selected stabilization points are structurally sound; stabilization equipment can be monitored; and the risk to rescuers is minimized.

N (A) Requisite Knowledge. Types of stabilization devices, mechanism of 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.

N (B) Requisite Skills. The ability to select, operate, and monitor stabilization devices.

N 8.3.6 Create access and egress openings for rescue from a common passenger vehicle that has come to rest on its side, given a common passenger 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 common passenger vehicle stability is maintained.

(A) Requisite Knowledge. Common passenger vehicle construction and features; electrical, mechanical, hydraulic, and pneumatic systems; alternative access and egress 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.

8.3.7 Create an incident action plan for an incident where a common passenger vehicle has come to rest in a configuration or environment where multiple concurrent hazards must be managed to access or remove the occupants, given agency guidelines, planning forms, and a technician-level common passenger 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, common passenger vehicle stabilization needs are evaluated, and resource needs are identified and documented for future use.

(A) Requisite Knowledge. Operational protocols, specific planning forms, common passenger 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 position of the common passenger vehicle, identify and evaluate various types of common passenger vehicles, request support and resources, identify anatomy, and determine the required fire suppression crew and safety measures.

8.3.8 Stabilize a common passenger vehicle that has come to rest in a configuration or environment where multiple concurrent hazards must be managed to access or remove the occupants, 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 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 select, operate, and monitor stabilization devices.

8.3.9 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.

Chapter 9 Heavy Vehicle Rescue

9.1 Awareness Level. Prior to qualification at the awareness level in heavy vehicle rescue, the individual shall meet the requirements in Section 9.1.

9.1.1 Size up a heavy vehicle 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 the 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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for heavy vehicle rescue incidents.

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

9.1.2 Recognize incident hazards and initiate isolation procedures, given scene control barriers, personal protective equipment (PPE), requisite equipment, and available specialized resources, so that all the hazards are identified; resource application fits the operational requirements; hazard isolation is considered; risks to rescuers, bystanders, 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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

9.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

- N (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.
- N 9.1.4** Support an operations- or technician-level incident, given an incident, an assignment, an 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.
- N (A) Requisite Knowledge.** AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, and scene support requirements.
- N (B) Requisite Skills.** The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.
- N 9.2 Operations Level.** The job performance requirements defined in Sections 8.3, 9.1, and 9.2 shall be met prior to or during operations-level qualification in heavy vehicle rescue.
- N 9.2.1** Create an incident action plan for a heavy 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.
- N (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.
- N (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.
- N 9.2.2** 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 suppression crew.
- N (A) Requisite Knowledge.** Types of fire and explosion hazards, incident management systems, types of extinguishing devices, agency policies and procedures, types of flammable and combustible substances and types of ignition sources, and extinguishment or control options.
- N (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.
- N 9.2.3** Stabilize a heavy vehicle that has come to rest in its position of use on the road or other stable surface, 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.
- N (A) Requisite Knowledge.** Types and rated capacities 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.
- N (B) Requisite Skills.** The ability to select, operate, and monitor stabilization devices.
- N 9.2.4** Isolate potentially harmful energy sources, including propulsion power, restraint systems, and construction materials, given a 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.
- N (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.
- N (B) Requisite Skills.** The ability to select and use hazard-specific PPE, identify hazards, operate beneficial systems in support of tactical objectives, and operate tools and devices for securing and disabling hazards.
- N 9.2.5** 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; access and egress points for victims, rescuers, and equipment are designated; flows of personnel, victims, 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 followed.
- N (A) Requisite Knowledge.** Heavy vehicle construction/features, access and egress points, routes and hazards operating systems, AHJ standard operating procedure, and emergency evacuation and safety signals.
- N (B) Requisite Skills.** The ability to identify access and egress points and probable victim locations, and to assess and evaluate impact of vehicle stability on the victim.
- N 9.2.6** Create access and egress openings for rescue from a heavy vehicle on its wheels 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.
- N (A) Requisite Knowledge.** Heavy vehicle construction and features; electrical, mechanical, hydraulic, pneumatic, and alternative access and egress equipment; points and routes of ingress and egress; techniques and hazards; agency policies and procedures; and emergency evacuation and safety signals.
- N (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.

N 9.2.7 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.

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

N (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.

N 9.2.8 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.

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

N (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.

N 9.2.9 Terminate a heavy 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.

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

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

N 9.3 Technician Level. The job performance requirements defined in Sections 9.2 and 9.3 shall be met prior to or during technician-level qualification in heavy vehicle rescue.

N 9.3.1 Create an incident action plan for an incident where a heavy vehicle has come to rest in a configuration or environment where multiple concurrent hazards must be managed to access or remove the occupants, 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.

N (A) Requisite Knowledge. Operational protocols, specific planning forms, common heavy vehicles, heavy vehicle hazards, incident support operations and resources, heavy vehicle anatomy, and fire suppression and safety measures.

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

N 9.3.2 Stabilize a heavy vehicle that has come to rest in a configuration or environment where multiple concurrent hazards must be managed to access or remove the occupants, 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.

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

N (B) Requisite Skills. The ability to select, operate, and monitor stabilization devices on heavy vehicles.

N 9.3.3 Lift a heavy vehicle, given a heavy vehicle incident, a vehicle tool kit and PPE, so that unanticipated movement is prevented during the rescue operations; entry, exit, and tool placement points are not compromised; anticipated rescue activities will not compromise vehicle stability; selected lift points are structurally sound; lifting equipment can be monitored; and the risk to rescuers is minimized.

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

N (B) Requisite Skills. The ability to deploy and operate lifting devices, ability to deploy cribbing, recognition of competent lift points, calculation of weights and center of gravity, assessment of vehicle stability, use of tools or systems to prevent unwanted movement.

N 9.3.4 Coordinate the use of heavy equipment as a part of a plan to lift, move, or stabilize a heavy vehicle, given a heavy vehicle incident, heavy equipment and an operator, a vehicle tool kit, and PPE, so that the objective is met and the risks to the responders are minimized.

N (A) Requisite Knowledge. Methods of requesting heavy equipment, methods of communication, use of rigging.

N (B) Requisite Skills. The ability to determine estimated weights to be moved or lifted and perform coordinated integrated lifting or moving operations utilizing heavy equipment.

N 9.3.5 Create access and egress openings for rescue from a heavy vehicle that has come to rest in a configuration or environment where multiple concurrent hazards must be managed to access or remove the occupants, 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.

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

N (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.

N 9.3.6 Disentangle victim(s) from a heavy vehicle that has come to rest in a configuration or environment where multiple concurrent hazards must be managed to access or remove the occupants, given a heavy vehicle 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.

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

N (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.

N 9.3.7 Remove a packaged victim to a designated safe area, as a member of a team from a heavy vehicle that has come to rest in a configuration or environment where multiple concurrent hazards must be managed to access or remove the occupants, 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, compartment syndrome due to crush injuries is managed, and stabilization is maintained.

N (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.

N (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.

Chapter 10 Animal Technical Rescue

10.1 Awareness Level. Prior to qualification at the awareness level in animal technical rescue, the individual shall meet the requirements defined in Section 10.1.

N 10.1.1 Size up an animal technical rescue incident, given background information and applicable reference materials, so that the scope of the rescue is determined, the number of animals is identified, the last reported location of all the animals is established, witnesses and reporting parties are identified and inter-

viewed, resource needs are assessed, primary search parameters are identified, and information required to develop an initial incident action plan is obtained.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for animal technical rescue incidents.

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

N 10.1.2 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, bystanders, and animals are minimized; and rescue time constraints are taken into account.

N (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 animal risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 10.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

N 10.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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.

N (A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, and scene support requirements.

N (B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow

and implement an incident action plan, and report the task progress status to a supervisor or incident command.

- **10.2 Operations-Level General Requirements.** The job performance requirements defined in Sections 5.2, 10.1, and 10.2 shall be met prior to or during operations-level qualification in animal technical rescue.

10.2.1 Recognize basic animal handling and behavior principles, given a representative animal, so that the incident is managed, risks to rescuers are minimized, and risks to the animal are minimized.

(A) Requisite Knowledge. Hazard-specific PPE selection and use, fight/flight behavior principles, and species-specific containment methods and devices.

(B) Requisite Skills. The ability to select and use hazard-specific PPE, apply species-specific handling principles, and identify species-specific behavioral cues.

• **10.2.2*** Stabilize a representative animal, given a first aid kit, and an actual or simulated EMS agency, so that rescuers and a representative animal are protected from hazards, the representative animal's injuries or illnesses are assessed and managed, and the representative animal is delivered to the appropriate EMS provider with information regarding the history of the rescue activity and the representative animal'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 writing.

10.2.3* 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.

10.2.4 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 animal is able to be led to a safe area.

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

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

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

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

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

- Δ **10.2.6** Move a representative animal 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 animal is moved without further injuries, risks to rescuers are minimized from both the hazard and the representative animal, the integrity of a representative animal's securement within the transfer device is established and maintained, the means of attachment to the rope rescue system is maintained, and the representative animal 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 species-specific hazards, types of risks to rescuers to include the hazard as well as species-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.

- Δ **10.2.7** Maintain rescue equipment, given maintenance logs and records, tools, resources, manufacturer's guidelines, and 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.

- Δ **10.2.8** Move a representative animal load in a high-angle environment, as a member of a team, given animal transport equip-

ment, litters, other specialized equipment, and animal removal systems specific to the rescue environment, so that the representative animal is moved without further injury, risks to rescuers are minimized from both the hazard and the representative animal, the integrity of the representative animal's securement within the transfer device is established and maintained, the means of attachment to the rescue system is maintained, and the representative animal 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 species-specific, types of risks to rescuers to include the hazard as well as species-specific hazards, ways to establish and maintain animal securement (species-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.

10.2.9 Develop a plan to release a representative animal from soil entrapment, as a member of a team, given an incident, a representative animal load, personal protective equipment, a mud rescue tool kit, and specialized equipment, so that hazards to rescue personnel and a representative animal 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.

10.2.10 Develop a plan for an animal transport vehicle incident, given an incident, agency guidelines, and 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 vehicle anatomy, and determine the required fire suppression and safety measures.

10.2.11 Remove a packaged representative animal 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 animal 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, including chemical with the assistance 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.

10.2.12* 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 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.

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

N 10.2.13 Interact with a person on the scene who is in an emotional or psychological crisis, given an animal emergency situation, 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.

N (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.

N (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 communication and interaction with the subject in a manner that does not escalate the incident.

10.2.14* Construct a simple, rope mechanical advantage system, given an incident, representative animal 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 suboptimal static system safety factor (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 setup, 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 setup, perform a system safety check, and evaluate system components for compromised integrity.

10.2.15* Construct a compound rope mechanical advantage system, given an incident, a representative animal 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 setup, 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 setup, perform a system safety check, and evaluate system components for compromised integrity.

10.2.16 Manage 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 animal 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 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.

△ **10.3 Technician Level.** The job performance requirements defined in Sections 10.2 and 10.3 shall be met prior to or during technician-level qualification in animal technical rescue.

△ **10.3.1*** Move a representative animal 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 representative animal is moved without further injuries, risks to rescuers are minimized from both the hazard and the representative animal, the integrity of the representative animal's securement within the transfer device is established and maintained, the means of attachment to the rope rescue system is maintained, and the representative animal 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 species-specific hazards; types of risks to rescuers, including the hazard as well as species-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, assemble and operate environment-specific animal removal systems, and choose an incident-specific transport device.

• **10.3.2** Complete an assignment while suspended from a rope rescue system in a high-angle environment, given a team, a representative animal 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, 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.

Δ 10.3.3* As a member of a team, remove a representative animal from a vertical depth, then across a horizontal path before lowering it to a designated point, 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; 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.

Δ (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 commands, common problems and ways to minimize or manage those problems, and ways to increase the efficiency of load movement.

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

Chapter 11 Wilderness Search and Rescue

11.1 Awareness Level. Prior to qualification at the awareness level in wilderness search and rescue, the individual shall meet the requirements defined in Section 11.1.

11.1.1 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 3.3.223*) 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 the environment, terrain, and hazard types found in the AHJ's jurisdiction.

N 11.1.2 Size up a wilderness search and 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for wilderness search and rescue incidents.

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

N 11.1.3 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 11.1.4 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

N 11.1.5 Support an operations- or technician-level incident, given an incident, an assignment, an 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.

N (A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, and scene support requirements.

N (B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

Δ 11.2 Operations Level. The job performance requirements defined in Sections 11.1 and 11.2 shall be met prior to or

during operations-level qualification in wilderness search and rescue.

11.2.1 Identify environmental and incident conditions, given the response area as defined by the AHJ, so that operations-level search and rescue functions and the need for additional resources are established.

(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.

11.2.2 Implement a wilderness search and rescue preplan, given existing and potential conditions, so that wilderness search and rescue is performed.

Δ **(A) Requisite Knowledge.** Where to acquire in advance weather history for a specific incident site; weather forecast; reports on winds, avalanches, tides, areas, trails, climbing routes; topographical maps; other AHJ-specific tactical information; 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 needs, personnel, and equipment necessary for each.

Δ **(B) Requisite Skills.** The ability to describe or obtain weather history, forecasts, and maps; apply the size-up components together, given checklists, to plans for and execute the search and rescue.

11.2.3 Identify factors affecting the preparation, selection, and use of PPE and equipment given the AHJ's wilderness environment, PPE, and equipment; so that rescuer safety is maintained and the hazards are mitigated.

Δ **(A) Requisite Knowledge.** Describe how factors such as temperature, weather, terrain, flora, fauna, altitude, travel time, patient care, duration of the incident, logistics, communications, navigation, and management needs, affect training or an incident in a wilderness environment.

(B) Requisite Skills. Ability to apply these factors in the selection of PPE and equipment, given classroom-type discussions, in-field training, and incidents.

11.2.4 Interface with wilderness search and rescue resources, given an available wilderness search and rescue resource list, so that the resources are requested and employed.

(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.

Δ **(B) Requisite Skills.** Ability to apply the request for resources and to interface with other responding wilderness search and rescue and emergency response resources, ability to recognize interface agencies' equipment.

11.2.5 Interview reporting parties, given interview recording forms, so that available information in regard to the potential location of 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.

