PERSONAL PROTECTIVE EQUIPMENT©

STUDY GUIDE: SECOND EDITION

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LIST OF ACRONYMS

ANL	Argonne National Laboratory
BDO	battledress overgarment
CAI	chemical accident/incident
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CQAB	Certification and Quality Assurance Branch of NIOSH
CSEPP	Chemical Stockpile Emergency Preparedness Program
DOD	Department of Defense
EOC	Emergency Operating Center
ERDEC	U.S. Army Edgewood Research, Development, and Engineering Center
IDLH	immediately dangerous to life or health
MOPP	mission-oriented protective posture
NCEH	National Center for Environmental Health
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAPR	powered air-purifying respirator
PPE	personal protective equipment

PREFACE

This **Study Guide** has been developed for use in a Federal Emergency Management Agency training course on **Personal Protective Equipment (PPE)** for the Chemical Stockpile Emergency Preparedness Program (CSEPP). Much of this material is derived directly from official documents provided by the U.S. Army and the respirator and protective clothing manufacturers. In many cases the only changes made to the information as given were modifications necessary to adapt the procedures to the civilian environment. Additional materials and review were provided by U.S. Army Defense Ammunition Center and School; U.S. Army Materiel Command; U.S. Army Research Institute of Environmental Medicine; Federal Emergency Management Agency; Argonne National Laboratory, and Oak Ridge National Laboratory (ORNL). The original training materials were prepared by C. B. Foust, C. J. Coomer, and E. D. Copenhaver of the Oak Ridge National Laboratory. The second edition was prepared by Barry Shumpert, John Sorensen, Elaine Thompson, and Barbara Vogt of ORNL.

Please remember that prequisities before this training are certification of medical competency and completion of the *Chemical Awareness* or *ACT FAST* training.

PERSONAL PROTECTIVE EQUIPMENT

OBJECTIVES

The required learning objectives in Personal Protective Equipment (PPE) are to be able to:

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

INTRODUCTION

Public Law 99-145 requires the U.S. Army to dispose of the lethal chemical agents and munitions stockpile stored at eight Army installations throughout the continental United States and Johnston Atoll in the Pacific. Recognition by the U.S. Department of the Army that a potential threat to the public from continued storage was greater than the threat from transportation and demilitarization of chemical agents gave rise to the Chemical Stockpile Emergency Preparedness Program (CSEPP).

The on-site (i.e., on-post) emergency response program is guided by the U.S. Department of the Army Pamphlet 50-6, *Chemical Accident or Incident Response and Assistance Operations*, which describes the Army functions, responsibilities, organizations and procedures for responding to chemical weapon agent events. Upon determining that a chemical accident/incident (CAI) has occurred, installation emergency response elements will respond immediately to the CAI site and take those actions necessary to gain control of the CAI—to include, but not be limited to saving lives, and containing and rendering safe the hazardous materials.

In contrast to the on-site emergency response actions to contain the chemical weapon agent release, off-post civilian response actions will be limited to those that protect the general population. Off-post emergency response actions are contained in State and local emergency plans that describe the functions, responsibilities, organizations, and procedures of off-post response to an incident involving Army chemical weapon agents from the initial notification by the Army that a release has occurred through the end of the incident.

CSEPP planning guidance bars the 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 the range for which the PPE provides protection. Emergency workers who may then have to enter possibly contaminated areas must be identified in State and local plans and provided PPE appropriate for their prescribed job functions.

Emergency workers involved in the off-post response may perform a variety of functions including:

- evacuation traffic control,
- providing emergency medical services, and
- performing emergency decontamination.

Physical activities needed to perform these duties vary in degree of complexity, movement and level of exertion. For example, emergency workers manning traffic control points will be:

- standing outside of or sitting in a vehicle while giving directions via hand or arm signals,
- talking on the radio and loudspeaker, or
- erecting barricades.

In contrast, emergency workers assigned to an emergency decontamination station must:

- bend,
- stoop,
- stretch the body,
- set up and operate the equipment, and
- perform decontamination according to established procedures.

Those who administer medical services similarly must bend, stoop, and walk to perform their jobs.

WHAT IS PPE?

Definition

PPE is defined as all articles worn or equipment used in order to protect the wearer from harmful contaminants in the environment.

Function

The main function of PPE is to provide a shield between the person and the agent which may be contaminating the environment. In order for this shield to be effective it must prevent the person from being contaminated by airborne and surface agents.

Many workers are accustomed to attending to an injured victim immediately, sometimes disregarding the possibility of danger to themselves. Consequently, a worker entering a contaminated area also risks exposure and has the potential to become a victim.

Even though the rescue of an injured or chemically exposed person is important, it should only be attempted after it is certain that the worker will not become injured or exposed. When dealing with nerve and blister agents, PPE protection may be required.

The recommended PPE for dealing with nerve and blister agent contamination consists of respiratory protection and protective covering for all parts of the body. It is important to learn the proper procedures for donning and removing PPE and to recognize the limitations of PPE use.

It is important to know one critical fact about the use of PPE; it must be used, and it must be used correctly. It is not possible to be partially protected from nerve or blister agents; a person is either protected or not protected.

Governmental PPE Requirements

In addition to the obvious need for protection, the U.S. Government requires that the employer provide PPE if it is required for the job. The Government's Code of Federal Regulations (CFR) prescribes guidelines for protective clothing, equipment and training. Please refer to Appendix B, PPE Regulations and Guidance, for specific CFR references and actions required.

In addition, State and local regulations may specify types of PPE and appropriate levels of protection for specific positions or tasks (e.g., firefighters, emergency medical technicians, 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 donning, removal, storage, and 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 demonstrating an adequate understanding of the material will be permitted to use PPE.

WHO NEEDS PPE AND TRAINING

All persons, including volunteers, 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. Also, 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.

To ensure CSEPP participants are prepared to the maximum extent possible, training courses 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, training equipment is being made available to CSEPP participants through appropriate State and local organizations. The capabilities of individual CSEPP participants to properly use the PPE will, as a minimum, be evaluated as part of the training program.

The equipment 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.

TYPES OF PPE

When work must be performed in an area where there are hazardous concentrations of contaminants, it is necessary to protect people from the environment with PPE. PPE has one serious drawback—it does nothing to reduce or eliminate the hazard. PPE places a barrier between the worker and the hazard; if the barrier fails, immediate exposure is the result. The fact that a protective device may become ineffective without the knowledge of the wearer is particularly serious.

In CSEPP, protective clothing, eye and face protection and respiratory protective devices are needed. The selected respirators provide both respiratory and eye and face protection. The protective suit, apron, gloves, and overshoes completely cover the body.

There are three main routes, or ways that a person can be exposed to nerve and/or blister agents. They are:

- inhalation
- direct contact
- ingestion

Although the likelihood of food or drink becoming contaminated with chemical agent is small, be aware that it is possible for someone to become exposed through ingestion. Exposure through inhalation and direct contact are the reasons respirators and protective clothing must be worn. This type of protection guards against skin, respiratory tract and eye exposures.

CSEPP PROTECTIVE EQUIPMENT COMPONENTS

The PPE approved for use by CSEPP responders includes the following chemical protective items:

- powered air-purifying respirator (PAPR),
- hood,
- protective suit,
- gloves,
- overshoes, and
- apron (for personnel performing decontamination).

Gloves, aprons, overshoes, coveralls, and other items made of protective materials must be worn to eliminate prolonged or repeated contact with chemical agents. The Army, in conjunction with the Centers for Disease Control and Prevention/National Center for Environmental Health (CDC/NCEH) has conducted several studies and tests on PPE to select the appropriate PPE for CSEPP.

The protective clothing components that have passed these tests and been certified for use by CSEPP responders include:

- Protective suits
  - DOD Battledress Overgarment (BDO)
  - DuPont/Kappler Responder Coverall
  - DuPont/Kappler CPF3 Coverall
  - ADI Technologies Mark IV Overgarment

- Chemical protective gloves (used with cotton glove inserts)
- Military issue vinyl overshoes
- Chemical protective PAPR hood
- Toxicological agent protective apron

Each responder's protective clothing ensemble will consist of one of the four protective suits plus the protective gloves, overshoes, and hood. Personnel performing decontamination should also wear a protective apron.

Although all four of the protective suits listed above are approved for CSEPP use, only two of them have been selected by States and counties in the program. **The remainder of this PPE training course focuses on these two suits: the DuPont/Kappler Responder Coverall and the DuPont/Kappler CPF3 Coverall.**

Availability of PPE

The CSEPP protective equipment is to be used **only** 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 (if performing decontamination tasks), overshoes, and PAPR will be kept available in the ready bag for each emergency worker in the event of an emergency situation. Sets of backup and training PPE will be made available to each emergency worker.

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

Protective Suits

The DuPont/Kappler Responder and CPF3 suits being used by CSEPP communities are one-piece suits that have demonstrated the ability to protect wearers against chemical agent challenges. Both suits have a hood with elastic around the face as well as elastic at the cuffs of the sleeves and pant legs. Some models have attached booties.

Responder Suit

The Responder suit is made from a multiple layer composite material laminated with a nonwoven substrate. The CPF3 suit uses a similar composite material laminated to a strong polypropylene fabric. While both suits meet the protective

requirements of CSEPP, the Responder suit is lighter in weight. The CPF3 suit provides greater physical strength for workers involved in more rigorous activities. The Responder suit is blue, the CPF3 is tan.

Both suits are made as coveralls with front zippers. The zipper is covered with a double overlapping storm flap with a velcro or taped closure. The seams of both suits are stitched and covered with heat-sealed tape. The suits are expected to provide chemical protection within a temperature range of –85°F (-60°C) to 200°F (93°C). They do not protect the wearer from the effects of heat or cold.

DuPont/Kappler recommends that the suits be replaced or used only for training purposes after 5 years or when visual inspection reveals any damage or weakness in the suit material or seams. The suit material is not repairable, and suits should not be worn if contaminated, punctured, torn, or if signs of abrasion or wear are apparent. Suits which have not been inspected or which are not completely free of damage should never be put into service.

CPF3 Suit

The suits can be stored on a hanger or in an opened shipping bag inside the Ready Bag. Suits should be decontaminated before being removed after a chemical agent response and must be properly disposed of after an actual incident according to State and local regulations. Additional information regarding the DuPont/Kappler Responder and CPF3 suits is available at http://dupont.kappler.com/ . (Note: This reference is correct at the date of publication of this document. If it becomes obsolete, please check with the protective clothing manufacturer for an update.)

Gloves

The gloves protect against liquid chemical agents and vapor hazards. Each glove consists of an outer glove for protection and an inner glove for perspiration absorption.

The outer gloves are made of an impermeable, black, butyl rubber. The inner gloves are made of thin, white cotton.

If the glove set becomes contaminated, replace within 24 hours after exposure. The glove set should be replaced if exposed to any petroleum-based products.

Gloves

The shelf life for gloves is 15 years.

Overshoes

Military issue vinyl overshoes with elastic fasteners protect the feet for up to 24 hours following contamination with chemical agent or up to 14 days if not contaminated. Street shoes are worn inside the overshoes. The overshoes can be decontaminated but are not intended for use in civilian hazardous materials response efforts.

Overshoes

The shelf life for the overshoes is 15 years.

Apron

Apron

The apron is made of nylon cloth, coated with butyl rubber on both sides. All sewn seams are cemented and taped to prevent leakage through the needle holes. The apron is a wrap around style, made of a front panel, two side panels, and raglan sleeves. It is equipped with a neck strap at the top-rear, tie tapes at the middle-rear, and draw tapes on the sleeve. The apron is designed to fit loosely and cover the wearer's arms and body from overshoes to neck. **Only** the CSEPP participants performing decontamination tasks must wear aprons.

