Chapter 10 – Personal Protective Equipment (PPE)

1. General

a. PPE is mandatory when engineering and administrative controls are insufficient. This chapter covers eye/face protection and Chemical Protective Clothing (CPC), including detailed guidance on glove selection.

b. Reference 10-1 and Chapter 20 of Reference 10-2 outline PPE policy and proper use. Reference 10-2 provides guidance on ensembles for CBRN first responders. Refer to Appendix 10-A for additional PPE resources. Hearing and respiratory protection are covered in Chapters 5 and 9, respectively.

c. The Commanding Officer/Officer-in-Charge ensures PPE availability, maintenance, and proper use. Personnel must be trained in selection, use, inspection, and care.

d. Industrial hygienists determine the need for PPE during surveys and upon request.

2. PPE Selection and Use

a. Criteria for PPE Use: The selection and use of PPE is governed by specific criteria and procedures designed to protect workers from occupational hazard. PPE is mandatory under the following conditions:
   (1) Inadequate Control Measures. When engineering and administrative controls are insufficient to eliminate or reduce occupational safety and health hazards, PPE must be used. PPE is not a substitute for these primary control methods but serves as the last line of defense.
   (2) Undetermined Hazard or Exposure. In situations where nature or degree of exposure is unknown, such as during emergency response scenarios (e.g., spills) or confined space entry, PPE is required.
   (3) Exceedance of Occupational Exposure Limits (OELs). Even with engineering and administrative controls in place, if OELs are exceeded, PPE must be utilized.

b. PPE Selection Process. The selection of appropriate PPE is based on several factors:
   (1) Nature of the Hazard. Identify the specific hazards present (e.g., chemical, physical, biological).
   (2) Route of Entry. Determine how the hazard may enter the body (e.g., inhalation, skin absorption, ingestion, injection).
   (3) Degree of Protection. Select PPE that provides an adequate level of protection against the identified hazards and routes of entry.

(4) User acceptability and ease of use. When multiple PPE options are available, consider user comfort, fit, and the ease with which the PPE can be used without hindering job performance.

c. Documentation. The selection of PPE must be thoroughly documented on PPE Hazard Assessment forms. This documentation must comply with 29 CFR 1910.132(d)(2), Reference 10A-3, and/or relevant Department of the Navy (DON) equivalent guidelines. Ensure documentation provides the rationale for PPE selection.

3. Hand Protection and Glove Selection

a. Importance of Hand Protection. Reference 10-3, OSHA 29 CFR 1910.138, Hand Protection, requires appropriate hand protection when employees' hands are exposed to hazards, including substances absorbed through the skin.

b. Skin as a Barrier. The skin's protective function lies primarily in the epidermis. Chemicals can cause dermatitis, immune-mediated responses, and irreversible damage. NIOSH estimates that workplace skin diseases account for 15-20% of occupational illnesses (Reference 10-4).

c. NIOSH Skin Notations. Consider NIOSH skin notations when selecting gloves, a few are listed below (Reference 10-4 and Table 10-1).

(1) SYS. Skin absorption may significantly contribute to overall chemical exposure and systemic health effects.

(2) DIR. Directly harms the skin on contact, like a chemical burn or rash.

(3) SEN. Potential for immune mediated allergic reactions to the skin (e.g. allergic contact dermatitis).

d. Glove Material Selection. No single glove material protects against all chemicals. Select gloves based on chemical compatibility, permeation, degradation, penetration, and physical properties. Consider using layered gloves for enhanced protection.

(1) Polymeric Glove Materials. Understanding glove polymers is critical. Quality varies between manufacturers due to differences in blends, thickness, and manufacturing methods.

i. When selecting the appropriate gloves consider the depth at which the arm will be immersed when selecting glove length and allow for protection against chemical splash. Gloves are tested and rated at room temperature unless specifically noted. Glove use during high temperature applications usually increase the permeation rate. Carefully consider how high temperature environments may affect permeation rates.

ii. Glove use may cause hand perspiration inside the gloves and internally increase the absorption rate of certain chemicals; carefully consider perspiration when selecting the appropriate gloves.