Δ **11.2.6** Collect evidence to determine subject's potential location, given various items of evidence, collection and documentation equipment, and wilderness tool kit, so that the scene (i.e., 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.

11.2.7* Prepare to work in a wilderness environment for an assigned operational 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 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.

Δ **11.2.8*** Navigate in a wilderness environment, given a location with directions from reporting parties, nontechnical terrain, and maps and trail guides, so that the rescuer arrives at the destination to locate the subject.

(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.

Δ **11.2.9** Establish the need for specialized resources in wilderness search and rescue operations, given aircraft, watercraft, or specialized vehicles and operators, as well as 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.

- ▲ **11.2.10*** Manage a subject in a wilderness environment, given basic life support equipment and a 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.

11.2.11* 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.

11.2.12 Terminate an incident, given PPE specific to the environment, so that rescuers and bystanders are protected and accounted for during termination operations; the AHJ is notified of any modification or damage created during the operational period; damaged or lost equipment is assessed and documented; scene documentation is performed; scene control is transferred to a responsible party; remaining 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, environment-specific hazard and risk identification, statutory requirements identifying responsible parties, accountability system use, reporting methods, and postincident analysis techniques.

- ▲ (B) **Requisite Skills.** The ability to select and use hazard-specific PPE, decontamination of PPE, use barrier protection techniques, administer data collection and record-keeping/reporting protocols, and conduct postincident analysis activities.

- ▲ **11.2.13** Traverse through a wilderness environment by foot, given an off-road trail or nontechnical terrain typical of the response area of the AHJ, so that the rescuer demonstrates the ability to reach the subject and maintain personal safety.

- ▲ (A) **Requisite Knowledge.** Characteristics of PPE; travel footwear and equipment such as hiking boots, snowshoes, and poles as determined by the terrain.

(B) **Requisite Skills.** The ability to select, don, and use footwear and travel equipment on a trail or on nontechnical terrain typical of the AHJ's environment.

- ▲ **11.3 Technician Level.** The job performance requirements defined in Sections 11.2 and 11.3 shall be met prior to or during technician-level qualification in wilderness search and rescue.

11.3.1 Identify environment- and incident-specific conditions, given the response area of the AHJ, so that the technician-level search and rescue functions are identified and the need for additional resources is established.

(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.

11.3.2 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.

11.3.3 Collect and purify water, given a natural source of water in the wilderness environment, so that the rescuer can have potable water.

(A) **Requisite Knowledge.** Water filters and purifiers, collection methods, and potential water sources.

(B) **Requisite Skills.** The ability to use water filters and purifiers, collect water, and identify water sources.

11.3.4 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.

- ▲ **11.3.5** Develop a search plan given standard search tactics, 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 and managed, and the plan continually updated.

(A) Requisite Knowledge. Search tactics, development of lost-person profiles, lost-person behaviors, reporting parties interviewed, and revised search plans given located clues and areas searched.

(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 to include search areas covered and clues located by a field team.

11.3.6 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.

▲ **11.3.7** Manage 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, direction is given, 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.

11.3.8 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.

11.3.9 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.

11.3.10* 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 12 Trench Rescue

12.1 Awareness Level. Prior to qualification at the awareness level in trench rescue, the individual shall meet the requirements defined in Section 12.1.

N **12.1.1** Interview any witness or "competent person," given a specific trench collapse incident, so that potential for rapid, nonentry rescue or victim self-rescue is recognized.

N **(A) Requisite Knowledge.** Need to secure "competent person" or witness; signs and evidence of victim involvement, number, and location.

N **(B) Requisite Skills.** Determine severe environmental conditions with implications for secondary collapse and victim survivability; interview techniques.

N **12.1.2** Facilitate a nonentry rescue or victim self-rescue, given a trench collapse incident, tools used for self-rescue, and the rescue area and general area are made safe, so that the nonentry and self-rescue tactics can be initiated.

N **(A) Requisite Knowledge.** Understand mechanics and extent of collapse effects; need to brief rescuers; criteria for rapid, nonentry rescues.

N **(B) Requisite Skills.** Ability to implement nonentry rescue and self-rescue tactics; select and deploy tools used to facilitate nonentry and self-rescue; reduce imposed loads at or near the lip of the trench.

N **12.1.3** Identify hazardous areas specific to a trench environment, given a trench collapse incident, so that the scene is secured, hazards are managed, and an approach path to the trench is identified.

N **(A) Requisite Knowledge.** Areas at risk for increased likelihood of collapse, general collapse patterns of trench's, methods of bridging and weight distribution, securing of scenes, and tactics for approaching the trench while minimizing the likelihood of collapse.

N **(B) Requisite Skills.** Ability to identify areas of high risk for additional collapse, select and deploy tools or materials for bridging or weight distribution, communicate high-risk areas to other responders.

N **12.1.4** Size up a trench 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 the 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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for trench rescue incidents.

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

12.1.5 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, bystanders, 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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

12.1.6 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

12.1.7 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow

and implement an incident action plan, and report the task progress status to a supervisor or incident command.

12.2 Operations Level. The job performance requirements defined in Sections 5.1, 12.1, and 12.2 shall be met prior to or during operation-level qualification in trench rescue.

12.2.1* Identify potential hazards to victims and rescuers in and around a trench excavation, given a trench collapse incident, a trench rescue toolkit so that potential areas of additional collapse in the trench are identified, utility lines are located, spoil piles are monitored, additional superimposed weight is identified, sources of atmospheric contamination are assessed, sources of water are identified, and environmental hazards are considered.

(A) Requisite Knowledge. Methods to distinguish soil types, collapse mechanics, and other contributing factors such as severe environmental conditions and other general hazards; effects and hazards of collapse and rescue efforts on utilities at the incident site; jurisdictional and community resource lists and agreements; atmospheric monitoring; effects of additional superimposed weight and vibrations on trench walls; effects of water in and around trench.

(B) Requisite Skills. The ability to interpret tabulated data information and tables; perform atmospheric monitoring; monitor spoil piles; assess and address the effects of water on trench stability.

12.2.2 Implement a hazard control plan given a trench collapse incident, hazard control plan and trench rescue tool kit so that provisions for ventilation, dewatering, energy control, air monitoring; and falls, and prevention of unplanned soil movement are accomplished.

(A) Requisite Knowledge. Protocols on making the general area safe, criteria for a safe zone within the trench, atmospheric monitoring and ventilation, types of collapses and techniques to stabilize, emergency procedures, selection of PPE, and consideration of selected stabilization tactics on extrication and victim safety.

(B) Requisite Skills. Employ hazard control plan to protect personnel inside and outside of trench, establish safe zones, perform atmospheric monitoring and initiate ventilation as needed, initiate dewatering, provide energy control, ability to select and use PPE, apply fall prevention, and implement strategies to minimize unplanned soil movement.

12.2.3 Develop a shoring plan for a nonintersecting trench no more than 8 ft (2.4 m) deep, given a trench collapse incident and trench rescue tool kit, so that the methods of potential collapse are recognized, the mechanisms of entrapment are identified, areas of the trench that are blown out or undercut are addressed, related tabulated data is consulted, the weights and hazards associated with the soils are considered, and the location of the victim and projected path for removal are incorporated.

(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. Determine shoring strategies, designate cut station location, and material and equipment needs; estab-

lish safe zones; ability to prebrief team on shoring strategies, victim release, and projected path for removal.

N 12.2.4 Implement a trench shoring plan for a nonintersecting trench no more than 8 ft (2.4 m) deep, given a trench collapse incident, trench shoring plan, and a trench rescue tool kit, so that the victim is protected from additional collapse, the trench walls are supported, prior areas of collapse are addressed, shoring team members work from protected areas, and shoring systems are installed so they perform their intended function.

(A) Requisite Knowledge. Shoring and shielding, criteria for a safe zone within the trench, types of collapse and techniques to stabilize, emergency procedures, selection of personal protective equipment, and consideration of selected stabilization tactics for extrication and victim safety.

(B) Requisite Skills. The ability to place shoring and shielding systems, install supplemental shoring, use protocols, choose methods to stabilize, establish a cut station, use personal protective equipment, anticipate extrication logistics, and create systems in trenches 8 ft (2.4 m) deep. (See Annex I.)

Δ 12.2.5 Release a victim from soil entrapment in a nonintersecting trench of 8 ft (2.4 m) or less in depth, given a trench collapse incident and a trench rescue tool kit, so that hazards to rescue personnel and victims are minimized; considerations are given to the victim's injuries, crush injuries related to compartment syndrome, and other injuries; techniques are used to enhance patient survivability; 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; compartment 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 constraints.

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

12.2.6 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 compartment syndrome; methods and packaging devices selected are compatible with intended routes of transfer; universal precautions are employed to protect personnel from blood-borne 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 compartment syndrome management, and use a removal system that matches logistical and medical management time frame concerns.

12.2.7 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.

(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.

12.2.8* 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.

(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.

Δ 12.3 Technician Level. The job performance requirements defined in Sections 12.2 and 12.3 shall be met prior to or during technician level qualification in trench rescue.

N 12.3.1 Develop a shoring plan for an intersecting trench, given a trench collapse incident and trench rescue tool kit, so that the methods of potential collapse are recognized, the mechanisms of entrapment are identified, areas of the trench that are blown out or undercut are addressed, related tabulated data is consulted, the weights and hazards associated with the soils are considered, and the location of the victim and projected path for removal are incorporated.

(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 PPE, and consideration of selected stabilization tactics for extrication and victim safety.

(B) Requisite Skills. Determine shoring strategies; designate cut station location and material and equipment needs; establish safe zones; pre-brief team on shoring strategies, victim release, and projected path for removal.

N 12.3.2 Implement a trench shoring plan for intersecting trench, given a trench collapse incident, trench shoring plan, and a trench rescue tool kit, so that the victim is protected from additional collapse, the trench walls are supported, prior areas of collapse are addressed, shoring team members work from protected areas, and shoring systems are installed so they perform their intended function.

N (A) Requisite Knowledge. Shoring and shielding, criteria for a safe zone within the trench, types of collapses and techniques to stabilize, emergency procedures, selection of PPE, and consideration of selected stabilization tactics on extrication and victim safety.

N (B) Requisite Skills. Ability to place shoring and shielding systems, install supplemental shoring, use protocols, choose methods to stabilize, establish a cut station, use personal protective equipment, anticipate extrication logistics, and create shoring systems in trenches 8 ft (2.4 m) deep. (*See Annex H.*)

N 12.3.3 Develop a shoring plan for a trench more than 8 ft (2.4 m) deep, given a trench collapse incident, and trench rescue tool kit, so that the methods of potential collapse are recognized, the mechanisms of entrapment are identified, areas of the trench that are blown out or undercut are addressed, related tabulated data is consulted, the weights and hazards associated with the soils are considered, the location of the victim and projected path for removal are incorporated.

N (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 PPE, and consideration of selected stabilization tactics on extrication and victim safety.

N (B) Requisite Skills. Ability to determine shoring strategies; designate cut station location and material and equipment needs; establish safe zones; pre-brief team on shoring strategies, victim release, and projected path for removal.

N 12.3.4 Implement a trench shoring plan for a trench more than 8 ft (2.4 m) deep, given a trench collapse incident, trench shoring plan, and a trench rescue tool kit, so that the victim is protected from additional collapse, the trench walls are supported, prior areas of collapse are addressed, shoring team members work from protected areas, and shoring systems are installed so they perform their intended function.

N (A) Requisite Knowledge. Shoring and shielding, 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.

N (B) Requisite Skills. Ability to place shoring and shielding systems, install supplemental shoring, use protocols, choose methods to stabilize, establish a cut station, use personal protective equipment, anticipate extrication logistics, and create systems in trenches more than 8 ft (2.4 m) deep. (*See Annex H.*)

12.3.5 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, identify types of collapse and methods to stabilize, identify hazards in a trench, use personal protective equipment, and anticipate extrication logistics.

12.3.6 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.

N 12.3.7* Utilize spot shoring techniques to support soil without incorporating uprights or panels as part of the shoring plan, given a trench incident, trench rescue toolbox, tabulated data, and trench shoring plan, so that the soil is prevented from collapse.

N (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.

N (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.

12.3.8 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.

12.3.9 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, operate the tools correctly, operate a lever, and apply load stabilization systems.

12.3.10 Coordinate the use of heavy equipment, given personal protective equipment, means of communication, equipment, 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.

12.3.11 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 compartment syndrome related to crush injuries 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; compartment 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 constraints.

Chapter 13 Machinery Rescue

13.1 Awareness Level. Prior to qualification at the awareness level in machinery rescue, the individual shall meet the requirements defined in Section 13.1.

N 13.1.1 Size up a machinery 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for machinery rescue incidents.

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

N 13.1.2 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 13.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

N (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.

13.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

13.2 Operations Level. The job performance requirements defined in Sections 13.1 and 13.2 shall be met prior to or during operations-level qualification in machinery rescue.

13.2.1* Preplan for a small machinery incident, 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; initial and ongoing size-ups are being completed; 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.

13.2.2* 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.

13.2.3* 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 suppression crew.

(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.

13.2.4* 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 and rated capacities 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 select, operate, and monitor stabilization devices.

13.2.5* 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 hazard-specific PPE, identify hazards, operate beneficial systems in support of tactical objectives, and operate tools and devices for securing and disabling hazards.

13.2.6 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; access and egress 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, access and egress points, routes and hazards operating systems, AHJ standard operating procedure, and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify access and egress points and probable victim locations, and to assess and evaluate impact of machine stability on the victim.

▲ **13.2.7** 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; 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 access and egress 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.

13.2.8 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.

▲ **13.2.9*** Identify potential emergency incidents involving mechanical equipment, given the associated structural and damage characteristics, so that incident-specific resources are identified and hazard control plans are developed.

(A) Requisite Knowledge. Types of stabilization devices, mechanism of machinery movement and travel, types of stabilization points, types of energy sources, system isolation and release methods, access and egress points, specialized system features, tool selection and application, and special features of unique machinery systems and accompanying subject matter experts.

▲ **(B) Requisite Skills.** The ability to identify access and egress points and probable victim locations, identify common energy control devices and construction, perform hazard control based on techniques selected, apply tactics and strategy based on assignment, select and operate tools and equipment specific to machinery rescue, apply victim care and stabilization devices, and demonstrate safety procedures.

