

**PERSONAL PROTECTIVE EQUIPMENT<sup>®</sup>**  
**INSTRUCTOR'S GUIDE**

**August 1994**

Prepared for the  
**Chemical Stockpile Emergency Preparedness Program**

**FEDERAL EMERGENCY MANAGEMENT AGENCY**  
Preparedness, Exercises, and Training Directorate  
Washington, D.C.

and

**U.S. DEPARTMENT OF THE ARMY**  
Office of the Assistant Secretary  
Installations, Logistics, and Environment  
Washington, D.C.



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**PERSONAL PROTECTIVE EQUIPMENT  
INSTRUCTOR'S GUIDE**

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## **PREFACE**

This **Instructor's Guide** has been developed for use in a Federal Emergency Management Agency training course on **Personal Protective Equipment (PPE)** for the CSEPP (Chemical Stockpile Emergency Preparedness Program). The course is largely based on the detailed literature provided by U.S. Army and the respirator manufacturers. You will also find specific references to related materials already developed for the CSEPP that may be useful in learning about the use of PPE. It is likely that this course may be taught at the same time as or as a module of the *Agent Characteristics and Toxicity First Aid and Special Treatment (ACT FAST)* Course or of the *Chemical Awareness* Course.

This course is targeted to emergency response personnel responding to a chemical warfare agent accidental release; to the extent that the PPE described is appropriate for recovery activities, it may also be applicable to those activities.

Much of this material is derived directly from official documents provided by the U.S. Army and the respirator manufacturers. In many cases the only changes made to the information as given were the modifications necessary to adapt the procedures to the civilian environment. Additional materials and review were provided by U.S. Army Defense Ammunition Center & School; U.S. Materiel Command; U.S. Army Research Institute of Environmental Medicine; Federal Emergency Management Agency; Argonne National Laboratory, and Oak Ridge National Laboratory. The training materials were prepared by C.B. Foust, C.J. Coomer, and E.D. Copenhaver of Oak Ridge National Laboratory.

**Please remember that prerequisites before this training are certification of medical competency, agreement to remain clean shaven for duration of the program, and completion of the Chemical Awareness or ACT FAST training.**

# ***INSTRUCTOR'S GUIDE***

## ***COURSE DESCRIPTION***

### **Purpose**

This course provides knowledge about the role of personal protective equipment (PPE) in the Chemical Stockpile Emergency Preparedness Program (CSEPP) emergency response, the different types of PPE involved in the Program, how to use and maintain the PPE, and factors that affect work rules, policies, and procedures relating to use of PPE.

### **Learning Objectives**

The objectives of the training module are to allow the participants to:

- Protect themselves from contamination by donning PPE,
- Remove potentially contaminated PPE without contaminating themselves,
- Recognize the limitations of PPE,
- Know when and how to use the chemical detector kits, and
- Know their State and local work rules, policies and procedures, as well as those established by CSEPP.

### ***TARGET AUDIENCES***

Training materials have been designed to prepare emergency workers to use PPE properly in a chemical agent emergency. Only personnel in States or counties potentially affected by emergencies related to the CSEPP are targeted for this training. The laws and regulations of each affected State will have to be reviewed to determine if additional training on PPE is required for the emergency workers. This document has been prepared to assist the trainer in preparing these persons to perform job functions requiring PPE.

All persons designated as part of the emergency response (e.g., police, medics, paramedics, firefighters, medical personnel) to a chemical agent release must have appropriate access to PPE. All persons who anticipate being active in potentially hazardous environments as part of the emergency response plan must be equipped with the recommended PPE and must be trained in its proper use.

### **Qualifications for Attendance**

This course is designed for those workers in CSEPP whose functions may require them to use PPE. A prerequisite or concurrent course requirement is either the Chemical Awareness Course or the ACT FAST Course. In addition, each person must agree to the conditions for issuance and to the medical requirements specified.

## **FACTORS CONTROLLING TRAINING**

### **Availability of PPE**

Only people who have successfully completed training in the chemical hazard, self-protection and use of PPE will be eligible to receive equipment. Based on information compiled on each individual (e.g., clothing size, whether corrective lenses used, etc.), a customized order will be placed with the U. S. Department of Defense's "supply" organization, the Defense Logistics Agency. The order will be filled and then sent to the location specified by the State where actual distribution of the equipment will occur.

Each person for whom equipment has been received will be asked to report to the distribution location. Once there the individual will be required to demonstrate the ability to don and remove the equipment. This will be done in the presence of an officially designated individual who will then complete, sign and send to the designated State office (for retention) a written certification of competence. Before those whose performance is judged to be successful may leave with their equipment, they will be required to

- sign one document acknowledging receipt of the equipment, and
- agree in writing to the terms of issuance contained in a second document (including but not necessarily limited to constraints on use of the equipment, mandatory procedures for regular care and inspection of the equipment, return of the equipment upon departure from the CSEPP or under other specified circumstances, and personal payment for equipment lost or damaged due to negligence or failure to provide proper care).

This equipment is only to be used in the event that a chemical accident or incident involving chemical weapon agents has occurred. Upon determination that a chemical accident or incident has occurred, the U.S. Army will notify State and local emergency response operations.

A protective suit, hood, gloves, apron, overshoes, powered air-purifying respirator (PAPR), and a chemical detector kit will be kept available in the ready bag for each worker in the event of an emergency situation. Sets of backup and training PPE will also be made available for emergency workers.

Upon termination of involvement with the CSEPP, the worker shall return his/her protective suit, hood, gloves, apron, overshoes, ready bag, PAPR, and chemical detector kit as outlined in the State and local plan.

## Respirator Fit Testing

Fit testing is being provided by the respirator manufacture (Racal), by the U. S. Army Defense Ammunition Center & School (USADACS), by the State, or by local personnel properly qualified [as required by Code of Federal Regulations (CFR) 1910.134 (e) (5)] to perform fit testing. 29 CFR 1910.134 (e) (5) states that respirators shall be fitted properly and shall be tested for their facepiece-to-face seal and shall not be worn when conditions prevent a good face seal. The 29 CFR 1910.1001 Appendix C outlines the mandatory testing procedures to be followed for qualitative and quantitative fit testing.

Fit testing should be repeated periodically (for instance, annually). One suggestion would be to issue respirator fit cards which each emergency worker would carry in order to confirm his/her fit-test certification and to serve as a reminder when it is time to repeat the fit-test. 29 CFR 1910.1001 Appendix C states fit testing should be repeated immediately when the worker has:

- weight change of 20 pounds or more
- significant facial scarring in the area of the facepiece seal
- significant dental changes; i.e., multiple extractions without prosthesis, or acquiring dentures
- reconstructive or cosmetic surgery, or
- any other condition that may interfere with facepiece sealing

29 CFR 1910.134 (b) (10) states the user's medical status should be reviewed periodically (for instance, annually). Be familiar with State and local requirements. The American National Standards Institute recommends the worker see the physician and answer a medical questionnaire (See Study Guide Appendix F Suggested Medical Questionnaire for Respirator Users) each year. Physical examinations would be required once every 5 years for workers below the age of 35, once every 2 years to age 45, and annually thereafter.

Fit testing shall be done while wearing protective equipment, such as corrective spectacles and hood, which will be worn during work activities and which could interfere with the fit and/or wearer acceptance.

## **Work Rules Based on State/Local Decisions**

At least two options have been identified for work rules, either of which can be adopted in State and local emergency plans.

### Option 1 – Plan Specifies That Emergency Workers Must Wear PPE When They Enter Any Area Where Protective Actions Have Been Determined For Public

Since the process of determining public protective actions is conservative in every jurisdiction, this policy will preclude emergency workers from being exposed to chemical agent without PPE. This includes those personnel (i.e., traffic control, decontamination stations, and emergency medical response) who assist in implementation of these protective actions.

### Option 2 – Plan Requires That Emergency Workers Wear PPE When They Enter Any Area Where Accident Conditions Indicate Chemical Agent May Be Present As Vapor Or Deposited On The Ground

In contrast to requiring PPE whenever public protective actions are specified, this strategy would require PPE only where there is reason to believe agent may be present, thus minimizing the risk of heat stress to emergency workers who otherwise might be required to wear PPE in areas where public protective actions are precautionary rather than based on projected exposure.

## **Army Precedents for PPE Selection**

It is suggested that the State and local governments may wish to adapt their emergency worker protective clothing and equipment rules in a manner similar to the Army's standard Mission-Oriented Protective Postures (often called MOPP). The Army MOPP Strategy would have to be altered somewhat to meet civilian needs, but its basic structure could be retained using the following modified structure:

The responsible person in command and control at the Emergency Operations Center and the in-field leader must be familiar with standard MOPP levels. Knowing these levels will aid the person in command in making rapid, educated decisions regarding the level of MOPP to be worn by the emergency workers. The Emergency Operations Center will determine which protective posture the emergency workers in the field will assume and then direct the workers to dress in accordance with the appropriate MOPP level. The decision on appropriate MOPP level will be based on the emergency worker's proximity to the projected plume, temperature considerations, the anticipated work functions and duration of expected tasks. The standardized MOPP levels assume that individual workers are carrying the specified clothing and equipment.

Level	MOPP1	MOPP2	MOPP3	MOPP4
Overgarment	Worn, open or closed	Worn, open or closed	Worn, open or closed	Worn, closed
Overshoes	Carried	Worn	Worn	Worn
PAPR/Hood	Carried	Carried	Worn, hood open or closed	Worn, hood closed
Gloves	Carried	Carried	Carried	Worn

### MOPP1

When MOPP1 is required, workers immediately don the protective suit. In hot weather the overgarment jacket can be left unbuttoned, and the protective suit can be worn directly over underwear. MOPP1 provides a great deal of protection against persistent agent. This level is automatically assumed when the emergency begins.

### MOPP2

When MOPP2 is required, individuals put on the green vinyl overshoes (GVOs) in addition to the protective suit. As with MOPP1, the overgarment jacket may be left unbuttoned, but trousers remain closed. When worn with a PAPR, this MOPP level would provide significant additional protection to individuals crossing or occupying a contaminated area, even though civilian emergency workers are not expected to enter such areas.

### MOPP3

When MOPP3 level is required, individuals add the protective respirator and hood. At this point the individual is almost completely covered. Again, flexibility is built into the system to allow workers relief at MOPP3. Particularly in hot weather workers can open the overgarment jacket and roll the respirator hood for ventilation, but trousers remain closed. Workers are at this point properly protected against vapor hazards.

### MOPP4

When MOPP4 is required, workers will completely encapsulate themselves by closing their overgarments, rolling down and adjusting the respirator hood, and putting on the rubber gloves with cotton liners. MOPP4 provides the highest degree of chemical protection.

**It will be necessary for the instructor to determine which Work Rules Option is chosen by the State and local government in order to customize this portion of the instruction to State and local needs.**

## **TRAINING STRATEGY**

To ensure off-site emergency workers are prepared to the maximum extent possible, training materials have been developed on the use and maintenance of PPE, the nature of the threat, ergonomic considerations, and work practices [e.g., adjustment for working under varying climatic conditions (heat/cold/humidity), exertion, monitoring of workers, etc.]. In addition, PPE equipment is being made available to emergency workers through appropriate State and local organizations. The capabilities of individual emergency workers to properly use the PPE will, as a minimum, be evaluated as part of the training program.

Before training, a medical exam should be performed. 29 CFR 1910.134 (b) states that persons should not be assigned tasks requiring the use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent. See the Study Guide for suggested guidelines on the medical examination of personnel required to use respirators.

Training alone cannot ensure readiness in the event of a chemical accident or incident. Therefore, in addition to this PPE training, the PPE must be adequately maintained and should be available at all times. Regular drills and training sessions designed to maintain familiarity with the equipment should be incorporated into emergency response protocols.

The PPE training can be used for formal classroom review, or for step-by-step detailed demonstration of the skills needed for PPE use. However, in the initial training sessions, step-by-step detailed demonstration of PPE skills is required, and must be documented, using the Checklists provided in the course materials. The following sections of this Instructor's Guide also provide handouts, vu-graphs or slides, and review questions.

If you are using these training materials in a stand-alone environment, as opposed to teaching them as a part of the *Agent Characteristics and Toxicity First Aid and Special Treatment (ACT FAST)* or *Chemical Awareness* courses, you may wish to use the CSEPP video on *Chemical Stockpile Agent Characteristics and Effects* as a part of your training in order to refresh the participants' knowledge on the potential health effects of the nerve and blister agents.

## **Time Schedule for Class**

- General Information (15 min)
- Clothing Lecture/Demonstration (30 min)
- Power Air-Purifying Respirator (PAPR) Lecture/Video/Demonstration (30 - 45 min)
- Chemical Detection Kits Lecture/Demonstration (15 min)
- Review Questions (30 min)
- Skills Review and Fit Testing (up to 30 min/per person, based on number of trainees, number of instructors and availability of equipment)

## **Description of Required Equipment**

Vu-Graph or Slide Projector  
Video Projector  
Flip Charts or Chalk Board  
Pencils  
Protective Suits  
Hoods  
Aprons  
Green Vinyl Overshoes  
Glove Sets  
Powered Air-Purifying Respirator (PAPR) Unit  
Candle (Fit-testing)  
Probe 7 Fit Test Unit (Probe visors)  
Port-A-Count Fit Test Unit  
PAPR Spectacle Kit  
Volt meter  
Chemical Detector Kits

## **List of Materials Needed**

Personal Protective Equipment Study Guide  
Donning Protective Clothing Wall Charts  
Removal of Protective Clothing Wall Charts  
Checklists on Clothing  
Breathe-Easy Systems Instruction Manual (provided with each PAPR ordered from Racal Health and Safety, Inc.)  
Breathe-Easy Turbo Unit Instruction, Racal Health and Safety, Inc., 529-03-68, 10/92 (24 min) (video)  
Breathe-Easy Facepiece Instruction, Racal Health and Safety, Inc., 529-03-68, 10/92 (\_\_\_ min) (video)  
Breathe-Easy PAPR Donning and Removal Wall Chart, Racal Health and Safety Inc.  
Respirator Cards  
Checklists on PAPRs

## Instructor Preparation Schedule

Use this checklist as you prepare to teach this course. Active learning occurs when the instructional environment is properly set up and instructional supports don't get in the way during delivery of instruction. In addition you may wish to review relevant portions of *Techniques for CSEPP Instructors* as you prepare for the course.

### One month before the course:

- Confirm your reservation for the facility
- Verify the content of the trainee manual and handouts
- Check with another instructor to be sure your time schedule for each lesson is realistic
- Practice demonstrations to be sure they can be done in the time you planned

### One week before the course:

- Assemble and inspect all course materials
- Assemble all supplies for yourself and for trainees
- Practice using all media and equipment
- Get names and registration information of your trainees
- Get the name and phone number of the nearest media support person in case bulbs burn out or fuses blow
- Be sure flip chart sheets can be posted on the classroom wall and markers don't bleed through—order more paper if they do.

### One hour before the course:

- Be sure projectors work
- Adjust classroom heating, lighting, and ventilation
- Arrange handouts and attendance sheet on a table near the entry door
- Lay out all supplies and materials you need to use in a place where they are easily accessible and won't interfere with your use of the instructor manual
- Practice the first five minutes of your presentation.