If the apron shows signs of deterioration (e.g., cracks, tears, punctures, rubber becomes sticky), replace the apron. Inspect the apron regularly to ensure the integrity is maintained and replace if necessary.

Ready Bag

The ready bag is a canvas bag designed to carry all the protective equipment (protective suit, hood, gloves, apron, overshoes, and PAPR.

Ready Bag

Respiratory Equipment

Respiratory equipment, in addition to protecting the facial skin from exposure, prevents airborne contaminants from being inhaled.

Powered Air-Purifying Respirators (PAPRs) protect against

- particulates
- gases and vapors

Tight and Loose Fitting PAPRs

The PAPR uses a battery-operated blower that is designed to deliver decontaminated air at a slight positive pressure into a full facepiece (air pressure in the facepiece is higher than the surrounding air). This means that if a leak occurs, air will flow from inside the facepiece to the outside air. The powered blower draws ambient air through air-purifying elements (filters or chemical cartridges) which remove specific contaminants and delivers the clean air through a corrugated breathing tube into a facepiece assembly on the face of the respirator wearer. Airflow also provides wearer comfort.

Why the PAPR was Selected

The cartridges from four civilian air-purifying respirators have been tested by Battelle Laboratories and approved by the CDC/NCEH. In addition the National Institute for Occupational Safety and Health (NIOSH) confirmed that the tests on cartridges were conducted in a valid scientific manner consistent with the Certification and Quality Assurance Branch of NIOSH certification test protocols and 42 CFR 84 requirements for chemical cartridges or filters. The data in the report support the conclusion that the commercial cartridges tested will remove up to 0.5 milligram per cubic meter of nerve agent GB for up to 16 hours. This concentration was chosen because it is the maximum predicted concentration to which a CSEPP participant would be exposed. The duration of 16 hours is longer than any CSEPP participant would be expected to wear a respirator (12 hours is the expected maximum duration). The cartridges were tested using nerve agent GB because data provided by the U.S. Army indicate that nerve agent GB wears out filters more quickly than the other lethal chemical agents.

PAPR Components

The PAPRs approved for CSEPP use consist of the following parts:

- a full facepiece,
- a hood,
- a belt-mounted blower unit,
- a battery pack,
- a breathing tube assembly, and
- appropriate filter cartridges

Blower Unit with Tight-fitting Facepiece

The Army has approved two types of Powered Air-Purifying Respirators (PAPRs) for CSEPP emergency workers: the tight-fitting PAPR and the loose-fitting PAPR. The hood for the tight-fitting PAPR has been designed to attach to the facepiece of the PAPR. In the loose-fitting PAPR, the facepiece and hood are integrated into one unit. The hoods are made of butyl rubber-covered cloth that prevents airborne agents from contaminating the head and neck. The hoods are not intended for civilian hazardous materials response.

Both types of PAPRs are attached with a breathing tube to a motor-blower unit that provides clean, filtered air to the facepiece. The tight-fitting PAPR provides greater respiratory protection but is more complex to use. Personnel wearing the tight-fitting PAPR must be clean-shaven since facial hair interferes with the ability to obtain a tight seal around the facepiece. The loose-fitting PAPR will accommodate facial hair and eyeglasses.

Providing respiratory protection for CSEPP participants wearing glasses can be a serious problem with the tight-fitting PAPR. A proper seal cannot be established if the temple bars of eyeglasses extend through the sealing edge of the full facepiece. 3M Corporation has developed a spectacle kit that mounts corrective lenses inside the full facepiece in order to meet the requirements stated in 29 CFR 1910.134 (g)(1)(ii). This standard requires spectacles to be worn that do not affect the fit of the facepiece. Lenses to fit the spectacle kit will have to be obtained locally. Response personnel who wear eyeglasses should either use one of these spectacle kits or use a loose fitting PAPR.

The PAPR removes contaminants by drawing air through filter media (also called filter cartridges or canisters). As required by 29 CFR 1910.134 (j), air-purifying cartridges display a color-coded NIOSH approval label. This label must not be removed from the cartridge and must remain legible. Cartridges approved for

CSEPP use are color-coded **black**, which indicates that they are certified to remove organic vapors. Each cartridge is stamped with an expiration date. No cartridge should be used after the indicated date.

Three sets of cartridges will be stored in each Ready Bag: one set to be used in a chemical agent response; one set for back-up use; and one set for training. The training cartridges will be marked “For Training Purposes Only.” Each set contains 3 cartridges.

Limitations of PAPRs

To protect the wearer’s health and avoid possible injury or death, it is essential that the following limitations be understood.

The PAPR does not protect exposed areas of the body. Some contaminants can be absorbed directly through the skin while others may irritate exposed areas. The wearer should immediately return to a non-contaminated area if:

- The taste or smell of contaminants is detected,
- The eyes, nose, or throat become irritated,
- Breathing becomes difficult,
- The air becomes uncomfortably warm,
- Nausea or dizziness sets in, or
- The flow of air through the respirator slows or stops.

Do **NOT** use in atmospheres where the concentration of contaminants is unknown or is immediately dangerous to life or health (IDLH).

Do **NOT** use in atmospheres containing less than 19.5% oxygen (applicable if in enclosed space).

Do **NOT** use the respirators in a flammable or explosive atmosphere. This restriction includes wearing, operating, testing, repairing, and charging or replacing batteries. The electrical parts are not approved for such use and might ignite a flammable or explosive atmosphere.

Before putting on the PAPR, it is essential to:

- remove all obstructions (including packaging, plugs and caps) to the free flow of air into the air-purifying elements, and
- ensure the initial flow test is performed satisfactorily (see Appendix A).

Always put on the respirator in a place where the ambient air is uncontaminated and satisfactorily perform the Negative and Positive Pressure Face Fit Tests (see Appendix A) before entering a contaminated area. The Negative and Positive Pressure Face Fit Tests fulfill 29 CFR 1910.134 (g) (1) (iii) which states in order

to assure proper protection, the facepiece fit shall be checked by the worker each time he puts on the respirator.

Only fully charged battery packs (batteries) are to be used when the respirator is donned.

To protect health, prevent severe injury, and avoid fire you should:

- protect batteries and battery packs from fire and heat at all times
- protect the poles of the battery packs from short circuiting
- do not open batteries
- dispose of batteries with due care (follow good industrial hygiene practices for disposal).

If the blower motor in the blower unit stops while the respirator is being worn, immediately leave the contaminated area and go to the closest place where there is uncontaminated air. The motor stopping may be an indication of internal damage to the blower unit, or that the battery pack should be recharged, or the air-purifying elements have become plugged and should be replaced. If wearing a loose-fitting PAPR, the wearer has only a few minutes to exit the contaminated area before running out of oxygen. (During operation, it is normal for the signal light on the blower unit to become steadily or intermittently illuminated.)

Always read the labels on air-purifying elements (filter cartridges) to be sure that the ones to be used will be effective against the contaminants being encountered. All air-purifying elements in a blower unit must be identical and must be replaced at the same time. Air-purifying elements must not be used beyond their useful life (when they become plugged with particulates or saturated with gases or vapors or whenever they contribute to increased airflow resistance).

Air-purifying elements that have been used may contain measurable quantities of the contaminant or contaminants they have been removing from the air passing through them. They must be handled accordingly. Follow applicable regulations when replacing elements and disposing of used elements.

REQUIRED MEDICAL EVALUATION

Federal regulations require that all people who will be assigned any type of respirator undergo a medical evaluation to determine their ability to use this type of equipment. Each person must provide pertinent information to a physician, either through a direct examination or by filling out a medical questionnaire. The Federal regulations (29 CFR 1910.134, Appendix C) include a questionnaire that specifies the information that must be provided. The mandatory questionnaire is included in this Study Guide as Appendix F.

A physician or other licensed health care professional will evaluate the results of the questionnaire and provide a written determination of the person's ability to use a respirator, including any restrictions on such use. In some cases, a medical examination may be necessary. Additional, follow-up medical evaluations are required under any of the following conditions:

- the person reports medical signs and symptoms that affect the ability to use a respirator;
- a health care professional or supervisor recommends reevaluation;
- a need for reevaluation is noted during respirator fit testing or program evaluation; or
- there is a relevant change in the duties the person would perform while wearing the respirator.

RESPIRATOR FIT TESTING FOR THE TIGHT-FITTING PAPR

Introduction

Tight-fitting PAPRs are effective only if a good seal is maintained between the respirator and the wearer's face. Because of this, Federal regulations require fit testing to ensure that each wearer is assigned the proper style and size of respirator. Fit testing may be provided by the respirator manufacturer, by U.S. Army Defense Ammunition Center and School, by the State, or by local personnel who are properly qualified. The 29 CFR 1910.134 Appendix A outlines the mandatory testing procedures to be followed for qualitative and quantitative fit testing.

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

Fit testing should be repeated periodically (at least, annually). In addition, regulations call for new fit testing whenever the worker has:

- obvious change in body weight,
- 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.

These changes are critical for tight-fitting PAPRs but not for loose-fitting PAPRs.

Facepiece Fit

With tight-fitting PAPRs, proper face fit is important in order to provide a tight seal to the face and exclude ambient gases, vapors and aerosols. Fit testing is not needed for the loose-fitting PAPR. Professional fit testing to determine whether a respirator fits the face tightly is an important step in the process of selecting a respirator. Only a facepiece that has been professionally tested and found to fit properly should be used.

According to Appendix A to 29 CFR 1910.134, fit testing shall not be conducted if there is any hair growth between the skin and the facepiece-sealing surface. 29 CFR 1910.134 (g) also expressly states that **all** beards and some mustaches will not allow a satisfactorily tight face fit. If the mustache interferes with the tight face fit, it will have to be shaved or disqualify the worker from wearing the tight-fitting PAPR. Facial hair interferes with the face seal with the CSEPP tight-fitting PAPR, but is not a problem with the loose-fitting PAPR. Cosmetics should not be worn as they could possibly prevent a good face seal. Other conditions such as scars, deformities of the face, or sunken cheeks could possibly interfere with the satisfactorily tight face fit with facepieces.

It is important to protect the eyes from exposure. The Army enforces prohibitions (AR 40-63) against soldiers wearing contact lenses in chemical environments; they only intensify vision problems. The eye is the most sensitive organ system for nerve agent effects. Threshold dose for the contraction of the pupil of the eye is the basis for both VX and GB exposure standards.

Quantitative Fit Test

Quantitative fit testing provides the best method of fitting the respirator to the individual under actual wearing conditions. This method satisfies Federal requirements by using quantitative methods to detect for leakage or malfunction.

Quantitative respirator fit tests involve exposing the respirator wearer to a test atmosphere containing an easily detectable, relatively nontoxic aerosol, vapor, or gas as the test agent and then measuring the penetration of the test agent into the respirator. There are a number of test atmospheres, test agents, and exercises to perform during the tests. The manufacturers' recommendations should be followed for specific tests. With this information, a quantitative fit factor can be calculated. This is an index that indicates how well the respirator fits the wearer; the higher the number the better the fit.

The advantages to this type of testing are:

- it does not rely on a subjective response, and
- it is much more accurate.

The disadvantages are:

- cost of instrumentation,
- need for trained personnel to conduct the test,
- use of special respirators equipped with a sampling probe so the same facepiece cannot be worn in actual service, and
- time consumption as a result of performing three trials.