▲ **13.2.10** Designate access and egress points for victim(s) and rescuer(s), given a machinery rescue tool kit and hazard-specific PPE, so that all machinery involved is stabilized and isolated, and chosen points can be protected.

▲ **(A) Requisite Knowledge.** Types of stabilization devices, mechanism of machinery movement and travel, types of stabilization points, types of energy sources, system isolation and release methods, access and egress points, specialized system features, tool selection and application, and special features of unique machinery systems.

▲ **(B) Requisite Skills.** The ability to identify access and egress points and probable victim locations, identify common energy control devices and construction, perform hazard control

based on techniques selected, apply tactics and strategy based on assignment, select and operate tools and equipment specific to machinery rescue, apply victim care and stabilization devices, and demonstrate safety procedures.

▲ **13.2.11** Control the hazards presented by the release of fluids or mechanical release devices; given an entrapment within machinery, so that mechanical processes are secured, the position of machinery is determined to optimize the removal of victim(s), and chosen points do not compromise the removal of a victim or rescuer.

▲ **(A) Requisite Knowledge.** Types of stabilization devices, mechanism of machinery movement and travel, types of stabilization points, types of energy sources, system isolation and release methods, access and egress points, specialized system features, tool selection and application, and special features of unique machinery systems.

▲ **(B) Requisite Skills.** The ability to identify access and egress points and probable victim locations, identify common energy control devices and construction, perform hazard control based on techniques selected, apply tactics and strategy based on assignment, select and operate tools and equipment specific to machinery rescue, apply victim care and stabilization devices, and demonstrate safety procedures.

▲ **13.2.12** Initiate stabilization of energized equipment, given an entrapment within machinery, so that undue injury is prevented and safety guideline points are followed.

▲ **(A) Requisite Knowledge.** Types of stabilization devices, mechanism of machinery movement and travel, types of stabilization points, types of energy sources, system isolation and release methods, access and egress points, specialized system features, tool selection and application, and special features of unique machinery systems.

▲ **(B) Requisite Skills.** The ability to identify access and egress points and probable victim locations, identify common energy control devices and construction, perform hazard control based on techniques selected, apply tactics and strategy based on assignment, select and operate tools and equipment specific to machinery rescue.

▲ **13.2.13*** Utilize specific information from a subject matter expert (SME), given a machinery rescue event and an SME capable of supplying event- or system-specific technical guidance, so that the technical guidance supports decision making and operational considerations applied during the event.

▲ **(A) Requisite Knowledge.** Operational protocols, data collection, and data interpretation.

▲ **(B) Requisite Skills.** Interviewing, note taking, diagram/technical drawing interpretation.

13.2.14 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; use of immobilization techniques; application of medical protocols and safety features to immobilize, package, and transfer; and use of all techniques for lifting the patient.

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

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

Δ 13.3 Technician Level. The job performance requirements defined in Sections 13.2 and 13.3 shall be met prior to or during technician-level qualification in machinery rescue.

13.3.1* 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. Awareness level 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. Operations level skills apply to those incidents that involve heavy machinery, complex extrication processes, multiple uncommon concurrent hazards, or more than digital entrapment of a victim.

13.3.2* 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 and rated capacities 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 select, operate, and monitor stabilization devices.

13.3.3 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; access and egress 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, access and egress points, routes and hazards, operating systems, AHJ standard operating procedure, and emergency evacuation and safety signals.

(B) Requisite Skills. The ability to identify access and egress points and probable victim locations and to assess and evaluate impact of large machinery stability on the victim(s).

13.3.4 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 access and egress 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.

13.3.5 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 14 Cave Rescue

14.1 Awareness Level. Prior to qualification at the awareness level in cave rescue, the individual shall meet the requirements defined in Section 14.1.

14.1.1 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.

14.1.2* 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 presence, 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 collapse mechanics, and other contributing factors such as severe environmental conditions and other general hazards; need to immediately secure a site-specific SME 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 caves; 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; apply governing regulations, laws, and standards; the ability to interpret size-up information, and choose and utilize PPE, identify hazard mitigation options, identify potential victim locations, and recognize characteristics and hazards of man-made caves.

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 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.

14.1.4* 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.

14.1.5 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.

■ **14.1.6** 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, bystanders, 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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

14.1.7 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

14.2 Operations Level. The job performance requirements defined in Sections 5.2, 5.3.9, 5.3.10, 5.3.11, 14.1, and 14.2 shall be met prior to or during operations-level qualification in cave rescue.

14.2.1 Establish entrance control, given perimeter markings that can be recognized and understood by others, perimeter boundaries that are communicated to incident command, and only authorized personnel being allowed access to the rescue scene, so that all known entrances are identified, maintained, 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.

14.2.2 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, setup lights, initiate environmental controls, and setup rehabilitation for rescuers.

14.2.3 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.

14.2.4 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 the 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 the ability to don and doff equipment in an expedient manner.

14.2.5* 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.

14.2.6 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.

14.2.7* 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 incident management system (IMS) as applied to communicating critical information to the other operational task forces.

(B) Requisite Skills. The ability to construct fixed line systems, flag and treat hypothermia, stabilize traumatic injuries common to cave rescue victims, and package patients for long-term extractions.

14.2.8* 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. Operation of the 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.

Δ (B) Requisite Skills. The ability to maintain communication logs, install wired communications, operate field telephones, troubleshoot communications failure, and repair wired communications systems in an emergency.

14.2.9* 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.

14.2.10 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 a victim manually and with mechanical advantage, construct anchor systems utilizing stemples and airbags, and care for patients.

14.2.11* 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.

14.2.12 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 caves 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.

14.2.13* Manage 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.

Δ (B) Requisite Skills. The ability to select natural anchors, use anchoring techniques using stemples, operate hand and electric drills, and orient site selection and setting of bolts and hangers correctly.

14.2.14* 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.

14.2.15 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 cave, injuries are avoided, further entry into the cave is denied, and the scene is secured.

(A) Requisite Knowledge. Methods to secure a scene, forms for documentation, tools for securing cave 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.

14.3 Technician Level. The job performance requirements defined in Sections 14.2 and 14.3 shall be met prior to or during technician-level qualification in cave rescue.

14.3.1* 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 caves, 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.

14.3.2 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.

14.3.3* 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.

14.3.4 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.

Chapter 15 Mine and Tunnel Rescue

15.1 Awareness Level. Prior to qualification at the awareness level in mine and tunnel rescue, the individual shall meet the requirements defined in Section 15.1.

15.1.1 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 of 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.

• **15.1.2*** 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.

• **N 15.1.3** Assist in establishing 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.

N (A) Requisite Knowledge. Use and selection of hazard-specific 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.

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

N 15.1.4 Size up a mine and tunnel 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for mine and tunnel rescue incidents.

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

N 15.1.5 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 15.1.6 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

Δ 15.2 Operations Level. The job performance requirements defined in Sections 5.2, 15.1, and 15.2 shall be met prior to **or during** operations-level qualification in mine and tunnel rescue.

15.2.1* 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.

• **15.2.2*** 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.

15.2.3* Conduct atmospheric monitoring of the mine and tunnel environment, given hazard-specific 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, hazard-specific 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 hazard-specific PPE, operate communications equipment, and utilize tracking documents.

15.2.4* 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 calculate using recognized measuring equipment, and initiate monitoring and hazard control measures specific to ventilation.

15.2.5 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 system and pump operation, troubleshooting, and hose management.

• **N 15.2.6*** Participate in a prerescue survey given a tunnel or mine rescue preplan, the specific location targeted in the rescue preplan, an operations-level tunnel rescue tool kit, and an operations-level tunnel rescue team, so that the targeted location or distance into the space is attained using the tools and techniques designated for use during an actual rescue operation, all elements of the rescue plan are implemented, and the full scope of the plan is exercised.

N (A) Requisite Knowledge. Tunnel preplan, contents and use of the operations-level tunnel rescue tool kit, and organization policies and procedures for operations tunnel rescue.

N (B) Requisite Skills. The ability to assemble the required tools and PPE; assess conditions at the site; ensure all required preentry elements are in place; and penetrate into the space using the designated tools, PPE, and transportation modes.

N 15.2.7* Employ egress-only respiratory protection given a rescue scenario requiring emergency egress and a device recognized by the AHJ as an emergency egress respiratory protection device so that the conditions for use are recognized, the device is donned, an emergency egress route is established, and the rescuer is protected from harm.

N (A) Requisite Knowledge. Situations requiring emergency egress; location, deployment, and methods of donning an emergency egress protection device.

N (B) Requisite Skills. The ability to deploy and don the recognized emergency egress respiratory protection device.

15.2.8* Participate in 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.

N 15.2.9 Participate in the development of a breathing air management plan, given breathing apparatus, maintenance equipment, refill materials, and maintenance and tracking documentation, so that a breathing air maintenance program and repair facility can be established with a repair and usage schedule.

N (A) Requisite Knowledge. Apparatus use, apparatus capabilities, apparatus inspection, apparatus disassembly, apparatus repair, component identification, apparatus testing, and apparatus rotation schedule.

N (B) Requisite Skills. The ability to don apparatus, measure apparatus capabilities, inspect apparatus, disassemble apparatus, repair apparatus, identify components, test apparatus, and create an apparatus rotation schedule.

15.2.10 Implement emergency procedures to provide respiratory protection and self-rescue, given a mine and tunnel rescue incident, a device to provide emergency respiratory protection, and conditions that require self-rescue, so that the device is properly donned, respiratory protection is maintained, and an emergency escape route is established.

(A) Requisite Knowledge. Conditions requiring egress, conditions requiring donning respiratory protection, methods for implementing emergency egress and donning self-rescue devices.

(B) Requisite Skills. The ability to recognize conditions that require self-rescue, don an emergency egress self-rescue device, and accomplish self-rescue.

15.2.11 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 hazard-specific 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, surface-to-underground and rescue team member to rescue team member communications systems are in place, continuous atmospheric monitoring capabilities are used, lighting is established, refuge locations are identified, 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, surface-to-underground and rescue team member to rescue team member communications methods, atmospheric monitoring requirements, lighting methods, use and operation of refuge locations, and mine and tunnel ingress and egress control points.

(B) Requisite Skills. The ability to choose and use hazard-specific PPE, follow identified rescue routes, interpret information sources, utilize accountability systems, operate surface-to-underground and rescue team member to rescue team member communications systems, utilize monitoring equipment, use and operation of refuge stations, and utilize lighting equipment.

Δ 15.2.12* Enter a mine and tunnel for rescue as a member of a team, given hazard-specific PPE, egress-only emergency respiratory protection, a site-specific rescue preplan, a mine and tunnel rescue tool kit, and a preentry 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 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.

15.2.13 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.

15.2.14 Package the victim for removal from a mine and tunnel, given a mine and tunnel tool kit and patient transfer devices identified for use in the rescue preplan, 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.

15.2.15 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.

15.2.16 Identify situations that exceed or violate the conditions that permit entry to perform rescue operations as defined in the site-specific rescue plan, given a mine and tunnel rescue incident, a site-specific rescue plan, and mine and tunnel rescue toolbox.

(A) Requisite Knowledge. Contents of the site-specific rescue plan, limits of the team, and available resources.

(B) Requisite Skills. The ability to interpret the rescue plan, assess on-site conditions, and measure factors that impact the implementation of the plan.

Δ 15.3 Technician Level. The job performance requirements defined in Sections 15.2 and 15.3 shall be met prior to or during technician-level qualification in mine and tunnel rescue.

15.3.1* Use of atmosphere-supplying respirators and life-support equipment designated by the AHJ, consistent with the size, shape, and length of the tunnel or mine and the most demanding potential work environment, given a rescue mission, so that the rescuer is protected from atmospheric hazards, emergency procedures are followed, work load and rescuer physiology are considered, service life and reserves are not exceeded, self-rescue needs have been evaluated and provided for, and preentry 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.

N 15.3.2 Implement support operations at mine and tunnel rescue scene, given 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 rehabilitation is facilitated, provisions for extended patient care and prolonged search and recovery are established, and the support operations facilitate operational objectives.

N (A) Requisite Knowledge. Equipment organization and tracking methods, lighting resources, dewatering methods, thermal control options, hand and power tool applications, atmospheric monitoring protocol, rehabilitation criteria, extrication and removal equipment options, and logistics and supply methodology for extended operations.

N (B) Requisite Skills. The ability to track equipment inventory, provide power, use lighting, choose and deploy dewatering techniques, use thermal control and task-specific personal protective equipment (PPE) for rescuers and victims, select rehabilitation areas and personnel rotations, and operate atmospheric monitoring and ventilation equipment.

Δ 15.3.3* Coordinate the use of specialized resources at a mine and tunnel rescue incident, given a prebriefing, hazard-specific PPE, communications equipment, size-up information, specialized resources, incident action plan, ventilation plans, and refuge stations, 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, ventilation plans, and refuge stations; communications methods; and mine and tunnel rescue hazards.

(B) Requisite Skills. The ability to coordinate resources, implement IMS components, utilize incident action plans, operate ventilation systems, operate refuge stations, operate communications equipment, and interpret size-up information.

N 15.3.4 Develop a breathing-air management plan given breathing apparatus, maintenance equipment, refill materials, and maintenance and tracking documentation, so that a breathing-air maintenance program and repair facility can be established with a repair and usage schedule.

N (A) Requisite Knowledge. Apparatus use, apparatus capabilities, apparatus inspection, apparatus disassembly, apparatus repair, component identification, apparatus testing, apparatus rotation schedule.

N (B) Requisite Skills. Ability to don apparatus, measure apparatus capabilities, inspect apparatus, disassemble apparatus, repair apparatus, identify components, test apparatus, and create an apparatus rotation schedule.

15.3.5 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.

15.3.6 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.

15.3.7* 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.

15.3.8 Coordinate the use of heavy equipment, given **hazard-specific 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 **hazard-specific PPE**.

15.3.9* Stabilize a collapsed mine and tunnel as a member of a team, given size-up information, **hazard-specific 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 **hazard-specific 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 **hazard-specific 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.

15.3.10 Conduct a search in a mine and tunnel collapse environment, given **hazard-specific 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.

15.3.11* Stabilize a vehicle or machine in a mine and tunnel environment, given a basic extrication tool kit and **hazard-specific 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, lock-out/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 **select, operate, and monitor** stabilization devices.