*Adapted from Nilson, 1989*

## Lecture Notes Planner

Title: \_\_\_\_\_ Audience: \_\_\_\_\_

Length of Lecture: \_\_\_\_\_ Date of Delivery: \_\_\_\_\_

- A. Define a succinct framework
  1. List objectives for the learner
  2. Define key terms alphabetically for your quick reference during the lecture
  3. List media and equipment required
  
- B. Structure the body of the lecture
  1. List key points in the order in which you will present them
    - Allow plenty of space between them
    - Write out key phrases; practice saying them aloud
  2. Define positive and negative instances of each conceptual point (examples of what it is and what it is not)
  3. Make notes in the margin correlating media with content
  4. Underscore or highlight transitions between topics
  
- C. Structure the end of the lecture
  1. Synthesize important information
  2. Re-emphasize or re-cast key points
  3. Suggest job-related action based on the key points
  4. Send them home challenged and smiling!

*Adapted from Nilson, 1989*

## Demonstration Planner

Title: \_\_\_\_\_ Audience: \_\_\_\_\_

Estimated Time: \_\_\_\_\_ Date of Delivery: \_\_\_\_\_

- A. List objectives for the learner
- B. List steps in the demonstration
  - 1. Prepare a "Step-by-Step" handout for each trainee
  - 2. Use a job aid wall chart
- C. Make the delivery personal
  - 1. Be sure each trainee can see all steps being demonstrated
  - 2. Maintain eye contact with each trainee during the demonstration
  - 3. Relate the demonstration to personal applications
  - 4. Relate the outcomes of training to a personal business goal
- D. Make the delivery active
  - 1. Involve each trainee; encourage each to handle equipment prior to or during the demonstration
  - 2. Supervise each trainee's demonstration of competence individually
  - 3. Provide feedback regarding success rate to each trainee immediately
  - 4. Involve each observer trainee in commentary, questioning, or assisting

*Adapted from Nilson, 1989*

## ***COURSE CONTENT***

The Study Guide summarizes the elements of information required to fulfill the learning objectives. The study guide content is listed below:

Objectives

Introduction

What Is PPE

- Definition

- Function

- Governmental PPE Requirements

Who Needs PPE and Training

Types of Personal Protective Equipment (PPE)

- CSEPP Protective Clothing Components

- Respiratory Equipment

- Why the PAPR was Selected

- Limitations of PAPRs

- Chemical Detectors

Respirator Fit Testing

- Facepiece Fit

- Quantitative Fit Test

- Qualitative Fit Test

Storage of PPE

- Protective Clothing

- Chemical Detectors

- Respiratory Equipment

Work Rules

- Introduction

- Basis for Work Rules

- State and Local Government Decisions on Work Rules

- Army Precedents for PPE Selection

- Basis and Timing for Working in PPE

Work Rules Summary

- Plan Ahead

- Think Teamwork

- Work Smart

References

Appendix A. Checklists for Protective Clothing and Respirator Use

Appendix B. Governmental PPE Requirements

Appendix C. Factors Controlling Limited Stay Times

Appendix D. First Aid/Buddy Aid

Appendix E. Comparison of Army and EPA PPE Levels.

Appendix F. Suggested Guidelines for the Medical Examination of Personnel Required to Use Respirators

## **Handouts**

Because it is basically a step-by-step listing of what to do, information on use of the PPE has been developed as short checklists that describe these steps. (See Appendix A)

## **Vu-Graphs or Slides**

A set of vu-graphs or slides are included for use in this training course. Full size copies are included in Appendix C for use in making vu-graphs, and color slides are enclosed.

## **Effect of State or Local Decisions on Course Content**

The instructor must also check with State and local program management to learn what decisions are made on the work rules applicable in the State or local program (See Option 1 or Option 2 under Factors Controlling Training). Among the State or local decisions that could effect this training are:

- Are there State or local decisions on work rules, such as Option 1 or Option 2?
- Are there State or local regulations that specify types of PPE or appropriate levels of protection for specific tasks (e.g., police, medics, firefighters)?
- Are there State or local decisions on medical exam requirements for emergency workers required to wear respirators? (See Appendix E, Study Guide)
- Are there State or local decisions on where PPE will be stored?
- Are there State or local decisions that might affect the stay times based on the capabilities of the protective clothing and/or the PAPRs?

## ***EVALUATION***

Evaluation will take place in the classroom, consisting of measurement of the objectives by various methodologies and techniques including review and demonstration of skills. This evaluation serves two purposes: to evaluate the participants' degree of understanding and to determine any revisions necessary in future courses.

Demonstration of skills is required, and checklists are enclosed to facilitate demonstration of skills and to document understanding the work rules and practices. Trainees must use the checklists. The Review Questions can be used as a self-study review or as examination questions on the knowledge base of this unit. It is recommended that only persons scoring at least 85% on these review questions be permitted to use PPE.

In addition, evaluation of the course is recommended by the participants and instructors, using the general form usually included in CSEPP courses, or the supplemental one included in this Guide.

## Review Questions

Assess understanding of the material presented in this training by completing the following questions.

### Multiple Choice

1. The PPE used in CSEPP for chemical agent emergencies includes:
  - a. protective suit and PAPR
  - b. protective suit, hood, gloves, overshoes, PAPR and apron
  - c. protective suit, hood, gloves, overshoes, PAPR and, when appropriate, apron
  - d. protective suit, gloves, and PAPR
  
2. This equipment is to be used
  - a. in the event that a chemical accident or incident involving transportation of hazardous materials has occurred
  - b. only in the event that a chemical accident or incident involving chemical weapon agents has occurred
  - c. all of the above
  - d. none of the above
  
3. Emergency workers involved in the off-site response may perform a variety of functions including:
  - a. providing emergency medical services
  - b. controlling evacuation traffic
  - c. performing emergency decontamination
  - d. all of the above
  
4. Emergency workers must wear PPE
  - a. when they enter any area where protective actions have been determined for public
  - b. when they enter any area where accident conditions indicate chemical agent may be present as vapor or deposited on the ground
  - c. a or b, based on decision of State and local government
  - d. none of the above

5. The following actions can assist the emergency worker is using the PPE within its capabilities:
  - a. use of limited stay times
  - b. use of the chemical detector kits
  - c. avoidance of IDLH environments
  - d. all of the above
  
6. The vapor-barrier bag holds the protective suit in order to:
  - a. keep from having to decontaminate it before use
  - b. protect it from rain, moisture and sunlight that might affect its protective effectiveness
  - c. keep it from being used in other chemical emergencies
  - d. make it fit into the limited space in Ready Bag
  
7. You should wear the apron if you:
  - a. perform decontamination tasks
  - b. direct traffic
  - c. both a and b
  - d. none of the above
  
8. The chemical detectors can detect
  - a. liquid concentrations of chemical agents
  - b. vapor concentrations of chemical agents
  - c. a and b above
  - d. none of the above
  
9. Powered air-purifying respirators (PAPRs) protect against
  - a. nerve agent exposure only
  - b. particulates, gases and vapors
  - c. blister agent exposure only
  - d. dermal exposure
  
10. The PAPR consists of the following parts:
  - a. a full facepiece, a breathing tube assembly, and appropriate cartridges
  - b. a full facepiece, a belt-mounted turbo unit, a battery pack, a breathing tube assembly, and appropriate cartridges
  - c. a full facepiece, a battery pack, and a breathing tube assembly
  - d. a full facepiece, a breathing tube assembly, and appropriate cartridges

11. The most common collection method for airborne particulates is a cartridge (also commonly referred to as filter or canister). In the Ready Bag you will find
  - a. the PAPR with one set of cartridges for the chemical accident/incident
  - b. training cartridges
  - c. one set of cartridges for backup
  - d. all of the above
  
12. Off-site emergency workers will handle
  - a. traffic control
  - b. aggressive spill containment
  - c. cleanup operations
  - d. none of the above
  
13. Emergency workers who enter an area where PPE may be advisable must limit their activities that protection from contamination and excessive exposure is assured. This requires that emergency workers
  - a. not remain in a potentially contaminated area long enough to exceed the agent absorption capacity of the cartridges used in the PAPR
  - b. be exposed to agent deposition density levels exceeding the maximum capability of the protective suits
  - c. remain in a potentially contaminated area long enough to receive an agent dosage sufficient to affect their health or their ability to execute assigned tasks
  - d. be sent into environments which are known or suspected to be immediately dangerous to life or health (IDLH)
  
14. The amount of heat accumulation or heat stress depends upon
  - a. amount of physical activity, level of hydration, and clothing worn
  - b. terrain and climatic conditions
  - c. a and b above
  - d. none of the above
  
15. How is performance affected by heat stress?
  - a. routine tasks are done more quickly
  - b. there are no significant effects
  - c. reaction times and decision times are longer
  - d. vigilance is sharpened

16. Cold can also effect the use of PPE by
- breaking the air hoses
  - freezing garments until work cannot be accomplished
  - making chemical detectors hard to operate
  - all of the above
17. When you remove the protective suit from the vapor barrier bag, the first thing you should do is
- check for rips, tears, any flaws in suit
  - don the trousers
  - don the jacket
  - none of the above
18. The hood should be stored in the Ready Bag in the following manner
- folded neatly next to vapor barrier bag
  - placed over the PAPR and its tubing
  - in the vapor barrier bag
  - none of the above
19. When removing the protective clothing, it is important for you to
- remove the overshoes first
  - keep the protective suit whole to be worn again
  - go through decontamination procedures if you suspect contamination
  - none of the above
20. Confirm that the PAPR battery pack:
- is fully charged
  - is fully charged, power lead is plugged into turned-on battery pack, and air flows through the system
  - is turned on, and air flows through the system
  - none of the above

## **Answer Key to Review Questions**

The Answer Key for the Review Questions can be found in Appendix B.

## **Checklists**

The Checklists to be used in class and in actual performance are contained in Appendix A.

## **PPE COURSE EVALUATION**

*Check the words that describe your reactions to today's session:*

- slow-moving
- illuminating
- overwhelming
- fun
- well-organized
- inappropriate

*Complete the following sentence:*

Something I am still confused about is: \_\_\_\_\_

---

---

---

What was the most important thing you learned today? \_\_\_\_\_

---

What *ONE WORD* best describes your reaction to today's session: \_\_\_\_\_

What would you like less of in this program? \_\_\_\_\_

---

---

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## ***INSTRUCTOR SUGGESTIONS***

After conducting this course, you may provide direct comments on the course and course materials by using this form if you wish.

1. List any questions from the participants that you could not answer:
  
  
  
  
  
  
  
  
  
  
2. List any additional information that participants would have liked to have covered in the course:
  
  
  
  
  
  
  
  
  
  
3. List any information that instructor or participants believed to be incorrect or inadequate:
  
  
  
  
  
  
  
  
  
  
4. List those features of the training course package that you found to be most useful:
  
  
  
  
  
  
  
  
  
  
5. Any other comments:

Name \_\_\_\_\_ Course \_\_\_\_\_

Phone Number \_\_\_\_\_ Date Taught \_\_\_\_\_

Address \_\_\_\_\_

**Return to CSEPP State Training Officer to be forwarded to the CSEPP Training Management Team, FEMA Headquarters**

## **REFERENCES FOR TRAINING COURSE MATERIALS**

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(Status: A= accepted; D= draft)
- D Planning Standards for Protective Action Decision Making (A)
  - E Planning Standards for Protective Actions and Responses (A)
  - H Planning Standards for Emergency Worker Operations (D)
  - L Planning Standards for Decontamination (A)

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## **APPENDIX A**

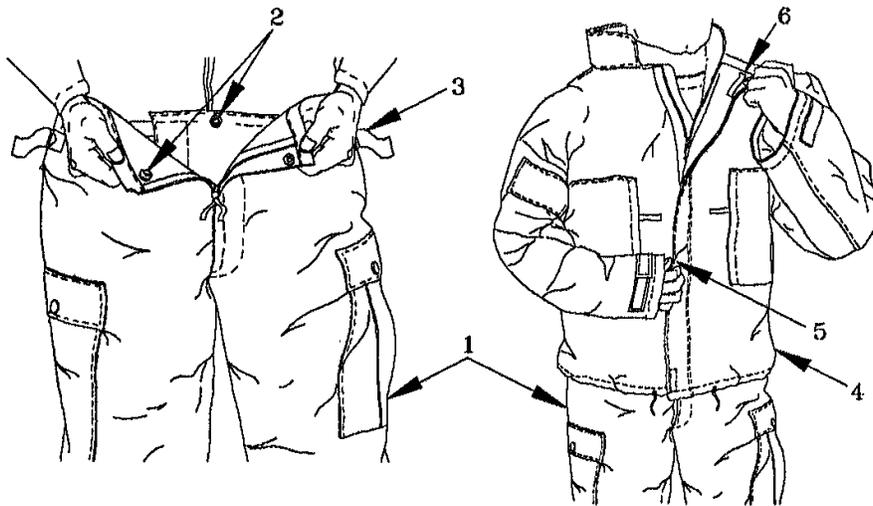
### **CHECKLISTS FOR PROTECTIVE CLOTHING AND RESPIRATOR USE**

This Appendix is reprinted from the *Operator's Manual for Individual Chemical Protective Clothing*, prepared by Headquarters, Departments of the Army and Marine Corps, Washington, D.C., and from the *Breathe-Easy Systems Instruction Manual*, prepared by Racal Health & Safety, Frederick, Maryland.

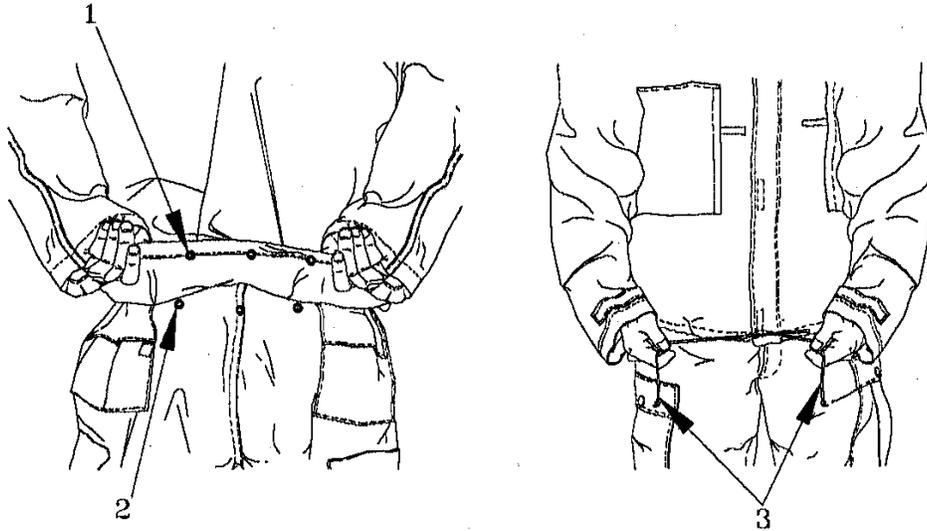
## ***CHECKLIST FOR DONNING PROTECTIVE CLOTHING***

Don the protective suit in the following manner:

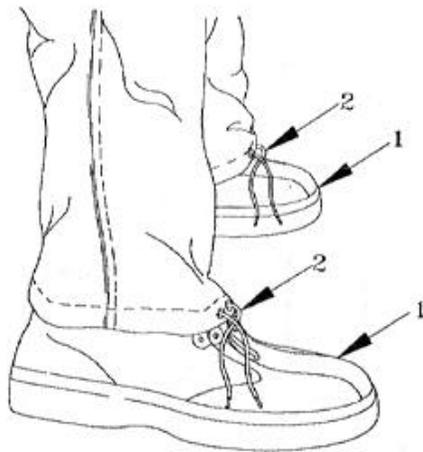
- \_\_\_\_\_ 1. Select proper size. Please refer to Size Prediction Chart.
- \_\_\_\_\_ 2. Open vapor-barrier bag and remove protective suit.
  - \_\_\_\_\_ a. If damaged, exchange item for a new one. Retain containers and packing.
- \_\_\_\_\_ 3. Don overgarment trousers (1) over normal clothes (or underwear in hot climate).