Port-a-Count

The Port-a-Count is a portable, battery-powered condensation particle counter designed specifically for quantitative respirator fit testing of a tight-fitting PAPR. It has a dual sampling hose system with an internal switching valve for in-mask and ambient concentration sampling. It requires a probed respirator for testing.

The tester will drill a hole in a PAPR visor and insert the probe, located in the oro-nasal area. The probe will then be sealed into the visor and the Port-A-Count will be used to ensure there are no leaks around the probe. The wearer can then perform quantitative fit testing on the PAPR.

Qualitative Fit Test

Qualitative fit tests involve a test subject's responding (either voluntarily or involuntarily) to a chemical outside the respirator facepiece.

The advantages to this type of testing are:

- fast,
- easily performed, and
- use inexpensive equipment.

Because these tests are based on the respirator wearer's subjective response to the test chemical, the disadvantages are:

- reproducibility and
- accuracy may vary.

Irritant Smoke Test

The most popular method is the irritant smoke test.

The irritant smoke test is performed by directing an irritant smoke, usually either stannic chloride or titanium tetrachloride, from a smoke tube towards the respirator being worn. If the wearer cannot detect the irritant smoke, a satisfactory fit is assumed to be achieved.

The respirator wearer will react involuntarily, usually by coughing or sneezing, to leakage around or through the respirator. Since this is a qualitative test, the tester is interested in any response to the smoke. The degree of response is not important.

STORAGE OF PPE

Protective Clothing

The DuPont/Kappler Responder and CPF3 protective suits come sealed in a shipping bag. The suit may be stored in the open shipping bag inside the Ready Bag along with the gloves, hood, overshoes, and apron. Alternatively, the suit may be stored on a hanger. The protective suits should be stored:

- away from sunlight and direct heat,
- in a clean, dry, cool place that is free from contaminating vapors, gases and particulates,
- where temperatures do not exceed 120°F (49°C).

Respiratory Equipment

Before storing the facepiece, it should be inspected, repaired, if necessary, cleaned, dried, and given a final inspection. Only then:

- place the facepiece (with hood) in a closed plastic bag,
- the bag and facepiece should be stored away from sunlight and direct heat,
- store in a clean, dry, cool place that is free from contaminating vapors, gases and particulates,
- storage temperatures must not exceed 120°F (49°C), and
- the bag should be clearly labeled to indicate type of facepiece.

While it is in storage, the facepiece should be protected from distortion from the weight or pressure of surrounding objects or being placed in too small a place.

Never store the PPE in a car or truck because of the potential for heat damage. Rather, store the PPE in a readily accessible location.

The fully charged battery pack should be stored in a closed plastic bag in a dry, cool place where the atmosphere is uncontaminated. When sold, the battery pack is not charged. Use the battery charger and AC/DC rectifier (adapter) to charge and recharge the battery pack. When the battery is fully charged, a light located on the adapter turns on.

All the parts in the plastic bag should be connected together in the manner of an assembled respirator. The facepiece and its subparts should be stored separately from the blower unit. Only fully operable facepieces should be stored.

USING PPE

All pre-operational checks must be performed monthly and after each time the PAPR is used. At such time you should replace any missing or damaged components and ensure the filter cartridges are properly fitted. You should also confirm that the battery pack is fully charged and that the airflow is appropriate for the facepiece being used. These checks ensure proper operation of the PAPR should an emergency arise. Follow the manufacturer's instructions and checklists. Periodically check for manufacturers recall notices for all PPE items.

States are responsible for developing acceptable procedures for using PPE. While there are incorrect procedures, there are also multiple variations of acceptable procedures. The two sequences presented in this training are examples of acceptable procedures. Checklists for these two procedures are in Appendix A.

Donning the Tight-Fitting PAPR and Responder Suit

Underclothing as a minimum is worn under the Responder suit. The manufacturer recommends wearing a long sleeve shirt and long pants or long underwear under the suit. If regular clothing is used, make sure that all personal effects that could damage the suit are removed from pockets. Tuck pant cuffs into socks to make putting on the coverall legs easier. Remember, shoes are worn under the vinyl overshoes. Place both legs into the suit. This is most easily done while seated. Then, place both feet into the overshoes. Button the overshoes, pull down the elastic cuffs over the tops of the overshoes. Some states tape the pant leg to the overshoes. A folded-over tab on the tape end will help when removing the tape from the suit later on. Stand up and pull the suit up to the waist. Communication equipment and life vests, if appropriate, can be added at this point using State-developed procedures.

There are two methods of putting on gloves. In the first method, the person puts on the glove liners followed by the rubber gloves. With both gloves on, insert the arms into the suit, leaving the suit open. Next, tape the suit cuffs to the outside of the gloves. The DuPont/Kappler suits are designed to allow the user to facilitate arm movement when wearing the suit. Taping too tightly restricts this type of movement. The second method is to insert the hands with the liners on into the suit and then place the rubber gloves over the elasticized wristbands, taping the gloves to the outside of the suit. To increase flexibility in arm movement, some states recommend raising the arms and bending the elbows before taping the gloves. Next, close the zipper and secure the velcro flap or adhesive strip. Have

a partner tape the Responder hood to the back of the suit when using a tight-fitting PAPR.

To put on the tight-fitting PAPR and hood, place the motor-blower back cover against the lower back with the breathing tube extended upward. Fasten the belt with the motor-blower around the waist. Turn on the battery. Hang the PAPR facepiece around the neck. After loosening the head harness straps, place the thumbs inside the straps and the chin in the chin cup inside the facepiece. Next pull the harness over the back of the head and tighten all the straps - lower straps first, side straps second and top strap last. Pull the hood over the head and fasten the straps.

Removing the Tight-Fitting PAPR and Responder Suit

If the suit has been exposed to a chemical agent, the wearer needs to decontaminate before removing the suit. After decontamination is completed, those wearing the tight-fitting PAPR should loosen the hood straps but not remove the hood. The motor-blower is then removed and set aside while the rest of the PPE is removed. Do not remove the tape from the sleeve cuffs. If needed have a buddy unseal and unfasten the front of the suit, touching only the outside of the suit. Remove the arms from the rubber gloves through the sleeves, touching only the inside of the suit. The white glove liners can be left on but should never touch the outside of the suit. Have a partner remove tape from the overshoes and unfasten the buttons. Remove the entire suit by pushing the suit downward over the overshoes. Then step out of the overshoes into a clean area.

The PAPR is removed last. To remove the tight-fitting PAPR, place your hands beneath the hood and turn the hood wrong side out over the front of the PAPR. Holding your breath, loosen the bottom side straps and pull the PAPR away from your face while lifting it over your head. CSEPP emergency workers are then advised to shower, making sure that all skin crevices and hair are cleaned thoroughly. The suits are not designed for use after being contaminated with a chemical warfare agent and should be bagged and properly disposed of after such exposure.

Donning the Loose-Fitting PAPR and CPF3 Suit

Underclothing as a minimum is worn under the CPF3 suit. The manufacturer recommends wearing a long sleeve shirt and long pants or long underwear under the suit. If regular clothing is used, make sure that all personal effects that could damage the suit are removed from pockets. Tuck pant cuffs into socks to make putting on the suit legs easier. Shoes are worn under the vinyl overshoes. If a suit with booties is used, wearing a lightweight shoe under the booty and donning the overshoe over the booty is recommended. Place both legs into the suit. This is most easily done while seated. Place both feet, with shoes on, into the overshoes. Button the overshoes, and pull down the splashguards over the tops

of the overshoes. On suits without booties, you may tape the pant leg to the overshoe. In training, duct tape is commonly used. A folded-over tab on the tape end will help when removing the tape from the suit later on. You may stand up and pull the suit up to facilitate putting on the motor blower. Communication equipment and life vests may be donned at this time, using procedures developed by the State.

To don the loose fitting PAPR and gloves, place the motor-blower back cover against the lower back with the breathing tube extended upward. Fasten the belt with the motor-blower around the waist. Turn on the battery. Verify airflow to the hood. Some States add life-vests or communication equipment at this point. To put on gloves, first remove the arms from the suit. There are two methods of putting on gloves. In the first method, the person puts on the glove liners and the rubber gloves. With both gloves on, insert the arms into the suit, leaving the suit open. Tape suit cuffs to the outside of the gloves. The CPF3 suits are designed to allow the user to facilitate arm movement when wearing the suit. Taping too tightly restricts this type of movement. The second method is to insert the hands with the liners on into the suit and then place the rubber gloves over the elasticized wristbands, taping the gloves to the outside of the suit. Pull the hooded respirator over the head and adjust the headband wraps and the elastic neck seal so it fits under the chin, making sure the breathing tube is not twisted. Fully zip up the suit and make sure the velcro flap or adhesive strip over the zipper is sealed.

Removing the Loose-Fitting PAPR and CPF3 Suit

If the suit has been exposed to a chemical agent, the wearer should decontaminate the suit before removing it. After decontamination, remove the hooded PAPR, turning the hood inside out while touching only the outside surface. The motor blower should be removed and the overshoes unbuckled. With butyl gloves on, unseal and unfasten the front of the suit touching only the outside of the suit. Remove one arm from the rubber gloves through the sleeve, touching only the inside of the suit. Remove the other arm in the same manner. The white glove liners may be left on but should never touch the outside of the suit. Roll the suit down your body from the inside out to the ankles, touching only the inside of the suit. Remove one foot from the suit and overshoe and place the foot in a clean area. Remove the other overshoe and the glove liners and step into a clean area. Toss the gloves back out of the clean area. CSEPP workers are then advised to shower, making sure that all skin crevices and hair are cleaned thoroughly. The suits are not designed for use after being contaminated with a chemical warfare agent and should be bagged and properly disposed of after such exposure. PAPRs should be sealed in a plastic bag prior to decontamination.

WORK RULES

Introduction

This section discusses some of the problems that are often encountered when wearing PPE so that responders can think about how to overcome or deal with them.

Slower Performance

An emergency responder wearing a PAPR, hood, suit, gloves, and overshoes will not be able to perform tasks as quickly, easily, and efficiently as when wearing street clothes. Workers wearing PPE will take about 1.5 times longer than normal to perform most tasks. Decision making and precision control tasks (such as typing a message or using an auto-injector) may take 2.5 times as long as normal. Even more time may be required if workers have been in PPE for an extended period or are overheated.

Restricted Vision

The PAPR and hood restrict the wearer's field of vision, largely eliminating peripheral vision. The wearer must turn his or her head from side-to-side to get a normal visual awareness of the surroundings.

Diminished Sense of Touch

When wearing butyl rubber gloves, sensitivity and dexterity are greatly diminished. This can cause problems with certain tasks that require sensitive touch and/or manual dexterity. Consider how the following tasks would be accomplished if suited out:

- feeling for a pulse
- opening eyelids to check for miosis (pinpoint pupils)
- administering an injection
- picking up a pencil

Heat Build Up

If the weather is warm and physical work is being done, it does not take long for body heat to raise the temperature inside the suit considerably. Some choose to leave on only their underclothes under the suit to help with this problem. On the other hand, the protective suits are not designed to ward off the effects of cold weather. Additional clothing may be needed under the suit in winter conditions.

Using the Rest Room

In addition to heat build up, going to the rest room can be another problem if expected to be in the PPE for a long period of time.

Personal Identification

If several emergency workers are suited-out, it may be difficult to quickly recognize the identity of each worker. This problem is most common when there are several workers in a fairly small area, such as a decontamination station. One way of addressing this problem would be to have each worker wear a vest with his or her name or title printed on it. Relying on voice recognition is not an adequate solution.