15.3.12 Disentangle victim(s), given a mine and tunnel incident involving vehicles or machinery, a mine and tunnel tool kit, **hazard-specific 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.

N 15.3.13 Perform intervention tactics, as part of a team, on behalf of a team member who is unresponsive and has experienced a failure of their respiratory protection in a contaminated or hazardous atmosphere at the most remote location in a tunnel or mine; given an unresponsive team member in a tunnel, a team, and identified intervention tools, so that the member's exposure to the hazardous atmosphere is minimized, a survivable environment is provided, the unresponsive member is removed from the tunnel or to an area of refuge without further disruption to their respiratory protection, and all members are protected from harm.

N (A) Requisite Knowledge. Identification of intervention tools and techniques used by the agency; identification of emergency conditions and procedures in the event of a failure of the specific respiratory equipment used by the team; identification of areas of refuge, and methods of transporting an unresponsive team member while providing the greatest likelihood of survival.

N (B) Requisite Skills. Ability to apply and operate rapid intervention tools, redundant air supplies, emergency systems, and components of respiratory protection devices; manage patients, manage movement of tools, implement tactics, and use and operate refuge areas.

N 15.3.14 Implement tactics and techniques specific to the work environment typically found in tunnels and mines where there are exceptionally long travel distances between the work location and areas of refuge or points of egress, given a tunnel or mine rescue team, a tunnel or mine rescue tool kit, and a tunnel or mine rescue scenario, so that the work load is managed; injury to the team members is eliminated; team

integrity, accountability, and communication is maintained; mission continuity is sustained; and the objective is achieved.

(A) Requisite Knowledge. Identification of physiological effects on the wearer of closed-circuit and other specialty respiratory equipment; how work load, pace, and PPE impact heat retention and member fatigue; impacts on team size on mission continuity and team member intervention; and impact on travel distances on survival of victims and rescuers who encounter emergencies while in the tunnel.

(B) Requisite Skills. Ability to structure team size, composition, and equipment to maximize potential success and minimize adverse impacts of unplanned events on the safety of the team members and mission continuity; and implement heat shedding and workload management techniques in the hot zone.

15.3.15* Terminate the mine and tunnel 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. Hazard-specific PPE characteristics, hazard and risk identification, isolation techniques, statutory requirements identifying responsible parties, accountability system use, reporting methods, and post-incident analysis techniques.

(B) Requisite Skills. Ability to select and use hazard-specific PPE, decontamination of PPE, use barrier protection techniques, implement data collection and record-keeping/reporting protocols, and conduct post-incident analysis activities.

Chapter 16 Helicopter Rescue

16.1 Awareness Level. Prior to qualification at the awareness level in helicopter rescue, the individual shall meet the requirements defined in Section 16.1.

16.1.1 Recognize a technical search and rescue incident requiring the need for helicopter assets, given a technical rescue incident, so that the selected air assets support the event's terminal objective.

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

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

16.1.2 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.

16.1.3 Size up an incident requiring helicopter rescue, 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 the 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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for incidents requiring helicopter rescue.

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

16.1.4 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, bystanders, 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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

16.1.5 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

16.1.6 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

16.2 Operations Level. The job performance requirements defined in Sections 16.1 and 16.2 shall be met prior to or during operations-level qualification in helicopter rescue.

16.2.1 Operate as part of a flight crew, ground support, or other assignment in or attached to the aircraft, given an assignment, hazard-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.

16.2.2 Select and use hazard-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.

16.2.3 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.

16.2.4 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, water-bound helicopter exit procedures, land-based helicopter exit procedures, emergency escape route procedures and protocols, use of signaling devices, emergency shutdown procedures, crash rescue equipment use, fire suppression equipment use, and personal survival skills.

16.2.5 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. Observation techniques for inflight searches, 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.

16.2.6 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 hazard-specific PPE, ground-to-air communications protocols, use of hand signals, aircraft ops lighting considerations, movement of people and materials, and safety.

16.2.7 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.

Δ (B) Requisite Skills. Ability to select and use hazard-specific PPE; decontamination of PPE; use barrier protection techniques, data collection, and record-keeping/reporting protocols and conduct postincident analysis activities.

Δ 16.3 Technician Level. The job performance requirements defined in Sections 16.2 and 16.3 shall be met prior to or during technician-level qualification in helicopter rescue.

16.3.1 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.

Δ (A) Requisite Knowledge. Airframe-specific operational requirements, weight and balance, load and force considerations, 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.

Δ (B) Requisite Skills. Consideration of weight and balance, 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 or hoist line, and scene safety management techniques.

16.3.2 Demonstrate hoisting techniques, as a member of a flight/rescue crew, given an airframe, an assignment, a packaged load, and an 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 consideration; 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 consideration, 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.

16.3.3 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.

16.3.4 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.

Δ 16.3.5 Interpret weight and balance considerations 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 considerations; center of gravity determination; and policies, procedures, and guidelines for the appropriate AHJ.

(B) Requisite Skills. Weight and balance considerations and protocols, task-specific performance factors, and interpret and apply technical data.

N 16.3.6* Establish a helispot or LZ, given a requirement to land a helicopter in an unimproved/undesigned area to support a technical search and rescue mission.

N (A) Requisite Knowledge. Helicopter operational specifications; including minimum size for an unimproved landing zone, based on the airframe; and policies, procedures, and guidelines for the appropriate AHJ.

N (B) Requisite Skills. Identify sufficient areas to support helicopter landing operations, object and debris removal, topography and composition of land.

Chapter 17 Surface Water Rescue

17.1* Awareness Level. Prior to qualification at the awareness level in surface water rescue, the individual shall meet the requirements defined in Section 17.1.

Δ 17.1.1 Size up a surface water incident, given an incident, so that the scope of the rescue is determined, the number of victims is identified, the last reported location of all the victims is established, witnesses and reporting parties are identified and interviewed, and search parameters are identified.

- (A) **Requisite Knowledge.** Information gathering techniques and how that information is used in the size-up process.
- Δ (B) **Requisite Skills.** The ability to interview people, gather information, relay information, manage witnesses, and use information sources.
- N 17.1.2 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.
- N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.
- N (B) **Requisite Skills.** The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.
- N 17.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.
- N (A) **Requisite Knowledge.** Operational protocols, specific planning forms, types of incidents common to the AHJ, hazards, incident support operations and resources, and safety measures.
- N (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.
- N 17.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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.
- N (A) **Requisite Knowledge.** AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, and scene support requirements.
- N (B) **Requisite Skills.** The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.
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- Δ 17.2* **Operations Level.** The job performance requirements defined in Sections 17.1 and 17.2 shall be met prior to or during operations-level qualification in surface water rescue.

17.2.1* Develop a site survey for an existing water hazard, given historical data, specific PPE for conducting site inspec-

tions, 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, the method of entrapment is considered, and areas with a 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 the 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.

17.2.2* 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 for PPE; 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.

Δ (B)* **Requisite Skills.** The ability to use PPE according to the manufacturer's directions, 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, proficiency in communicating distress signals, proficiency in emergency escape procedures, and proficiency in communications.

17.2.3* Define search parameters for a water rescue incident, given topographical maps of a search area; descriptions of all missing persons and incident history; and 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 areas of high probability of detection, critical interview questions and practices, methods to identify track traps, ways to identify spotter areas and purposes for spotters, personnel available and their effect 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.

17.2.4 Develop an action plan for a shore-based rescue of a single or multiple water-bound 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.

• **17.2.5*** Deploy a water rescue reach device to a water-bound 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 water-bound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on the 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 tide), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

17.2.6* Deploy a water rescue rope to a water-bound 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 water-bound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on the 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 tide), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

△ **17.2.7*** Develop and implement an action plan for the use of watercraft to support the rescue of a single or multiple water-bound victims, given watercraft, 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 access and egress procedures and communications with watercraft crew, use emergency/safety equipment, identify hazards, and operate within the rescue environment.

17.2.8* 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 communication is 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.

17.2.9* Implement procedures for performing watercraft-based rescue of an incapacitated, water-bound 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 access and egress procedures, parbuckling (rollup) techniques, dynamics of moving water and its effects on watercraft handling, conditional requirements for PPE, and the 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 water-bound victim using techniques identified by the AHJ.

17.2.10 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.

17.2.11 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.

17.2.12 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 act as spotters and tend to water rescuers.

17.2.13* Terminate an incident, given PPE specific to the incident, isolation barriers, and a tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modifications 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.

Δ (B) Requisite Skills. Select and use task and hazard-specific PPE; decontaminate PPE; use barrier protection techniques, collect data, follow record-keeping/reporting protocols, and conduct postincident analysis activities.

Δ 17.3* Technician Level. The job performance requirements defined in Sections 17.2 and 17.3 shall be met prior to or during technician-level qualification in surface water rescue.

17.3.1* 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 a representative body of water.

(B) Requisite Skills. The ability to swim and float over the required distances and for the necessary duration as outlined in the watermanship test found in Annex M 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.

17.3.2 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.

Chapter 18 Swiftwater Rescue

Δ (A) Requisite Knowledge. Hydrology and specific hazards anticipated for a 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 water-bound 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.

17.3.3 Demonstrate defensive tactics in the water rescue environment, given a water-bound 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.

N 17.3.4 Perform an entry surface rescue from a rescue platform (such as a vessel, boat, watercraft, or other waterborne transportation aid) while negotiating a designated surface course, given a course that is representative of the bodies of surface water existing or anticipated within the geographical confines of the AHJ, water rescue PPE, and swim aids, so that the specific objective is reached, the victim is retrieved, movement is controlled, hazards are continually assessed, distress signals are demonstrated, and rapid intervention for the rescuer has been staged for deployment.

N (A) Requisite Knowledge. Watercraft operational characteristics, hydrology features, water entry and exit techniques, and water-bound victim management.

N (B) Requisite Skills. Watercraft operation, watercraft stability and maneuvering techniques, rescuer entry and egress methods, capsized vessel upset recovery techniques, waterborne victim packaging and management techniques, and hand signals.

17.3.5 Direct a rescue team 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 the 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, and personnel accountability techniques.

(B) Requisite Skills. The ability to implement emergency procedures, communications procedures, incident management, personnel accountability, and resource management.

18.1 Awareness Level. Prior to qualification at the awareness level in swiftwater rescue, the individual shall meet the requirements defined in Section 18.1.

N 18.1.1 Size up a swiftwater 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for swiftwater rescue incidents.

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

N 18.1.2 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 18.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

N 18.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

18.2 Operations Level. The job performance requirements defined in 5.2.1 through 5.2.10, 5.2.12, 5.2.16, 5.2.18 through 5.2.20, 5.2.23, 5.2.24, and Sections 17.1, 17.2, 18.1, and 18.2 shall be met prior to or during operations-level qualification in swiftwater rescue.

18.2.1 Construct rope systems particular to the swiftwater rescue needs of the AHJ, given rescue personnel, rope equipment, a load to be moved, and personal protective equipment (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.

18.2.2 Support swiftwater 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, personnel accountability is maintained, 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 spotter, and the ability to implement personnel accountability systems and tend to an in-water rescuer.

18.2.3* 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 the flow and conditions are estimated accurately, mechanisms of entrapment are considered, hazards are assessed, the 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 the flow and environmental factors, the effects on victims and rescuers, and interpretation of maps or charts.

18.2.4* Perform a non-water 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 water-bound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on the 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 and use task-specific PPE, identify water hazards (i.e., upstream or downstream, current or tide), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

18.2.5* Terminate an incident, given PPE specific to the incident, isolation barriers, and a tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modifications or damage created during the operational period; documentation of loss or material use is accounted for; scene documentation is performed; and control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing, postincident analysis, and critique are conducted; 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. Ability to select and use hazard-specific PPE; decontaminate PPE; use barrier protection techniques, data collection, and record-keeping/reporting protocols; and participate in conduct postincident analysis activities.

18.3 Technician Level. The job performance requirements defined in 5.3.5, 5.3.6, 17.3.1 through 17.3.5 and Sections 18.2 and 18.3 shall be met prior to or during technician-level qualification in swiftwater rescue.

18.3.1 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 water-bound victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on the water environment and conditions, hazards and limitations of shore-based rescue, personnel accountability protocols, and information on local water environments.

(B) Requisite Skills. Select and utilize task-specific PPE, identify water hazards (i.e., upstream or downstream, current or tide), identify hazards directly related to the specific rescue,

and demonstrate appropriate victim packaging and removal techniques, and use a personnel accountability system.

18.3.2 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 demonstrated, 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 a representative body of water, and personnel accountability methods.

(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, implement personnel accountability protocols, and evaluate water conditions to identify entry points and hazards.

18.3.3 Perform an entry 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 demonstrated, personnel accountability is implemented, 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 the regulatory and applicable laws of safe water transportation according to the AHJ and understand personnel accountability methods.

(B) Requisite Skills. The ability to locate water entry and egress methods from the platform used, assess swiftwater conditions, recover capsized vessels, move vessels in swiftwater conditions, implement personnel accountability methods, and understand patient packaging and handling techniques.

Chapter 19 Dive Rescue

19.1 Awareness Level. Prior to qualification at the awareness level in dive rescue, the individual shall meet the requirements in Section 19.1.

- N 19.1.1** Size up a dive 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for dive rescue incidents.

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

N 19.1.2 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 19.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

N 19.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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.

N (A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, and scene support requirements.

N (B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

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▲ **19.2 Operations Level.** The job performance requirements defined in Sections 19.1 and 19.2 shall be met prior to or during operations-level qualification in dive rescue.

19.2.1 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 water movement, so that areas likely to contain the subject are differentiated from other areas, witnesses are interviewed, critical interview information is recorded, passive (i.e., indirect) and active (i.e., 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, refloat theory, topographical map components, hydrologic and weather 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.

19.2.2* 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 and weather; 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, depth, respiratory rates, and dive times.

▲ **19.2.3*** Implement procedures for use of watercraft in dive operations, given watercraft used by the AHJ, 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 vessel 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 and station keeping 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.

19.2.4 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.

19.2.5* Secure the area as a potential crime scene and generate an accurate record of possible evidence and its environment, given documentation tools, 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 documentation skills.

19.2.6 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.

19.2.7* 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.

19.2.8* 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.