- \_\_\_\_\_ 4. Close the fly, fasten two fly opening snaps (2),
  - \_\_\_\_\_ a. Adjust waistband tabs (3) for snug fit.
- \_\_\_\_\_ 5. Don overgarment jacket (4),
  - \_\_\_\_\_ a. Close front slide fastener (5), and
  - \_\_\_\_\_ b. Secure three hook and pile fasteners tapes on front flap (6).



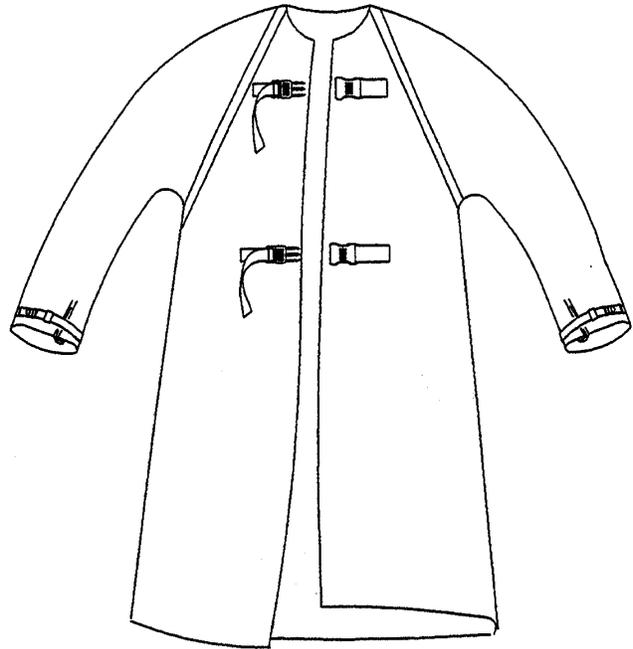
- \_\_\_\_\_ 6. Fasten three snaps in rear of jacket (1) to three snaps on overgarment trousers (2).
- \_\_\_\_\_ 7. Adjust and tie jacket waist drawcord (3) for snug fit to minimize bellowing action that may draw contaminants into suit.
- \_\_\_\_\_ 8. Don and button GVOs.



- \_\_\_\_\_ 9. Blouse overgarment trouser legs (2) over GVOs (1).
- \_\_\_\_\_ 10. Close trouser leg slide fastener (3) and snug and tie drawcords (4).

\_\_\_\_\_ 11. Don apron (if needed).

- \_\_\_\_\_ a. Adjust wrist straps to maintain comfortable but snug fit, ensuring gloves remain inside apron sleeves.
- \_\_\_\_\_ b. Have buddy secure back straps.

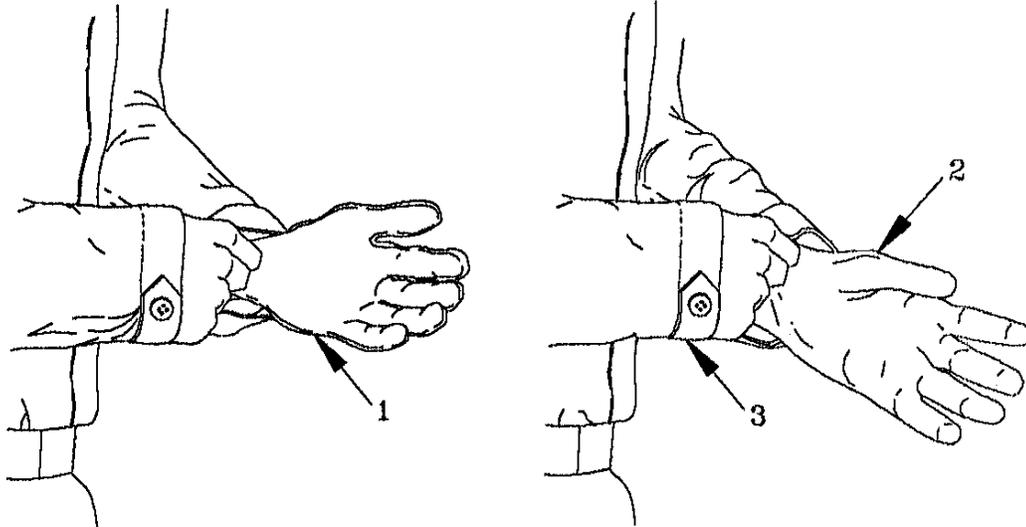


\_\_\_\_\_ 12. Put hood on PAPR (hood should be stored on the PAPR).

- \_\_\_\_\_ a. Insert the PAPR breathing tube into the hood tubular cover.
- \_\_\_\_\_ b. Extend the breathing tube while working the hood cover over it.
- \_\_\_\_\_ c. Secure the hood cover to the breathing tube.



\_\_\_\_\_ 13. Don PAPR and hood. **Please refer to the PAPR Checklist for exact donning procedures for PAPR. When completed, fasten down the hood with straps.**



\_\_\_\_\_ 14. Don glove liners and gloves as follows:

- \_\_\_\_\_ a. Don glove liners (1). Don gloves (2) over liners (1).
- \_\_\_\_\_ b. Place cuffs of overgarment jacket (3) over gloves (2) and secure hook and pile fastener tapes (4) for snug fit.

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## **SIZE PREDICTION CHART FOR PROTECTIVE SUIT**

Waist Size	Over underwear	Over clothes	Over coat	Over coat and trousers
23"	XXX-S	XX-S	X-S	S
27"	XX-S	X-S	S	M
31"	X-S	S	M	L
35"	S	M	L	X-L
39"	M	L	X-L	XX-L
43"	L	X-L	XX-L	XX-L



## ***CHECKLIST FOR REMOVAL OF PROTECTIVE CLOTHING***

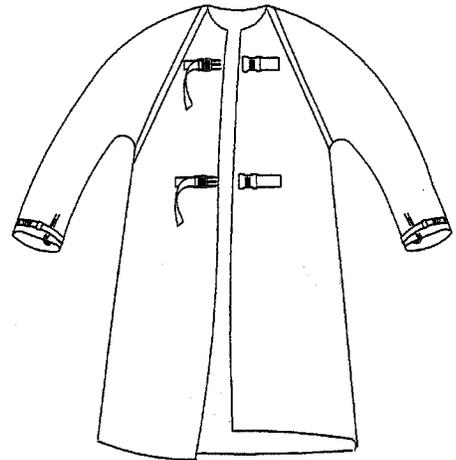
These procedures should be followed when removing the protective.

Perform the following steps.

- \_\_\_\_\_ 1. Loosen the hood from the rest of the protective clothing, but do not remove.



- \_\_\_\_\_ 2. Unfasten the hook and pile fastener tapes (1) at wrist of apron (if worn) and overgarment jacket.
- \_\_\_\_\_ 3. Loosen back tapes and remove apron (if worn).

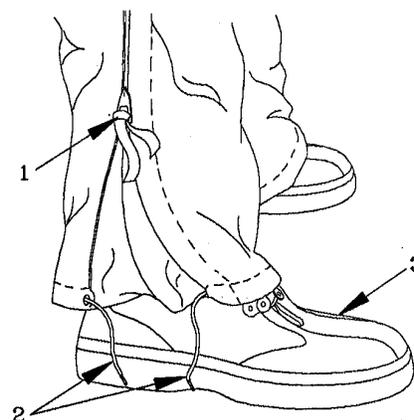


\_\_\_\_\_ 4. Turn off and remove the turbo unit.



\_\_\_\_\_ 5. Open trouser leg slide fasteners (1) and drawcords (2) on overgarment trousers.

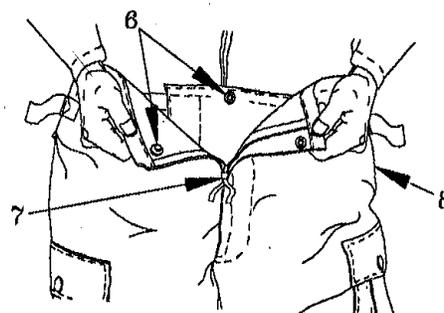
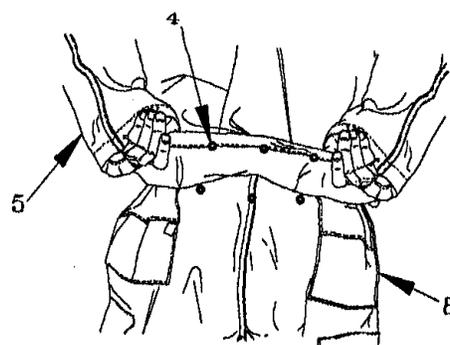
\_\_\_\_\_ 6. Remove your GVOs.



\_\_\_\_\_ 7. Untie overgarment jacket drawcords (1), open front flap (2) and open slide fastener (3).

\_\_\_\_\_ a. Unfasten three snaps (4) in rear of overgarment jacket (5).

\_\_\_\_\_ 8. Remove jacket (5).

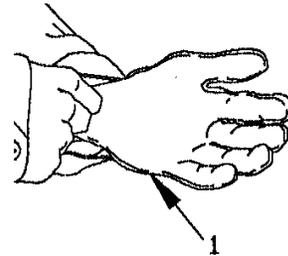
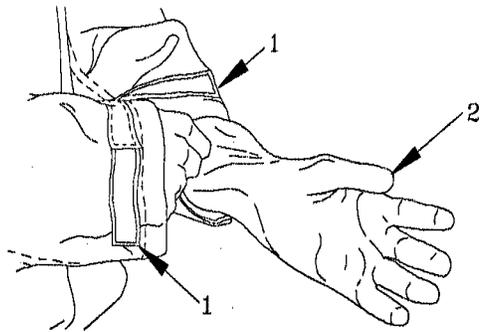


\_\_\_\_\_ 9. Unfasten snaps (6), open fly slide fastener (7), and remove trousers (8).

\_\_\_\_\_ 10. Remove PAPR and hood, using PAPR Removal Chart.



\_\_\_\_\_ 11. Remove gloves (2), then glove liners (1).



\_\_\_\_\_ 12. Pack and seal PPE in appropriate containers.

\_\_\_\_\_ Date

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\_\_\_\_\_ Trainer or Authorized Representative

## **MONTHLY INSPECTION FOR PROTECTIVE CLOTHING**

An inspection program must be established to ensure the protective qualities of the clothing. Inspection should be performed only by responsible and trained individuals. The program is to include the following elements:

### **PROTECTIVE SUIT/VAPOR BARRIER BAG**

\_\_\_\_\_ 1. Replace the Vapor Barrier Bag if:

\_\_\_\_\_ a. ripped or torn.

The protective suit provides a minimum of up to 24 hours of protection against exposure to liquid or vapor chemical agent. When the protective suit is removed from its vapor-barrier bag and worn, its protective qualities last for a minimum of 22 days if not exposed to a contaminated environment.

### **GLOVES, HOOD, AND APRON**

\_\_\_\_\_ 1. Replace gloves, hood, and apron if:

\_\_\_\_\_ a. exposed to any petroleum-based products

\_\_\_\_\_ b. cracks, tears or punctures

**NOTE:** The hood should be stored on the PAPR.

### **OVERSHOES**

The green vinyl overshoe (GVO) is used to protect feet for a minimum of up to 12 hours once exposed to contamination. If not exposed to a contaminated environment, the GVO provides protection for a minimum of 14 days.

\_\_\_\_\_ 1. Replace the GVO if found:

\_\_\_\_\_ a. cracks

\_\_\_\_\_ b. tears

\_\_\_\_\_ c. punctures

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PPE Wearer

## **PRE-OPERATIONAL PAPR INSPECTION CHECKLIST**

*Do the following preoperational inspection to ensure proper operation.*

- \_\_\_\_\_ If any components are missing or damaged, replace them prior to using the PAPR.
- \_\_\_\_\_ Ensure the filter media are properly fitted to the PAPR.
- \_\_\_\_\_ Confirm that the battery pack is:
  - \_\_\_\_\_ a. fully charged,
  - \_\_\_\_\_ b. the power lead is plugged into the battery pack,
  - \_\_\_\_\_ c. the battery pack is turned on, and
  - \_\_\_\_\_ d. air flows through the system.

*Check the airflow using the airflow indicator as follows:*

- \_\_\_\_\_ 1. With the breathing tube assembly disconnected from the turbo unit and the system still running, insert the base of the airflow indicator into the turbo unit outlet.
- \_\_\_\_\_ 2. Ensure that the center of the float rests at or above the appropriate mark; 4 cfm.
- \_\_\_\_\_ 3. Make sure the head harness straps are not torn, and there are no pinpoint holes in the facemask fabric.
- \_\_\_\_\_ 4. Make sure the gasket is fitted in the threaded cavity in the front of the facemask.
- \_\_\_\_\_ 5. Make sure the inhalation and exhalation valves are not worn, torn, bent, dry or sticky.
- \_\_\_\_\_ 6. The visor is not cracked and is properly installed in the facemask.
- \_\_\_\_\_ 7. There are no holes, cracks, breaks, tears or other damage in the breathing tube; and other damage in the Breathing Tube.

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## ***PRE-OPERATIONAL BATTERY USE CHECKLIST***

A completely exhausted Battery Pack should be charged for 14-16 hours using the single unit Battery Charger. A longer charging period will not normally damage the Battery Pack but may reduce battery life if repeated regularly. Battery charging is accomplished as follows:

- \_\_\_\_\_ 1. Connect the Battery Pack to the charger by plugging the charger lead into the top of the Battery Pack. The position of the switch on the Battery Pack does not affect the ability of the charger to charge.
- \_\_\_\_\_ 2. Plug the charger into a suitable source of AC power (110-120 vac).
- \_\_\_\_\_ 3. Check that the LED indicator on the charger illuminates.

**NOTE:** The Battery Pack should be charged for 14-16 hours. The brightness of the LED indicator will gradually diminish to indicate the Battery is charged. Check the battery voltage (using Volt Meter) after charging to be sure that it is 5.0 volts or greater.

Under optimum conditions, Nickel Cadmium Battery Packs have a service life of 500 - 600 charge/discharge cycles, or a minimum useful service life of 2 years. When the Battery Pack's useful service life has ended (no longer holds charge), the Battery Pack must be recycled or disposed of properly. Consult your local and state guidelines or Racal's Customer Service Department for proper disposal procedures.

