

# Chapter 5.6

## Personal protective equipment

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### *This could be you . . .*

*An employee accidentally cut into a chemical line and some of the chemical splashed on the particulate respirator he was wearing. He suffered throat irritation and coughing because the particulate respirator wasn't designed to protect against the chemical.*

*An employee who wasn't wearing a hard hat hit his head on a pipe and fell to the floor.*

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### **1. Applicability of this chapter**

You are required to follow this chapter if you use personal protective equipment (PPE) in your work.

### **2. What this chapter covers**

This chapter covers the selection, use, and maintenance of PPE. You can find specific requirements for respirators, hearing conservation, and asbestos in Chapter 7.2, "Respiratory protection," Chapter 7.1, "Hearing Conservation," and Part 12 of this Handbook, "Asbestos Control Requirements."

### **3. When you need PPE**

You need to use PPE when you work in hazardous situations where engineering controls, management controls, or other corrective actions do not reduce the hazard to an acceptable level. The Safety and Test Operations Division and the Occupational Health Branch along with your supervisor will determine the need for and selection of PPE based on the hazards in your work area. The process is as follows:

- a. Your supervisor or company shall do a hazard assessment on your need for PPE and verify the assessment in writing. Include this assessment in your facility's safety and health documentation.
- b. The written verification shall state that it certifies that the assessment has been done and includes the following:
  - Workplace location.
  - The date of the hazard assessment (Job Hazard Analysis).
  - The person who certifies that the evaluation has been done.

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### **4. How you get PPE**

Your supervisor (for civil service employees) or company (for contractor employees) is responsible for providing PPE. If you are a transient employee or a visitor, your host organization is responsible for providing PPE.

Where allowed by contract, you may obtain rigid frame prescription safety spectacles by completing a JSC Form 557 along with an eye prescription issued within the last year. . On the form, state that you work in an eye hazard area, and list your duties and specific hazards that require safety glasses. Have the form approved by your supervisor and the organization's safety representative and bring it to the Occupational Health Branch, 281-483-4317. You pay for any eye exams. Prescription safety glasses are provided at the maximum frequency of one pair every two years unless the current pair has been lost or damaged.

See NPR 4100.1, "NASA Materials Management Manual," for requirements for stocking and issuing PPE.

### **5. Providing and using your own PPE**

You shall only use PPE recommended and provided by your employer.

### **6. How to select PPE**

Select PPE based on a hazard assessment (Job Hazard Analysis) that your supervisor performs. He or she will let you know what hazards are found and what PPE is required. You shall select PPE that will fit you properly. PPE selection factors include:

- a. Exposure potential to hazard, including frequency and length of contact.
- b. Potential effects of skin contact with the hazard.
- c. The body part that could be exposed, such as hands, face, chest, arms, etc.
- d. The protection factor of the PPE.
- e. Other safety hazards present such as falling, slipping, falling objects, electrical shock, etc., and the hazards that may be induced by wearing the PPE.
- f. Limitations caused by the PPE, such as reduction in sight, hearing, or touch.
- g. Work area conditions such as temperature, humidity, abrasion, and cutting or tearing potential.
- h. Characteristics and limitations of the PPE such as resistance to degradation, size, comfort, and dexterity.
- i. Anticipated use (single use vs. routine use, duration of use).
- j. Regulatory requirements. Use only PPE that is approved.
- k. PPE service life and cost.

NOTE: Help in selecting your PPE is available from the Safety and Test Operations Division for potentially hazardous physical or mechanical hazards and from the Occupational Health Branch for potentially hazardous chemical and biological agents.

### 7. Precautions to take when working around physical hazards

You shall observe the following requirements when working around physical hazards:

- a. Wear flame-retardant clothing when operations involve the possibility of explosion or fire.
- b. Wear protective gloves made of strong, durable material when operations include handling sharp-edged or abrasive objects.
- c. Wear gloves made of thermal protective material when handling hot or cryogenic substances.
- d. Wear gloves made of rubber or other nonconductive material that conform to the OSHA standard for dielectric strength when operations include potential exposure to electrical current.
- e. Wear hearing protection in hazardous noise areas.
- f. Wear hard hats when there is a potential for injury to the head from falling objects.
- g. Wear eye and face protection when there is a potential for injury from flying particles, chemicals, or laser radiation.

### 8. Precautions to take when working around chemical and biological hazards

You shall wear protective clothing when working with hazardous chemical and biological agents and when required by the EPA, Centers for Disease Control and Prevention, or OSHA standards. Base the selection of protective clothing on the environment in which it will be used. The section of the material safety data sheet marked "Exposure Controls and/or Personal Protective Equipment" will give you specific instructions on PPE for the material you're using. Use the following key points when selecting protective clothing:

- a. All chemicals pass or permeate through protective barriers sooner or later, with or without any visible evidence or change in the protective materials.
- b. A material may protect against one chemical very well but perform poorly against another chemical. Each chemical and material combination shall be considered. No single protective material is an absolute barrier against all chemicals.
- c. Protective gloves and other chemical protective clothing may all look alike. Make sure that the clothing you select is the right clothing for the job that you are doing.
- d. When a chemical is absorbed by protective clothing material, it will continue to pass through the material.

