Technical Rescuer Lesson One Personal Protective Equipment

DOMAIN: COGNITIVE / PSYCHOMOTOR

LEVEL OF LEARNING: KNOWLEDGE / APPLICATION

MATERIALS

IFSTA Fire Service Search and Rescue, 7th Edition; IFSTA 6th Edition, Essentials of Firefighting; NFPA 1006, Standard for Technical Rescuer Professional Qualifications; NFPA 1670, Standard on Operations and Training for Technical Rescue Incidents; North Carolina Wildlife Commission Course on Boating, Boat North Carolina. Have available for the class various types of PPE used by the authority having jurisdiction (AHJ), SCBA, SABA, cartridge respirator, rescue harness and personal floatation device (PFD). Laptop computer; multimedia projector; whiteboard or flipchart; and marker pens.

NFPA 1006, 2013 Edition JPRs

5.2.1 Identify the needed support resources
5.2.2 Size up a rescue incident
5.2.3 Manage incident hazards
5.2.4 Manage resources in a rescue incident
5.2.5 Conduct a search
5.3.1 Victim triage
5.4.1 Inspect and maintain hazard-specific PPE

Junior Member Statement:

Junior Member training activities should be supervised by qualified instructors to assure that the cognitive and psychomotor skills are completed in a safe and non-evasive manner. While it is critical that instructors be constantly aware of the capabilities of all students both mentally and

physically to complete certain tasks safely and successfully, the instructor should take every opportunity to discuss with departmental leaders and students the maturity and job awareness each participant has for the hazards associated with fire and rescue training.

TERMINAL OBJECTIVE

The Technical Rescuer candidate shall correctly describe in writing the appropriate personal protective equipment associated with incidents involving the different rescue environments, and shall demonstrate the proper donning, doffing, inspection and maintenance of PPE associated with incidents involving the different rescue environments.

ENABLING OBJECTIVES

1. The Technical Rescuer candidate given the appropriate equipment shall correctly demonstrate the proper use of basic PPE and describe its purpose for incidents involving the different rescue environments.

2. The Technical Rescuer candidate given the appropriate equipment shall correctly demonstrate the proper donning/doffing techniques of basic PPE associated with incidents involving the different rescue environments.

3. The Technical Rescuer candidate given the appropriate equipment shall correctly demonstrate the proper use of basic PPE and accessory gear and describe its purpose for rope rescue incidents.

4. The Technical Rescuer candidate shall correctly describe in writing the guidelines for inspecting, servicing and maintaining PPE used for various rescue disciplines.

Technical Rescuer Lesson One Personal Protective Equipment

MOTIVATION

What PPE is needed when responding to a wreck or a confined space incident? When performing an aquatic rescue, would you respond with only a throw bag and Jet Ski and no proper PFDs? How does the rescuer ensure that they are part of the solution and not part of the problem? In today's fire and rescue community, it is becoming increasingly recognized that proper PPE is imperative to ensuring a safe rescue.

As a part of the Incident Action Plan and hazard assessment, the instructor must stress to the Technical Rescuer candidates the importance of factoring in the proper use of PPE to balance the risk/benefit equation. Rescuers will risk their lives to save another, but it does not have to be at the expense of their own.

PRESENTATION

ENABLING OBJECTIVE #1

The Technical Rescuer candidate given the appropriate equipment shall correctly demonstrate the proper use of basic PPE, and describe its purpose for incidents involving the different rescue environments.

1. Initiate a discussion on the importance of basic and specialized PPE to be used when conducting a risk analysis of any rescue incident. Rescuer safety is essential and must be stressed.

2. Initiate a discussion regarding the need and proper use of typically required PPE used at most rescue incidents

such as the proper outerwear, gloves, helmets, eye protection and boots.

NOTE: There are 12 different NFPA standards that address PPE. They vary from station work uniforms to PPE for medical emergencies. Instructors should review the standards that are applicable to the AHJ in which they are teaching.

3. List the various rescue disciplines, and identify any PPE specific to those disciplines. Be sure to discuss their importance and use.

4. Display an SCBA typical of the jurisdiction in which you are teaching and identify and describe the features, components, and required maintenance issues.

