TERMINAL OBJECTIVE

Given incident scenarios, the participant will be able to identify the basic PPE requirements for operations based upon the anticipated job function and the capabilities and limitations of PPE provided by his employer.
EDUCATIONAL OBJECTIVES

Describe the advantages, limitations, uses, and operations components of the following types of respiratory protection at hazardous materials/WMD incidents:

- Positive pressure self-contained breathing apparatus (SCBA)
- Positive pressure air-line respirators with required escape unit
- Closed circuit SCBA
- Powered air-purifying respirators (PAPR)
- Air-purifying respirators (APR)
- Particulate respirator (2.3.1.1)

Identify skin contact hazards encountered at hazardous materials/WMD incidents. (2.3.2.1.)

Identify the purpose, advantages, and limitations of the following types of protective clothing at hazardous materials/WMD incidents:

- Chemical protective clothing
- Liquid splash protective clothing
- Vapor protective clothing
- High temperature protective clothing
- Proximity suit
- Entry suits
- Structural firefighting protective clothing (2.3.2.2)

USE OF PPE

Describe considerations for the use of personal protective equipment provided by the AHJ. (3.4)

Identify the importance of the buddy system. (3.4.1)

Identify the importance of backup personnel. (3.4.2)

Identify the safety precautions to be observed when approaching and working at hazardous materials/WMD incidents. (3.4.3)

Identify the signs and symptoms of heat and cold stress and procedures for their control. (3.4.4)

Identify the capabilities and limitations of personnel working in the personal protective equipment as provided by the AHJ. (3.4.5)

Identify the procedures for cleaning, disinfecting, and inspecting personal protective equipment provided by the AJH. (3.4.6)
Describe the maintenance, testing, inspection, and storage procedures for personal protective equipment provided by the AHJ according to the manufacturer’s specifications and recommendations. (3.4.7)
UNIT 3.3 — PERSONAL PROTECTIVE EQUIPMENT (CORE)

UNIT TIMELINE

<table>
<thead>
<tr>
<th>DURATION</th>
<th>TYPE</th>
<th>TITLE</th>
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</thead>
<tbody>
<tr>
<td>10 min.</td>
<td>Discussion</td>
<td>Protection and Standards</td>
</tr>
<tr>
<td>10 min.</td>
<td>Discussion</td>
<td>Respiratory Protection</td>
</tr>
<tr>
<td>10 min.</td>
<td>Discussion</td>
<td>Dermal Protection</td>
</tr>
<tr>
<td>10 min.</td>
<td>Discussion</td>
<td>Ensembles</td>
</tr>
<tr>
<td>5 min.</td>
<td>Discussion</td>
<td>PPE and WMD</td>
</tr>
<tr>
<td>5 min.</td>
<td>Discussion</td>
<td>Support Requirements for Entering the Isolation Area</td>
</tr>
<tr>
<td>5 min.</td>
<td>Review</td>
<td>Summary</td>
</tr>
<tr>
<td>30 min.</td>
<td>Activity 3.3</td>
<td>Evaluating PPE Needs</td>
</tr>
<tr>
<td>1 hr 30 min.</td>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>

REQUIRED MATERIALS

- Visuals for Unit 3.4
- Samples of various protective ensembles used within the community

ATTITUDES TO FOSTER

NOTE TO INSTRUCTOR: This unit presents the Core Competencies for PPE only. If the responder will be functioning in the Mission Specific areas using PPE provided by the employer, then the content of the Mission Specific Personal Protective Equipment unit should ALSO be presented.
I) PROTECTION & STANDARDS (10 MINUTES)

A) OSHA 29 CFR 1910.120 defines minimum level of protection

1) Full turnout gear and PP/SCBA

2) Level must be maintained until atmosphere is quantified (identified and measured)

It is the Incident Commander's responsibility to insure that all personnel operating within the hazard area are wearing the appropriate level of protection. The MINIMUM level of protection that MUST be worn during an emergency response is full firefighter protective clothing with PP/SCBA. Only after the Incident Commander has thoroughly evaluated the hazards through proper air monitoring, can that level of protection be reduced. THIS IS NOT NEGOTIABLE.