Δ **(B) Requisite Skills.** Ability to select and use of hazard-specific PPE; decontamination of PPE; use barrier protection techniques, data collection, and record-keeping/reporting protocols; conduct postincident analysis activities.

Δ **19.3* Technician Level.** The job performance requirements defined in Sections 19.2 and 19.3 shall be met prior to or during technician-level qualification in dive rescue.

19.3.1 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.

(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.

19.3.2* 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 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 pre dive checklists.

19.3.3* 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.

Δ **(A) Requisite Knowledge.** Manufacturer's recommendations, standard operating procedures, basic signals, communications techniques, 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 a full face mask 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.

19.3.4* 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.

Δ **19.3.5** Supervise dive teams during operations, given incident checklists, dive checklists, maps, topographic surveys, charts, and pre dive/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, pre dive briefing is conducted, and postdive medical evaluation and briefing are performed.

(A) Requisite Knowledge. Dive supervisor-level knowledge; knowledge of supervisory practices, dive tables, emergency procedures, communications procedures, local protocols, and pre dive safety checks.

(B) Requisite Skills. The ability to use dive equipment, dive tables, emergency procedures, and communication procedures; and leadership and management skills.

- ▲ **19.3.6*** Select 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, 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.

(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 pre-dive 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.

19.3.7 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.

19.3.8* 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, buoy-

ancy control devices, and regulators; remove weight systems, communicate via hand signals, and conduct emergency ascents.

19.3.9* 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 illness, 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; and equipment loss or failure procedures; and weight system removal and emergency treatment of injured divers.

19.3.10 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 20 Ice Rescue

20.1 Awareness Level. Prior to qualification at the awareness level in ice rescue, the individual shall meet the requirements defined in Section 20.1.

- **20.1.1** Size up an ice 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 the 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 the size-up to the incident management system, information gathering techniques and how that information is used

in the size-up process, and basic search criteria for ice rescue incidents.

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

20.1.2 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, bystanders, 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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

20.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

20.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

20.2 Operations Level. The job performance requirements defined in Section 20.1 and 20.2.1 through 20.2.6 shall be met prior to or during operations-level qualification in ice rescue.

20.2.1 Support ice rescue technician-level operations, given a designated mission, safety equipment, props, and a 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, personnel accountability systems, and communications issues.

(B) Requisite Skills. Basic support skills, personnel accountability protocol implementation, and tending to an in-water rescuer.

20.2.2 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, the 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. The ability to determine flow and environmental factors and their effect on victims and rescuers and to interpret maps and charts.

20.2.3 Perform a self-rescue in the ice rescue environment, given an incident scenario and personal protective equipment (PPE), so that a self-rescue is achieved.

(A) Requisite Knowledge. Types and capabilities of PPE, effects of hydrodynamic forces on rescuers, hydrology and characteristics of water, physiological effects of immersion and cold water near-drowning, methods of effective movement onto or through ice, incident-specific hazard identification, self-rescue techniques, and information on local water environments.

(B) Requisite Skills. The ability to select PPE and equipment specific to the water/ice environment, don and use PPE, identify hazards directly related to the specific self-rescue, and demonstrate appropriate self-rescue techniques.

20.2.4 Perform a shore-based 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 the water/ice interface, behaviors of victims, water rescue rope-handling techniques, incident-specific hazard identification, criteria for selecting victim retrieval locations based on the water/ice environment and conditions, hazards and limitations of shore-based rescue, local policies/procedures for rescue team activation, environmental conditions, and limitations of shore-based rescue.

(B) Requisite Skills. The ability to select PPE specific to the ice rescue environment, don and use PPE, identify water hazards (e.g., upstream or downstream, current or tide), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

20.2.5* Perform a nonentry rescue in an ice rescue environment, given an incident scenario, PPE, an ice rescue tool kit, and waterborne transportation aid, 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 environmental conditions, hazards, and information on local water environments.

(B) Requisite Skills. The ability to select PPE specific to the ice rescue environment, don and use PPE, identify water hazards (e.g., upstream or downstream, current or tide), identify hazards directly related to the specific rescue, and demonstrate appropriate shore-based victim removal techniques.

20.2.6* Terminate an incident, given PPE specific to the incident, isolation barriers, and a tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; the party responsible is notified of any modifications 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, 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.

Δ (B) Requisite Skills. Select and use task and hazard-specific PPE; decontaminate PPE; use barrier protection techniques, data collection, and record-keeping/reporting protocols; and participate in postincident analysis activities.

20.3 Technician Level. The job performance requirements defined in Section 20.2 and 20.3.1 through 20.3.2 shall be met prior to or during technician-level qualification in ice rescue.

20.3.1 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.

20.3.2 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 21 Surf Rescue

21.1 Awareness Level. Prior to qualification at the awareness level in surf rescue, the individual shall meet the requirements defined in Section 21.1.

N 21.1.1 Size up a surf 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used in the size-up process, and basic search criteria for surf rescue incidents.

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

N 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and

terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

21.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

21.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

21.2 Operations Level. The job performance requirements defined in Sections 21.1 and 21.2 shall be met prior to or during operations-level qualification in surf rescue.

21.2.1 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, access and egress 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.

21.2.2* 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.

21.2.3* 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.

21.2.4* 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.

21.2.5* 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.

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

Δ 21.3 Technician Level. The job performance requirements defined in Sections 21.2 and 21.3 shall be met prior to or during technician-level qualification in surf rescue.

21.3.1 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.

21.3.2 Perform a swimming rescue for a water-bound surf victim, given PPE, including a pair of swimming fins and a rescue flotation device, 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.

21.3.3 Perform a subsurface retrieval of a submerged victim in a surf environment, given PPE, including swimming fins, dive 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 rescue flotation device, tow a victim with the tube, and demonstrate victim removal techniques.

Chapter 22 Watercraft Rescue

22.1* Awareness Level. Prior to qualification at the awareness level in watercraft rescue, the individual shall meet the requirements defined in Section 22.1.

22.1.1 Initiate a discipline-specific search, given hazard-specific PPE, equipment pertinent to the search mission, an incident location, and victim investigative information, so that search parameters are established, the victim profile is established, the access and egress 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.

22.1.2* 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.

22.1.3 Select hazard-specific PPE, given PPE, including personal flotation devices (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 of accidental immersion, exposure to the elements, and injury from unanticipated movement of the watercraft.

Δ (A) Requisite Knowledge. Hazards present on and near the water and aboard watercraft used by the AHJ including those presented by weather, current, water conditions, and the capacities.

(B) Requisite Skills. Ability to locate, identify, and don PPE and flotation devices.

22.1.4 Maintain watercraft stability, 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 and exiting a watercraft in a manner that prevents injury and minimizes the impact on the stability of the watercraft.

N 22.1.5 Size up a watercraft 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 the 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.

N (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 the size-up to the incident management system, information gathering techniques and how that information is used

in the size-up process, and basic search criteria for watercraft rescue incidents.

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

N 22.1.6 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

N (B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

N 22.1.7 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

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

N (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.

N 22.1.8 Support an operations- or technician-level incident, given an incident, an assignment, an 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.

N (A) Requisite Knowledge. AHJ operational protocols, hazard recognition, incident management, PPE selection, resource selection and use, and scene support requirements.

N (B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

Δ 22.2* Operations Level. The job performance requirements defined in Sections 22.1 and 22.2 shall be met prior to or during operations-level qualification in watercraft rescue.

22.2.1 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.

22.2.2 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.

22.2.3 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.

22.2.4 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.

22.2.5 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.

22.2.6 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.

Δ 22.2.7 Use of hazard-specific PPE, given a watercraft rescue incident/scenario, so that the PPE is used in accordance with AHJ policies relative to the specific incident/scenario, PPE emergency escape procedures are followed, and distress signals are communicated.

(A) Requisite Knowledge. The capabilities and limitations of hazard-specific PPE and personal flotation devices, distress signals, emergency escape procedures, and preoperational checklists for the PPE.

(B) Requisite Skills. Ability to don and doff PPE and personal flotation devices, including water rescue helmets and water insulating garments; communicate distress signals; follow emergency escape procedures for the PPE; use preoperational checklists for the PPE.

22.2.8 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.

22.2.9 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.

▲ **22.2.10** Launch 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.

22.2.11 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 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.

22.2.12 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.

22.2.13 Perform procedures for launching and recovery of in-water rescuers given a watercraft available to the agency, in-water 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.

22.2.14 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.

22.2.15 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.

22.2.16 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.

22.2.17 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.

22.2.18* 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, 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.

Δ (B) Requisite Skills. Ability to select and use of hazard-specific PPE; decontamination of PPE; use barrier protection techniques, data collection, and record-keeping/reporting protocols; and postincident analysis activities.

Δ 22.3* Technician Level. The job performance requirements defined in Sections 22.2 and 22.3 shall be met prior to or during technician-level qualification in watercraft rescue.

22.3.1 Prepare a watercraft to get underway, given a watercraft available to the agency so that preoperational checks are performed, systems are energized, propulsion 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.

22.3.2 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.

22.3.3 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.

22.3.4 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.

22.3.5 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.

22.3.6 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.

22.3.7 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.

22.3.8 Operate a watercraft to deploy and recover in-water rescuers, given a watercraft available to the agency, in-water 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.

22.3.9 Operate a watercraft to perform a rescue of an incapacitated water-bound 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 water-bound 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.

22.3.10 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.

22.3.11 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).

Δ 22.3.12 Shut down a watercraft, given a watercraft available to the agency, so that postshutdown checks are conducted, and the craft is secured and 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 23 Floodwater Rescue

23.1 Awareness Level. Prior to qualification at the awareness level in floodwater rescue, the individual shall meet the requirements defined in Section 23.1.

23.1.1 Size up a floodwater rescue 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 the 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 the 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 floodwater rescue incidents.

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

N 23.1.2 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, bystanders, and victims are minimized; and rescue time constraints are taken into account.

N (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 risks; risk/benefit analysis methods and practices; hazard recognition, isolation methods, and terminology; methods for controlling access to the scene; and types of technical references.

(B) Requisite Skills. The ability to identify resource capabilities and limitations, identify incident hazards, assess potential hazards to rescuers and bystanders, place scene control barriers, and operate control and mitigation equipment.

23.1.3 Recognize the need for technical rescue resources at an operations- or technician-level incident, given AHJ guidelines, 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.

23.1.4 Support an operations- or technician-level incident, given an incident, an assignment, an 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, and scene support requirements.

(B) Requisite Skills. The ability to apply operational protocols, function within an incident management system, follow and implement an incident action plan, and report the task progress status to a supervisor or incident command.

23.2* Operations Level. The job performance requirements defined in Sections 17.2, 18.2, 23.1, and 23.2 shall be met prior to or during operations-level qualification in floodwater rescue.

23.2.1 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 an in-water rescuer.

23.2.2* 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.

23.2.3 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 water-bound 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.

23.2.4 Implement an incident action plan, as a member of a team, for the use of watercraft to support floodwater search and rescue operations, given an incident action plan and defined resources, so that operational objectives are achieved.

(A) Requisite Knowledge. Incident management techniques, entry and exit procedures, communications techniques, boat operation techniques, design limitations, climatic conditions, characteristics of floodwater events, and specific hazards presented by floodwater events in the potential rescue environment.

(B) Requisite Skills. Implement access and egress procedures and communication with watercraft crew, use emergency/safety equipment, identify hazards, and operate within the rescue environment.

23.2.5 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, and 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 by the aircraft, and communicate mission priorities with the aircrew or operator of the aircraft.

23.2.6* Implement measures identified by the AHJ to limit exposure of victims and rescuers to 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 their 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. The ability to use related engineering controls and personal protective equipment (PPE), determine the practices that limit an individual's likelihood of exposure to contaminants, and implement methods for the removal of potential contaminants or to render them inert.

23.2.7* Identify locations at a floodwater search and rescue incident that have a high probability of containing victims, given a flood rescue scenario, and a tool kit, so that all accessible areas of the incident are surveyed and the victim locations are marked.

(A) Requisite Knowledge. Locations that are typically associated with areas of entrapment or refuge during floodwater events, including the interior of vehicles and attic spaces of structures, and human behavior during flood events.

(B) Requisite Skills. Conducting a search, marking victim locations, using search marking systems, and using communications systems to share findings.

23.2.8* Manage the hazards unique to the terrain and environment when covered with floodwater or subject to differential pressures, given an incident consistent with a predicted floodwater environment and a floodwater search and rescue toolkit, so that all hazards are recognized and potential control measures are implemented.

(A) Requisite Knowledge. Specific hazards that could be present in a floodwater environment that are hidden or covered by water and hazard mitigation measures.

(B) Requisite Skills. The ability to survey the rescue environment for indicators of potential hazards and avoid, isolate, or control identified hazards.

23.2.9* 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 a GPS 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.

Δ 23.2.10 Terminate an incident, given PPE specific to the incident and a floodwater rescue tool kit, so that rescuers and bystanders are protected and accounted for during termination operations; scene documentation is performed; scene control is transferred to a responsible party; potential or existing hazards are communicated to that responsible party; debriefing, 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 hazard-specific PPE; decontaminate PPE; use barrier protection techniques, data collection, and record-keeping/reporting protocols; and conduct postincident analysis activities.

23.2.11 Perform a nonentry floodwater rescue from a rescue platform such as a vessel, boat, watercraft, or other waterborne transportation aid, given an operator, a simulated flood environment, water rescue PPE, and a floodwater rescue tool kit, so that the assignment is completed, all performance parameters are achieved, movement is controlled, hazards are continually assessed, and any related distress signals are communicated.

Δ (A) Requisite Knowledge. Limitations, manufacturer's recommendations, and operation of the waterborne transportation device and regulatory and applicable laws of safe water transportation according to the AHJ.

Δ (B) Requisite Skills. The ability to enter and exit the waterborne transportation aid in a floodwater condition, correct a capsized waterborne transportation aid, and apply packaging and movement techniques to water-bound victims.

23.3 Technician Level. The job performance requirements defined in Sections 17.3, 23.2, and 23.3 shall be met prior to or during technician-level qualification in floodwater rescue.

23.3.1* 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 water-bound 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.

N 23.3.2 Develop an incident action plan for the use of watercraft to support floodwater search and rescue operations, given a watercraft, 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.