Voice Recognition/Distinction

Ever heard someone speak while placing a hand over his/her mouth? The volume and clarity of a voice while wearing a respirator sounds about the same. Although this is not a big problem (most people learn to overcome it by raising their voice and paying particular attention to pronunciation), it does require minor adjustments in communication with others.

Eating and Drinking

Eating and drinking are not possible while wearing the fullface respirator, and it is important to replenish the water lost through sweating and to prevent dehydration from occurring while wearing PPE.

Basis for Work Rules

The delegation of responsibilities following a release of chemical warfare agent will differ significantly from that following other types of hazardous materials releases. Normally, a jurisdiction's emergency response forces would be responsible for all aspects of the situation—everything from containing and cleaning up the spill to controlling access to the hazard area. In a CSEPP event, on the other hand, Army personnel will have **sole** responsibility for containing the release and cleaning up any remaining chemical agent. Off-post responders will be responsible **only** for public safety and related measures, such as facilitating the flow of evacuation traffic, conducting search and rescue, decontaminating possibly exposed individuals, and controlling access to the hazard area. This division of responsibilities allows Army personnel, who have proper training, equipment, and experience, to deal with the physical presence of chemical agent. This frees up off-post responders to take the quick actions that are necessary to assist in public protection.

The CSEPP Planning Guidance states that off-post emergency responders may enter an area where chemical agent is known or suspected to be present only after the Army installation has determined that

- the release of agent has stopped, and
- emergency responders' PPE will protect them from the concentration of agent that may be present in the area.

The intent of this general principle is to ensure that no CSEPP responders receive a harmful dose of chemical agent while performing their duties.

State and Local Government Decisions on Work Rules

State and local governments are responsible for establishing detailed procedures to implement this general principle and ensure that emergency workers can accomplish their duties safely. These responsibilities ranges from ensuring that responders have the appropriate PPE for their assignments (such as aprons for personnel who will perform decontamination) to monitoring the work activities of personnel who are wearing PPE to avoid heat stress or exhaustion.

At least two optional approaches have been identified that State and local jurisdictions can adopt as a basis for the detailed work rules embodied in their emergency operations plans:

Option 1 — The plan specifies that emergency workers must wear PPE when they enter any area where protective actions have been recommended for the public.

When identifying protective actions to recommend for the public, decision makers want to be sure that their recommendations cover all members of the public who might potentially be in danger. Therefore, the processes they use to develop their protective action recommendations significantly overestimate the area that would be affected by a chemical agent release. As a result, adopting Option 1 would ensure that emergency workers would not be exposed to chemical agent without PPE.

Option 2 — The plan requires that emergency workers wear PPE when they enter any area where accident conditions indicate that chemical agent may be present as vapor or deposited on the ground.

Under this option, PPE would be required only in areas where modeling, monitoring, or other techniques indicate that chemical agents are likely to be present. By reducing the overestimation of the hazard area, this option would be somewhat less protective of emergency workers than Option 1. On the other hand, it would allow workers to perform their duties free from the obstacles posed by protective clothing and equipment and would reduce the risk of heat stress.

Basis and Timing for Working in PPE

Emergency workers who enter an area where PPE is required, must limit their activities to ensure they are protected from contamination and excessive exposure. This requires that emergency workers:

- not be sent into environments which are known or suspected to be IDLH
- not 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
- not remain in a potentially contaminated area long enough to exceed the agent absorption capacity of the cartridges used in the PAPR
- not be exposed to agent deposition levels that exceed the capability of the protective suit.

Good industrial hygiene practice recommends that a buddy system be used. Use the buddy system to assist the emergency workers in dressing out in PPE and to ensure that all workers are regularly checked for signs of stress and agent exposure. Pair an experienced emergency worker with an inexperienced “buddy” whenever possible.

Respirators

Respirators must be only used in the context of a complete respiratory program as described in OSHA regulations and NIOSH publications. Examples of work rules to ensure that this protective equipment is used only within its tested tolerances are presented below.

Exposure Limits

The Office of the U.S. Army Surgeon General has recommended the establishment of IDLH airborne concentration levels for various chemical weapons agents in the U.S. stockpile. The recommended IDLH concentration levels corresponding to an exposure time of 30 minutes are listed in Table 1. This exposure time should allow an individual working in an area where the agent concentration is at or below the IDLH level sufficient time to exit the area if a respirator failure were to occur.

Table 1. Airborne Agent Concentrations Pertinent to Emergency Workers

Agent	IDLH Concentration (mg/m^3)	Occupational Exposure (8-hour TWA)[b]
GA/GB	0.2	0.0001
VX	0.02	0.00001
HD/L	[a]	0.003[c]

[a]U.S. Army Environmental Hygiene Agency proposed a value of 1.67 mg/m^3. However, as of this date the Office of U.S. Army Surgeon General has not formally established IDLH levels for HD and L.
[b]TWA – time-weighted average.
[c]Value represents technologically feasible real time detection limit.

Immediately following an accidental chemical agent release, it would most likely be the IDLH concentration level that would restrict emergency workers from entering a contaminated area. At later times, as the agent is transported downwind and disperses, the protection capacity of the respirators would limit the time emergency workers could remain in an contaminated area.

The simplest and most effective work rule to assure that respirators are used within their capacity is to avoid sending emergency workers into areas where a cloud containing airborne chemical agent may be present. Since the only challenge to cartridge capacity comes from airborne agent, this will eliminate the possibility that this capacity could be exceeded during a CAI.

Activity of off-site emergency workers in areas where airborne chemical agent may be present must be limited to ensure that:

- the emergency workers are not exposed to average airborne agent concentrations greater than those established for occupational exposure, even when using respiratory protection (see Table 1) and
- the agent absorption capacity of their respirator cartridges is not exceeded.

Respirator Cartridge Limits

The respirator cartridges have been determined to provide at least 16 hours of protection when exposed to an agent vapor concentration of 0.5 mg/m^3. This corresponds to protection against a total dosage of 480 mg-min/m^3 (0.5 mg/m^3 × 16 hr × 60 min/hr). It is possible that under certain release and atmospheric conditions this dosage (480 mg-min/m^3) may be exceeded outside the controlled boundaries of several storage installations. The alternative work rules discussed above will avoid the possibility that State or local emergency workers can be exposed to conditions in excess of the cartridge's absorption capacity.

Once the airborne agent concentration level has declined below the IDLH level, limitations on stay times can assist the emergency worker in using the PPE within its capabilities. In addition, chemical agent detector kits can also help monitor for the presence of contamination for those states that use these kits.

PAPR Limited Stay Times

Because it is possible that the dosage of chemical agent in the air may exceed the respirator capacity at some CSEPP locations, the length of time a responder remains in a potentially hazardous area must be limited. In an emergency situation, response commanders will calculate maximum stay times using a method similar to that presented in Appendix C of this Study Guide. This calculation takes into account the time-weighted occupational exposure limit for the chemical agent (see Table 1), the estimated concentration of agent in the hazard area, and the respirator's protection factor. The result is a conservative estimate of how long the responder can safely remain in the hazard area without exceeding the occupational exposure level for the chemical agent.

For more detailed information on limited stay times, please refer to Appendix C, PAPR- and Clothing-Limited Stay Times.

Clothing

Total Encapsulation Strategy

In the earlier discussion on choosing work rules for civilian emergency workers, two options were outlined, either of which can be adopted in State and local emergency plans. These two options represent a total encapsulation strategy. As noted, Option 1, in which the plan specifies that emergency workers must wear PPE when they enter any area where protective actions are recommended for public, is highly conservative since the process used to determine public protective actions consistently overestimates the area affected by chemical agent.

Option 2, in which the 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 ground, is less conservative and would require PPE only where there is reason to believe agent may be present, thus minimizing the risk of heat stress to emergency workers. Though less conservative, this strategy preserves an immediate ability to don appropriate PPE but provides some relief from performance and health problems brought about by heat stress.

Heat Stress Factors

Guidelines for reducing heat stress should be followed whenever protective clothing and equipment is used. Body temperature must be maintained within narrow limits for optimum physical and mental performance. Normally, the body cools itself by evaporation of sweat and radiation of heat at the skin's surface. PPE restricts these heat loss mechanisms because of its low permeability to water vapor. In addition to causing significant health effects, heat stress degrades performance by lengthening reaction times and decision time.

The body produces more heat during work than rest. In addition, physical work tasks require more effort when workers wear protective equipment because of added weight and restricted movement. This results in more body heat to be dissipated than normal and body temperature tends to rise quickly. The amount of heat accumulation depends upon:

- the amount of physical activity,
- the level of hydration,
- the clothing worn,
- the load carried,
- the state of heat acclimatization, physical fitness and fatigue, and
- terrain and weather conditions.

Table 2 contains limited stay times for clothing. For example, if temperatures are cool (50 – 70°F/10 – 21°C), responders can safely work for 30 – 45 minutes followed by 10 – 15 minutes rest.

Table 2. Clothing Limited Stay Times[1]

Temperature Range	Work Time	Rest Time
50 – 70°F/10-21°C	30 – 45 minutes	10 –15 minutes
70 – 85°F/21-29°C	20 – 30 minutes	40 – 60 minutes
85 – 100°F/29-38°C	15 – 20 minutes	indefinite

[1]Must use Wet Bulb/Globe Temperature.

There are several things that can be done during rest periods outside the hazard area to reduce the level of heat stress:

- Unzip the protective suit
- Unbutton and loosen overshoes
- Roll back the PAPR hood, and so forth.

These actions will reduce barriers to body cooling.

For more information on heat stress and how to deal with it, see Appendix C, PAPR- and Clothing-Limited Stay Times.

Cold Stress Factors

Though far less likely to be a complicating factor than is heat stress, cold stress can directly affect an individual's health and performance while wearing PPE. Cold can lower body temperature, resulting in injuries and impaired performance. Cold weather is often accompanied by wind, rain, snow and ice, which can worsen the effects of cold, as well as contribute to injury and performance impairments in and of themselves. Cold weather clothing and PPE are difficult to integrate.

For more information on the effects of cold temperature on PPE-clad workers, see Appendix C, PAPR- and Clothing-Limited Stay Times.

First Aid/Buddy Aid in Heat and Cold

Wearing PPE while working in hot or cold conditions clearly exposes emergency responders to additional risks. Workers must pay attention to how their bodies are reacting to the environment in which they are working. They must also note how their buddies are handling the work stresses. The following section, which provides guidance on first aid and buddy aid in such situations, is reprinted from *Sustaining Health and Performance in the Desert: A Pocket Guide for Operations in Southwest Asia,* Technical Note 91-2, prepared by the Staff of the U.S. Army Research Institute of Environmental Medicine, Natick, MA, December 1990.

Heat Illness (General)

- Watch your buddy for symptoms or signs of overheating; inability to remain at work, red or flushed face, confusion or disorientation, fainting or collapse. It is always better to take care of a problem early. When in doubt, act.

- Immediately get heat-stricken buddies into shade [outside the hazard area], remove heavy clothing and if they are alert, give them drinking water. They will probably need at least 3 quarts. The water should be cool but not cold.

- If enough water is available, sprinkle water on the skin and t-shirt for cooling. Fan the casualty. Even non-potable water will do in this circumstance, as long as you do not get any in the person's eyes, mouth, or open wounds.

- If unconscious or confused, the casualty will need evacuation for further evaluation and care.

- If confused and very hot, the individual probably has heat stroke and should be given the highest priority for medical evacuation. If ice is not available, immersion in cool water is the quickest way of reducing body temperature. A field expedient immersion device can be built from tent canvas mounted in a frame off the ground. The water can then evaporate from the canvas and help to cool the bath. If an aboveground frame cannot be constructed, a shallow pit lined with canvas can be used.