5. Demonstrate the usage of an SCBA common to the AHJ.
   a) Familiarize each candidate with wearing and using an SCBA. Discuss the difference in air consumption during a resting time versus an actual rescue working time.
   b) Identify and discuss the four hazardous atmospheres for which respiratory protection is needed such as, an oxygen deficient atmosphere, elevated temperatures, and smoke and toxic atmospheres.
   c) Describe the physical requirements and limitations associated with SCBA usage including physical stress, medical considerations, and mental stamina. Point out that above average strength and endurance is required. Discuss how strength and endurance minimize mental fatigue and lessen the chance of making mistakes.
   d) Discuss the limitations of SCBA in various rescue environments. Point out the air limitation problems as well as the problems that are encountered with the physical size of the SCBA.
   e) Discuss the two general types of SCBA used, open circuit and closed circuit, and discuss where they would be used best.
   f) Demonstrate and have the candidates practice controlled breathing.

6. Identify and discuss the safety checks that should be conducted for Self-Contained Breathing Apparatus (SCBA).
    a) Check the facepiece for a cracked lens. Does the wearer get an adequate seal?
    b) Check the cylinder gauge pressure and hydrostatic pressure test date.
    c) Is the low-pressure alarm working? What is the procedure when it is activated?
    d) Check the pressure regulator gauge. For accuracy, compare it to the reading on the cylinder gauge. How accurate is it?
    e) Check the PASS alarm device.

7. Identify the five types of PFDs and identify the differences between a standard PFD and a rescue PFD. Identify which type of PFD is recommended for various water related environments.
    a) Type I – most buoyant of all types. Designed for rough water, remote areas, and/or extended periods of time when rescue may be delayed. Designed to help roll an unconscious victim to a face-up position.
    b) Type II – for recreational use. Designed for inland water, good flotation capability where quick rescues are imminent. May roll an unconscious victim to a face-up position.
    c) Type III – for use in calm inland waterways where quick rescues are imminent. Will not automatically roll an unconscious victim to a face-up position.
    d) Type IV – throwable flotation devices such as, throw ropes, ResQ-discs, ring buoys and boat cushions. Items may be used for initial shore-based rescue attempts.
    e) Type V – designed for special activities such as rescue PFDs, Mustang Suits (USCG), and Gumby Suits (immersion suit for ice rescue operations).
    f) Type III / V are used by rescuers in water related operations.

NOTE: If the instructor feels it is necessary, have the students practice tossing throw bags and ropes to gain familiarity and accuracy.

8. Emphasize that besides wearing a PFD on the water, all rescuers working within 15' of the shoreline should be wearing a rescue helmet and appropriate PFD.

9. Note that PFDs will keep a person from sinking but not necessarily from drowning.

10. It is essential to emphasize to all students that a PFD of any kind must have a United States Coast Guard rating tag of approval before they are acceptable for rescue work.

Reference: IFSTA Fire Service Search and Rescue, 7th Edition, pages 113 through120.

11. Identify and discuss the safety checks that should be conducted for a PFD.
    a) Follow manufacturer's recommended guidelines for use, inspection and maintenance.
    b) Improper maintenance and cleaning can lead to rapid deterioration of the PFD.

12. Identify and discuss the requirements for high visibility vest.
    a) On November 24, 2008, a new federal regulation (23 CFR 634) went into effect mandating that anyone working in the right-of-way of a federal-aid highway must be wearing high-visibility clothing that meets the requirements of ANSI / ISEA 107; 2004 Edition Class 2 or 3. This requirement applies to all emergency responders.
    b) The Code of Federal Regulations Title 23 (Highways) Part 634 was originally published in the Federal Register Vol. 71, No 226, pp 67792 - 67800.
    c) The rule itself (634.3) simply states that: "All workers within the right-of-way of a Federal-aid highway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel."
    d) Definitions (634.2) within Part 634 cover what is meant by "workers" and "high-visibility safety apparel." Emergency responders are included in this definition anytime they are working "within the

right-of-way of a Federal-aid highway" with some exceptions for law enforcement officers working on an incident involving criminal activity.

e) "High-Visibility Safety Apparel" is defined to mean "personal protective safety clothing that is intended to provide conspicuity during both daytime and nighttime usage, and that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004."

13. Have the class identify other important PPE necessary for various rescue environments, and discuss the safety checks that should be conducted.

Reference: IFSTA 5th Edition Essentials of Firefighting, pages 180 through 198.

NOTE: Include manufacturer's safety guidelines for each PPE listed.