TABLE 10-1

Glove Material Comparison Chart			
Glove Material	**Advantages**	**Disadvantages**	**Protects Against**
Natural Latex	Low cost, good physical properties, dexterity	Poor protection against organic solvents, latex allergies, poor flame resistance	Aqueous solutions, some salts, mercury, ethylene glycol, food handling
PVC	Medium cost, good physical properties, medium chemical resistance	Plasticizers can be stripped, poor protection against many organic compounds	Acids, bases, some salts, hydrazine, ethylene glycol, glycerol, tricresyl phosphate, polychlorinated biphenyls, mercury, oils, fats
Neoprene	Medium cost, medium chemical resistance, excellent physical hazard protection, flexibility over wide temperature range	Poor protection against isocyanates, hydrocarbons, ketones	Acids, bases, some alcohols, mercury, polychlorinated biphenyls, hydrazine, chlorine gas, oils, greases, petrochemicals, some aldehydes
Nitrile	Low cost, excellent physical properties, dexterity	Poor protection against methylene chloride, trichloroethylene, aromatic hydrocarbons, ketones, acetates	Oils, greases, hydraulic oil, motor oil, weak acids & bases, hydrazine, carbaryl, aliphatic & alicyclic hydrocarbons, fuels, pesticides, mercury

Glove Material Comparison Chart			
Glove Material	**Advantages**	**Disadvantages**	**Protects Against**
Butyl	Good resistance to wide variety of chemicals, highly resistant to gases	Expensive, poor protection against aliphatic & aromatic hydrocarbons (including gasoline), chlorinated solvents	Glycol ethers, aniline, ketones, some esters, acids, bases, acetates, alcohols, acetone, some amines, hydrazine, hydroxyl compounds, isocyanates, tricresyl phosphate, mercury, peroxides, polychlorinated biphenyls, nitro compounds, chlorine gas, aldehydes
PVA	Durable, resists a very broad range of organic compounds, flexible over a wide temperature range	PVA is water soluble - do not use in water or aqueous solutions., poor protection against alcohols	Aliphatic & aromatic hydrocarbons, methylene chloride, isocyanates, perchloroethylene, trichloroethylene, some ketones, tricresyl phosphate, xylene, some esters
Viton™	Specialty glove, highly resistant to gases	Expensive, poor physical properties - minimal resistance to cuts & abrasions, poor protection against most ketones	Acids, bases, chlorinated hydrocarbons, aromatic & aliphatic hydrocarbons, hydroxyl compounds, glycol ethers, some esters, tricresyl phosphate, trichloroethylene, aniline, perchloroethylene, mercury, styrene, toluene, alcohols, polychlorinated biphenyls, some amines

(2) Glove Service Life. Dependent on breakthrough time, permeation rate, and degradation (References 10-5 and 10-6).

i. ASTM F79. Use ASTM F739 for permeation testing data

ii. Breakthrough Time. Time for the chemical to be first detected on the inside of the glove.

iii. Permeation. Diffusion of the chemical through the glove material.

iv. Penetration. Flow of the chemical through defects.

v. Degradation. Physical changes in the glove material due to chemical exposure.

(3) Permeation Process. Solvents permeate in a three-step process. solution, diffusion, and evaporation (Reference 10-6).

(4) General Considerations for Selection (Reference 10-7).

i. Involve supervisors and employees in glove selection to ensure proper fit and comfort.

ii. Consider chemical and physical resistance, and dexterity.

iii. No single glove material protects against all chemicals.

iv. Permeation can occur without visible signs.

v. Do not rely on glove color for identification.

vi. Use the most current technical references (e.g., ANSI/ISEA 105 cut resistance scale).

(5) Properly document the PPE selection on the PPE Hazard Assessment form per 29 CFR 1910.132(d)(2), Reference 10-1 and/or DON equivalent.

4. Eye and Face Protection

a. Standards and Regulations.

(1) Reference 10-3 provides the requirements for design, construction, testing, and use of eye and face protection.

(2) The current standard incorporated into 29 CFR 1910.133(b)(1)(i) for eye and face protection is Reference 10-8, ANSI/ISEA Z87.1.

b. Eye Protection. Rated as either “impact” or “non-impact” and marked Z87+ or Z87, respectively. Use only impact protection whenever eye protection is required. Table 10-1 summarizes the ANSI Z87.1 eye protection markings.