Heat Cramps

- Heat cramps may be a problem encountered in individuals working hard in the heat. Stricken individuals develop painful cramps in major muscles in the abdomen and limbs. The symptoms are probably associated with dehydration and/or inadequate salt intake.

- Affected individuals need shade and rehydration. Massage sometimes helps the cramps while rehydration is being done.

- In heat cramps, rehydration should be done with liquids that contain some added salt or electrolytes. At least 3 quarts of fluid will be needed. Give slowly, no more than 1.5 quarts per hour.

- Although administration of dilute oral salt solutions can be effective in many cases, immediate evacuation may be appropriate if unit resources cannot manage the problem. Faster relief can be obtained when medical personnel give the fluids by vein.

Hypothermia

- Watch your buddy. Continuous shivering means the body is losing heat at a rapid rate. You need to provide help now. Provide more warmth and cover.

- Someone who is cold and confused needs to be evacuated. Provide more cover and warmth. If the person is not shivering, active warming is needed. Confused or delirious patients should not be given anything to eat or drink.

- Someone who is cold and unconscious needs evacuation, even if there are not signs of life. Treat the individual gently and keep the individual from losing more heat. Do not start CPR except under the supervision of medical personnel.

Work Rules Summary

Plan Ahead

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

Think Teamwork

- Use methods of individual identification (name tags, etc.).
- If resources permit, use the buddy system to ensure that all emergency workers are regularly checked for signs of stress and agent exposure.
- Pair an experienced emergency worker with an inexperienced “buddy” whenever possible.

Work Smart

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

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APPENDIX A

CHECKLISTS FOR PROTECTIVE CLOTHING AND RESPIRATOR USE

CHECKLIST FOR DONNING THE TIGHT-FITTING PAPR WITH THE DUPONT/KAPPLER RESPONDER SUIT

States are responsible for developing acceptable procedures for using PPE. While there are incorrect procedures, there are also multiple variations of acceptable procedures. This checklist is an example of an acceptable procedure. Use of the buddy system is required for this procedure.

____ 1. Wear underclothing as a minimum. The manufacturer recommends wearing either a long sleeve shirt and long pants or long underwear under the suit.

____ 2. If regular clothing is worn under the suit, empty pockets of all personal effects that could damage the suit.

____ 3. Tuck pants legs into socks to make it easier to put on coverall legs.

____ 4. While wearing shoes, place the legs into the suit (most easily done while seated).

____ 5. Don the vinyl overshoes.

____ a. Place both feet into overshoes.
____ b. Button overshoes.
____ c. Pull down elastic cuffs of the suit over the tops of the overshoes.
____ d. Tape the suit's pant legs to the overshoes. (A folded-over tab on the tape end will help when removing the tape later.)

____ 6. Stand up and pull the suit up to the waist.

____ 7. Don communication equipment and life vest, if appropriate.

____ 8. Don the gloves.

____ a. Put on the cotton glove liners.
____ b. Insert the hands through the arms of the suit.
____ c. Place the butyl rubber gloves over the elasticized wristbands of the suit.
____ d. With the arms raised and the elbows bent, tape the gloves to the suit.

____ 9. Close the zipper of the suit and secure the covering velcro flap or adhesive strip.

____ 10. Have buddy tape the Responder hood to the back of the suit. (This step is not performed with the loose-fitting PAPR.)

____ 11. Don the tight-fitting PAPR

____ a. Place the PAPR motor-blower back cover against the lower back with the breathing tube extended upward.
____ b. Fasten the belt with the motor-blower around the waist.
____ c. Turn on the battery to the motor-blower unit.
____ d. Hang the PAPR facepiece around the neck.
____ e. Loosen the head harness straps.
____ f. Place the thumbs inside the straps and the chin in the chin cup inside the facepiece.
____ g. Pull the harness over the back of the head.
____ h. Tighten the harness straps, beginning with the lower straps, then the side straps, then the top strap.

____ 12. Pull hood over the head and fasten straps.

____ 13. Perform positive pressure fit test.

____ a. Inhale.
____ b. Place palm of hand over the exhalation valve cover.
____ c. Exhale slowly.
____ d. Notice if a slight positive pressure builds up inside the facepiece indicating a good seal.
____ e. If any leakage is detected, readjust the headstraps and repeat test.
____ f. If you cannot maintain a seal by adjusting the headstraps, check the facepiece for leaks.

____ 14. Perform negative pressure fit test.

____ a. Use the palm of your hand to block off the breathing tube.
____ b. Breathe in and hold your breath for 10 seconds.
____ c. Notice if the facepiece collapses and remains collapsed against the face indicating a good seal.
____ d. If the facepiece does not remain collapsed or if you notice any leakage, readjust the headstraps and repeat test.

____ 15. Attach the breathing tube to the outlet on the motor-blower.

_____ _____
Date Trainee

_____ _____
Date Trainer or Authorized Representative

CHECKLIST FOR REMOVING THE TIGHT-FITTING PAPR WITH THE DUPONT/KAPPLER RESPONDER SUIT

States are responsible for developing acceptable procedures for using PPE. While there are incorrect procedures, there are also multiple variations of acceptable procedures. This checklist is an example of an acceptable procedure. Use of the buddy system is required for this procedure.

____ 1. Decontaminate if the suit has been exposed to a chemical agent.

____ 2. Loosen the PAPR hood straps but don't remove the hood.

____ 3. Remove and set aside the motor-blower.

____ 4. Remove the Responder suit and the gloves and boots.

____ a. Unseal and unfasten the front of the suit touching only the outside of the suit. (This may require assistance from a buddy.) Do not remove the tape from the sleeve cuffs.

____ b. Remove the arms from the rubber gloves through the sleeves, touching only the inside of the suit. (The white glove liners can be left on but should never touch the outside of the suit.)

____ c. Have the buddy remove the tape from the overshoes and unfasten the buttons.

____ d. Remove the entire suit by pushing the suit downward over the overshoes.

____ e. Step out of the overshoes into a clean area.

____ 5. Remove the tight-fitting PAPR.

____ a. Place your hands beneath the hood and turn the hood wrong-side-out over the front of the PAPR.

____ b. Holding your breath, loosen the bottom side straps and pull the PAPR away from your face while lifting it over your head.

____ 6. If the suit has been exposed to a chemical agent, ensure that it is bagged for proper disposal.

____ 7. Take a shower, making sure that all skin crevices and hair are cleaned thoroughly.

_____ _____

Date Trainee

_____ _____

Date Trainer or Authorized Representative

CHECKLIST FOR DONNING THE LOOSE-FITTING PAPR WITH THE DUPONT/KAPPLER CPF3 SUIT

States are responsible for developing acceptable procedures for using PPE. While there are incorrect procedures, there are also multiple variations of acceptable procedures. This checklist is an example of an acceptable procedure. Use of the buddy system is required for this procedure.

____ 1. Wear underclothing as a minimum. The manufacturer recommends wearing either a long sleeve shirt and long pants or long underwear under the suit.

____ 2. If regular clothing is worn under the suit, empty pockets of all personal effects that could damage the suit.

____ 3. Tuck pants legs into socks to make it easier to put on the suit legs.

____ 4. Wear shoes. (If donning a suit with booties, wear a lightweight shoe under the booty.)

____ 5. Place both legs into the suit (most easily done while seated).

____ 6. Don the vinyl overshoes.

____ a. Place both feet, with shoes on, into the overshoes.
____ b. Button the overshoes.
____ c. Pull down the splashguards over the tops of the overshoes.
____ d. On suits without booties, tape the pant legs to the overshoes. (A folded-over tab on the tape end will help when removing the tape later.)

____ 7. Stand up and pull the suit up to facilitate putting on the motor-blower.

____ 8. Place the motor-blower back cover against the lower back with the breathing tube extended upward.

____ 9. Fasten the belt with the motor-blower around the waist.

____ 10. Turn on the battery.

____ 11. Verify air flow to the hood.

____ 12. Don life vests or communication equipment, if appropriate.

____ 13. Don the gloves.

____ a. Remove the arms from the suit.
____ b. Put on the cotton glove liners and the rubber gloves.
____ c. Insert the arms into the suit, leaving the suit open.
____ d. Tape suit cuffs to the outside of the gloves, taking care not to tape so tightly as to restrict arm movement.

____ 14. Pull the hooded respirator over the head.

____ 15. Adjust the headband wraps.

____ 16. Adjust the elastic neck seal so it fits under the chin, making sure the breathing tube is not twisted.

____ 17. Fully zip up the suit and make sure the velcro flap or adhesive strip over the zipper is sealed.

_____ _____
Date Trainee

_____ _____
Date Trainer or Authorized Representative

CHECKLIST FOR REMOVING THE LOOSE-FITTING PAPR WITH THE DUPONT/KAPPLER CPF3 SUIT

States are responsible for developing acceptable procedures for using PPE. While there are incorrect procedures, there are also multiple variations of acceptable procedures. This checklist is an example of an acceptable procedure. Use of the buddy system is required for this procedure.

____ 1. Decontaminate if the suit has been exposed to a chemical agent.

____ 2. Remove the hooded PAPR, turning the hood inside out while touching only its outside surface.

____ 3. Remove the motor blower unit.

____ 4. Unbuckle the overshoes.

____ 5. With the rubber gloves on, unseal and unfasten the front of the suit, touching only the outside of the suit.

____ 6. Remove one arm from the rubber gloves through the sleeve, touching only the inside of the suit. The white glove liners may be left on but should never touch the outside of the suit.

____ 7. Remove the other arm in the same manner.

____ 8. Roll the suit down your body from the inside out to the ankles, touching only the inside of the suit.

____ 9. Remove one foot from the suit and overshoe and place the foot in a clean area.

____ 10. Remove the other overshoe and step into the clean area.

____ 11. Remove the glove liners and toss them back out of the clean area.

____ 12. If the suit has been exposed to a chemical agent, ensure that it is bagged for proper disposal.

____ 13. Take a shower, making sure that all skin crevices and hair are cleaned thoroughly.

_____ _____

Date Trainee

_____ _____

Date 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:

DUPONT/KAPPLER RESPONDER OR CPF3 COVERALL

____ 1. Lay suit on a clean, flat surface.

____ 2. Inspect exterior of suit carefully. The suit should be discarded or used only for training if any abrasions, rips, tears, cracks, or pinholes are found. White spots may indicate ozone damage, which could compromise the integrity of the suit, and the suit should be discarded.

____ 3. Examine the inside of the suit for damage and inspect the seam tapes for lifts or delamination. A flashlight may be used to facilitate the inspection. If any damage is observed the suit should be discarded or used only for training.

____ 4. Inspect the zipper. Discard the suit if the zipper is broken or inoperable. The zipper can be lubricated with a small amount of paraffin, if needed.

GLOVES, HOOD, AND APRON

____ 1. Replace gloves, hood, and apron if:

____ a. exposed to any petroleum-based products
____ b. cracks, tears or punctures are present

NOTE: The hood should be stored on the PAPR.

OVERSHOES

____ 1. Replace the overshoe if there are:

____ a. cracks
____ b. tears
____ c. punctures

_____ _____
Date PPE Wearer

PRE-OPERATIONAL TIGHT-FITTING 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 cartridges are properly fitted to the PAPR in accordance with manufacturer's instructions.

____ 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 blower unit outlet.

____ 2. Ensure that the center of the float rests at or above the appropriate mark as indicated for the filter cartridge being used.

____ 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. Ensure the visor is not cracked and is properly installed in the facemask.