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- e. Chapter 7.4 provides information on PPE and precautions to be used when handling biohazards.

### **9. Precautions to take when working where head protection is required**

You shall observe the following requirements if you are exposed to head hazards:

- a. Wear a well-fitting hard hat that meets 29 CFR 1910.135, "Head Protection," and ANSI specifications in ANSI Z89.1, "Industrial Head Protection."
- b. Sanitize the shell and replace or sterilize the cradle and sweatband before giving your hard hat to another worker.
- c. Replace the cradle and sweatband to maintain the effectiveness of the hard hat. Replace them on a regular schedule as recommended by the manufacturer.
- d. Clean the shells with a mild soap and water. Never use solvents or abrasives.
- e. Wear a Class A or Class B hard hat around electrical hazards.
- f. Store hard hats away from ultraviolet rays.
- g. Don't drill holes in your hard hat to attach things unless your hard hat is designed to accommodate holes.

### **10. Precautions to take when working where eye protection is required**

You shall observe the following requirements when working in eye hazard areas:

- a. Wear side shields on your safety glasses when there is a hazard from flying objects.
- b. If you wear corrective lenses in spectacles, use one of the following types of eye protection:
  - 1. Goggles worn over the protective lenses
  - 2. ANSI-approved safety eyewear
- c. Observe the following policy for wearing contact lenses:
  - 1. You may wear contact lenses if allowed by a workplace or task eye injury hazard evaluation. You need to request this evaluation through your supervisor and it will be conducted by Occupational Health Department (OHD). The OHD will identify chemical exposures (as required by 29 CFR 1910.132), and appropriate eye and face protection for contact lens wearers.
  - 2. Follow current OSHA regulations on contact lens wear and eye and face protection.
  - 3. In the event of a chemical exposure, begin eye irrigation immediately and remove contact lenses as soon as practical.
  - 4. Remove contact lenses at the first sign of eye redness or irritation.
  - 5. You shall never wear contact lenses when exposed to hazardous heat, radiation, and

high-dust or high-particulate environments. The NIOSH Current Intelligence Bulletin 59 (<http://www.cdc.gov/niosh/docs/2005-139/pdfs/2005-139.pdf>) provides recommendations about contact lens use in a chemical environment.

- d. Wear goggles when handling corrosive liquids, such as acids and caustics. Make sure the goggles:
  1. Have soft, nonflammable eyecups.
  2. Are flexible enough to fit your face readily.
  3. Are made so that no splashing liquid can get in your eyes through the ventilation openings.
- e. Wear goggles when exposed to vapors or fumes that could cause injury or discomfort to your eyes. Make sure the goggles have eyecups that fit your face snugly and have no ventilation openings.
- f. Wear goggles, helmets, and shields with a filter lens that meets ANSI-Z87.1, “Occupational and Educational Eye and Face Protection,” when doing arc welding, oxy-acetylene welding, furnace work, or any operation where your eyes are exposed to glare.
- g. Wear face masks and shields to protect your face from light impacts, sparks, or chemical splashes. Make sure the mask or shield has a nonflammable transparent visor that is free from scratches or other flaws.
- h. Always wear safety glasses or goggles under face shields. Face shields are designed to protect the face, not as primary protection for the eyes.
- i. Sanitize goggles and glasses before giving them to another worker. Replace any parts such as elastic headbands that can’t be sterilized.
- j. When not in use, keep goggles, glasses, and face shields in containers to protect them from damage or scratches and from contamination by oil, grease, or other materials.

### **11. Precautions to take when working where foot protection is required**

You shall observe the following requirements when working where foot protection is required:

- a. Wear steel-toed safety shoes that meet the requirements of ANSI Z41.1 where your feet are exposed to falling heavy materials, such as in a materials warehouse or machine shop.
- b. Wear footwear made of rubber, specially treated leather, wood, or other suitable corrosion-resisting materials when you handle corrosive liquids such as acids and caustics.
- c. Wear snug footwear when handling molten metals or hot or corrosive liquids. Make sure your footwear has no laces that would allow liquids to reach your foot.
- d. Wear nonmetallic footwear when working with electricity.

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- e. Wear high-top leather footwear when working with cryogenics.

### **12. Precautions to take when working where fall protection is required**

You shall use appropriate fall protection devices when working in any area that is 4 feet or more above adjoining surfaces and is unprotected by guardrails. Follow the guidelines below:

- a. Use a full body harness whenever practical.
- b. Use lifelines, drop lines, lanyards, safety belts, and harnesses only for safeguarding workers. Don't use them for any other purpose. A lifeline shall be able to support a minimum dead weight of 5400 lb (2450 kg) per person applied to the center of the lifeline.
- c. Don't reuse a drop line, lanyard, belt, or harness that has been stressed by a worker falling.
- d. Securely buckle all harnesses and belts, and wear them tight enough to prevent yourself from slipping out.
- e. Secure lanyard to fixed anchorages; make sure they are long enough to reach the ground; and use pads over sharp corners. Make sure deployed lanyard is the correct length so that you do not hit the ground if it opens. A fixed anchorage shall be able to support a minimum dead weight of 5400 lb (2450 kg) per person.
- f. Keep lanyard length as short as the work allows. If possible, don't attach to the lifeline below your waist.
- g. Use a body harness and shock-absorbing device in the lanyard system if a long freefall is possible.
- h. Make sure you are securely attached to a secondary restraint system when using a boson's chair suspension belt.