N (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.** Ability to implement access and egress procedures and communications with watercraft crew, use emergency/safety equipment, identify hazards, and operate within the rescue environment.

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.

- Δ 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.

- N A.1.2.7** 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 1.3.9 and clarified in A.1.3.9.

- Δ 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.

- N A.1.3.5** These sections may reference one another for overlapping or corresponding JPRs.

A.1.3.9 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 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.

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

- (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.

N A.1.5(1) The AHJ must understand that Section 1.5 is a minimum standard and that what is included in the awareness level is just the minimum. Nothing prohibits the AHJ from requiring additional items that awareness-level personnel are required to meet.

For example, should the AHJ require additional requirements to be met in addition to the minimum requirements identified in this standard, the AHJ can make that determination based on unique hazards and include items that might be required at higher levels. The AHJ can pull-down from higher levels within the same discipline or other disciplines, but that is something the AHJ will have to address within their jurisdiction.

In any case, awareness level personnel must possess the fundamental knowledge, skills, and abilities to enable them to do the following:

- (1) Perform initial size-up of the incident, including the needs for rescue or recovery
- (2) Recognize when an incident has unique hazards that are beyond the scope of their capabilities
- (3) Take defensive measures to protect themselves or others from harm
- (4) Summon resources that have the capabilities to take definitive actions to mitigate the incident
- (5) Perform support functions at a technical rescue incident under the direct supervision of individuals inside their existing level of training and capabilities

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 depart-

ment, 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) **Reestablish** 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

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	

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.

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.3.3.42 Compartment 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 19.3.1, 19.3.5, and 19.3.7.

A.3.3.52 Dive Tender. See Section 19.2 through 19.2.8.

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.3.3.55 Dive Tables. Many organizations publish or refer to tables for controlling and managing a diver's hyperbaric exposure. While all dive tables are based on common scientific principles, the exposure limits in the tables themselves can vary significantly based on the type of breathing gas, diving environment, activity performed by the diver, and their fitness level. For this reason, the standard does not refer to a specific table or the authors of tables. The AHJ should perform their own research for the tables that best suit their agency for the type of diving they will undertake and to meet local regulations.

A.3.3.67 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.3.3.68 Face(s). Also called *wall*, *side*, or *belly*.

A.3.3.73 General Area. Within the general area, access by people, heavy machinery, and vehicles is limited and strictly controlled.

A.3.3.78 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.3.3.81 Heavy Equipment. Examples include, but are not limited to, excavators, bulldozers, cranes, backhoes, and paving machines.

CONFINED SPACE Pre-Entry Evaluation					
1	Location of confined space		Additional descriptor (<i>Ex; location #, risk assessment #, etc.</i>)		
	Description of confined space (<i>Tank #, manhole, etc.</i>)				
2	Date issued	Time of entry/issued		Time permit expires (<i>Max duration = hr</i>)	
	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 (<i>examples</i>)	Hazards present or potentially present (check all that apply)		
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.3.3.83 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.3.3.89 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.3.3.90 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.3.3.92 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.3.3.107 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.3.3.110 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.3.3.114.2 Simple Rope Mechanical Advantage System. Figure A.3.3.114.2 illustrates such a system.

A.3.3.116 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.

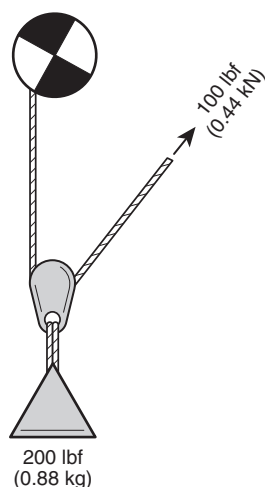


FIGURE A.3.3.114.2 A Simple Rope 2:1 Mechanical Advantage System.

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.

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 ft³ (2.27 m³) at 3000 psi. Because there is no redundant air supply (RAS), the entire reserve one-third volume of 26.6 ft³ (0.74 m³) must be carried in the primary system.

$$(26.6 \text{ ft}^3 \times 3000 \text{ psi}) / 80 \text{ ft}^3 = 1000 \text{ psi}$$

A diver equipped with an 80 ft³ (2.27 m³) primary HP Steel and Pony cylinder with a working pressure of 3500 psi and 21 ft³ (0.59 m³) redundant air system cylinder has a total of 101 ft³ (2.86 m³). The diver needs to be on the surface with approximately 33.6 ft³ (0.93 m³) to meet the one third. Subtract the 21 ft³ (0.59 m³) provided in the RAS cylinder to leave 12.6 ft³ (0.34 m³) in the primary system for the required reserve.

$$(12.6 \text{ ft}^3 \times 3500 \text{ psi}) / 80 \text{ ft}^3 (2.27 \text{ m}^3) = 472 \text{ psi}$$

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.3.3.125 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.3.3.126 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.3.3.127 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.3.3.128 Preclimb Checklist. A preclimb checklist can include the following:

- (1) A location-specific examination of key structural elements to ensure they are not compromised
- (2) An examination of pre-engineered fall protection systems
- (3) Proper resources on hand, including the type and quantity of rescuers and equipment
- (4) Weather and environmental conditions
- (5) Protection from sources of energy (i.e., mechanical, electrical, RF)

▲ A.3.3.130 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
- (5) Emergency decontamination as needed
- (6) Technical-level rescue service assistance

A.3.3.131 Protective System. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection. [1670, 2017]

A.3.3.134 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.3.3.135 Rated Capacity. Nominal working conditions typically include a specific combination of factors, such as equipment configuration, radii, boom length, and other parameters of use.

A.3.3.138 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 face-mask (FFM).
- (2) The device is in addition to a conventional second stage.

A.3.3.139 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.3.3.143 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.3.3.144 Rescue Entrant. The rescue entrant meets the following training requirements:

- (1) *Confined space.* **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.3.3.147 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.3.3.148 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.3.3.153.1 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.3.3.153.3 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.3.3.159 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.3.3.164 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.3.3.169 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.3.3.171 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.3.3.192 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.3.3.202 Tool Kit. See Annex K, 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.3.3.206.1 Intersecting Trench. Common configurations are "L," "X," and "T."

A.3.3.219 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.3.3.220 Watercraft Conveyance. Examples include trailers, pickup trucks, forklifts, and davits.

A.4.1.1 Agencies that have established practices for using conventional tools in the rescue of persons from an above grade environment should not be prevented by this standard from using those tools to perform a rescue from a tower. This job performance requirement is not meant to address rescues requiring rescuers to climb on or work from the tower itself, but rather it addresses the utilization of elevated devices to make external access to the patient for removal from the tower. Where this is possible, rescuers must utilize due caution to minimize fall hazards.

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.5.2.2 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 record-keeping 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 (i.e., 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 to the use of either a single- or two-tensioned rope system, because either can be utilized in rope-based lowering or mechanical advantage systems. In either case, redundancy is important to compensate for potential system equipment or operational failures.

A.5.2.11 The intent of the JPR is to assess the ability of the rescuer to arrest a falling load effectively, whether within a single- or two-tensioned rope system. This can be accomplished by having a person perform a hard, unexpected jerk on the distal end of the belay system or other methods to simulate the sudden addition of force due to a system failure. Testing methods should not include the use of people or persons as live loads.

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, 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).

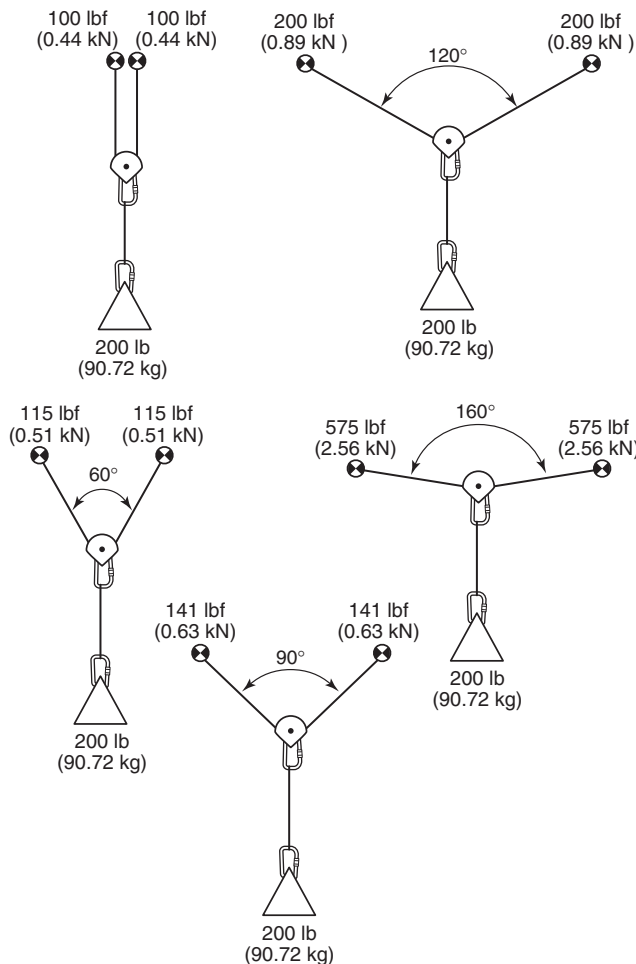


FIGURE A.5.2.6(A) The Effect of Angle Forces on Anchors and Lines: Critical Angles.

Table A.5.2.6(A) Force Conversion Table

Angle	Force at Each Anchor	
	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.5.2.16 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.5.2.18 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 a 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.5.2.22 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.5.2.23 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.5.2.24 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.5.3.9 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).

A.5.3.10 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.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.6.2.8 Utilization of the victim transfer devices authorized by the AHJ should include horizontal and vertical applications, proper patient securing methods, and rigging attachments.

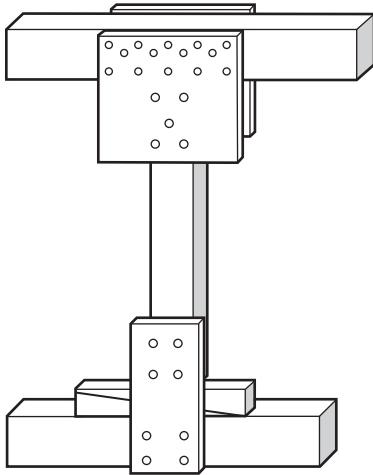


FIGURE A.6.2.6(a) T Shore.

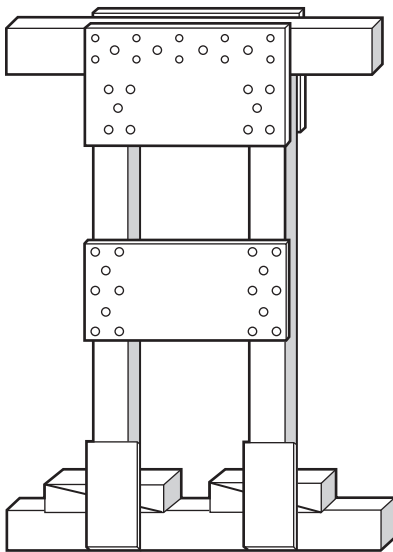


FIGURE A.6.2.6(b) Double T Shore.

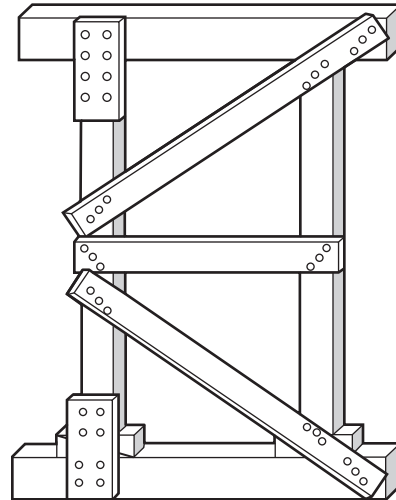


FIGURE A.6.2.6(c) Two-Post Vertical Shore.

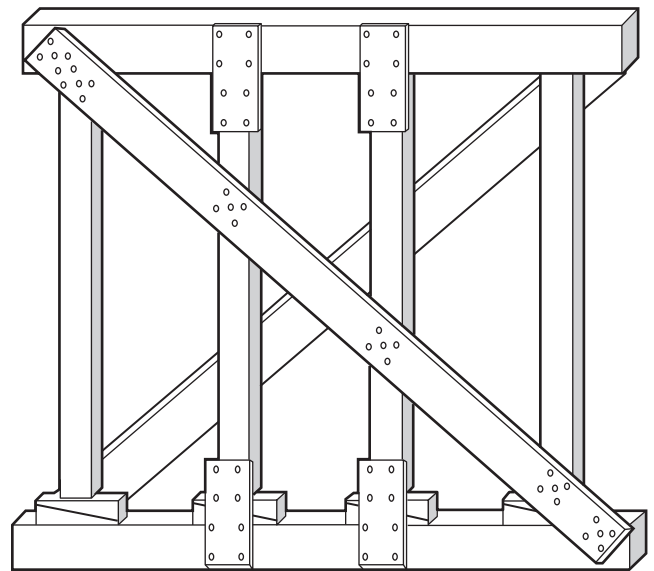


FIGURE A.6.2.6(d) Multi-Post Vertical Shore.

A.6.2.9 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.6.2.10 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.6.2.12 Cribbing systems should consist of the following five basic configurations of cribbing, shown in Figure A.6.2.12:

- (1) Two-piece layer crosstie
- (2) Three-piece layer crosstie
- (3) Platform crosstie
- (4) Triangle crosstie
- (5) Modified crosstie

Included in this section are the knowledge of the advantages, disadvantages, and limitations of each type of system.

A.6.2.15 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.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.

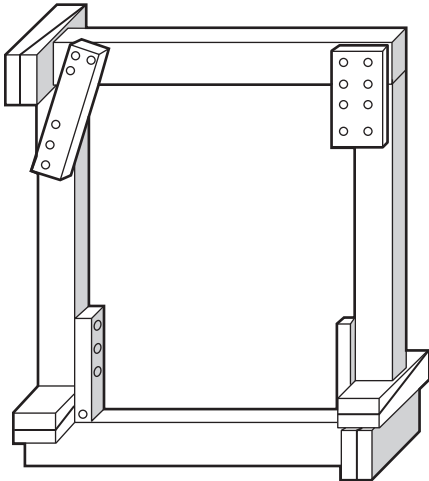


FIGURE A.6.2.6(e) Window Shore.