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## ***PRE-OPERATIONAL CHECKLIST FOR FITTING CARTRIDGES***

**NOTE:** All contaminant-filtering canisters, cartridges, and filters will be referred to as Filter Media to avoid confusion.

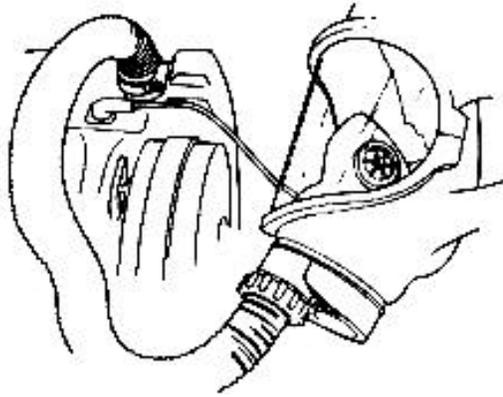
- \_\_\_\_\_ 1. Remove the packaging from the three Filter Media.
  - \_\_\_\_\_ a. Discard Filter Media that show signs of damage. Consult the User Instructions provided with each Filter Media Pack for information pertinent to its use.
  - \_\_\_\_\_ b. Check date of manufacture to calculate expiration date (4 years from date of manufacture).
  - \_\_\_\_\_ c. Check color coding to ensure Filter Media is for organic vapors (black).
  
- \_\_\_\_\_ 2. Remove the screw caps, if present, from each of the Filter Media and retain them in a safe place for later use.
  - \_\_\_\_\_ a. Ensure that an Air Inlet Insert is seated inside each air inlet on the Turbo Unit.
  - \_\_\_\_\_ b. Screw the Filter Media loosely into each of the three threaded adaptors.
  - \_\_\_\_\_ c. When all three media are in place, hand-tighten them so that an airtight seal is achieved between the neck of each Filter Medium and the air inlet molding in its adaptor.
  
- WARNING:** Do not overtighten the Filter Media. Overtightening may distort or displace the seal and may expose the user to the risk of serious injury or death.
  
- \_\_\_\_\_ 3. Stretch each canister strap over the body of its Filter Medium, release the strap, and ensure that it grips the Filter Medium tightly.
  - \_\_\_\_\_ a. Repeat this procedure for the remaining two until all Filter Media are secured with the canister straps. (NOTE: Use of canister straps is optional.

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## ***PRE-OPERATIONAL INSPECTION CHECKLIST FOR TURBO UNIT***

Before beginning each work shift, do the following Pre-Operational Inspection to ensure proper operation. If any components are missing or damaged, replace them prior to using the Turbo Unit. Ensure that the Filter Media are properly fitted to the Turbo Unit.



Confirm that the Battery Pack is fully charged, the power lead from the Turbo Unit is plugged into the Battery Pack, the Battery Pack is turned on, and air flows through the system. Check the airflow using the Airflow Indicator as follows:

- \_\_\_\_\_ 1. With the Breathing Tube Assembly disconnected from the Turbo Unit and the system still running, insert the base of the Airflow Indicator into the Turbo Outlet.
- \_\_\_\_\_ 2. Ensure that the center of the float rests at or above the appropriate mark: **a minimum airflow of 4 cfm.**

**NOTE:** If the Airflow Indicator float is not at the applicable level, install new Filter Media and dispose of used Filter Media in accordance with local and State guidelines.

- \_\_\_\_\_ 3. Perform the Headpiece Pre-Operational Inspection.

**CAUTION:** If this system will be exposed to a large amounts of water, the Battery Pack **must be placed** in a Water Repellent Battery Cover (available from Racal) or in a water proof plastic bag prior to use to avoid corrosion, deterioration, and possible battery failure.

## **WARNING**

*To ensure adequate protection, the performance of this system must be monitored in a non-hazardous environment. During user break periods, confirm sufficient airflow by performing the airflow check. When the user notices a decrease in the airflow, refer to the Turbo Unit trouble-shooting checklist.*

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PPE Wearer

## **CHECKLIST FOR DONNING PAPR**

The PAPR should be put on in uncontaminated air as follows:

- \_\_\_\_\_ 1. Screw the Breathing Tub handwheel into the threaded cavity in front of the Facemask until a hand-tight seal is achieved.
- \_\_\_\_\_ 2. Put the hood on the PAPR.
  - \_\_\_\_\_ a. Insert the PAPR breathing tube into the hood tubular cover.
  - \_\_\_\_\_ b. Extend the PAPR breathing tube while working the hood cover over it.
  - \_\_\_\_\_ c. Secure the hood cover to the PAPR breathing tube.
- \_\_\_\_\_ 3. Place the Hose Clamp onto the free end of the Breathing Tube.
  - \_\_\_\_\_ a. Slide that end of the Breathing Tube over the Turbo Unit Outlet, and tighten the Clamp.
  - \_\_\_\_\_ b. Ensure that the Breathing Tube is secured to the Turbo Unit Outlet and that the end of the Breathing Tube is visible between the Turbo Unit and the hose Clamp.
- \_\_\_\_\_ 4. Pull the whole belt to the right or left through the Turbo Unit's bracket so the buckle centers at your waist (in front) and the Turbo Unit is behind you.
- \_\_\_\_\_ 5. To don the System, place the Turbo Unit Back Cover against your lower back (along your spinal column) with the Breathing Tube extending upward.
  - \_\_\_\_\_ a. Fasten the Belt around your waist at the front so the Turbo Unit rests comfortably and securely against your lower back.
  - \_\_\_\_\_ b. Plug the Turbo Unit into a fully charged Battery Pack, and attach the Battery Pack to the Belt using the Clothing Clip.



- \_\_\_\_\_ 6. Remove spectacles or other eye protection which could project under the face seal.
  - \_\_\_\_\_ a. If protective or corrective eye wear is required, equip facepiece with a pair of holders for short temple spectacles.
- \_\_\_\_\_ 7. Hang the Facemask's Neckstrap around your neck.
- \_\_\_\_\_ 8. Loosen the Head Harness Straps, and fit the Facemask by placing your thumbs inside the straps, placing your chin into the chin cup, and pulling the straps over your head.
- \_\_\_\_\_ 9. Tighten the lower side straps first, then the top side straps, and finally the top strap. A correct seal may be obtained without overtightening the straps.
- \_\_\_\_\_ 10. Confirm good facial fit of the Facemask. (Positive or Negative Pressure Field Face Fit Test.)

**NOTE: Return to the Checklist for Donning Protective Clothing, Item 13.**

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## **CHECKLIST FOR PERFORMING POSITIVE AND NEGATIVE PRESSURE FIELD FACE FIT TESTS**

### **POSITIVE PRESSURE FIELD FACE FIT TEST**

- \_\_\_\_\_ Inhale, then place the palm of your hand over the exhalation valve cover.
- \_\_\_\_\_ Exhale gently. A slight positive pressure should build up inside the facepiece.
- \_\_\_\_\_ If any leakage is detected around the facial seal, readjust the headstraps and repeat the first two steps.
- \_\_\_\_\_ If you cannot maintain a seal by adjusting the headstraps, check the facepiece for leaks. Locate the problem and correct it before using the respirator.

### **NEGATIVE PRESSURE FIELD FACE FIT TEST**

- \_\_\_\_\_ Block off the breathing tube with either the palm of your hand, or by placing your thumb over the opening inside the breathing tube coupling nut.
- \_\_\_\_\_ Breathe in and hold your breath for 10 seconds. If the seal is good, the facepiece will collapse and remain collapsed against your face.
- \_\_\_\_\_ If the facepiece does not remain collapsed, or you notice any leakage, readjust the headstraps and test again. If this does not correct the leak, do not use the facepiece.
- \_\_\_\_\_ If you cannot get a seal by adjusting the headstraps, check the facepiece and breathing tube for leaks. Locate the problem and correct it before using the respirator.

Reprinted from *OptimAir 6A Powered Air-Purifying Respirator (with Facepiece or Hood) Instructions*, Mine Safety Appliances Company, Pittsburgh, PA.

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## CHECKLIST FOR REMOVAL OF RESPIRATOR

For your protection, only remove the respirator in an **uncontaminated** environment.

- \_\_\_\_\_ 1. Remove the facepiece. Turn the power switch off.
- \_\_\_\_\_ 2. On facepieces using the elastic headstrap, unfasten the top and bottom headstrap clips. Pull the facepiece out and away from your face to remove it.
- \_\_\_\_\_ 3. On facepieces using the cradle headstrap, just unfasten the bottom headstrap. Pull the facepiece away from your face and up over your head.
- \_\_\_\_\_ 4. Remove the support belt. Be careful that you do not drop the motor-blower.



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Trainer or Authorized Representative



## **PAPR POST-OPERATIONAL MAINTENANCE**

Always inspect individual parts, repairing/replacing any missing or damaged components prior to reusing the PAPR.

\_\_\_\_\_ **Remove protective overlays (if present).**

- \_\_\_\_\_ 1. Wash the facemask in a solution of warm water and mild detergent.
- \_\_\_\_\_ 2. Rinse the facemask and visor in clean, running water and shake excess water from the facemask.
- \_\_\_\_\_ 3. Wipe the visor dry with a soft, clean, lint-free cloth and replace the visor guard.
- \_\_\_\_\_ 4. Handle the facemask carefully to avoid unnecessary scratching of the visor.

\_\_\_\_\_ **Cover both ends of the breathing tube and rinse the breathing tube under clean, running water.**

- \_\_\_\_\_ 1. Wipe the outside only of the breathing tube assembly with a soft, damp cloth to remove any dirt and grime.
- \_\_\_\_\_ 2. Abrasive cleaners must not be used.

\_\_\_\_\_ **After cleaning the system, inspect all parts for damage or wear, replacing parts, if necessary.**

- \_\_\_\_\_ 1. Allow components to dry completely, away from sunlight and direct heat.
- \_\_\_\_\_ 2. Place the facemask in a clean plastic bag.
- \_\_\_\_\_ 3. Store the system in a clean area, away from moisture, heat and direct sunlight.

\_\_\_\_\_ **Storage temperatures must not exceed 120°F (49°C).**

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PPE Wearer

## **POST-OPERATIONAL MAINTENANCE FOR TURBO UNIT**

### **WARNING**

Avoid contaminant entry into the Turbo Unit; respiratory protection may be compromised.

Water must not enter the Turbo Unit or the Battery Pack. Any Filter Media which have been directly exposed to water must be disposed of in accordance with local and State guidelines.

To preserve the System's integrity, gasoline, organic—based solvents, or chlorinated degreasing fluids (such as trichloroethylene) must not be used to clean any part of this system.

### **CLEANING**

- \_\_\_\_\_ 1. Clean the outer surfaces of the Turbo Unit and Battery Pack with a soft cloth dampened in a mild solution of clean, warm water and mild detergent. Abrasive cleaners must not be used.
- \_\_\_\_\_ 2. The surfaces of the Filter Media should be wiped clean with care to prevent contaminants from entering the Filter Media.
- \_\_\_\_\_ 3. Detach the Breathing Tube from the Turbo Unit, and wipe the connection sites.

### **INSPECTION**

After cleaning the system,

- \_\_\_\_\_ 1. Inspect the individual parts,
- \_\_\_\_\_ 2. Ensure that all components and connection sites, including the handwheel threads, are clean and in good condition.
- \_\_\_\_\_ 3. The Filter Media must be removed and stored or disposed of in accordance with local and State guidelines. Check with your local safety professional to determine the proper course of action.
- \_\_\_\_\_ 4. Examine the parts of the system and replace any parts found to be damaged.

- \_\_\_\_\_ 5. Recharge the Battery Pack.
- \_\_\_\_\_ 6. Perform the Headpiece Post-Operational Maintenance as detailed in the appropriate checklist.

***AFTER CLEANING AND INSPECTING THE SYSTEM,***

- \_\_\_\_\_ 1. Allow all components to dry away from sunlight and direct heat.
- \_\_\_\_\_ 2. Store the System in a clean area, away from moisture, heat and direct sunlight.
- \_\_\_\_\_ 3. Storage temperature must not exceed 120°F (49°C).

\_\_\_\_\_  
Date

\_\_\_\_\_  
PPE Wearer

## ***PAPR TROUBLE-SHOOTING***

If airflow over your face reduces or stops, leave the contaminated environment immediately and perform the following troubleshooting procedures. Make sure that:

- \_\_\_\_\_ 1. There are no pinpoint holes in the facemask fabric, tears in the head harness straps, or cracks in the visor.
- \_\_\_\_\_ 2. The visor has been installed properly and no gaps exist between the visor and the visor clamps.
- \_\_\_\_\_ 3. A gasket is fitted in the threaded cavity in the front of the facemask.
- \_\_\_\_\_ 4. The inhalation or exhalation valves are not worn, torn, bent, dry, or sticky.
- \_\_\_\_\_ 5. The breathing tube is securely connected to the facemask and turbo unit, and is not twisted.
- \_\_\_\_\_ 6. There are no holes, cracks, breaks, tears, or other damage to the breathing tube.
- \_\_\_\_\_ 7. Enough air is available at the air inlet of the facemask using the airflow check. If adequate airflow is not maintained, the problem may be in the turbo unit, battery pack, filter media, or a combination of these components.

If any components are not functioning properly, remove and replace them, and perform the Pre-Operational Inspection.

Always make sure sufficient airflow is maintained before reentering the contaminated work environment.

## ***TROUBLE-SHOOTING CHECKLIST FOR TURBO UNIT***

If the airflow over the face reduces or stops, leave the contaminated environment immediately and perform the following trouble-shooting procedures. Make sure:

- \_\_\_\_\_ 1. Battery Pack has not been turned off.
- \_\_\_\_\_ 2. Battery Pack has a sufficient charge (5 volts or greater).
- \_\_\_\_\_ 3. Battery Pack fuses have not blown.
- \_\_\_\_\_ 4. No physical damage has occurred to any part of the Turbo Unit.
- \_\_\_\_\_ 5. Filter Media are not exhausted (substitute fresh media).
- \_\_\_\_\_ 6. Sufficient air flows through the system (perform the airflow check).
- \_\_\_\_\_ 7. Headpiece is functional (perform the trouble-shooting procedures).

### ***WARNING***

The user must ensure that the center of the Airflow Indicator float rests at or above the mark specified for his/her system prior to re-entering the work area. Failure to do so may expose the user to the risk of serious bodily injury or death.

If, at any time during operation, an odor or taste of gas in the inspired air is detected, or eye or throat irritation is felt, leave the contaminated environment immediately, perform the trouble-shooting procedures on the Turbo Unit and the Headpiece, and if necessary, replace all Filter Media. Failure to do so may expose the user to the risk of serious bodily injury or death.