Table 10-2

Summary Of ANSI Z87.1 Eye Protection Markings		
Type of Z87.1 Marking	**Category**	**Marking**
Impact	Meets Z87.1 high mass impact, high velocity impact, and penetration tests	
	Impact rated lens	Z87+
	Impact rated prescription lens	Z87-2+
Non-impact	Meets all Z87.1 requirements except impact requirements	
	Non-impact rated lens	Z87
	Non-impact rated prescription lens	Z87-2
Lens Type	Clear	None
	Welding	"W" + shade # (Shades range from 1.3 – 14)
	UV Filter	"U" + scale # (Scale ranges from 2 – 6)
	Visible Light Filter	"L" + scale # (Scale ranges from 1.3 – 10)
	Infrared (IR) Filter	"R" + scale # (Scale ranges from 1.3 – 10)
	Variable Tint	"V"

Summary Of ANSI Z87.1 Eye Protection Markings		
	Special Purpose	“S” (for lenses with less than 85% visible light transmission)
Chemical Splash and Dust Protection	Splash/Droplet	“D3”
	Dust	“D4”
	Fine Dust	“D5”

c. Types of Eye and Face Protection.
   (1) Safety Spectacles. Shield eyes from impact and radiation hazards. Side shields are required in identified eye hazard areas to meet ANSI Z87.1. Prescription safety lenses are available.
   (2) Flexible Goggles. Provide frontal and side protection but may not provide a facial seal. Ventilation may allow passage of liquids.
   (3) Chemical Splash Goggles. Feature covered ventilation openings to protect eyes against sprays and chemical splashes.
   (4) Non-Vented Goggles. Offer the most protective against dusts, mists, liquid splashes and vapors.
   (5) Face Shields. Protect the whole face from debris and liquid splashes. Must be worn with safety glasses or goggles due to potential liquid bypass.
   (6) Welding Helmets. Protect against arc rays, weld sparks and splatters. Some helmets have lenses that darken instantaneously when an arc is struck. Welding helmet-respirator combinations are available for long-duration welding applications.
   (7) Full Face Respirators. May be required even when contaminant concentrations are below 10 times the OELs. Check with manufacturers to ensure respirator lenses comply with ANSI Z87.1+ impact testing requirements if impact protection is needed, as NIOSH has not incorporated this requirement into all respirator certification standards.

5. Chemical Protective Clothing (CPC)

a. This section summarizes the key aspects of Chemical Protective Clothing (CPC) covering its purpose, usage guidelines, and classification as per References 10-9 and 10-10.

b. CPC. A subset of PPE, designed to protect the skin from chemical, physical and biological hazards. This includes gloves, aprons, coveralls, jackets, pants, and boots. Detailed considerations for gloves are outlined in Section 3. Many hazards are "invisible" and offer no warning properties, making CPC necessary. No single ensemble protects against all hazards; therefore, CPC should be used with other protective methods, such as engineering controls, to limit exposure.

c. CPC can introduce hazards like heat stress, physical and psychological stress, impaired vision and restricted mobility and communication. Select CPC that provides adequate protection without over-protection, which can also create hazardous situations.

d. CPC must be worn when potential hazards from direct exposure, such as. emergency response; equipment leaks; chemical treatment hazardous waste cleanup; particulate hazards (e.g., asbestos removal) and pesticide application.

6. CPC Classification

a. CPC can be classified based on the following criteria:

    (1) Design. This categorizes CPC based on the area of the body it protects. Examples include gloves, boots, coveralls, aprons and full body suits. References 10-5 and 10-9 provide more detail.

b. Performance. This classifies CPC by protective capabilities such as protection against particulates, liquids, vapors, and/or heat/cold. The physical and chemical properties of the hazard must be considered when selecting for performance.

c. Service life. This is determined by the user and considers the cost and risks of decontamination and reuse. CPC can be labeled as reusable (multi-use) or disposable (one-time use). Disposable clothing is generally lightweight and less expensive, reusable clothing is more durable, but also more costly.

d. Extensive contamination of any garment may render it disposable.

7. CPC Detailed Guidance.

This section provides detailed guidance on Chemical Protective Clothing (CPC), including worksite characterization, ensemble selection, chemical and physical resistance, donning/doffing, decontamination, inspection, storage, heat stress considerations, and training requirements (Reference 10-5, 10-7, and 10-11).

a. Workplace Characterization. Characterizing the workplace is crucial before recommending PPE; this involves assessing the environment and processes. Conduct characterization during plan reviews, process changes, after hazardous material changes, or in response to worker complaints. Factors to consider:

    (1) Physical Conditions. Assess indoor/outdoor locations, temperature, and physical hazards (confined spaces, heavy lifting). Ensure ensemble components allow adequate mobility and dexterity.

    (2) Chemical Hazards. Evaluate toxicity, corrosivity, flammability, reactivity, and potential for oxygen deficiency. Determine chemical concentration and whether it's Immediately Dangerous to Life or Health (IDLH). Consider skin exposure consequences, chronic hazards, reported fatalities by skin absorption, and whether

the chemical is a sensitizer.