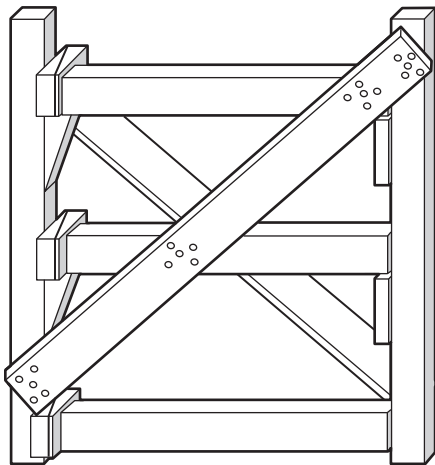


FIGURE A.6.2.6(f) Horizontal Shore.

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.6.3.13 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.7.1.3 This statement applies to nonentry methods of victim communication only. Awareness-level personnel cannot enter a space for rescue.

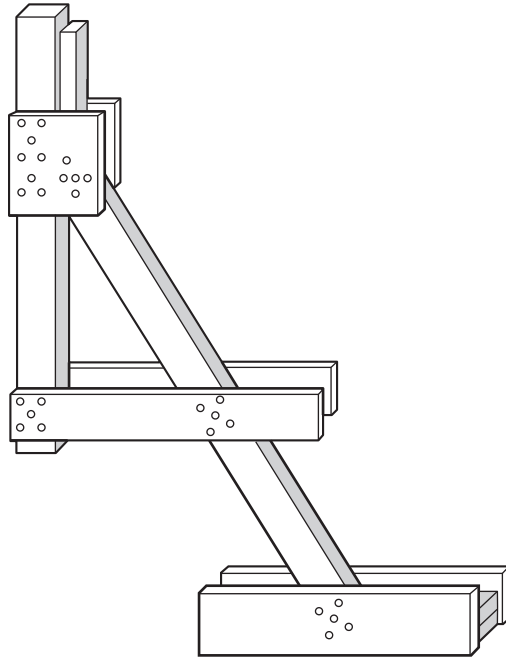


FIGURE A.6.2.6(g) Flying Raker Shore.

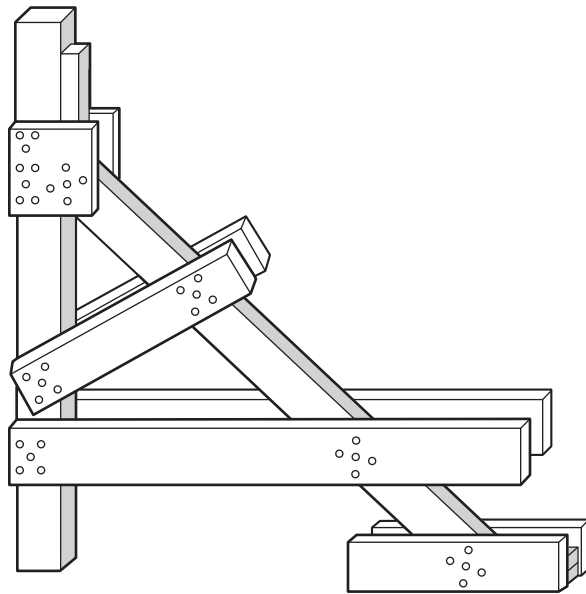


FIGURE A.6.2.6(h) Split Sole Raker Shore.

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.

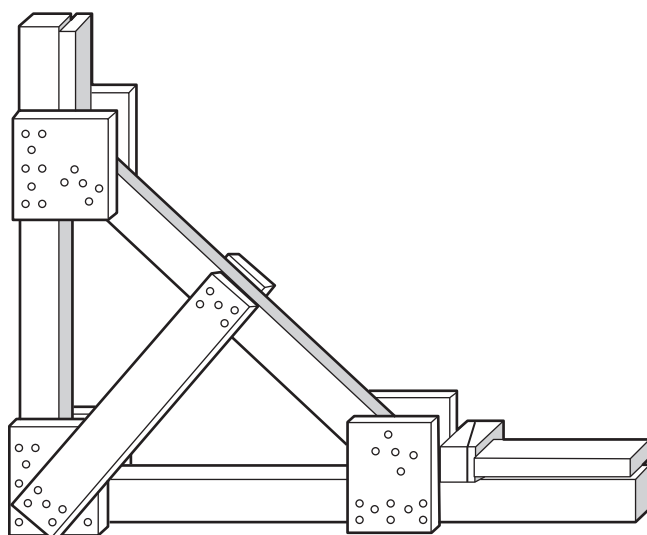


FIGURE A.6.2.6(i) Solid Sole Raker Shore.

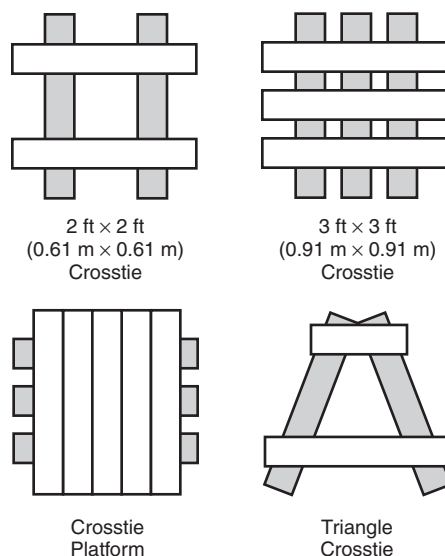


FIGURE A.6.2.12 Five Basic Configurations of Cribbing.

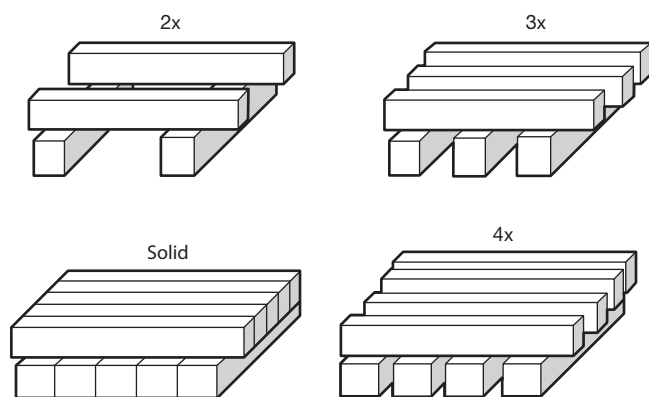


FIGURE A.6.2.6(j) Box Cribbing.

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.

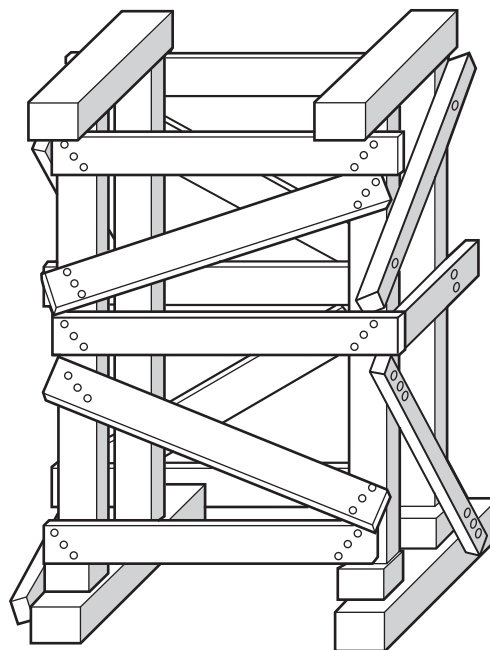


FIGURE A.6.3.6(a) Laced Post Shore.

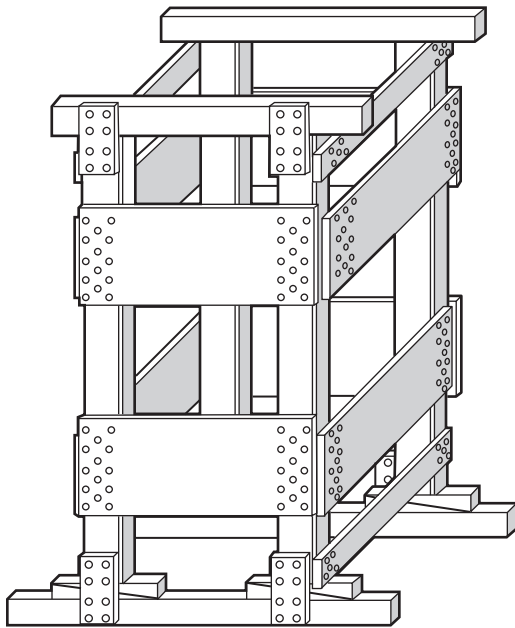


FIGURE A.6.3.6(b) Plywood Laced Post Shore.

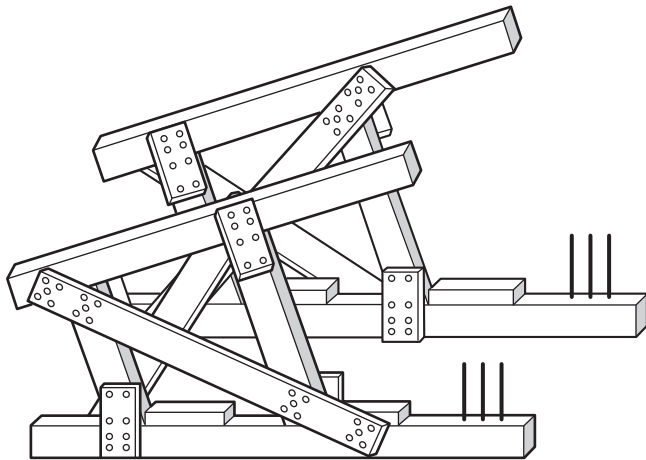


FIGURE A.6.3.6(c) Sloped Floor Shore Type 2.

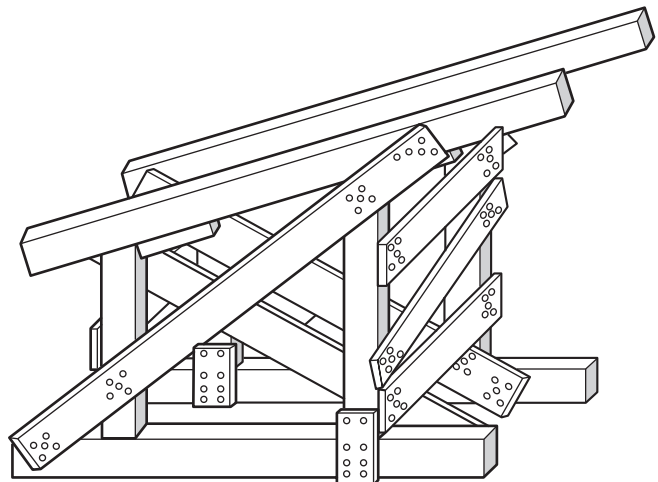


FIGURE A.6.3.6(d) Sloped Floor Shore Type 3.

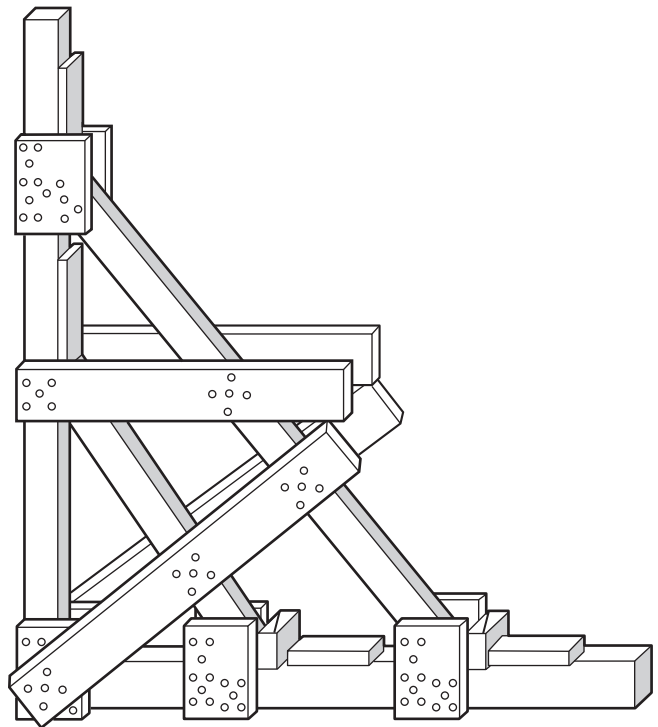


FIGURE A.6.3.6(e) Double Raker Shore.

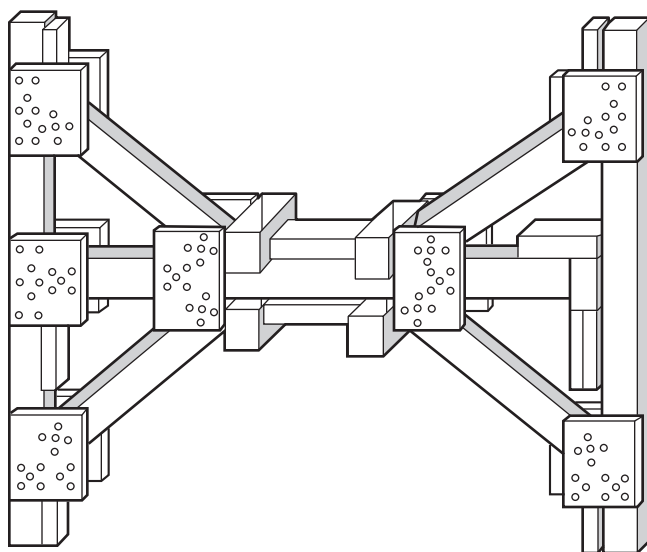
Assessment of the space should consider all potentially dangerous forms of energy to assure a rescue entrant is appropriately protected before entry. The necessity for assessment and isolation of dangerous forms of energy could include more than the atmosphere.

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.

- (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.



▲ FIGURE A.6.3.6(f) Flying Shore.