## **MONTHLY INSPECTION FOR PAPRS**

An monthly inspection program must be established to ensure the operability of respiratory protective equipment. Inspection should be performed only by responsible and trained individuals. Check with the manufacturer for information on the establishment of a yearly inspection program performed by the manufacturer. Be familiar with State and local guidelines. The monthly inspection program is to include:

- \_\_\_\_\_ 1. Check the tightness of connection and condition of the:
  - \_\_\_\_\_ a. facepiece
  - \_\_\_\_\_ b. headband
  - \_\_\_\_\_ c. valves
  - \_\_\_\_\_ d. connecting tube
  - \_\_\_\_\_ e. cartridges
  - \_\_\_\_\_ f. battery pack has a sufficient charge (5 volts or greater)

**NOTE:** Special attention should be given to rubber or elastomer parts to ensure that they are pliable and flexible and not deteriorating.

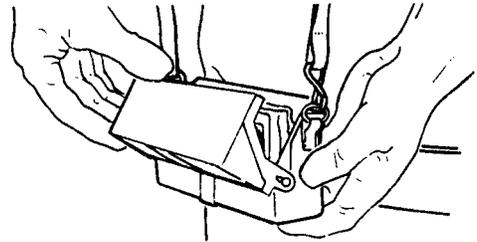
- \_\_\_\_\_ 2. Test the following devices for proper function in accordance with the manufacturer's instructions or applicable standards:
  - \_\_\_\_\_ a. regulators
  - \_\_\_\_\_ b. valves
  - \_\_\_\_\_ c. warning devices
  - \_\_\_\_\_ d. cylinder
- \_\_\_\_\_ 3. Repair of any component of a respiratory protective device may be undertaken:
  - \_\_\_\_\_ a. only by persons thoroughly familiar with the device who have been instructed in the type of repair to be performed.
  - \_\_\_\_\_ b. No attempt shall be made to replace components or to make adjustments or repairs beyond the manufacturer's recommendations.
- \_\_\_\_\_ 4. Components of respiratory protective devices must be:
  - \_\_\_\_\_ a. changed on a replacement schedule as required by conditions of use.
  - \_\_\_\_\_ b. In no case may replacement time exceed the time recommended by the manufacturer.

\_\_\_\_\_  
Date

\_\_\_\_\_  
PPE Wearer

## **INSTRUCTIONS FOR USE OF CHEMICAL DETECTOR KIT – TESTING FOR TOXIC AGENT VAPORS**

**A set of 3 or 4 instruction cards are included in the kit.** This checklist deals only with the agents of concern: blister and nerve agents.



### **WARNING**

Do not expose the sampler-detector to direct flame or other high heat source. Some of the chemicals in the ampoules are flammable and/or explosive.

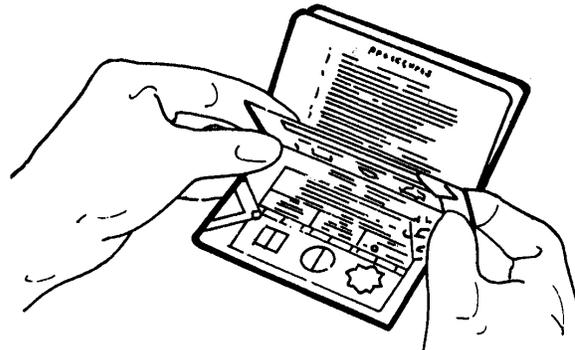
Do not use an outdated sampler-detector because it will give test results you cannot trust.

**Do not use kit if you do not see colors correctly.** Color combinations and comparison are used during tests. A wrong reading of results might cause you to remove protective equipment while toxic agent are actually present, and you could become a casualty.

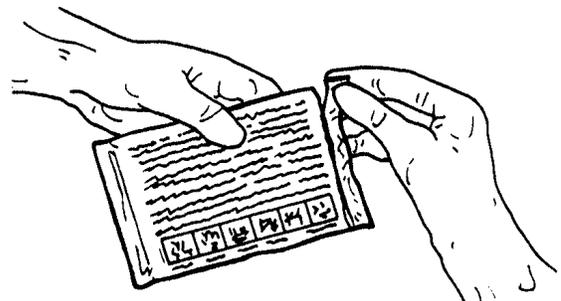
**NOTE:** Kit operator will stimulate the waiting times—10 minutes, 5 minutes, etc. Operator cannot wear or use watch while wearing protective clothing.

### **PERFORM THE FOLLOWING STEPS:**

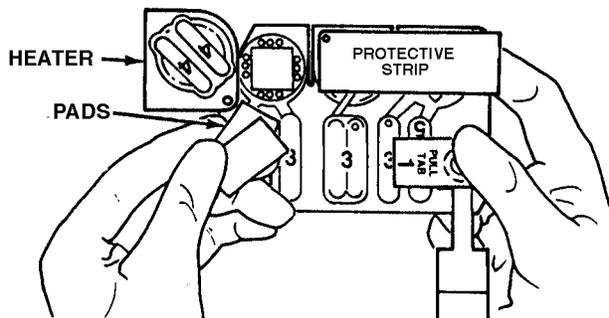
1. Open kit, take out instruction cards and read them.



2. Take out a sampler-detector. Read both sides of sampler-detector protective bag; then tear protective bag along line marked by arrows. Carefully pull out sampler-detector and save bag for reference to instructions.

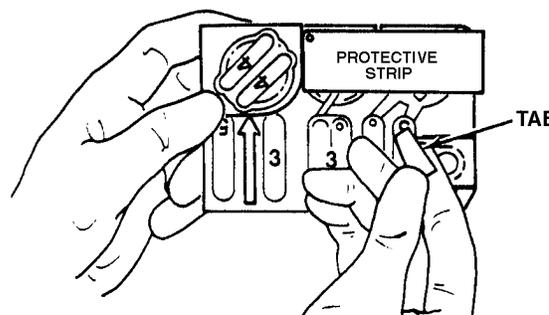


- Before breaking glass ampoules (except heater ampoules), place one heater pad on each side of the sampler-detector, covering the ampoule to be broken. These pads will prevent pieces of glass from cutting your gloves or hands.

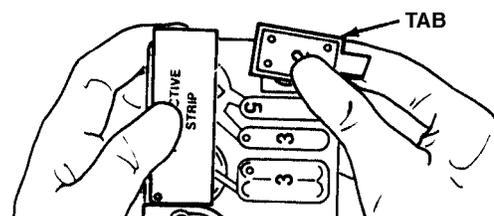


- Save pads under hinged heater. Swing out heater, remove and save two loose pads. Swing heater back in.

- Remove pull tab marked 1. Pull upward to expose lewisite detecting tablet.



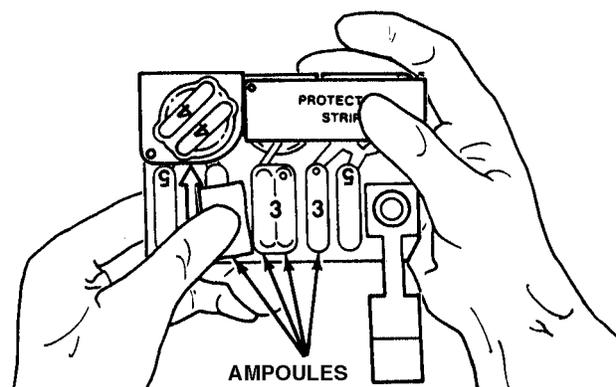
- Mark lewisite rubbing tab. Bend tab over lewisite detecting tablet and rub upper half of tab until a mark is visible.



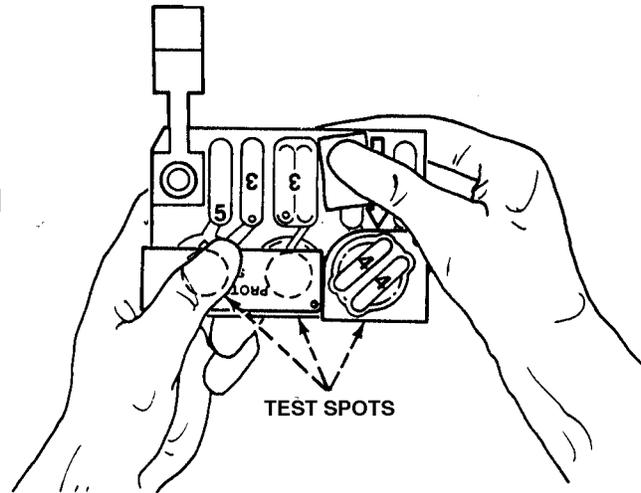
- Hold sampler-detector with test spots or arrow pointing up.

- Using heater pads, crush 4 ampoules in the 3 center pockets marked 3.

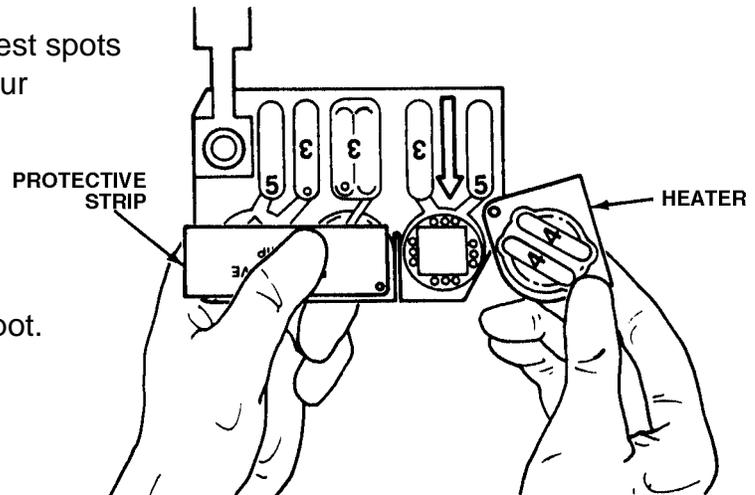
**NOTE:** Nerve spot may be difficult to wet with solutions as kit gets older. Work solutions into spot carefully while pressing protective strip over nerve agent test spot.



- Turn sampler-detector upside down and insure wetting of test spots. Hold sampler-detector with test spots or arrow pointing down. Using heater pads, squeeze ampoules to force liquid through formed channels.



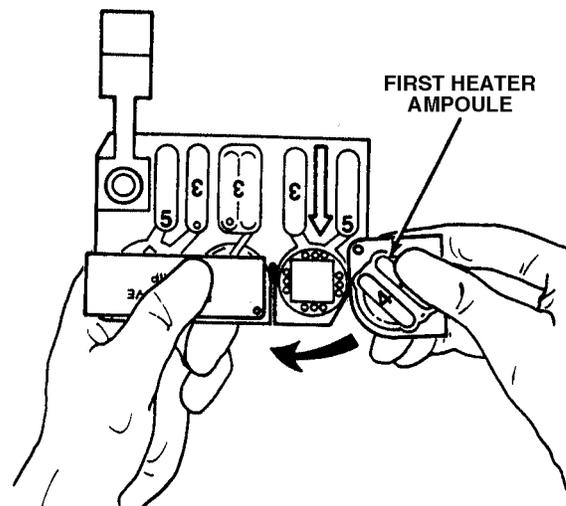
- Hold sampler-detector. With test spots or arrow pointing down, put your thumb on the protective strip over middle test spot.



- Swing heater away from test spot.

**WARNING:** Avoid hot vapors that may burn you when crushing heater ampoules. You will be facing into the wind. Hold sampler-detector down and to one side while vapors are venting.

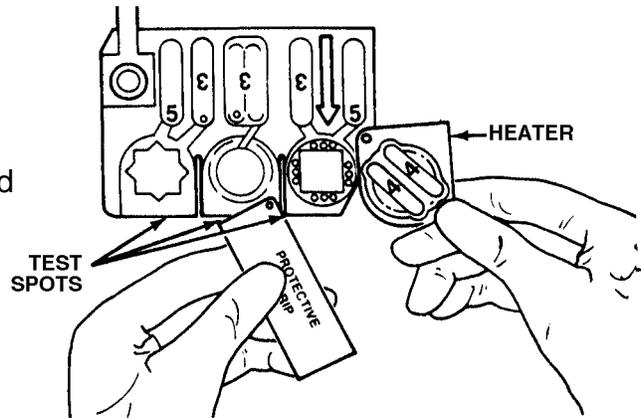
- Activate first heater ampoule marked 4. Being sure not to use heater pads, crush one green ampoule and swing heater immediately over test spot. Hold sampler-detector to one side while venting to avoid vapor.



- After about 2 minutes swing heater away from test spot, and protective strip away from test spots.

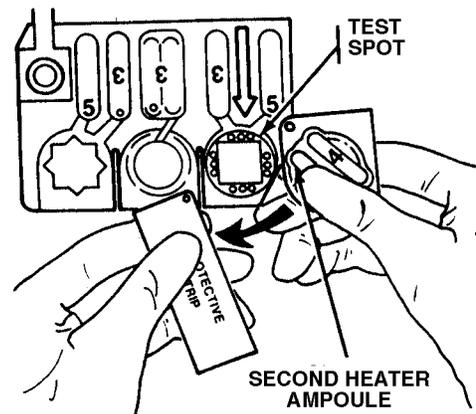
**WARNING:** Do not hold sampler-deter in direct sunlight while exposing test spots. You may not be able to trust the test results.

14. Expose test spots for about 10 minutes. Sampler-detector can be laid down or held by hinged protective strip.

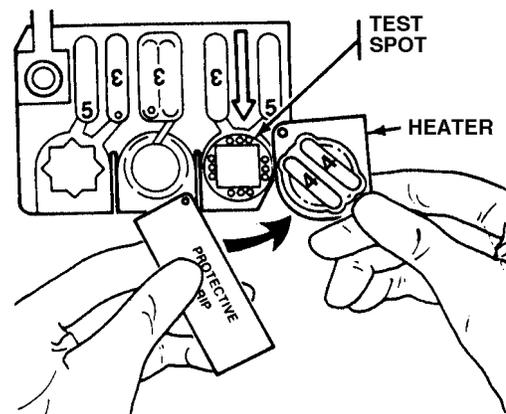


**WARNING:** Avoid hot vapors that may burn you when crushing heater ampoules. You will be facing into the wind. Hold sampler-detector down and to one side while vapors are venting.

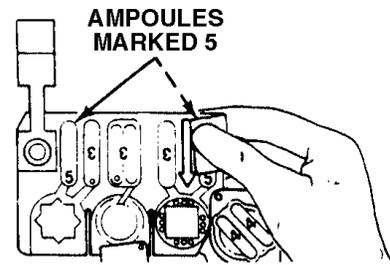
15. After about 10 minutes activate second heater marked 4. Being sure not to use heater pads, crush second green ampoule. Swing heater immediately over test spot.



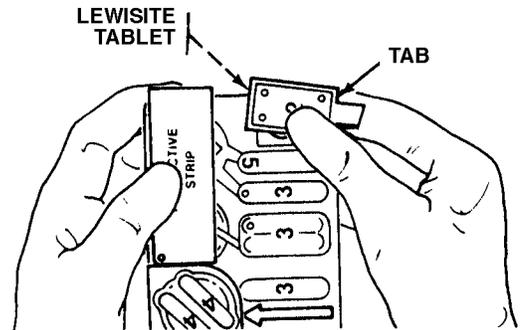
16. After about 1 minute, swing heater away from test spot.