B) OSHA 29 CFR 1910.134 defines standards for respiratory protection programs

1) Training

   (a) Identifies the minimum training requirements for use of PPE

2) Selection and use

3) Fitness

   (a) Identifies the medical requirements for use of respiratory protective equipment (RPE)

   (b) Requires and user of RPE be medically evaluated by a physician prior to use

   (c) Medical questionnaire may be used provided all questions are appropriately answered

   (d) Any trigger question must be followed up with by physician
4) Fit testing
   (a) Must to completely annually
   (b) Quantitative Fit Tests (QNFT) provide the greatest accuracy.
   (c) Qualitative Fit Tests (QLFT) can also be used, but are much less accurate.

C) National Fire Protection Association (NFPA)

1) Standard 1991 – Vapor protective garment
   (a) With or without a flash fire protection option

2) Standard 1992 – Splash protective garments

   (a) Class 2 – Vapor or liquid hazards at or above IDLH
   (b) Class 3 – Liquid splash, vapor non-IDLH
   (c) Class 4 – Particulate/biological

D) National Institute of Justice

1) Law enforcement specific protective ensembles

2) Same chemical protective capabilities as NFPA 1994

3) Specific capabilities for the unique law enforcement functions
   (a) LERL 1 – IDLH and flash fire
   (b) LERL 2 – IDLH no fire
   (c) LERL 3 – Non-IDLH respiratory hazard
(d) LERL 4 – Perimeter security operations

II) RESPIRATORY PROTECTION (20 MINUTES)

A) Six types

The instructor will discuss various types of protective equipment for the purpose of informing the responder of the types of equipment that is available so that they can make an educated decision as to when to call for technician level assistance. This lecture is not intended to condone the use of specialized equipment by operations level responders.

1) Particulate filter
   (a) Filters particulates out of the air
   (b) Particulate size
       - N95
       - P100
   The terms 95 and 100 relate to the level of efficiency at removing aerosolized particulates as small as 0.1 microns in diameter. Filters rated at 100 are 99.97% efficient and those rated at 95 are 95% efficient
   (c) Lightweight
   (d) Limited length of use
   (e) Do not provide protection from chemical or asphyxiant hazards

2) Air purifying respirator (APR)
   (a) Pre-treats ambient air through use of chemical specific cartridges
   (b) Advantages
<table>
<thead>
<tr>
<th></th>
<th>Lightweight</th>
<th>Extended work periods</th>
<th>Stress reduction</th>
<th>Matches protection to actual hazard</th>
</tr>
</thead>
</table>

(c) Limitations

|   | Less protective | Protection factor 100:1 max | Not to be used in IDLH atmosphere | N/A for firefighting | Cannot be used in oxygen deficient atmospheres | Chemical specific | Must have known chemical and known concentration | Develops negative pressure on inhalation |

Discuss the use of APRs in decontamination. Explain that the likelihood of high concentrations is very low because responders are dealing only in small amounts and they are being diluted. However, to use APRs, responders must be properly fit tested. Additionally, this protective measure must not be utilized without expert technical recommendation.

3) PAPR (CBRN rating)

(a) Fan draws air into system and forces it through filters like APR
UNIT 3.3 — PERSONAL PROTECTIVE EQUIPMENT (CORE)

(b) Advantages
- Positive pressure — higher protection
- Cooling effect
- Much the same as APR
- Stacked filters

(c) Disadvantages
- Requires battery

4) Supplied Air Breathing Apparatus (SABA)

(a) Air is supplied to user from known source through tether line

(b) Advantages
- Reduced weight
- Extended operations periods
- Less physical stress, greater mobility
- Some are positive pressure
- Protection factor 10,000:1 if positive pressure