____ 7. Ensure there are no holes, cracks, breaks, tears or other damage in the breathing tube.

_____ _____

Date PPE Wearer

PREOPERATIONAL BATTERY USE CHECKLIST

A completely exhausted battery pack should be charged for 16-24 hours using a 3M smart charger. Battery charging is accomplished as follows:

____ 1. Place the battery charger horizontally on a flat surface.

____ 2. Plug the battery charger AC power cord into a regulated 120v – 60 Hz outlet. The green LED light will turn on.

____ 3. Insert the charging lead into the battery pack. The LED will turn off, indicating that the battery pack is being charged in a high rate mode. After approximately 8 hours, the LED will turn back on, indicating that the charger has switched to a trickle rate mode to prevent damage to the battery from overcharge.

3M battery packs have a service life of up to 500 charge/discharge cycles. However, the life of the batteries will be significantly reduced when they are exposed to high heat over an extended period of time. 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 3M's Customer Service Department for proper disposal procedures.

_____ _____

Date PPE Wearer

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 packs.

- ____ 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 the expiration date stamped on the filter media pack.
- ____ c. Check color-coding to ensure filter media is for organic vapors (black).

____ 2. Remove the packaging, plugs, and caps, if present, from each of the filter media and retain them in a safe place for later use.

- ____ a. Ensure that a circular plastic air inlet insert is seated inside each air inlet on the turbo PAPR assembly.
- ____ 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. Over tightening 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 media, release the strap, and ensure that it grips the filter media tightly.

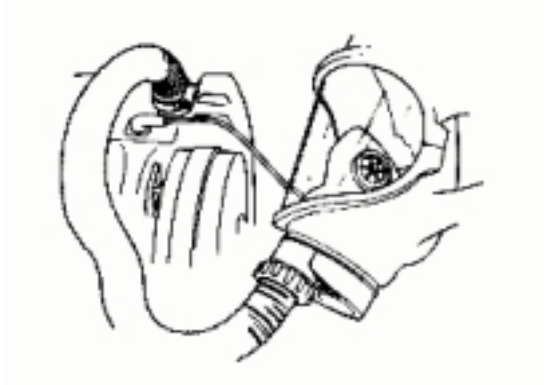
- ____ a. Repeat this procedure for the remaining two until all filter media are secured with the canister straps. (NOTE: Use of canister straps is optional.)

_____ _____

Date PPE Wearer

PRE-OPERATIONAL INSPECTION CHECKLIST FOR BLOWER 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 blower unit. Ensure that the filter media are properly fitted to the blower unit.



Confirm that the battery pack is fully charged, the power lead from the blower 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 blower unit and the system running, insert the base of the flow meter into the blower outlet. Be sure the blower unit and flow meter are resting in a vertical position. The blower unit may need to be propped up so that the lower filter media opening is not blocked.

____ 2. Ensure that the center of the float rests at or above the appropriate mark. The blower unit must maintain at least 6 cfm.

NOTE: If the flow meter float is below 6 cfm, install new filter media and dispose of used filter media in accordance with local and State guidelines. Check the flow rate again. If it is still below 6 cfm, refer to Troubleshooting section of the manufacturer's User Instructions.

____ 3. Verify that the respirator headpiece is connected to the blower unit and that air is flowing before donning the respirator headpiece.

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 3M) 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 Troubleshooting section of the turbo PAPR assembly User Instructions.

_____	_____
Date	PPE Wearer

RESPIRATOR CLEANING AND DISINFECTING

Federal regulations (29 CFR 1910.134 [h]) require that respirators be cleaned and disinfected as often as necessary to maintain them in a sanitary condition. Respirators issued to more than one employee must be cleaned and disinfected before being used by different individuals. Respirators must be cleaned and disinfected after each use, whether for fit testing, training, or in an actual emergency. All washing, disinfecting, and rinsing should be performed in warm water solutions at a temperature not over 43° C (110° F).

_____ 1. Remove filter media.

_____ 2. Disassemble facepiece by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

_____ 3. Wash components in warm water using a mild detergent or a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt. Do not clean facepieces with strong solvents (such as MEK, acetone, or toluene) or with detergents that contain lanolin or other oils. These substances may soften or distort the face shield.

_____ 4. Rinse components thoroughly in clean, warm, preferably running water. Drain.

_____ 5. If the cleaner used in step 3 does not contain a disinfecting agent, the respirator components should be immersed for two minutes in one of the following:

_____ a. Hypochlorite solution made by adding approximately one milliliter of laundry bleach to one liter of water; or

_____ b. Aqueous solution of iodine made by adding approximately 0.8 milliliters of tincture of iodine to one liter of warm water. (Tincture of iodine consists of 6-8 grams of ammonium and/or potassium iodide per 100 cc of 45% alcohol.); or

_____ c. Other commercially available cleaners of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

_____ 6. Rinse components thoroughly in clean, warm, preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dematitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

_____ 7. Components should be hand-dried with a clean lint-free cloth or air-dried.

_____ 8. Reassemble facepiece, replacing filter media.

_____ 9. Test the respirator to ensure that all components work properly.

_____ _____

Date PPE Wearer

POST-OPERATIONAL MAINTENANCE FOR BLOWER UNIT

WARNING

Avoid contaminant entry into the blower unit; respiratory protection may be compromised.

Water must not enter the blower 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 blower 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 blower 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 respirator cleaning and disinfecting 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 blower 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 blower 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 BLOWER 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 blower 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 filtered air is detected, or eye or throat irritation is felt, leave the contaminated environment immediately, perform the trouble-shooting procedures on the blower 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 PAPR INSPECTION CHECKLIST

Federal regulations (29 CFR 1910.134 [h]) require that all respirators maintained for emergency use be inspected at least monthly following the manufacturer's recommendations. Repair of any component of a PAPR should be performed only by persons thoroughly familiar with the device and who have been instructed in the type of repair to be performed. No attempt shall be made to replace components or to make adjustments or repairs beyond the manufacturer's recommendations. The PAPR manufacturer's website should be checked periodically for information on product recalls.

Inspecting the Tight-Fitting PAPR

_____ 1. Check facepiece for cracks, tears and dirt.

_____ 2. Be certain facepiece, especially face seal area, is not distorted.

_____ 3. Examine inhalation valves for signs of distortion, cracking or tearing.

_____ 4. Make sure that head straps are intact and have good elasticity.

_____ 5. Examine all plastic parts for signs of cracking or fatiguing.

_____ 6. Make sure filter gaskets are properly seated and in good condition .

_____ 7. Remove exhalation valve cover and examine exhalation valve and valve seat for signs of dirt, distortion, cracking or tearing. Replace exhalation valve cover.

_____ 8. Inspect lens for any damage that may impair respirator performance or vision.

_____ 9. Make sure all airway connections fit tightly.

_____ 10. Confirm that the expiration date stamped on each filter medium will not have elapsed before the next monthly inspection.

Inspecting the Loose-Fitting PAPR

_____ 1. Check that there are no dents or cracks in the hood assembly. Look closely at the stitching. There should be no tears that could permit contaminated air to enter the hood.

_____ 2. Look for scratches or other visual distortions that make it difficult to see through the face shield.

_____ 3. Carefully examine the entire breathing tube. Look for tears, holes, or cracks. Bend the tube to verify that it is flexible.

_____ 4. Make sure all airway connections fit tightly.

_____ 5. Confirm that the expiration date stamped on each filter medium will not have elapsed before the next monthly inspection.

Inspecting the Turbo Powered Air Blower/Filtration Unit

_____ 1. Remove the filter media cartridges from the blower unit.

_____ 2. Examine the blower housing for cracks. Replace if cracked or damaged.

_____ 3. Examine the inside of the blower intake manifold (note the red and white wires). The presence of dust or other particulate matter inside the manifold or on the wires may indicate a damaged filter, improper seating of the filter media cartridge or incorrect filter media selection. Contact 3M Technical Service for assistance.

_____ 4. Examine the outside of the battery pack for cracks. Replace if damaged.

_____ 5. Carefully examine the entire breathing tube. Look for tears, holes or cracks. Bend the tube to verify that it is flexible. Replace if punctured, cracked or worn.

_____ 6. Confirm that the battery pack has a sufficient charge.

_____ _____

Date PPE Wearer

APPENDIX B
PPE REGULATIONS AND GUIDANCE

In addition to the obvious need to protect yourself, the Occupational Safety and Health Administration (OSHA) requires that your employer provide you with PPE if it is required on your job. The *Code of Federal Regulations* (CFR) prescribes guidelines for protective clothing, emergency response, equipment and training under Title 29-Labor. The table below summarizes several of the relevant regulations.

CFR Reference	Requirement
1910.120(q) 3-7-96	Emergency response to hazardous substance releases. Requirements for: • emergency response plan • elements of an emergency response plan • procedures for handling emergency response • skilled support personnel • specialist employees • training (number of hours/general content required) • trainers • refresher training • medical surveillance and consultation • chemical protective clothing • post-emergency response operations.
1910.132(a) 7-1-94	PPE (including respirators, eye and face protection and protective clothing) shall be provided, used and maintained in sanitary and reliable condition.
1910.132(f)(1) 7-1-94	Employer shall provide training for PPE. Employee will know: • when is PPE necessary • what PPE is necessary • how to properly don, doff, adjust and wear PPE • limitations of PPE • proper care, maintenance, useful life and disposal of PPE.
1910.132(d)(1) 7-1-94	Select the PPE that properly fits each employee. After PPE is selected, communicate selection decisions to each employee.
1910.132(f)(4) 7-1-94	Employer shall verify each employee received and understood required training through written certification containing: • name of employee trained • the date(s) of training • subject of certification.

CFR Reference	Requirement
1910.134(a)(2) 4-23-98	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(c) 4-23-98	Requirements for a Respiratory Protection Program. Develop written standard operating procedures (selection and use) • respirators based on hazards • breathing air quality and use • instruction and training on proper use and limitations • regularly cleaned and disinfected • storage location requirements • routine inspections (monthly) • training for emergencies • regular program evaluation • medical requirements • fit testing requirements (tight-fitting) • must be NIOSH approved

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 of this document. If a CSEPP participant 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 from Appendix A of this document, can be used to meet certification requirements by documenting that 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. Each State will determine their passing score, and only those persons will be permitted to use PPE.

APPENDIX C
PAPR- AND CLOTHING-LIMITED STAY TIMES

This appendix is adapted from *NBC Protection*, Department of the Army Field Manual No. 3-4, U.S. and Marine Corps Fleet Marine Force Manual No. 11-9, FM 3-4/FM 11-9, Washington, DC, May 1992, and *Sustaining Health and Performance in the Desert: A Pocket Guide for Operations in Southwest Asia*, Technical Note 91-2, prepared by the Staff of the U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts, December 1990.

IMPORTANT NOTE: While the principles in this appendix are highly relevant to the situation faced by CSEPP emergency responders, there is one very important difference. This appendix is based on the U.S. Army's approach to PPE called Mission-Oriented Protective Posture (MOPP) which allows the level of protection to be varied depending on the situation. For instance, personnel may be allowed to unzip their protective clothing or roll up their respirator hoods under certain circumstances. This approach is not acceptable for CSEPP civilian responders. **All CSEPP civilian responders wearing PPE must maintain the maximum level of protection provided by the clothing and respiratory equipment at all times when they are in a potential hazard area. Therefore the CSEPP PPE is equivalent to MOPP 4 for the purpose of assessing limited stay times.**

PAPR LIMITED STAY TIMES

The following calculation is used to determine how long an emergency worker wearing a respirator can safely remain in a potentially contaminated area based on the time-weighted average concentration to which the worker will be exposed:

- Estimate the maximum unprotected stay time by multiplying the Occupational Exposure Limit for the agent (see Table C.1) by the time-weighted interval (8 hours or 480 minutes) and then dividing the result by the airborne chemical agent concentration in the area where the worker is assigned.