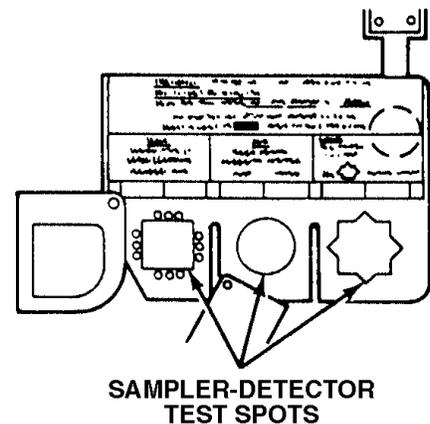
17. Hold sampler-detector with test spots or arrow pointing down.
18. Using heater pads, crush remaining ampoules marked 5. Be sure to wet test spots by squeezing ampoules to force liquid onto test spots.



19. Re-rub lewisite detecting tablet. Bend tab over lewisite detecting tablet and rub bottom half of tab until a mark is visible.



20. Compare colors to determine safe or danger conditions. Turn sampler-detector upside down and compare colors of test spots with those shown on sampler-detector. Look for a change in color or rub marks on lewisite detecting tab. If your kit has a fourth instruction card, use it to compare colors to determine safe or danger condition.



**WARNING:** Each sampler-detector contains 2.6 mg of mercuric cyanide and should be considered hazardous waste. It must be disposed of in an environmentally correct method.

**NOTE:** You can compare lewisite (rubbing tab) tests after about 10 minutes exposure time. Blister agent develop color immediately after all ampoules are broken. Nerve agent requires a waiting period of about 3 minutes. If no color develops for M256A1, a positive nerve test is indicated. If peach color develops for the M256, a positive nerve test is indicated.

Reprinted from *Operator's Manual for Chemical Agent Detector Kit M256 (6665-01-016-8399) and M256A1 (6665-01-133-4964)*, Department of the Army Technical Manual TM 3-6665-307-10, Headquarters, Department of the Army, Washington, DC, September 1985.

## **INSTRUCTIONS FOR USE OF CHEMICAL DETECTOR KIT – TESTING FOR TOXIC AGENT ON SURFACES**

A set of 3 or 4 instruction cards are included in the kit. This list deals only with the agents of concern: blister and nerve agents. NOTE: Lewisite is present only at Tooele Army Depot; the other locations do not have to be concerned with the Lewisite testing.

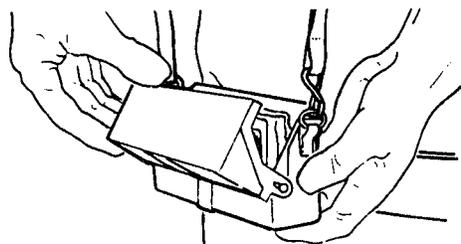
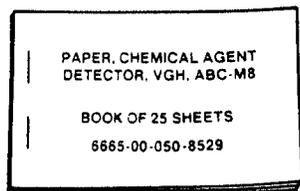
### **WARNING**

Do not use kit if you do not see colors correctly. Color combinations and comparison are used during tests. A wrong reading of results might cause you to remove protective equipment while toxic agents are actually present, and you could become a casualty.

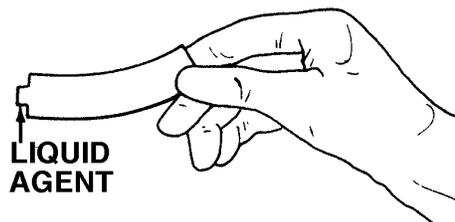
**NOTE:** Kit operator will stimulate the waiting times—10 minutes, 5 minutes, etc. Operator cannot wear or use watch while wearing protective clothing.

### **PERFORM THE FOLLOWING STEPS.**

1. Open kit and remove and open M8 paper. Tear off and discard plastic bag.



2. Test liquid. Tear out a sheet of M8 paper (use half a sheet if it is perforated). Blot, do not rub, M8 paper where liquid agent is thought to be.



3. Compare color change. Check typical colors shown on inside cover of M8 paper.

**NOTE:** Red indicates presence of blister agents (H, L, or CX). Yellow indicates presence of G-agent. Dark green indicates presence of V-agent. Some G-agents give a red-brown color which is between H and G color.

Some decontaminants will give false positive tests on M8 paper. In an area where decontaminants have been used, positive results must be confirmed by tests with sampler-detector.

**NOTE:** Non-persistent agents (i.e., VX) can be present and would produce a positive reading on the M8 paper, but not produce a positive reading on the M256A1 kit because of the low vapor pressure. A solution to this problem is to rub the suspected liquid directly onto the test spot of the M256A1 kit to confirm or deny a positive M8 paper test.

Reprinted from *Operator's Manual for Chemical Agent Detector Kit M256 (6665-01-016-8399) and M256A1 (6665-01-133-4964)*, Department of the Army Technical Manual TM 3-6665-307-10, Headquarters, Department of the Army, Washington, DC, September 1985.

***APPENDIX B. ANSWER KEY TO REVIEW QUESTIONS***

Assess understanding of the material presented in this training by completing the following questions.

Multiple Choice

1. The PPE used in CSEPP for chemical agent emergencies includes:
  - c. protective suit, hood, gloves, overshoes, PAPR and, when appropriate, apron
2. This equipment is to be used
  - b. only in the event that a chemical accident or incident involving chemical weapon agents has occurred
3. Emergency workers involved in the off-site response may perform a variety of functions including:
  - d. all of the above
    - a. providing emergency medical services
    - b. controlling evacuation traffic
    - c. performing emergency decontamination
4. Emergency workers must wear PPE
  - c. a or b, based on decision of State and local government
    - a. when they enter any area where protective actions have been determined for public
    - b. when they enter any area where accident conditions indicate chemical agent may be present as vapor or deposited on the ground
5. The following actions can assist the emergency worker in using the PPE within its capabilities:
  - d. all of the above
    - a. use of limited stay times
    - b. use of the chemical detector kits
    - c. avoidance of IDLH environments
6. The vapor-barrier bag holds the protective suit in order to:
  - b. protect it from rain, moisture and sunlight that might affect its protective effectiveness

7. You should wear the apron if you:
  - a. perform decontamination tasks
8. The chemical detectors can detect
  - c. a and b above
    - a. liquid concentrations of chemical agents
    - b. vapor concentrations of chemical agents
9. Powered air-purifying respirators (PAPRs) protect against
  - b. particulates, gases and vapors
10. The PAPR consists of the following parts:
  - b. a full facepiece, a belt-mounted turbo unit, a battery pack, a breathing tube assembly, and appropriate cartridges
11. The most common collection method for airborne particulates is a cartridge (also commonly referred to as filter or canister). In the Ready Bag you will find
  - d. all of the above
    - a. the PAPR with one set of cartridges for the chemical accident/incident
    - b. training cartridges
    - c. one set of cartridges for backup
12. Off-site emergency workers will handle
  - a. traffic control
13. Emergency workers who enter an area where PPE may be advisable must limit their activities that protection from contamination and excessive exposure is assured. This requires that emergency workers
  - a. **not remain** in a potentially contaminated area long enough to exceed the agent absorption capacity of the cartridges used in the PAPR
14. The amount of heat accumulation or heat stress depends upon
  - c. a and b above
    - a. amount of physical activity, level of hydration, and clothing worn
    - b. terrain and climatic conditions

15. How is performance affected by heat stress?
  - c. reaction times and decision times are longer
16. Cold can also effect the use of PPE by
  - c. making chemical detectors hard to operate
17. When you remove the protective suit from the vapor barrier bag, the first thing you should do is
  - a. check for rips, tears, any flaws in suit
18. The hood should be stored in the Ready Bag in the following manner
  - b. placed over the PAPR and its tubing
19. When removing the protective clothing, it is important for you to
  - c. go through decontamination procedures if you suspect contamination
20. Confirm that the PAPR battery pack:
  - b. is fully charged, power lead is plugged into turned-on battery pack, and air flows through the system

## ***APPENDIX C. VU-GRAPHS***



**PERSONAL  
PROTECTIVE  
EQUIPMENT**



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# Objectives

**Required learning objectives are to be able to:**

- â Protect person from contamination by donning PPE**
- â Remove potentially contaminated PPE without contaminating person**
- â Recognize limitations of PPE**
- â Know when and how to use chemical detector kits**
- â Know state and local work rules, policies and procedures, as well as those established by CSEPP**

**CSEPP planning guidance does not provide for deployment of civilian emergency workers into areas which are known or suspected to be contaminated with chemical weapon agent until monitoring and sampling confirms that concentrations are within range for which PPE provides protection**

**To provide protection in event of entry into contaminated areas, individuals identified in state and local plans as initial off-site emergency workers will be issued PPE appropriate for prescribed job functions**

# On-Post Response Program

- a **Guided by U.S. Department of Army Pamphlet 50-6, Chemical Accident or Incident Response and Assistance (CAIRA) Operations**
- a **Describes Army functions, responsibilities, organizations, and procedures for responding to chemical weapon agent events**

# Off-Post Civilian Response

- a **Actions limited to those that protect general population, as documented in state and local emergency plans**
- a **Describes functions, responsibilities, organizations, and procedures of off-site response to incident involving Army chemical weapon agents from initial notification by Army that a release has occurred through end of incident**

# Off-Site Emergency Worker Functions

- a **May perform variety of functions including:**
  - â **Controlling evacuation traffic**
  - â **Providing emergency medical services**
  - â **Performing emergency decontamination**

# Work Intensities

- a **Physical activities needed to perform duties vary in degree of complexity, movement and level of exertion**
  - â **Emergency workers manning traffic control points will be performing less strenuous tasks**
  - â **Emergency workers assigned to an emergency decontamination station or to medical services must perform more physical tasks**

# **Governmental PPE Requirements**

- a U.S. Government requires that employer provide you with PPE if it is required on your job**
- a Code of Federal Regulations (CFR) prescribes guidelines for training, protective clothing and equipment**
- a Other state and local regulations may specify types of PPE for specific positions or tasks in dealing with wide range of hazardous materials**
- a You should be familiar with local and job specific requirements in your area**

# Who Needs PPE and Training

- a **All persons designated as part of the emergency response (e.g., police, medics, paramedics, firefighters, medical personnel) to a chemical agent release**
- a **All persons who anticipate being active in potentially hazardous environments as part of CSEPP emergency response plan**
- a **Before training, a medical exam should be performed**
- a **Regular drills and training sessions designed to maintain familiarity with equipment should be incorporated into emergency response protocols**

# What is PPE?



- a **Personal Protective Equipment (PPE) is defined as articles worn or equipment used in order to protect wearer from harmful contaminants in environment**
- a **Main function of PPE is to provide shield between you and agent contaminating environment**
  - â **To be effective it must prevent you from being contaminated by airborne or surface agents**



# Proper Use Critical

***If it must be used, it must be used correctly***

- a **It is not possible to be partially protected from nerve or blister agents; you are either protected or not protected**



## Recommended PPE

- a **Potential nerve and blister agent contamination requires respiratory protection and protective covering for all parts of the body. Includes:**
  - â **Powered air-purifying respirator (PAPR)**
  - â **Protective suit**
  - â **Overshoes**
  - â **Gloves**
  - â **Apron (if needed)**
  - â **Hood**
- a **This type of protection guards against skin, respiratory tract, and eye exposures**



# CSEPP Protective Clothing Components

- a **CSEPP, in conjunction with the Centers for Disease Control/ National Center for Environmental Health (CDC/NCEH) have conducted several studies and tests on PPE to select the appropriate PPE for CSEPP**



## **Availability of PPE**

- a This equipment is only to be used in the event that chemical accident or incident involving chemical weapon agents has occurred**
- a Protective suit, hood, gloves, overshoes, PAPR, and apron if appropriate will be kept available in Ready Bag for designated emergency workers**
- a Backup and training suits will also be made available**
- a Upon termination from CSEPP, worker shall return protective suit, hood, gloves, apron, overshoes, Ready Bag, and PAPR as outlined in state and local plans**

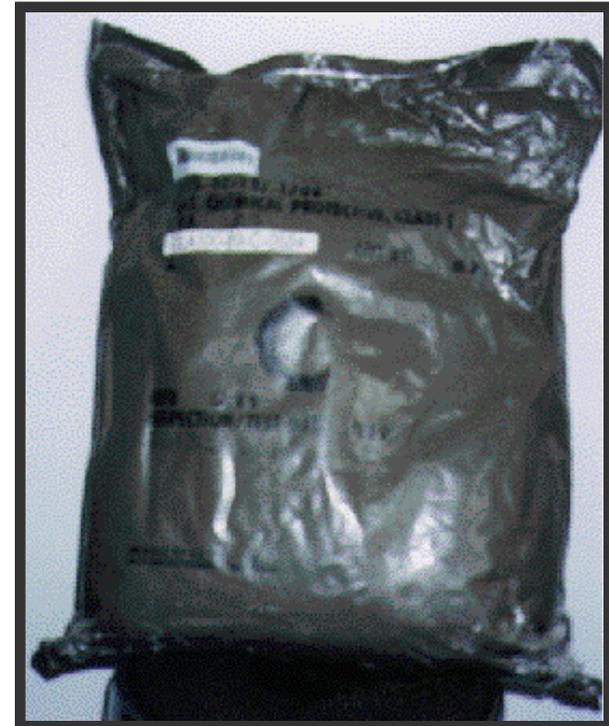
# Protective Suit

- a **Permeable, expendable two-piece overgarment**
- a **Outer layer of nylon cotton and inner layer of charcoal impregnated polyurethane foam**
- a **Not flame resistant; not water proof but is water resistant**
- a **Normally worn as an outer garment; in high temperature may be worn over underwear**



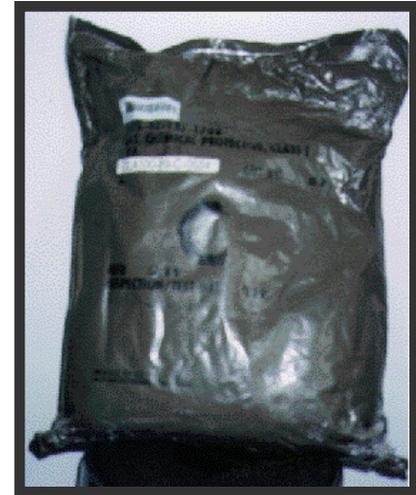
# Protective Suit

- a **Provides protection against chemical agent vapors and liquid droplets, etiological agents, and toxins**
- a **Comes sealed in a vapor-barrier bag that protects against rain, moisture, and sunlight**



# Protective Suit

- a **Weartime for protective suit begins when removed from sealed vapor-barrier bag**
  - â **Do not remove until needed**
  - â **Provides minimum of 24 hours of protection against exposure to liquid or vapor chemical agent (permeability)**
  - â **Protective qualities last for minimum of 22 days (durability)**
  - â **Not designed to be decontaminated or reimpregnated for reuse**



# Protective Suit

**Becomes unserviceable if it is**

- â **Ripped**
- â **Torn**
- â **Fastener broken or missing**
- â **Petroleum, oils, or lubricants are spilled or splashed on the garment**



# Gloves

- a **Outer glove for protection and inner glove for perspiration absorption**
- a **Outer gloves impermeable, black, butyl rubber**
- a **Inner gloves thin, white cotton**
- a **Protect against liquid chemical agents and vapor hazards**
- a **If become contaminated, replace within 24 hours**
- a **Replace if exposed to any petroleum-based products**