(3) Physical State of the Hazard.

i. Solids or Particulates. Porous CPC minimizes heat stress but must effectively block particulates.

ii. Liquids and Vapors. Non-porous CPC is essential for liquid protection. Liquid splash protective garments also offer particulate protection. Vapor protective suits provide both liquid splash and particulate protection.

(4) Exposure Duration. Consider the maximum time CPC will be worn and potential exposure levels to apply safety margins when selecting CPC materials.

b. The CPC Ensemble

(1) Variety and Fit. Provide a range of clothing and equipment sizes to accommodate various chemical exposures. Proper fit prevents hazards from overly loose (trip hazard, loss of dexterity) or overly tight clothing (restricted movement, tears).

(2) Integration. Select an ensemble of integrated clothing and equipment that provides appropriate protection while allowing task performance.

(3) Factors Affecting Ensemble Use.

i. Fit and Integration. Ensure items fit well together. Incompatible components (e.g., SCBA fitting poorly in a suit) can compromise safety and mobility.

ii. Interface Ease. Facilitate easy interfacing of components without sacrificing performance (e.g., properly fitting over-gloves to maintain dexterity).

iii. Limit the number of PPE items to reduce donning time and complexity.

(4) Performance is Key. Ensemble design alone is insufficient; the performance of clothing and equipment must be known.

(5) Protection Level Evaluation. Re-evaluate the type of PPE and protection level periodically as chemical information or task requirements change. Upgrade or downgrade protection with the concurrence of the safety officer, industrial hygienist, or incident commander.

c. CPC Chemical Resistance.

(1) Material and Construction. CPC's ability to act as a chemical barrier depends on the material and construction method.

(2) Unique Interactions. Each chemical interacts differently with plastics or isomers, creating unique material/chemical pairings.

(3) Selection Criteria. Selection should be based on:

i. Permeation. The process of chemical movement through materials at a molecular level.

1. Permeation Rate. The amount of chemical passing through a given area per unit of time ($mg/m^2/min$). The total amount depends on the exposed area and duration. Permeation rate decreases with increased material thickness.

2. Breakthrough Time. The time elapsed between initial contact and the first detection of the chemical on the inside surface. Shorter breakthrough times may be acceptable if the permeation rate is very low. Breakthrough time is crucial for carcinogens. Reference 10-9 is commonly used to determine breakthrough time and permeation rates.

ii. Degradation. Physical changes in a material due to chemical/physical exposure (discoloration, swelling, loss of strength).

iii. Penetration. Gross movement of a chemical through zippers, seams, or imperfections.

(4) Chemical Mixtures. Mixtures can be more aggressive than single chemicals, potentially pulling other chemicals through or altering the material structure. Reference 10-10 provides chemical resistance data, with over 10,500 permeation tests and 3,000 degradation tests.

d. CPC Physical Resistance.

(1) Assess a garment's physical properties considering the following questions.

i. Will it resist tears, punctures, cuts, and abrasions?

ii. Can it withstand repeated use after contamination and decontamination?

iii. Is it flexible enough for required tasks?

iv. Will the material maintain integrity and flexibility under temperature extremes?

v. Is it flame resistant or self-extinguishing if necessary?

vi. Are seams as strong as the garment material?

e. CPC Selection.

(1) Expertise. CPC selection is complex and requires trained, experienced personnel.

(2) Performance-Based. Select clothing by evaluating performance against application

requirements.

(3) Guiding Principles.

i. Chemicals in the same family tend to permeate at similar rates with similar breakthrough times.

ii. Permeation rate is inversely proportional to molecular weight within the same family.

iii. Attached groups slow permeation.

iv. Polar chemicals permeate polar materials faster than non-polar chemicals (and vice versa).

v. Consider material thickness and temperature effects.

(4) Sources of Selection Information.

i. Vendor Data. Obtain current material compatibility data from CPC manufacturers. Ensure recommendations are based on tests per Reference 10-9. Simple ratings ("poor," "good") are insufficient; quantitative data is needed.

ii. Reference 10-7. Provides data for multiple CPC materials against over 800 chemicals, using color codes to indicate resistance to chemical breakthrough for reported service life.

iii. Appendix 10-A. Provides a list of websites with free manufacturers' software for chemical breakthrough times and permeation rates.

iv. NIOSH. Offers PPE recommendations for hazardous chemicals on its website, Recommendations for Protective Clothing, A Companion to the NIOSH Pocket Guide to Chemical Hazards.

f. Wearing CPC.

(1) Procedures. Establish and practice routine donning and doffing procedures for various ensembles.

(2) Assistance. Plan for donning and doffing assistance if ensembles are cumbersome or damage is likely.