PRESENTATION

ENABLING OBJECTIVE #2

The Technical Rescuer candidate given the appropriate equipment shall correctly demonstrate the proper donning/ doffing techniques of basic PPE associated with incidents involving the different rescue environments.

1. Begin by identifying any PPE that requires the Technical Rescuer candidate to learn donning and doffing techniques.
   a) Examples include PFDs, SCBAs, Cartridge Respirators, SABAs, commercial rescue harnesses, and modified rescue harnesses.
   b) Discuss the rescue incidents that require a specific type of PPE.

2. Demonstrate donning and doffing techniques of the various types of SCBAs, SABAs, Cartridge Respirators, Rescue Harnesses and PFDs used by the authority having jurisdiction. Have the candidates practice.

3. When demonstrating and practicing, include all safety checks specific to each specialized PPE.

4. Allow the candidate sufficient time to practice with the PPE available, and advise the candidates regarding correct or incorrect procedures.

5. Keep track of the time it takes to correctly don all of the different types of PPE. Then try to reduce the amount of time to two minutes, and then to one minute.

6. Emphasize to the students that this is an area where the saying “practice makes perfect” is most appropriate.

Reference: IFSTA 6th Edition Essentials of Firefighting, pages 200 through 205 and pages 215 and 216.
Reference: IFSTA Fire Service Search and Rescue, 7th Edition, pages 58 through 60, 113 through 120.

APPLICATION

Lay out various types of PPE or provide pictures and have the students identify which PPE is best suited for each rescue environment.

PRESENTATION

ENABLING OBJECTIVE #3

The Technical Rescuer candidate given the appropriate equipment shall correctly demonstrate the proper use of basic PPE and accessory gear, and describe its purpose for rope rescue incidents.

1. Point out that when conducting a risk analysis of any rope rescue incident, the importance of specialized PPE must be stressed. Rescuer safety is essential and rescuer comfort is a must.

2. Describe the general guidelines established in NFPA 1951 for the use of helmets in a rope rescue environment.
   a) Helmets worn in high angle rescue should be designed to withstand the rigors of the environment.
   b) A narrow brim and a non-stretch chin strap are essential.

c) The chin strap should have three non-stretch suspension points, one on each side of the helmet, and one in the rear.
d) Materials used for rescue helmets include plastic, Fiberglass and Kevlar composites.
e) The shell should be rigid enough to withstand impact and penetration by sharp objects.
f) The inside suspension should keep the shell from touching the skull.
g) Construction helmets and motorcycle helmets do not make good rescue helmets.
h) Fire helmets tend to be cumbersome in the high angle environment.

3. Discuss the general performance criteria for outerwear.
   a) Outerwear must fit snugly in order to reduce the likelihood of entanglement in the rope system, but must be loose enough to allow for optimum body movement.
   b) Must be tough enough to resist tearing and abrasion damage.
   c) Having a waterproof outer shell that has wicking capabilities is critical for protecting the rescuers from perspiration, wind and rain.
   d) A criterion for selecting the appropriate waterproof material is if you can stand under a shower for 1/2 hour without getting soaked through.
   e) An insulating layer of clothing should be worn under the waterproof shell.
   f) Cotton is the least desirable fabric in wet and cold environments.
   g) Wool is the traditional choice of fabric chosen for maximum warmth.
   h) Polyester pile is another fabric that provides comfort and warmth when in contact with the skin.
   i) Neither wool nor polyester pile provides adequate protection from the wind, so an outer shell must be worn.
   j) Polypropylene or a polypropylene blend has become the material of choice for underwear when participating in outdoor activities.
   k) Underwear made of flammable material may not be suited for personnel working in helicopters or other environments subject to flash fires.

4. Emphasize the fact that structural firefighting gear is seldom appropriate for rope rescue operations.
    a) Structural firefighting PPE would only be used when the operation would place rescuers in close proximity to fire or potential fire and in extremely cold or wet environments.

5. Discuss the general performance criteria for footwear.
    a) Criteria include comfort, protection and adhesion.
    b) Leather composition affords the best qualities needed for a rescue boot.
    c) Boots should provide support to the ankles and protect the feet from penetrating injuries.
    d) The boot sole should have a reasonable amount of adhesive quality.
    e) A good choice of socks is important for warmth, comfort and prevention of blisters.
    f) A two-sock combination consisting of a lightweight inner polypropylene sock that reduces friction on the skin, and a thick wool outer sock that increases warmth, and provides good comfort.