# Hood

- a Prevents airborne agents from contaminating the head and neck
- a Designed to attach to face pieces of respirators
- a Material is butyl covered cloth
- a Designed by the Army for use with respirators approved for civilian use



# Green Vinyl Overshoes (GVO)

- a **Plain olive drab, vinyl green shoe with elastic fasteners**
- a **Protects feet from contamination by all known agents for up to 12 hours of protection following contamination; for up to 14 days if not contaminated**



# Apron



PPE22©

- a **Only those performing decontamination tasks need to wear aprons**
- a **Wrap-around style, made of a front panel, two side panels, and raglan sleeves**
- a **Designed to fit loosely and cover the wearer's arms and body from overshoes to neck**
- a **Nylon cloth, coated with butyl rubber on both sides**



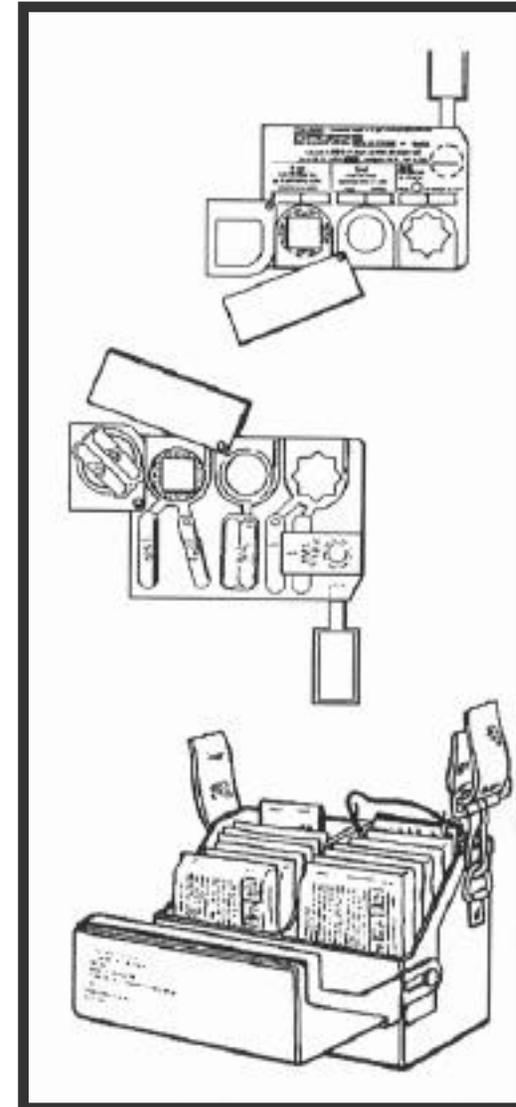
# Ready Bag

- a **Canvas bag designed to carry all the protective equipment (protective suit, hood, gloves, apron, overshoes, PAPR, and detection kits)**



# Chemical Detectors

- a CSEPP planning guidance does not provide for deployment of civilian emergency workers into areas known or suspected to be contaminated with chemical weapon agent
- a However, in the event that worker is in situation where it is questionable whether there is contamination, a detection kit is provided

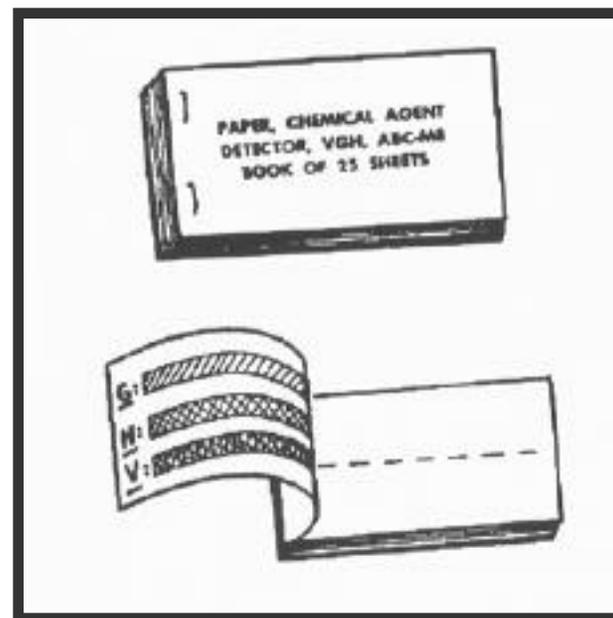


## **M256 Series Chemical Agent Detector Kit**

- a Capable of detecting liquid and vapor concentrations of nerve or blister agents**
- a Used primarily to determine if there is chemical agent present, and type of chemical agent present**
- a Contains:**
  - â 12 individually packaged samplers/detectors**
  - â Set of instruction cards**
  - â Packet of M8 VGH chemical agent detector paper**
- a Changes color upon contact with chemical agents at concentrations hazardous to unmasked person**
- a Will be kept in Ready Bag and backup kits available**

## ABC-M8 Chemical Agent Detector Paper

- a Included in M256 Chemical Agent Detector Kit
- a Turns colors when the paper touches a chemical agent
  - â V-type nerve agent turns dark green
  - â G-type nerve agent turns yellow
  - â H-type blister agent turns red



# Respiratory Equipment



- a Prevents airborne contaminants from being inhaled
- a Protects facial skin from exposure
- a Must be only used in context of complete respirator program as described in OSHA regulations and NIOSH publications

## Powered Air-Purifying Respirator (PAPR)

- a **Protects against**
  - â **particulates**
  - â **gases and vapors**
- a **Air-purifying element may be**
  - â **filter**
  - â **chemical cartridge**
  - â **combination filter and chemical cartridge**
  - â **canister**



# PAPR Components

- a **PAPR consists of:**
- â **Full facepiece with or without a spectacle kit and protective/corrective lenses**
  - â **Belt-mounted turbo unit**
  - â **Battery pack (batteries must be kept fully charged)**
  - â **Breathing tube assembly**
  - â **Appropriate filter media**



## Powered Air-Purifying Respirator (PAPR)

- a **Battery-operated blower delivers decontaminated air at slight positive pressure into full facepiece**
  - â **If leak occurs, air will flow from inside facepiece to outside air**
- a **Draws ambient air through filters or chemical cartridges which remove specific contaminants and deliver subsequent air through corrugated breathing tube into facepiece assembly on face of wearer**
- a **Air flow also provides wearer comfort**



# Why the PAPR Was Selected

- a **Civilian air-purifying respirators approved by CDC/ NCEH**
- a **NIOSH confirmed cartridge tests were conducted in valid scientific manner**
- a **Data support conclusion that commercial cartridges tested will remove up to 0.5 milligram per cubic meter of nerve agent GB for up to 16 hours**
  - â **Concentration chosen because maximum predicted concentration to which emergency worker would be exposed (12 hours more likely)**
  - â **U.S. Army data on military-gas masks indicate sorbents have shortest service life against nerve agent GB than other lethal chemical agents**

## **Spectacle Kit**

- a **Proper seal cannot be established if the temple bars of eyeglasses extend through sealing edge of full facepiece**
- a **Racal has developed spectacle kit that mounts corrective lenses inside full face pieces**

# Limitations of PAPRS

- a **Do NOT use in atmospheres immediately dangerous to life or health (IDLH)**
- a **Do NOT use in atmospheres containing less than 19.5% oxygen (confined spaces)**
- a **Do NOT use the respirators in a flammable or explosive atmosphere**
- a **Do NOT use air-purifying elements beyond useful life**
- a **Use only fully charged battery packs when respirator is donned**
- a **Protect batteries/battery packs from fire and heat at all times**

# Air-Purifying Cartridges

- a **Most common collection method for airborne particulates**
- a **Often referred to as filter or canister**
- a **Standard cartridges/filters are 37 mm in diameter, placed in closed-face cassette, with backup pad, to avoid contamination**
- a **Always read labels**
- a **All cartridges in blower unit must be the same and be replaced at same time**
- a **Follow good industrial hygiene practices when replacing and disposing of cartridges**

# Cartridges

- a **29 CFR 1910.134 requires that all cartridges be easily identifiable**
- a **Identify cartridge by properly worded labels and color code**
  - â **Correct color code for organic vapor cartridge is black**

## **In each Ready Bag:**

- a **PAPR**
- a **3 sets of 3 cartridges**
  - â **1 for chemical accident/ incident**
  - â **1 for backup**
  - â **1 for training marked  
“For Training Purposes Only”**

# Respirator Fit Testing

- a **Shall be done while wearing all protective equipment that could interfere with fit and/or wearer acceptance**
- a **Should be repeated based upon 29 CFR 1910.134 (b) (10) which states the user's medical status should be reviewed periodically (for instance, annually)**
- a **You should be familiar with state and local requirements**

# Storage of PPE

## RESPIRATOR

- a **Before storing the facepiece, it should be**
- â **Inspected**
  - â **Repaired, if necessary**
  - â **Cleaned**
  - â **Dried**
  - â **Given final inspection**



# Storage of PPE

## RESPIRATOR

- a **After preparing facepiece for storage:**
  - â **Place facepiece in closed plastic film bag**
  - â **Bag and facepiece should be stored away from sunlight and direct heat**
  - â **Store in clean, dry, cool place that is free from contaminating vapors, gases and particulates**
  - â **Storage temperatures must not exceed 120°F (49°C)**
  - â **Bag should be clearly labeled to indicate type of facepiece**

# Storage of PPE

## RESPIRATOR

- a **While in storage, facepiece should be protected from distortion from weight or pressure of surrounding objects or being placed in too small a place.**
- a **NEVER store PPE equipment in car or truck because of potential for heat damage but in a location easily accessible**
- a **Fully charged battery pack should be stored in closed plastic bag in dry, cool place where atmosphere is uncontaminated**
  - â **When sold, battery pack is not charged**

# Storage of PPE

## RESPIRATOR

- a **Use battery charger and AC/DC rectifier (adapter) to charge and recharge battery pack**
- a **All parts in plastic bag should be connected together in manner of assembled respirator**
- a **Facepiece and its subparts should be stored separately from remainder of PAPR**
- a **Only fully operable facepieces should be stored**

# Storage of PPE

## PROTECTIVE CLOTHING

- a **Protective suit comes sealed in a vapor-barrier bag that protects against rain, moisture and sunlight**
- a **Protective suit, gloves, hood, overshoes, apron and chemical detection kit should all be stored in the Ready Bag**
- a **Store:**
  - â **away from sunlight and direct heat**
  - â **in a clean, dry, cool place that is free from contaminating vapors, gases and particulates**
  - â **storage temperatures must not exceed 120°F (49°C)**

# Storage of PPE

## CHEMICAL DETECTOR KIT

- a **Should also be stored in Ready Bag**
- a **Store:**
  - â **away from sunlight and direct heat**
  - â **in a clean, dry, cool place that is free from contaminating vapors, gases and particulates**
  - â **storage temperatures must not exceed 120°F (49°C)**

# Basis For Work Rules

- a **Not planned for off-site emergency workers to conduct aggressive spill containment or cleanup operations**
- a **Modification of established state and local response plans may be required**
- a **Basis of modifications will include**
  - â **Technical information developed by Army over last 30 years about potential threat from chemical weapon agents**
  - â **Ergonomic considerations**
  - â **Capabilities of PPE to provide protection**

## **State and Local Government Decisions**

**Option 1 – Emergency workers must wear PPE when they enter any area where protective actions have been determined for public.**

- â Includes traffic control, decontamination stations, and emergency medical response who assist in implementation of protective actions**
- â Will preclude emergency workers from being exposed to chemical agent without PPE**

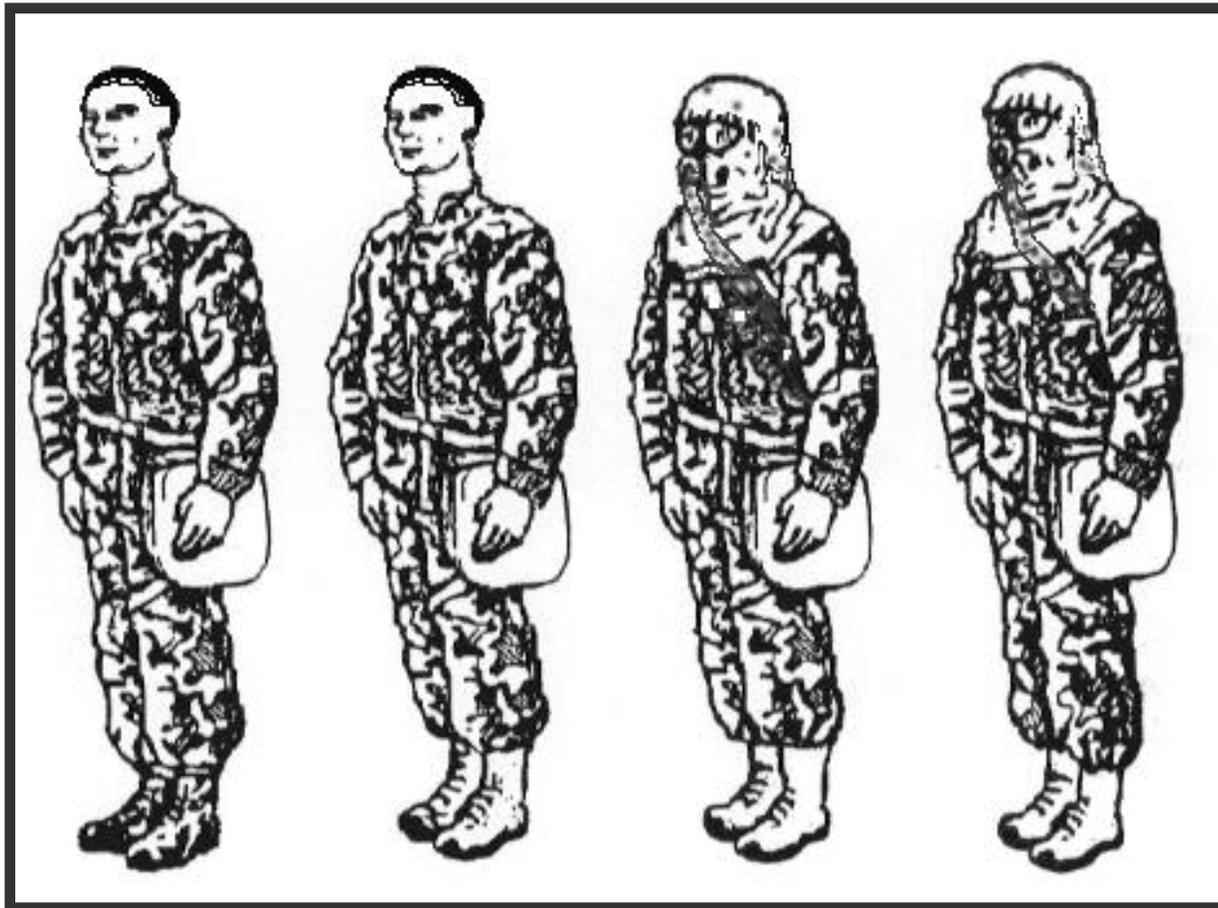
**Option 2 – Emergency workers wear PPE when they enter any area where accident conditions indicate chemical agent may be present as vapor or deposited on the ground**