### **13. Precautions to take when inspecting fall protection equipment**

You shall observe the following requirements when inspecting fall protection equipment:

- a. Don't use safety belts, harnesses, and lanyards that have been impact- or load-tested for safety purposes.
- b. For testing purposes, use only sample belts and worn belts or those of doubtful. Test them to destruction, if possible, or at least to a 4:1 safety factor of the anticipated load. Keep belts that were used for testing only as samples to help judge the safety of other belts.
- c. Observe the following guidelines to inspect fall protection equipment:
  - 1. Inspect all safety equipment such as belts, harnesses, lanyards, and lines before use.

2. Follow your employer's inspection program. Inspect all safety equipment at least every 6 months, and document the date on the equipment.
3. Use the detailed inspection and maintenance procedures that are published by many safety equipment manufacturers and vendors as a guide.
- d. Do all preventive maintenance on schedule. This keeps the equipment ready for use and extends the life of the equipment.
- e. Don't use defective PPE. Notify your supervisor so that it can be replaced.

### 14. Precautions to take when working in a confined space

Follow the requirements in Chapter 6.10, "Entering confined spaces," of this Handbook.

### 15. Using and maintaining PPE

Use the guidelines below to get the most from your PPE:

- a. Inspect your PPE before putting it on. Look for:
  1. Imperfect seams and poor closures.
  2. Non-uniform coatings and scratches.
  3. Pinholes, tears, and cracks.
  4. Stiffness and discoloration.
- b. Don't use PPE that fails inspection. Put it aside and notify your supervisor.
- c. Put your PPE on and inspect it to make sure you have it closed, that you are wearing it correctly, and that it fits snugly, but doesn't bind.
- d. Inspect your PPE every so often while you work and make sure it is still protecting you.
- e. Stop work if your PPE fails. Stop work if you get too hot when wearing your PPE.
- f. If required, clean and decontaminate your PPE before taking it off. Take off your PPE before leaving the work area.
- g. Take off your PPE and store or dispose of it properly.
- h. Store your PPE separately from your regular clothing.
- i. Some chemicals permeate protective clothing. Follow the manufacturer's recommendations for decontamination, storage and reuse.
- j. If you reuse damaged PPE, make sure it is fixed to manufacturer's specifications.
- k. Maintain your PPE according to the manufacturer's schedule or to your organization's schedule, whichever is stricter. Minimize field repairs.
- l. Account for PPE as described in NPR 4200.1, "NASA Equipment Management Manual."

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### 16. Training for PPE?

See Chapter 4.5, “Personal Protective Equipment Training,” of this Handbook.

### 17. Where you can get more information on PPE

You can find more information on personal protective equipment in these documents:

- a. 29 CFR 1910, Subpart I, “Personal Protective Equipment”
- b. *Accident Prevention Manual for Business and Industry: Administration and Programs*, 12<sup>th</sup> Edition, National Safety Council, Washington, D.C., 2000
- c. *Accident Prevention Manual for Business and Industry: Engineering and Technology*, 12<sup>th</sup> Edition, National Safety Council, Washington, DC, 2000
- d. *Chemical Protective Clothing*, J. S. Johnson, ed., American Industrial Hygiene Association, Akron, Ohio, 1990
- e. ANSI Z41.1, “Personal Protection—Protective Footwear”
- f. ANSI Z87.1, “Occupational and Educational Eye and Face Protection”
- g. ANSI Z89.1, “Industrial Head Protection”

### 18. Responsibilities for PPE

- a. As a *supervisor*, you are responsible for:
  1. Surveying, identifying, and documenting all actual and potentially hazardous work areas, job operations, and working conditions where PPE is required.
  2. Obtaining the required PPE after review by the Occupational Health Branch and the Safety and Test Operations Division.
  3. Making sure everyone is aware of the specific PPE required for his or her work assignment.
  4. Making sure your operating procedures reflect PPE requirements.
  5. Making sure everyone uses the equipment as directed and maintains it in good condition.
- b. As a *procurement coordinator*, you are responsible for:
  1. Processing all requests for PPE.
  2. Verifying PPE approvals with the Occupational Health Branch for chemical and biological hazards and the Safety and Test Operations Division for physical and mechanical hazards.
- c. The *Occupational Health Branch* and the *Safety and Test Operations Division* are responsible for:

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1. Helping supervisors to determine hazards and the need for PPE.
2. Helping in selecting and approving PPE.
3. Reviewing and monitor JSC's respiratory protection program.
4. Fit-testing, training, and consulting with on-site respirator users.
5. Providing general training on PPE.