- Multiply the maximum unprotected stay time by the respirator protection factor to estimate the maximum time the worker can remain in the area while wearing the respirator.

Table C.1. Occupational Exposure Limits for Chemical Warfare Agents

Agent	Occupational Exposure Limit (8-hour TWA[a])
GA/GB	0.0001
VX	0.00001
HD/L	0.003[b]

[a]TWA = time-weighted average.
[b]Value represents technologically feasible real time detection limit.

For example, the time-weighted-average exposure limit for GB is 0.0001 milligram per cubic meter (mg/m^3) and the time-weighted interval is 8 hours. At a maximum airborne concentration of 0.2 mg/m^3 (the IDLH level of GB), the unprotected stay time is 0.24 min [(0.0001 mg/m^3 × 8 hr × 60 min/hr)/ (0.2 mg/m^3)], based on a time-weighted-average exposure. Assuming an assigned respirator protection factor of 50, the resulting stay time would be 12 min (50 × 0.24 min). Lower airborne chemical agent concentrations or larger protection factors would yield proportionately longer stay times.

The limit on the stay time based on the capacity of the respirator cartridge can be estimated by the following rule-of-thumb used by the U.S. Army:

- Multiply the cartridge service life (16 hours or 960 minutes) by the agent concentration at which it was tested (0.5 mg/m^3) which yields a total dosage of 480 mg-min/m^3.
- Divide the total dosage capacity of the cartridge by the airborne chemical agent concentrations in the area where the emergency worker is assigned to estimate the maximum stay time based on the cartridge capacity.

Continuing the above example, at an airborne concentration level of 0.2 mg/m^3, the stay time based on cartridge capacity would be 2,400 min or 40 hours

[(480 mg-min/m^3)/(0.2 mg/m^3)]. Consequently in this example the emergency worker stay time in an area with an airborne concentration of GB of 0.2 mg/m^3 would have to be limited to 12 minutes, the smaller of the two restrictions on the stay time (40 hours vs. 12 minutes).

CLOTHING LIMITED STAY TIMES

Heat Stress Factors

Guidelines for reducing heat stress should be followed whenever protective clothing and equipment is used. Body temperature must be maintained within narrow limits for optimum physical and mental performance. The body produces more heat during work than rest. Normally, the body cools itself by evaporation of sweat and radiation of heat at the skin's surface. PPE restricts these heat loss mechanisms because of its low permeability to water vapor. In addition, physical work tasks require more effort when workers wear protective clothing because of added weight and restricted movement. This results in more body heat to be dissipated than normal and body temperature tends to rise quickly. The amount of heat accumulation depends upon:

- the amount of physical activity
- the level of hydration
- the clothing worn
- the load carried
- the state of heat acclimatization
- physical fitness and fatigue
- as well as terrain and weather conditions.

Adjusting the level of heat stress by (1) unzipping the protective suit, (2) unbuttoning and loosening overshoes, (3) rolling back the PAPR hood, and so forth will reduce barriers to body cooling. These adjustments can only be made when outside the hazard area.

Work intensity is a major contributing factor to heat stress that can be managed in the field. Work tasks can be characterized as very light, light, moderate or heavy; Table C.2 provides examples of tasks that can be used as a guide in estimating the work intensity for a particular emergency worker task. In an emergency situation, work/rest cycles may offer no advantage to continuous work; for example, when the environmental and clothing conditions do not permit PPE to be adjusted or removed, during rest breaks).

The calculated PAPR and clothing tolerance times (Table C.3) can be used to limit the risk of heat casualties. Although strict adherence to work/rest criteria is possible during training exercises, this may not be possible during an emergency situation.

These 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.

Table C.2. Work intensities of tasks

Work Intensity not wearing PPE	Activity	Work Intensity wearing PPE
Very Light	Standing on ground Sitting in truck Driving truck	Very Light
Light	Walking hard surface [1 meter per second (m/s) no load] Walking hard surface (1 m/s, 20 kg load) Walking hard surface (1 m/s, 30 kg load)	Light
Moderate	Walking loose sand (1 m/s, no load) Walking hard surface (1.56 m/s, no load) Calisthenics	Moderate
	Walking hard surface [1.56 m/s, 20 kg (44 lbs) load] Patrol Pick and shovel	Heavy
Heavy	Walking hard surface [1.56 m/s, 30 kg (66 lbs) load] Walking hard surface (2.0 m/s, no load) Walking hard surface (2.25 m/s, no load) Walking loose sand (1.56 m/s, no load)	Heavy

The work intensity categories of this table are based on metabolic expenditures.

Very light = 105 to 175 watts
Light = 172 to 325 watts
Moderate = 325 to 500 watts
Heavy = 500 + watts

A watt is a unit of power, equal to one joule per second. A joule is a unit of energy equal to 0.239 calories.

The weight of the chemical protective overshoe is a primary contributor to increased work intensity in MOPP.

Source: Adapted from USARIEM 1/11/91.

Table C.3. Clothing Limited Stay Times[1]

Temperature Range	Work Time	Rest Time
50 – 70°F/10-21°C	30 – 45 minutes	10 –15 minutes
70 – 85°F/21-29°C	20 – 30 minutes	40 – 60 minutes
85 – 100°F/29-38°C	15 – 20 minutes	indefinite

[1]Must use Wet Bulb/Globe Temperature.

Dehydration

Because of higher body temperatures, individuals in PPE sweat considerably more than usual, often more that 1.5 quarts of water every hour during work. Water must be consumed to replace lost fluids or dehydration will follow. Even a slight degree of dehydration impairs the body's ability to regulate its temperature and nullifies the benefits of heat acclimatization and physical fitness, increases the susceptibility to heat injury, and reduces work capacity, appetite, and alertness. Even in workers who are not heat casualties, the combined effects of dehydration, restricted heat loss from the body, and increased work effort place a severe strain on the body's functions, and workers suffer declines in mental and physical performance.

The inability to drink in full PPE, as it has been modified for civilian use to include the PAPR, increases the likelihood of dehydration. Thirst is not an adequate indicator of dehydration; workers may not sense when they are dehydrated and may fail to replace body water losses. Even when drinking water is readily available, it is not possible for them to drink while in full gear. Dehydration and the need for regular and timely fluid replacement in the workers is a limiting factor on stay time in full PPE.

Psychological Factors

Wearing full PPE reduces the ability to see and hear clearly and makes it more difficult to recognize and communicate with others. This creates or increases feelings of isolation and confusion. The awkwardness and bulkiness that accompanies wearing the PPE causes frustration in many and claustrophobia in others. Experience in wearing and exercising in the PPE can reduce these feelings.

PPE reduces the emergency worker's ability to recognize and communicate efficiently and may require dramatic changes in personal habits. All emergency workers can experience deficits in performance due to the awkwardness of PPE. Those persons inexperienced in the use of the PPE are more likely to become frustrated. Those who must perform without knowing when they will be relieved from PPE use are also more susceptible. Certain jobs are more likely to be

affected than others; e.g., tasks that require clear vision, precise hearing, social and emotional support, or communication by facial expression, gestures, and inflections in voice.

Identifying emergency workers by name and job function can be accomplished through various means. One way is to use tape showing name and job function. When emergency workers are not in PPE, a strip of tape with the information already printed on it can be placed on the emergency worker's Ready Bag. When the overgarments are put on, the emergency worker can pull the tape off the overgarment bag and place it on the overgarment to further increase ease of identification. Another method might be the use of vests as long as they do not damage or interfere with the use of other equipment and allow the workers to perform unimpeded.

Effects of Heat Stress on Performance in PPE

Emergency workers wearing CSEPP PPE will take about 1.5 times longer to perform most tasks. Decision-making and precision control tasks are slowed even more than manual tasks. For decision-making and precision control (for example, typing a message or using auto-injector) the normally expected completion time should be multiplied by 2.5 (or more, if workers have been in PPE for extended period or are overheated.).

Heat stress affects performance in many different kinds of jobs. Jobs which require physical exertion cause physiological and mental performance to deteriorate rapidly. However, mental performance of emergency workers working at sedentary tasks also deteriorates sharply over time in the heat.

Performance in the following jobs is most likely to be affected by heat stress:

- monotonous, repetitive, or boring tasks
- tasks which require attention to detail, concentration, and short-term memory (e.g., calculations, repeating communications, etc.)
- tasks which are not self-paced (i.e., any tasks that must be done quickly or according to a fixed schedule)
- tasks which require arm or hand steadiness
- tasks where confusion, misinformation, and disorientation are common (e.g., command, control, communications, etc.).

Performance is affected by stress in a variety of ways:

- reaction times and decision times are longer
- routine tasks are done more slowly
- errors of omission are more common
- performance of tasks which require vigilance may degrade slightly after 39 minutes, and certainly after 2–3 hours.

Use the buddy system whenever possible; a buddy can check for signs of stress and fatigue. Pair experienced buddies with inexperienced emergency workers. Critical jobs should be shared and work should be double-checked.

Cold Stress Factors

Though far less likely to be a complicating factor than is heat stress, cold stress can directly affect an individual's health and performance while wearing PPE. Cold can lower body temperature, resulting in cold injuries and impaired performance. Cold weather is often accompanied by wind, rain, snow and ice, which can worsen the effects of cold, as well as contribute to injury and performance impairments in and of themselves. Cold weather clothing and PPE are difficult to integrate.

Hypothermia

Body temperature falls when the body cannot produce heat as fast as it is being lost. This can result in hypothermia, which is a life threatening condition in which deep-body temperature falls below 95°F (35°C). Generally, deep-body temperature will not fall until after many hours of continuous exposure to cold air, if the individual is healthy, physically active and reasonably dressed. However body temperatures can fall even when air temperatures are above freezing if conditions are windy, clothing is wet, and/or the individual is inactive.

Hypothermia can be difficult to recognize in the early stages of development. Things to watch for include:

- unusually withdrawn or bizarre behavior
- irritability
- confusion
- slowed or slurred speech
- altered vision
- uncoordinated movements and
- unconsciousness.

Even mild hypothermia can cause victims to make poor decisions or act drunk (e.g., removing clothing when it is clearly inappropriate).

Effects of Cold on Agent Detection

The function of chemical agent detectors is degraded in the cold. Chemical agent detectors sense volatilized agent vapors. Agents do not vaporize readily when it is cold; therefore, the detectors respond more slowly in the presence of agents. The solution in the capsules of the M256/M256A1 chemical detection kit can freeze, and once frozen, thawing may not restore operability.

Effects of Cold on Performance in PPE

Wearing PPE during cold-weather operations increases the risk of injuries due to cold and even heat stress. PPE can restrict the blood flow to the fingers and areas of the face, increasing the susceptibility of these areas to frostbite and limiting the ability to visually inspect for signs of cold injury.

When PAPRs are carried to the hazard area outside the clothing at below freezing temperature, donning the cold PAPR can cause a contact freezing injury, especially if metal contacts the face.

Wearing the protective suit over heavy cold-weather clothing creates the unexpected situation where heat exhaustion becomes a real possibility for emergency workers working hard, even in cold weather. The added insulation and decreased ventilation of the protective suit can result in heavy sweating and wetting of the clothing during hard work, eventually degrading cold protection.

Agent decontamination procedures are extremely difficult under cold-weather conditions. Water and decontamination solutions can freeze and may limit effective decontamination.