- â Would require PPE only where agent believed to be present, thus minimizing risk of heat stress to emergency workers where public protective actions are precautionary rather than based on projected exposure**

## **Army Precedents for PPE Selection**

- a State and local governments may wish to adapt their emergency worker protective clothing and equipment rules in manner similar to Army's standard Mission-Oriented Protective Postures (MOPP)**
- a EOCs will determine which protective posture emergency workers in field will assume**
- a EOCs will direct workers to assume specified MOPP level**
- a Standardized MOPP levels assume that individual workers are carrying specified clothing and equipment**

# MOPP Gear Modified for Civilian Use



# MOPP1

- a **When MOPP1 is required, workers immediately don protective suit**
- a **In hot weather, overgarment jacket can be left unbuttoned, and protective suit worn directly over underwear**
- a **MOPP1 provides great deal of protection against persistent agent**
- a **This level is automatically assumed when emergency begins**



# MOPP2

- a **When MOPP2 is required, individuals put on the green vinyl overshoes (GVOs) in addition to protective suit**
- a **Overgarment jacket may be left unbuttoned, but trousers remain closed**
- a **When worn with PAPR, this MOPP level would provide significant additional protection to individuals crossing or occupying a contaminated area, even though civilian emergency workers are not expected to enter such areas**



# MOPP3

- a **When MOPP3 is required, individuals add protective respirator and hood**
- a **Flexibility built into system to allow workers relief at MOPP3**
- a **Can open overgarment jacket and roll respirator hood for ventilation, but trousers remain closed**
- a **Workers are at this point properly protected against vapor hazards**



# MOPP4

- a **When MOPP4 is required, workers will completely encapsulate themselves**
  - â **Closing their overgarments**
  - â **Rolling down and adjusting respirator hood**
  - â **Putting on rubber gloves with cotton liners**
- a **MOPP4 provides highest degree of chemical protection**



## **Basis And Timing For Working In PPE**

- a Emergency workers who enter an area where PPE may be advisable must limit their activities so that protection from contamination and excessive exposure is assured**

## Basis And Timing For Working In PPE

**This requires that emergency workers**

- a **Not be sent into environments which are known or suspected to be immediately dangerous to life or health (IDLH)**
- a **Not remain in potentially contaminated area long enough to receive agent dosage sufficient to affect health or ability to execute assigned tasks**
- a **Not remain in potentially contaminated area long enough to exceed agent absorption capacity of canisters used in PAPR**
- a **Not be exposed to agent deposition density levels exceeding maximum capability of protective suit**

**Airborne Agent Concentrations  
Immediately Dangerous to Life or Health (IDLH)**

<b>Agent</b>	<b>IDLH Concentration (mg/m<sup>3</sup>)</b>
<b>GA/GB</b>	<b>0.2</b>
<b>GD</b>	<b>0.06</b>
<b>VX</b>	<b>0.02</b>
<b>HD/L</b>	<b>*</b>

**\*The U.S. Army Environmental Hygiene Agency proposed a value of 1.67 mg/m<sup>3</sup>. However, as of this date, the Office of the U.S. Army Surgeon General has not formally established IDLH levels for HD or L.**

# Exposure Limits

- a **Simplest, most effective work rule to assure that respirator cartridges are used within capacity is to avoid sending emergency workers into areas where a plume containing airborne chemical agent may be present**
- a **Activity of off-site emergency workers in areas where airborne chemical agent may be present must be limited**
  - â **To ensure that workers are not exposed to average airborne agent concentrations greater than those established for agent workers, even when using respiratory protection**
  - â **Agent absorption capacity of respirator cartridges is not exceeded**

# Respirator Cartridge Limits

- a **Have been determined to provide at least 16 hours of protection when exposed to an agent vapor concentration of  $0.5 \text{ mg/m}^3$**
- a **Possible that under certain release and atmospheric conditions this dosage may be exceeded beyond controlled boundaries at several storage installations**



# Respirator Cartridge Limits

- a **Alternative work rules will avoid possibility that emergency workers can be exposed to conditions in excess of cartridge's absorption capacity**
- a **Once airborne agent concentration level has declined below IDLH level, combination of limited stay times and use of chemical detector kits can assist emergency worker in using PPE within its capabilities**

# PAPR-Limited Stay Times

- a **Emergency workers stay time in potentially contaminated area based on time-weighted-average concentration to which worker will be exposed can be estimated by U.S. Army:**
- â **Multiply cartridge service life (16 hours or 960 minutes) by agent concentration at which it was tested ( $0.5 \text{ mg/m}^3$ ) which yields total dosage of  $480 \text{ mg-min/m}^3$**
  - â **Divide total dosage capacity of cartridge by airborne chemical agent concentrations in area where emergency worker is assigned to estimate maximum stay time based on cartridge capacity**

# Clothing

- a **Strategy similar to Army MOPP Levels strategy**
- a **Though less conservative, it preserves immediate ability to don appropriate PPE but provides some relief from performance and health problems brought about by heat stress**

# Work Intensity

- a **Work intensity is major contributing factor to heat stress**
- a **Recommend work/rest cycle estimates, representing average expected values within a large population, should be considered approximate guidance and not be used as a substitute for common sense or experience**

# Clothing-Limited Stay Times

## **COOL TEMPERATURES**

**50 – 70°F (10 – 21°C) [Wet Bulb/Globe Temperature (WBGT)]**

**Work 30 – 45 minutes**

**Followed by 10 – 15 minutes rest**

## **WARM TEMPERATURES**

**70 – 85°F (21– 29°C) [Wet Bulb/Globe Temperature (WBGT)]**

**Work 20 – 30 minutes**

**Followed by 40 – 60 minutes rest**

## **HOT TEMPERATURES**

**85 – 100°F (29 – 38°C) [Wet Bulb/Globe Temperature (WBGT)]**

**Work 15 – 20 minutes**

**Followed by indefinite rest**

# Heat Stress Factors

- a **PPE restricts heat loss mechanisms because of high insulation and low permeability to water vapor**
- a **Amount of heat accumulation depends upon**
  - â **Amount of physical activity**
  - â **Level of hydration**
  - â **Clothing worn**
  - â **Load carried**
  - â **State of heat acclimatization**
  - â **Physical fitness and fatigue**
  - â **Terrain and climatic conditions**



# Dehydration

- a **Because of higher body temperatures, individuals in PPE sweat considerably more than usual, often more than 1.5 quarts of water every hour during work**
- a **Water must be consumed to replace lost fluids or dehydration will follow**
- a **Inability to drink in full PPE, as it has been modified for civilian use to include the PAPR, increases likelihood of dehydration**
- a **Dehydration and need for regular and timely fluid replacement in workers is limiting factor on stay time in full PPE**

# Psychological Factors

- a **Wearing full PPE reduces ability to see and hear clearly**
- a **Makes it more difficult to recognize and communicate with others**
- a **Creates or increases feelings of isolation and confusion**
- a **Causes frustration in many and claustrophobia in others**
- a **Experience in wearing and exercising in PPE can reduce these feelings**

## **Effects of Heat Stress on Performance in PPE**

- a Workers wearing full PPE (MOPP4) will take about 1.5 times longer to perform most tasks**
- a Performance is affected by stress in a variety of ways:**
  - â Reaction times and decision times are longer**
  - â Routine tasks are done more slowly**
  - â Errors of omission are more common**
- a Use the buddy system whenever possible; a buddy can check for signs of stress and fatigue**
- a Critical jobs should be shared and work should be double-checked**

# Cold Stress Factors

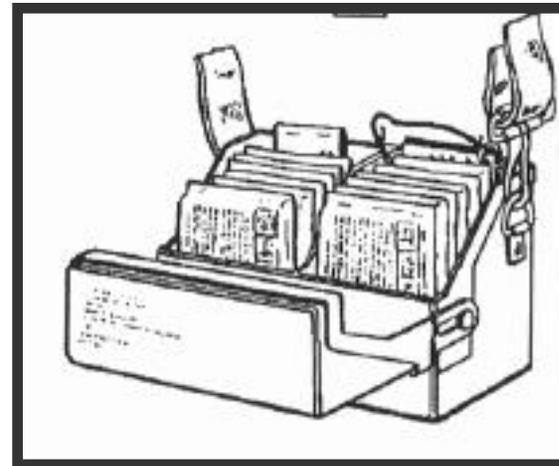
- a **Can directly affect an individual's health and performance while wearing PPE**
- a **Can lower body temperature, resulting in cold injuries and impaired performance**
- a **Often accompanied by wind, rain, snow and ice, which can worsen the effects of cold**
- a **Cold weather clothing and PPE are difficult to integrate**

## **Buddy System Recommended**

- a Good industrial hygiene practice recommends buddy system be used if resources permit**
- a Can assist other workers in dressing out in PPE**
- a Can ensure that all workers are regularly checked for signs of stress and agent exposure**
- a Pair an experienced worker with inexperienced “buddy” whenever possible**

# Using Chemical Detectors

- a **Standard Army-issue Chemical Agent Detector Kit (M256A1) can be used in the field to detect concentrations, with response time of 12 – 15 minutes, of**
- â **GB down to 0.005 mg/m<sup>3</sup>**
  - â **airborne HD (mustard) down to 2.5 mg/m<sup>3</sup>**
  - â **airborne VX down to 0.02 mg/m<sup>3</sup>**

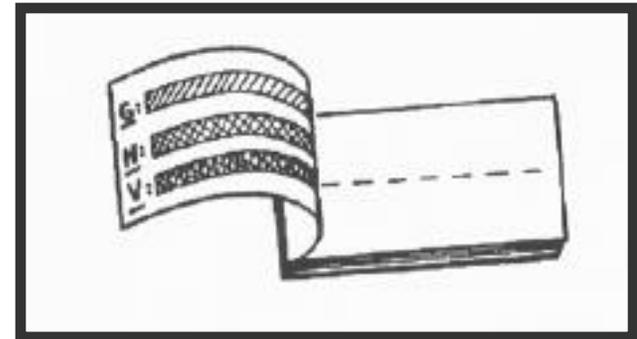


# Using Chemical Detectors

- a **Emergency workers who must be sent into areas potentially contaminated with airborne chemical agent can be**
  - â **Provided with these kits**
  - â **Trained to sample the air at appropriate intervals**
  - â **As appropriate, instructed to leave any area where positive result is indicated**
- a **Although this would not immediately alert emergency worker to agent HD concentrations of 0.5 mg/m<sup>3</sup>, 16-hour capacity of respirator cartridge for more challenging agent GB should provide sufficient safety margin**

# Using Chemical Detectors

- a **Also available is chemical agent detector paper (M8) that detects and identifies**
  - â **liquid V- or G-type nerve agents**
  - â **H-type blister agents**
- a **Paper must touch liquid agent**
- a **Does not detect vapor**
- a **Unreliable for determining completeness of decontamination**
- a **Since unlikely that liquid agent will even be released outside installation boundaries, workers will not likely get any true readings using M8 detector paper**



# Work Rules Summary

## Plan Ahead

- â Check guidance for working in PPE
- â Ensure serviceability or shortfalls in equipment through regular inspections of PPE equipment
- â Plan work/rest cycles appropriate to environment and situation
- â Use standard operating procedures to reduce command, control, and communication tasks
- â Keep plans simple

# Work Rules Summary

## Think Teamwork

- a **Use methods of individual identification**
- a **Encourage small talk while in MOPP**
- a **If resources permit, use the buddy system to ensure that all workers are regularly checked for signs of stress and agent exposure**
  - â **Pair experienced worker with inexperienced “buddy” whenever possible**

# Work Rules Summary

## Work Smart

- a Provide relief from MOPP4 as soon as situation allows
- a Use work/rest ratios, slow work rate, and minimize work intensity
- a Work in the shade whenever possible
- a Rotate jobs and people during long periods of relative inactivity
- a Provide relief from extreme temperatures (hot or cold) as soon as possible
- a Remember that even short breaks from total encapsulation are effective in sustaining performance
- a Enforce drinking water to reduce dehydration and heat casualties

***APPENDIX D. GOVERNMENTAL PPE REQUIREMENTS***

In addition to the obvious need to protect yourself, the U.S. Government requires that your employer provide you with PPE if it is required on your job. The Government's Code of Federal Regulations (CFR) prescribes guidelines for protective clothing, equipment and training.

<b>CFR Reference</b>	<b>Requirement</b>
1910.132(a) 7-1-93	PPE (including respirators, eye and face protection and protective clothing) shall be provided and used and maintained in sanitary and reliable condition.
1910.1030(3)(i) 7-1-93	Employer shall provide, at no cost, appropriate PPE. PPE considered appropriate only if does not permit blood or other potentially infectious materials to pass through to or reach employees': <ul style="list-style-type: none"> <li>• clothes</li> <li>• skin</li> <li>• eyes</li> <li>• mouth</li> <li>• other mucous membranes.</li> </ul>
1910.132(f)(1) 4-6-94	Employer shall provide training for PPE. Employee will know: <ul style="list-style-type: none"> <li>• when is PPE necessary</li> <li>• what PPE is necessary</li> <li>• how to properly don, doff, adjust and wear PPE</li> <li>• limitations of PPE</li> <li>• proper care, maintenance, useful life and disposal of PPE.</li> </ul>
1910.132(d)(1) 4-6-94	After PPE is selected, relay selection decisions to each employee. Make sure the selected PPE properly fits each employee.
1910.132(f)(4) 4-6-94	Employer shall verify each employee received and understood required training through written certification containing: <ul style="list-style-type: none"> <li>• name of employee trained</li> <li>• the date(s) of training</li> <li>• subject of certification.</li> </ul>
1910.134(2) 7-1-93	Respirators shall be provided when such equipment is necessary to protect health of employee. Respirators shall be applicable and suitable for purpose intended.
1910.134(f)(2) 7-1-93	A respirator that is not routinely used, but kept ready for emergency use, shall be inspected after each use and at least monthly to ensure satisfactory working condition.

**CFR Reference****Requirement**

1910.134(f)(5)(i)  
7-1-93

Stored respirators should:

- be quickly accessible at all times
- not be stored in such places as lockers or tool boxes unless they are in carrying cases.

1910.1001 App. C  
7-1-93

Written certification is to be maintained for three years and should include:

- name of test subject
- date of testing
- name of test conductor
- fit factors (manufacturer, model, size, approval number).

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In addition, State and local regulations may specify types of PPE and appropriate levels of protection for specific positions or tasks (e.g., firefighters, EMTs, hazardous materials management teams, etc.) in dealing with a wide range of hazardous materials. Be familiar with State and local regulations in addition to State OSHA requirements where applicable.

Checklists for the inspection, donning, removal, storage, and monthly inspection of PPE are provided in Appendix A. If an emergency worker is contaminated, decontamination procedures as outlined in the *Planning Guidance For the Chemical Stockpile Emergency Preparedness Program, Appendix L, Planning Standards for Decontamination*, should be followed. Completed checklists can be used to meet certification requirements by documenting the employee has received and understood the requisite training and that the requirements specified by the CFR have been fulfilled. In addition, a Review Examination will be given and only persons scoring at least 85% on the Review Questions will be permitted to use PPE.