6. Discuss the general performance criteria for gloves.
    a) Criteria include comfort, protection and adhesion.
    b) Leather composition affords the best qualities needed for a glove.
    c) Deerskin or goatskin offers the best protection.
    d) Gloves should shield the hand and prevent discomfort.
    e) Commercial gloves with reinforced palms are available for purchase.

Reference: IFSTA Fire Service Search and Rescue, 7th Edition, pages 54 through 58.

7. Discuss the characteristics of the escape belt.
    a) The intended use of the escape belt is to provide emergency escape capability to a firefighter from an immediate life-threatening emergency above the ground floor of a structure. Escape belts do not have leg loops to prevent the belt from rising up the torso of the user. The firefighter using an escape belt should always be able to maintain foot contact with the surface of the structure during descent or use a life safety harness.

8. Discuss the characteristics of the Class II rescue harness.
   a) Life safety harness shall be designed and designated in accordance with the requirements for either Class II or Class III.
   b) A harness that fastens around the waist and around thighs or under buttocks and is designed for rescue with a design load of 2.67 kN (600 lbf) shall be designated as a Class II life safety harness.
   c) Class II life safety harness shall be permitted to consist of one or more parts.
   d) It is designed for rescue operations.
   e) The harness has a minimum breaking strength of design load is 600 lbf.
   f) The harness fastens around the waist and thighs, or under the buttocks.

9. Discuss the characteristics of the Class III rescue harness.
   a) A harness that fastens around the waist, around thighs, or under buttocks, and over shoulders and is designed for rescue with a design load of 2.67 kN (600 lbf) shall be designated as Class III life safety harness.
   b) Class III life safety harness shall be permitted to consist of one or more parts.
   c) It is designed for fall protection and rescue operations where the potential for inversion may occur.
   d) It has a minimum design load is 600 lbf.
   e) It fastens around the waist and thighs or under the buttocks and over the shoulders.

10. Identify the minimum guidelines for webbing to be used as improvised rescue harnesses for humans.

11. Discuss the characteristics and design of improvised harnesses:
   a) Rescue knot.
   b) Seat harness.
   c) Seat harness with chest harness.

12. Identify and discuss the safety checks that should be conducted for rescue harnesses.

a) Check Class II and III rescue harness straps and buckles.
b) Check for frayed stitching and damaged metal.
c) Follow the manufacturer's guidelines for use, inspection, and maintenance.

13. Discuss the pathology of harness suspension.
    a) Serious problems can occur when rescuers suspend motionless for a long period of time. The compression created by the straps reduces the venous flow to the legs.
    b) This reduction in flow also affects the right side of the heart that causes reduction in overall cardiac output. This pathology can result in unconsciousness or death.
    c) A potential medical consequence of harness suspension is crush syndrome that can lead to renal failure and other life threatening conditions.

Reference: IFSTA 7th Edition Fire Service Search and Rescue, pages 115 through 120.
Reference: High Angle Rescue Techniques, 3rd Edition, pages 13 through 16.

APPLICATION

Lay out the various types of PPE typically used by the respective jurisdiction. Have the Technical Rescuers identify known local rope rescue locations and provide pictures of these locations if possible. Have the students identify which PPE and equipment is best suited for rescue operations.

PRESENTATION

ENABLING OBJECTIVE # 4

The Technical Rescuer candidate shall correctly describe in writing the guidelines for inspecting, servicing and maintaining PPE used for various rescue disciplines.

1. Discuss the importance of proper maintenance of all types of PPE.

2. Discuss the importance of developing proper SOGs for maintaining PPE.

3. Discuss the importance of proper record keeping for maintaining PPE.

NOTE: The instructor should gain access to appropriate manufacturer's guidelines, NFPA standards, and OSHA standards pertaining to inspection, care and maintenance of equipment discussed in this lesson plan. See materials list.

Reference: IFSTA 6th Edition Essentials of Firefighting, pages 179 and 180.
Reference: Fire Service Search and Rescue, 7th Edition, pages 61 and 62.