Well-prepared workers suffer less stress in PPE than do persons who are less prepared. Well-prepared workers are those who are in good physical condition and have trained extensively in protective gear. Physically fit persons are more resistant to physical and mental fatigue and acclimatize more quickly to climatic heat or the heat associated with PPE gear than less fit persons.

APPENDIX D
PPE: LEVELS OF PROTECTION

This appendix is reprinted from 29 CFR 1910.120, Appendix B, “General Description and Discussion of the Levels of Protection and Protective Gear,” July 1, 2001.

GENERAL DESCRIPTION AND DISCUSSION OF THE LEVELS OF PROTECTION AND PROTECTIVE GEAR (APPENDIX B TO 29 CFR 1910.120)

This appendix sets forth information about personal protective equipment (PPE) protection levels, which may be used to assist employers in complying with the PPE requirements of this section.

As required by the standard, PPE must be selected which will protect employees from the specific hazards, which they are likely to encounter during their work on-site.

Selection of the appropriate PPE is a complex process, which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards; their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to up-grade or downgrade the level of PPE protection to match the tasks at hand.

The following are guidelines, which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation and re-selection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

P*art A.* Personal protective equipment is divided into four categories based on the degree of protection afforded. (See Part B of this appendix for further explanation of Levels A, B, C, and D hazards.)

I. *Level A*—To be selected when the greatest level of skin, respiratory, and eye protection is required.

The following constitute Level A equipment; it may be used as appropriate;

1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
2. Totally-encapsulating chemical-protective suit.
3. Coveralls.[1]
4. Long underwear.[1]
5. Gloves, outer, chemical-resistant.
6. Gloves, inner, chemical-resistant.
7. Boots, chemical-resistant, steel toe and shank.
8. Hard hat (under suit).[1]
9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).

II. *Level B*—The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

The following constitute Level B equipment; it may be used as appropriate.

1. Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.[1]
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots, outer, chemical-resistant steel toe and shank.
7. Boot-covers, outer, chemical-resistant (disposable).[1]
8. Hard hat.[1]
9. [Reserved]
10. Face shield.[1]

III. *Level C*—The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air-purifying respirators are met.

The following constitute Level C equipment; it may be used as appropriate.

1. Full-face or half-mask, air-purifying respirators (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.[1]
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots (outer), chemical-resistant steel toe and shank.[1]
7. Boot-covers, outer, chemical-resistant (disposable).[1]
8. Hard hat.[1]
9. Escape mask.[1]
10. Face shield.[1]

IV. *Level D*—A work uniform affording minimal protection, used for nuisance contamination only.

The following constitute Level D equipment; it may be used as appropriate:

1. Coveralls.
2. Gloves.[1]
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).[1]
5. Safety glasses or chemical splash goggles*.
6. Hard hat.[1]
7. Escape mask.[1]
8. Face shield.[1]

Part B. The types of hazards for which levels A, B, C, and D protection are appropriate are described below:

I. *Level A*—Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin;
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or

3. Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

II. *Level B*—Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

NOTE: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

III. *Level C*—Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
3. All criteria for the use of air-purifying respirators are met.

IV. *Level D*—Level D protection should be used when:

1. The atmosphere contains no known hazard; and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

NOTE: As stated before, combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

As an aid in selecting suitable chemical protective clothing, it should be noted that the National Fire Protection Association (NFPA) has developed standards on chemical protective clothing. The standards that have been adopted by include:

NFPA 1991—Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing).

NFPA 1992—Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing).

NFPA 1993—Standard on Liquid Splash-Protective Suits for Non-emergency, Non-flammable Hazardous Chemical Situations (EPA Level B Protective Clothing).

These standards apply documentation and performance requirements to the manufacture of chemical protective suits. Chemical protective suits meeting these requirements are labeled as compliant with the appropriate standard. It is recommended that chemical protective suits that meet these standards be used.

[1]Optional, as applicable.

APPENDIX E
MANDATORY MEDICAL EVALUATION OF PERSONNEL REQUIRED TO USE RESPIRATORS

This appendix is reprinted from 29 CFR 1910.134, Appendix C, “OSHA Respirator Medical Evaluation Questionnaire (Mandatory),” July 1, 2001.

OSHA Respirator Medical Evaluation Questionnaire
(Mandatory)
(Appendix C to 29 CFR 1910.134)

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee: Can you read (circle one): Yes/No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date: _____
2. Your name: _____
3. Your age (to nearest year): _____
4. Sex (circle one): Male/Female
5. Your height: ____ ft. ____ in.
6. Your weight: ____ lbs.
7. Your job title: _____
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code):

   _____
9. The best time to phone you at this number: _____
10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes/No

11. Check the type of respirator you will use (you can check more than one category):

    a. ____ N, R, or P disposable respirator (filter-mask, non-cartridge type only).

    b. ____ Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).

12. Have you worn a respirator (circle one): Yes/No

    If ``yes,'' what type(s): _____

    _____

    _____

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle ``yes'' or ``no'').

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: Yes/No

2. Have you ever had any of the following conditions?

    a. Seizures (fits): Yes/No
    b. Diabetes (sugar disease): Yes/No
    c. Reactions that interfere with your breathing: Yes/No
    d. Claustrophobia (fear of closed-in places): Yes/No
    e. Trouble smelling odors: Yes/No

3. Have you ever had any of the following pulmonary or lung problems?

    a. Asbestosis: Yes/No
    b. Asthma: Yes/No
    c. Chronic bronchitis: Yes/No
    d. Emphysema: Yes/No
    e. Pneumonia: Yes/No
    f. Tuberculosis: Yes/No
    g. Silicosis: Yes/No
    h. Pneumothorax (collapsed lung): Yes/No
    i. Lung cancer: Yes/No
    j. Broken ribs: Yes/No
    k. Any chest injuries or surgeries: Yes/No
    l. Any other lung problem that you've been told about: Yes/No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

    a. Shortness of breath: Yes/No
    b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No
    c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No
    d. Have to stop for breath when walking at your own pace on level ground: Yes/No
    e. Shortness of breath when washing or dressing yourself: Yes/No
    f. Shortness of breath that interferes with your job: Yes/No
    g. Coughing that produces phlegm (thick sputum): Yes/No
    h. Coughing that wakes you early in the morning: Yes/No
    i. Coughing that occurs mostly when you are lying down: Yes/No
    j. Coughing up blood in the last month: Yes/No
    k. Wheezing: Yes/No
    l. Wheezing that interferes with your job: Yes/No
    m. Chest pain when you breathe deeply: Yes/No
    n. Any other symptoms that you think may be related to lung problems: Yes/No

5. Have you ever had any of the following cardiovascular or heart problems?

    a. Heart attack: Yes/No
    b. Stroke: Yes/No
    c. Angina: Yes/No
    d. Heart failure: Yes/No
    e. Swelling in your legs or feet (not caused by walking): Yes/No
    f. Heart arrhythmia (heart beating irregularly): Yes/No
    g. High blood pressure: Yes/No
    h. Any other heart problem that you've been told about: Yes/No

6. Have you ever had any of the following cardiovascular or heart symptoms?

    a. Frequent pain or tightness in your chest: Yes/No
    b. Pain or tightness in your chest during physical activity: Yes/No
    c. Pain or tightness in your chest that interferes with your job: Yes/No
    d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
    e. Heartburn or indigestion that is not related to eating: Yes/No
    f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No

7. Do you currently take medication for any of the following problems?

    a. Breathing or lung problems: Yes/No
    b. Heart trouble: Yes/No
    c. Blood pressure: Yes/No
    d. Seizures (fits): Yes/No

8. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator, check the following space and go to question 9:) ____

    a. Eye irritation: Yes/No
    b. Skin allergies or rashes: Yes/No
    c. Anxiety: Yes/No
    d. General weakness or fatigue: Yes/No
    e. Any other problem that interferes with your use of a respirator: Yes/No

9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you ever lost vision in either eye (temporarily or permanently): Yes/No

11. Do you currently have any of the following vision problems?

    a. Wear contact lenses: Yes/No
    b. Wear glasses: Yes/No
    c. Color blind: Yes/No
    d. Any other eye or vision problem: Yes/No

12. Have you ever had an injury to your ears, including a broken eardrum: Yes/No

13. Do you currently have any of the following hearing problems?

    a. Difficulty hearing: Yes/No
    b. Wear a hearing aid: Yes/No
    c. Any other hearing or ear problem: Yes/No

14. Have you ever had a back injury: Yes/No

15. Do you currently have any of the following musculoskeletal problems?

    a. Weakness in any of your arms, hands, legs, or feet: Yes/No
    b. Back pain: Yes/No
    c. Difficulty fully moving your arms and legs: Yes/No
    d. Pain or stiffness when you lean forward or backward at the waist: Yes/No
    e. Difficulty fully moving your head up or down: Yes/No
    f. Difficulty fully moving your head side to side: Yes/No
    g. Difficulty bending at your knees: Yes/No
    h. Difficulty squatting to the ground: Yes/No
    i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes/No
    j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

Part B. Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No

   If “yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No

   If “yes," name the chemicals if you know them:

   _____

   _____

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:

   a. Asbestos: Yes/No
   b. Silica (e.g., in sandblasting): Yes/No
   c. Tungsten/cobalt (e.g., grinding or welding this material): Yes/No

d. Beryllium: Yes/No
e. Aluminum: Yes/No
f. Coal (for example, mining): Yes/No
g. Iron: Yes/No
h. Tin: Yes/No
i. Dusty environments: Yes/No
j. Any other hazardous exposures: Yes/No

If “yes,'' describe these exposures_____

_____

4. List any second jobs or side businesses you have: _____

_____

5. List your previous occupations: _____

_____

6. List your current and previous hobbies: _____

_____

7. Have you been in the military services? Yes/No

   If “yes,'' were you exposed to biological or chemical agents (either in training or combat): Yes/No

8. Have you ever worked on a HAZMAT team? Yes/No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No

   If “yes,'' name the medications if you know them: _____

   _____

10. Will you be using any of the following items with your respirator(s)?

    a. HEPA Filters: Yes/No
    b. Canisters (for example, gas masks): Yes/No
    c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle “yes'' or “no'' for all answers that apply to you)?:

    a. Escape only (no rescue): Yes/No
    b. Emergency rescue only: Yes/No
    c. Less than 5 hours per week: Yes/No
    d. Less than 2 hours per day: Yes/No
    e. 2 to 4 hours per day: Yes/No
    f. Over 4 hours per day: Yes/No

12. During the period you are using the respirator(s), is your work effort:

    a. Light (less than 200 kcal per hour): Yes/No

       If “yes,'' how long does this period last during the average shift: _____hrs._____mins.

       Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.

    b. Moderate (200 to 350 kcal per hour): Yes/No

       If “yes,'' how long does this period last during the average shift: _____hrs._____mins.

       Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

    c. Heavy (above 350 kcal per hour): Yes/No

       If “yes,'' how long does this period last during the average shift: _____hrs._____mins.

       Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No

    If “yes,'' describe this protective clothing and/or equipment: _____

    _____

14. Will you be working under hot conditions (temperature exceeding 77 deg. F): Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you'll be doing while you're using your respirator(s):

    _____

    _____

17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

    _____

    _____

18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

    Name of the first toxic substance: _____

    Estimated maximum exposure level per shift: _____

    Duration of exposure per shift: _____

    Name of the second toxic substance: _____

    Estimated maximum exposure level per shift: _____

    Duration of exposure per shift: _____

    Name of the third toxic substance: _____

    Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

The name of any other toxic substances that you'll be exposed to while using your respirator:

_____

_____

_____

19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well being of others (for example, rescue, security):

_____

_____