- (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 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 (LC₅₀)
- (2) Lethal dose-50 (LD₅₀)
- (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) Entanglement 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

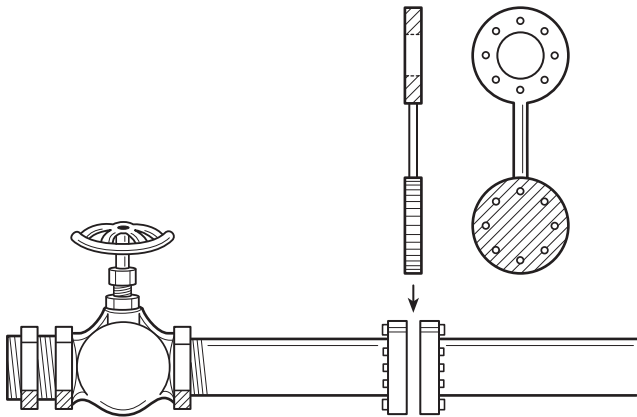


FIGURE A.7.2.4 Blanking or Blinding.

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.

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 unit can 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.10.2.2** A representative animal could include a live animal or mannequin, and could include a small animal (i.e., under 300 lb) or large animal (i.e., over 300 lb).

A.10.2.3 The local authority will determine who is qualified to decide if an animal should be euthanized as well as who within that jurisdiction is authorized to conduct it, and by what means. Rescuers need to work through the process of determining rescue versus humane euthanasia and who can accomplish it in their zone of response.

A.10.2.12 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 (i.e., 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.10.2.14 Animal technical rescue often includes marginal SSSF. Rescues as low as 2:1 are not uncommon due to a single component in the system that cannot be mitigated.

A.10.2.15 Animal technical rescue often includes marginal SSSF. Rescues as low as 2:1 are not uncommon due to a single component in the system that cannot be mitigated.

A.10.3.1 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.10.3.3** This section is intended to address the use of portable or other high-point anchorage to lift the load vertically to clear the depth, move it over, and then place it the ground in a safe area. It is necessary that large animals, after removal from depths, be moved far enough from unprotected edges to allow safe movement for rescue personnel. It is also the reflex of many animals to run when they have ground contact. This operation assures the greatest degree of safety for both the animal and rescuers following removal. Appropriate confined space safety precautions must be applied in spaces designated as such. This JPR is in no way intended to imply the use of systems such as high lines to move large animals across a horizontal path.

A.11.2.7 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.11.2.8 The National Search and Rescue Committee recommends using the georeferencing (coordinate) systems as shown in Table A.11.2.8.

- Δ **A.11.2.10** 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 recognize the need for advanced life support.

Table A.11.2.8 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

¹During 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).

²GARS: Global Area Reference System.

³Land 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).

⁴Aeronautical 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.

⁵Air space deconfliction will only be implemented and managed using latitude and longitude.

⁶Aeronautical 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.

⁷Describes 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.11.2.11 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.11.3.10 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.12.2.1 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.12.2.8 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.

A.12.3.7 Based on the soil conditions, uprights and panels may need to be implemented according to tabulated data.

A.13.2.1 Requisite Skills.

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.13.2.2 The intent of 13.2.2 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.13.2.3 The intent of 13.2.3 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.13.2.4 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 operations level, stabilization would include basic techniques such as cribbing, blocking, and wedging components against unwanted movement.

A.13.2.5 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.13.2.9 It is the intent of this standard to acquire and analyze information about mechanical equipment within a building or structure that could lend to emergency incidents. Because the

type of mechanical equipment is greatly varied, it is important for rescuers to assess and understand the risks posed by the type of equipment within a given jurisdiction. While not all types of emergencies can be easily determined, a general understanding of the characteristics of the building, content, and exposure, could allow rescuers to plan for those incidents that are most likely to occur.

A.13.2.13 It is the intent of the committee that the skill of identifying and applying information from an SME (on site or remotely) is essential to the successful outcome of a machinery rescue incident. An SME that is applicable to this type of event includes, but is not limited to, manufacturers, installers, specially trained mechanics or technicians, or plant maintenance personnel, all who possess specialized technical and/or institutional knowledge of the device, equipment, or process involved in the event. Identifying and keeping relevant SMEs in contact with command staff of the event is a critical component of machinery rescue incident management.

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 (i.e., 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 It is the intent of the committee that the differentiation between awareness level and operations level 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.

Awareness level 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.

Operations level 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.13.3.2 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 responder's head
- (4) Shoring

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 I 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.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 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.14.2.5 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.14.2.7 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.14.2.8 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.14.2.9 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.14.2.11 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.14.2.13 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.14.2.14 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.14.3.1 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.14.3.3 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.14.2.7*)
- (2) Search (*see A.14.2.9*)
- (3) Communications underground (*see A.14.2.8*)
- (4) Rigging (*see A.14.2.13*)
- (5) Evacuation (*see A.14.2.14*)

Medical considerations can be addressed by operations either through a team (*see 14.2.11*) or using single resources. Equipment can be moved to the rescue site through the use of a team or teams (*see A.14.2.14*).

- **A.15.1.2** 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.15.2.1 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.15.2.2** 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.15.2.3 The intent of 15.2.3 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.15.2.4 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 **reestablish** 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.15.2.6** Tunnels under construction and former mines pose unique hazards and challenging working conditions that might 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. Because 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 increase 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 prerescue plan needs to be present and physically exercised prior to deploying resources at this level. The prerescue 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 impacting, 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, or collapse, and that the rescue operations will not unintentionally introduce those hazards. Because each tunnel and space is unique, the elements of the prerescue rescue plan must specifically identify how those conditions are established and outline the definitive criteria to allow entry. The operations-level resources shall than practice the prerescue plan and each member who might be required to enter the space should be familiar with the actual work environment by physically being present in the space.

- **A.15.2.7** 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 from 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 the service life of the SCBA exceeds the potential time it could take to make egress or reach an area of refuge under emergency conditions.

A.15.2.8 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. **Because** 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 **prerescue** plan needs to be present and physically exercised prior to deploying resources at this level. The **prerescue** 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 **prerescue** plan must specifically identify how those conditions are established and outline the definitive criteria to allow entry. The operations-level resources **should** then practice the **prerescue** plan and each member who might be required to enter the space **should** be familiar with the actual work environment by physically being present in the space.

A.15.2.12 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.

• **Δ A.15.3.1** The intent **15.3.1** is to ensure that **technician-level rescuers** have evaluated and selected proper personal protective equipment (PPE) that includes, but is not limited to, long-duration closed-circuit 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.15.3.3 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.15.3.7 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.15.3.9 The intent of **15.3.9** 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.15.3.11 **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.

• **N A.15.3.15** 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 (i.e., 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.

N A.16.3.6 This is intended to support helicopter rescue missions and not for common air medical evacuations.

A.17.1 This section is for rescue situations with water moving less than 1 knot. Awareness-level water rescue skills are applica-

ble only to survival swimming skills and support of water rescue operations.

A.17.2 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.17.2.1 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.17.2.2 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.17.2.2(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.17.2.3 *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 inci-

dent 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.17.2.5 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.17.2.6 See A.17.2.5.

A.17.2.7 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.17.2.8 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.17.2.9 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.17.2.13 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.17.3 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.17.3.1 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.18.2.3 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.18.2.4 In the water rescue environment, a non-water entry rescue might be performed from a watercraft, placing the rescuers on, but not directly in the hazard. Rescuers should ensure they use proper PPE, that rapid intervention crews are in place, and should be trained in the operation, parameters, and emergency procedures of the watercraft and accidental immersion.

A.18.2.5 The committee recognizes that technical rescue incidents pose unique challenges in terms of safely concluding or demobilizing an event. The sequence and manner by 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.19.2.2 Resources should include the consideration of high-tech electronics such as sonar, underwater video, ROV units, and the use of canine teams.

A.19.2.3 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.19.2.5 Drowned victims should 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.19.2.5) according to AHJ protocol.

A.19.2.7 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.19.2.8 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.

A.19.3 The committee is of the opinion that specialty training courses provided by most nationally recognized certifying agencies can help build an acceptable foundation required for dive technical rescuers. Examples of specialty diving include dry suit, full face mask, underwater communications, deep diving, night and limited visibility, current, polluted water, underwater lifting, cave, surface supplied air, and ice.

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 demonstrate leadership and dive management skills similar to that of a dive supervisor as defined by the World 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 postdive needs.

A.19.3.2 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.19.3.2 is an illustration of a prediving safety checklist.

A.19.3.3 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, and so forth) positioned according to AHJ protocols.

DIVE SITE DIAGRAM	
Department Name: _____	
Incident location: _____	Date: _____
GPS coordinates: _____	Lat: _____ Long: _____
Access locations: _____	
Type of access: _____	What was found/recovered: _____
Conditions	Witness name and phone
☐ Weather _____ ☐ Surface _____ ☐ Current _____ ☐ Visibility _____ ☐ Water temp. _____ ☐ Thermocline _____ ☐ Surf _____ ☐ High tide _____ ☐ Low tide _____ ☐ Depth where evidence was found _____	☐ 1 _____ ☐ 2 _____ ☐ 3 _____ ☐ 4 _____
Scene diagram	Number indicates witness location. Letter indicates evidence location.
Not to scale Completed by: _____	

FIGURE A.19.2.5 Sample Form for Dive Site Diagram.

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 _____	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: _____ _____ _____
Search ☐ RESCUE VS. RECOVERY ☐ Search pattern _____ ☐ Review procedure for found object	
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.19.3.2 Sample Pre-dive Safety Checklist. (Courtesy of Dive Rescue International)

Δ A.19.3.4 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 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 **dive supervisor** 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.19.3.4.*)

A.19.3.6 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.19.3.8 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.19.3.9 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 **dive supervisor** certification.

Δ A.20.2.5 In the ice rescue environment, a nonentry rescue might be performed from a watercraft, placing the rescuers on, but not directly in the hazard. Rescuers should ensure proper PPE, that rapid intervention crews are in place, and should be trained in the operation, parameters, and emergency procedures of the watercraft and accidental immersion.

Δ A.20.2.6 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, presence of fatalities or multiple injuries, or chemical releases.

A.21.2.2 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.21.2.3 The term *nonmotorized watercraft* refers to items such as kayaks, surfboards, rafts, or boats.

A.21.2.4 Motorized watercraft includes items such as motorboats, Jet Skis, and other motorized personal watercraft.

A.21.2.5 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.22.1 Chapter 22 outlines the requirement for use of both powered and nonpowered watercraft to perform rescue operations. The AHJ should ensure its members that meet the requirements of Section 22.1 do so in conditions representative of the waters and weather typical to the jurisdiction.

For Chapter 22, 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.

Section 22.1 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.22.1.2 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.22.2 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.22.2.18 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 (i.e., 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.22.3 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.23.2 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.

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.

<u>Time to Complete</u>	<u>Points Awarded</u>
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.

<u>Performance Criteria</u>	<u>Points Awarded</u>
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.

<u>Performance Criteria</u>	<u>Points Awarded</u>
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.

<u>Performance Criteria</u>	<u>Points Awarded</u>
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

<u>Performance Criteria</u>	<u>Points Awarded</u>
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.19.3.4 Sample Watermanship Test. (Courtesy of Dive Rescue International)

A.23.2.2 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.23.2.2.

A.23.2.6 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.

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.23.2.7 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.23.2.8 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.

Table A.23.2.2 Basic Calculations for a Marker Float Traveling 100 ft Down Current

Time (sec)	Speed		
	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

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.23.2.9 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.23.3.1 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 job and 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.

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.

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.

(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. (Reserved)

Annex D National Fallen Firefighters Foundation

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.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.

D.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 E Collapse Types

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

E.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 E.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 E.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 E.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 E.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 E.1(e).]

E.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:

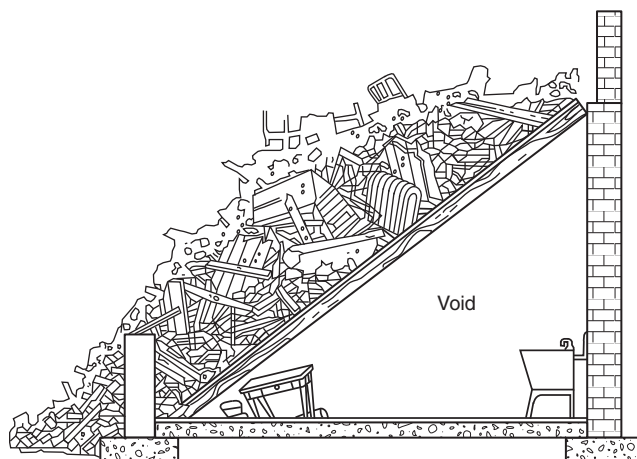


FIGURE E.1(a) Lean-To Floor Collapse. [Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense)]

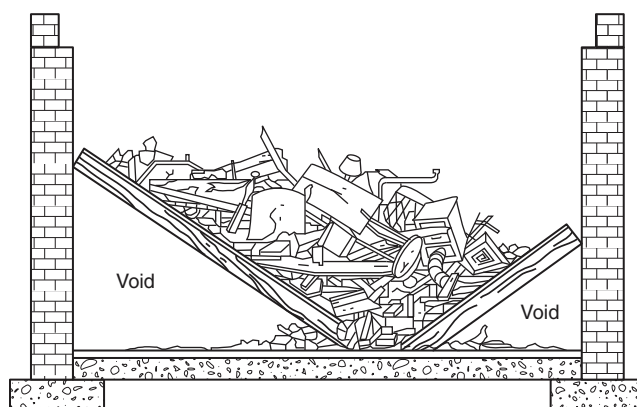


FIGURE E.1(b) V-Shape Floor Collapse. [Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense)]

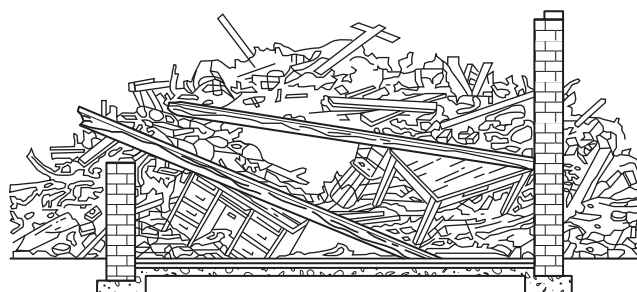


FIGURE E.1(c) Pancake Floor Collapse. [Courtesy of Defense Civil Preparedness Agency (U.S. Department of Defense)]