4. Discuss the procedures to be followed in the care and maintenance of helmets.
   a) Keep helmet clean.
   b) Remove chemicals, oils and petroleum products as soon as possible. These agents can soften the shell material and reduce impact effectiveness.
   c) Repair and or replace damaged helmets or helmet components.
   d) Inspect suspension systems such as headbands, chinstraps, and integrated faceshields/safety glasses frequently for deterioration.
   e) The above inspection includes denoting the absence of any of the components and taking necessary action to remedy the problem.
   f) Remove from service polycarbonate helmets that have come into contact with hydraulic oils. Some hydraulic oils will weaken the helmet. Refer to helmet manufacturer's guidelines.

Reference: IFSTA 6th Edition, Essentials of Firefighting, pages 179 and 180.

5. Discuss the procedures to be followed in the care and maintenance of personal protective clothing including gloves and boots.
   a) The shell of turn-out gear should be cleaned regularly according to manufacturer's guidelines. See clothing label for cleaning instructions.
   b) Remember, dirty shells absorb more heat.
   c) NFPA 1500 requires that protective clothing be cleaned by a cleaning service or cleaned in house

provided the facilities are equipped to process contaminated clothing.

d) Gloves and boots should be cleaned and maintained according to manufacturer's guidelines.

e) NFPA 1581 Standard on Fire Department Infection Control Program requires that personal protective clothing be cleaned and dried, minimally, every six months in accordance with manufacturer's guidelines.

f) NFPA 1975 identifies station work uniforms to include trousers, shirts, jackets, and coveralls. Underwear is not included.

6. Point out the minimum guidelines for station work uniforms established by NFPA.
   a) They should be fire resistant.
   b) Components of the garments should not ignite, melt, drip, or separate when exposed to a temperature of 500 degrees for a period not to exceed five minutes.
   c) Wildland PPE used by many rescue departments, depending on design, may be worn over station uniforms or directly over undergarments.

Reference: IFSTA 6th Edition Essentials of Firefighting, page 178.

7. Discuss OSHA CFR-1910.1030 regulations on the cleaning of Personal Protective Equipment.

Reference: CFR-1910.1030 regulations.

8. Emphasize the necessity of having departmental SOGs concerning the care and use of Personal Protective Equipment. Summarize the importance of proper maintenance of personal protective clothing.

9. Discuss inspection, care and maintenance procedures for SCBAs.
   a) NFPA 1404 and NFPA 1500 require all SCBAs to be inspected after each use, weekly, monthly, and annually.
   b) A weekly inspection includes cylinder full, all gauges work, low pressure alarm is operational, all hoses are tight and free of leaks, facepiece is

clean and functioning properly, harness system is in good condition, all valves are operational, and PASS device is functional.

c) SCBA should be cleaned and sanitized after each use.
d) Facepieces should be washed with warm soapy water, sanitized, and lens dried with a lint free cloth or air-dried.
e) Monthly inspections include checking all components for deterioration, check for leaks around valves and air cylinder connections, check operation of gauges, valves, regulator, exhalation valve, and low air alarm.
f) Annual inspection and repairs should be made by a factory certified technician and in accordance with manufacturer guidelines.

10. Point out that air cylinders are stamped with the date of manufacture and the last hydrostatic test date.
    a) Steel and aluminum cylinders must be tested every five years.
    b) Composite bottles are tested to the standard in which they were purchased. Could be 3 or 5 years depending on the standard.

11. Note that hydrostatic testing must be performed in compliance with the U.S. Department of Transportation guidelines.

Reference: IFSTA 6th Edition Essentials of Firefighting manual, pages 205 and 206.
Reference: Manufacturer's Specification manuals.

APPLICATION

Have the Technical Rescuer candidates bring the PPE they respond to calls with to class. Using available manufacturer guidelines and appropriate NFPA and OSHA guidelines, have the candidates inspect each other's gear and report findings. At random have each candidate identify inspection, care, and maintenance procedures for various types of PPE.

SUMMARY

The importance of proper PPE and its correct use for any of the rescue environments cannot be over stressed. It is the

instructor's obligation to make sure the Technical Rescuer candidate understands that importance for the sake of safety and efficiency. It is also the obligation of the instructor to ensure that each candidate is familiar and comfortable working in the various rescue environments normally found in the candidate's jurisdiction while using proper PPE.

Although PPE is discussed for the disciplines listed in IFSTA Fire Service Rescue Practices, 7th Edition, it does little to show the ways to properly put on specialized gear such as SCBAs or PFDs. The instructor needs to be proficient in these techniques in order to pass them along to the candidates. Candidates need as much practice time as possible to become comfortable and proficient with donning and doffing the various types of PPE.