(c) Limitations
- Air source has potential for failure so emergency egress must be maintained
- Tether length limited to 300 feet
- Contamination or damage to tether
5) Positive Pressure Self-Contained Breathing Apparatus (PP/SCBA) (CBRN rating)

(a) Air supply worn on wearer’s back

(b) Advantages
- Readily available
- 30 to 60 min. duration
- Freedom of movement
- Greatest protection
- Protection factor 10,000:1

(c) Disadvantages
- Duration
- Weight
- Physical stress

6) Closed Circuit Breathing Apparatus

(a) Advantages — High level of protection
- Longer duration up to 4 hrs

(b) Disadvantages
- Air supplied is heated
- Not rated for firefighting or CBRNE
- Cold temp may impede scrubber
- May be difficult to decontaminate

B) Determining work mission duration
1) Low pressure alarm during normal firefighting operations
   (a) Provides a safety period to allow emergency egress
   (b) Decontamination is generally not required during firefighting.

2) During hazmat in which time may not be sufficient
   (a) Safety factor of 25 – 30% of bottle life
   (b) Travel time to and from site
   (c) Decontamination time
   (d) Workload expected
   (e) Environmental $<85 = 0 \text{ min.}, 85 – 90 = 5 \text{ min.}, >90 = 10 \text{ min.}$

Show the calculations for allowed work time in the hot zone adding all the factors. Explain why short duration work missions are needed.

III) DERMAL PROTECTION (10 MINUTES)

A) Minimum level of protection is full turnout gear and PP/SCBA

1) NFPA Standard 1971 addresses the requirements for FF turn out gear.

2) Ensembles can be purchased with or without chemical, biological, radiological and nuclear (CBRN) certification.

NFPA Certified turnout gear with the CBRN option meets the requirements for NFPA 1994 Class 2 ensembles.

B) Any higher protection requires specialized training.
C) Special fire protective clothing can also be utilized.

1) Must be defensive operations
2) Garment includes
   (a) Proximity clothing
   (b) Entry clothing
   (c) Structural firefighting clothing

D) Skin contact hazards

1) Vapors and gases
2) Vapors evolved from liquids
3) Solids

E) Dermal protective garments

1) Turnout gear has extreme protective limitations.
2) Types of protection
   (a) Vapor
   (b) Splash
   (c) Particulate
3) These combined with the different types of respiratory give us four levels of protection.

F) Splash protective garments

1) Provides protection from incidental splashes
2) No vapor protection
3) Cannot be used where
   (a) IDLH concentrations exist
   (b) There is potential for gross contamination with products absorbed through skin
   (c) In potential fire areas
   (d) Large volumes of vapors are expected
   (e) Heat stress is created because moisture cannot evaporate from skin

4) Are well suited for
   (a) Decontamination operations in well established systems
   (b) Dealing with non-sublimating solids
   (c) When perimeter operations quantified safe
   (d) Caring for patients that no longer pose significant risk of secondary contamination

IV) ENSEMBLES (10 MINUTES)

This discussion presents the classical method of PPE ensemble classification. The instructor must be familiar with ensemble used in their organization and community and be prepared to discuss standards such as NFPA 1991, 1992 and 1994 as well as the NIJ PPE standards as needed. Additional information can be found in the Mission Specific PPE training module.

A) Level B

1) Most closely NFPA 1994 Class 2 or 3
2) Splash suit + PP/SCBA
3) Provides splash protection with highest level of respiratory protection
   
   (a) Splash contact hazards from liquids and solids

B) Level C

1) Most closely NFPA 1994 Class 3

2) Splash suit
   
   (a) Air Purifying Respirator

   (b) Powered Air Purifying Respirator

3) Splash protection with lower level of respiratory protection

4) Must know chemical and concentration

C) Level A (vapor protection)

1) Most closely NFPA 1991 or NFPA 1994 Class 2

2) Protection from outside through full encapsulation

3) Designed for area of high concentrations of vapors and repeated contact or accidental immersion in product

4) Limitations:
   
   (a) No thermal protection

   (b) Limited dexterity and sight

   (c) Limited communications

   (d) Physical stress
      
      • 100% humidity

      • Temperature inside can be as much as thirteen degrees higher than outside.
(e) Specialized training and maintenance

5) Level A vapor protective suit and PP/SCBA

6) Offers the highest level of protection; but also, the greatest risk physical stress

D) Comparison of EPA/OSHA Levels A, B & C with NFPA standard ensembles

<table>
<thead>
<tr>
<th>Ensemble Description Using Performance-Based Standard(s)</th>
<th>OSHA/EPA Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFPA 1991, worn with NIOSH CBRN SCBA</td>
<td>A</td>
</tr>
<tr>
<td>NFPA 1994 Class 2 worn with NIOSH CBRN SCBA</td>
<td>A or B</td>
</tr>
<tr>
<td>NFPA 1994 Class 2 worn with NIOSH CBRN APR</td>
<td>C</td>
</tr>
<tr>
<td>NFPA 1994 Class 3 worn with NIOSH CBRN SCBA</td>
<td>B</td>
</tr>
<tr>
<td>NFPA 1994 Class 3 worn with NIOSH CBRN APR</td>
<td>C</td>
</tr>
</tbody>
</table>

Source: DMS Interagency Board

V) PPE AND WMD (5 MINUTES)

A) Radiological

1) Radiological materials are particulates

2) Respiratory protection prevents inhalation and ingestion.

3) Particulate protective garments will enhance the ability to decontaminate.

4) NFPA 1994 Class 4 ensembles with PAPR

B) Nerve agents

1) Mostly low volatility liquids

2) Positive pressure SCBA is selected in IDLH environments.

3) In low vapor concentrations, NFPA 1994 Class 2 ensembles are indicated.

C) Blister agents
I) Low volatility liquids

2) Positive pressure SCBA is selected in IDLH environments

3) In low vapor concentrations, NFPA 1994 Class 2 ensembles are indicated

D) Biological agents

1) Particulates

2) Particulate respiratory protection

3) Particulate protective garment found in NFPA 1994 Class 4

Have the participants explain how much protection their PPE would provide for each of the above WMD classes.

Draw the participants’ attention to the matrix in their student manual and reinforce the different levels of protection.

Discuss the concept that no one suit is good for all chemicals. The manufacturer will supply their department with a list of chemicals their suit has been tested against. They will also list the break through time of each. They will need to pick the garment that offers the longest time.

VI) SUPPORT REQUIREMENTS FOR ENTERING THE ISOLATION AREA (5 MINUTES)

A) OSHA 29 CFR 1910.120 requires support functions be in place for personnel entering into isolation zones caused by hazardous materials

1) Use of a buddy system

2) Use of RIC

3) EMS on scene dedicated to responders

4) Decontamination in place

5) Proper level of PPE
6) Proper training

B) Maintenance of PPE

1) Must be maintained according to manufacturer’s recommendations
   (a) Storage temperature
   (b) Shelf life
2) Enforced by employers SOPs
3) Cleaned and disinfected according to manufacturer’s recommendations

VII) SUMMARY (10 MINUTES)

A) Hazards based response

1) Identify the hazards present using TEAM CPR
2) Develop protective measures necessary to bring each of the identified hazards to an acceptable level of risk
3) If the risk remains unacceptable, get help

B) Personal protective equipment

1) Minimum level of protection is PP/SCBA and full firefighter protective clothing until proven otherwise. No exceptions.
2) Levels of respiratory protection
   (a) APRs and Positive SABA or SCBA
   (b) APRs not applicable to the operations level responder without fit testing and expert evaluation
3) Levels of dermal protection
   (a) Bunker gear
   (b) Particulate protective
(c) Liquid Splash resistant

(d) Vapor protective

4) Level of PPE ensembles

Activity 3.3 (30 minutes)

Evaluating PPE Needs

Demonstrate to the class the various types and levels of protection used by your organization and community. Discuss the capabilities and limitations of each and emphasize the additional training requirements necessary for their use.