(3) Fit Evaluation. Evaluate fit after donning. Clothing that is too small restricts movement, while clothing that is too large increases snagging.

(4) Doffing. Focus on preventing contaminant migration and transfer to the wearer, other personnel, or the environment. Doffing should occur after decontamination or in a manner to minimize contamination.

g. CPC Decontamination. Removes or neutralizes contaminants from CPC, personnel, and equipment. Proper decontamination protects users from hazardous substances and minimizes contaminant transfer to clean areas.

(1) Considerations.

i. CPC Compatibility. Ensure decontamination methods do not adversely affect the CPC's physical or chemical resistance.

ii. Effectiveness. Verify that the decontamination process is effective.

iii. Exposure Prevention. Evaluate chemicals used in decontamination to avoid unacceptable exposures.

(2) Reference 10-12. Provides guidelines for decontaminating CPC.

h. CPC/PPE Inspection.

(1) User Responsibility. Users must inspect PPE to ensure proper function; inspection should include checking for tears, cuts, punctures, discoloration, and stiffness.

(2) Inspection Program Features.

i. Inspection and operational testing upon receipt.

ii. Inspection before and after each use.

iii. Inspection after use or training.

iv. Periodic inspection of stored equipment.

v. Inspection when questions arise or problems are discovered.

(3) Resources.

i. Reference 10-9 provides CPC inspection guidelines.

ii. Appendix A of Reference 10-10 lists procedures for inspecting fully encapsulating suits.

iii. The OSHA eTool on Eye and Face Protection provides maintenance requirements and guidance.

i. CPC/PPE Storage.

(1) Prevention of Damage. Store PPE properly to prevent damage from dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact.

(2) Guidelines.

i. Store potentially contaminated clothing separately from street clothing and unused PPE.

ii. Store contaminated PPE in a well-ventilated area.

iii. Store different CPC materials separately to prevent issuing the wrong material.

iv. Fold or hang clothing per manufacturer instructions.

j. CPC/PPE Heat Stress Considerations.

(1) Risk. Wearing full-body PPE poses a considerable risk of heat stress.

(2) Factors. Heat stress is caused by environmental conditions, the type of ensemble, work activity, and the wearer's physical condition.

(3) Mitigation. Carefully evaluate each item’s potential for increasing heat stress. Choose lighter, less insulated options, when possible, without sacrificing protection.

(4) Resources. Consult References 10-13, 10-14, and 10-15 for more information.

k. CPC/PPE Training.

(1) Requirement. Training is required for each employee required to wear PPE.

(2) Training Content.

i. When to wear PPE.

ii. What PPE to wear.

iii. How to don, doff, adjust, and wear PPE.

iv. Capabilities and limitations of the PPE.

v. How to properly maintain PPE.

vi. When and how to dispose of PPE.

(3) Competency. Employees must demonstrate knowledge of the training and ability to use PPE properly before performing work requiring PPE.

(4) Frequency. Training is required annually or when workplace operations change, previous training is obsolete, or employees demonstrate a lack of understanding.

(5) Records. Written training records must include the employee’s name, organization, job title, training date(s), course title, instructor’s name, and a description of the lesson plan. Maintain training records for five years (Paragraph 0605 of Reference 10-2).

8. References

10-1 U.S. Department of Labor, Occupational Safety and Health Administration. (n.d.). Personal protective equipment. 29 C.F.R. § 1910.132.

10-2 Department of the Navy. (2024). Navy safety and occupational health program manual (M-OPNAVINST 5100.23).

10-3 U.S. Department of Labor, Occupational Safety and Health Administration. (1994). Hand protection. 29 C.F.R. § 1910.138.

10-4 National Institute for Occupational Safety and Health. (2009). A strategy for assigning new NIOSH skin notations (NIOSH Publication No. 2009–147).

10-5 Anna, D. H. (Ed.). (2003) Chemical protective clothing (2nd ed.). AIHA Press.

10-6 ASTM International. (2007). Standard test method for permeation of liquids and gases through protective clothing materials under conditions of continuous contact (Standard No. ASTM F739-07).

10-7 Forsberg, K., & Mansdorf, S. Z. (2020). Quick selection guide to chemical protective clothing (7th ed.). ACGIH®.

10-8 American National Standards Institute. (2010). American national standard for occupational and educational eye and face protection (ANSI/ISEA Z87.1-2010).

10-9 Occupational Safety and Health Administration. (n.d.). Chemical protective clothing (Instruction TED 1-0.15A).

10-10 U.S. Department of Labor, Occupational Safety and Health Administration. (n.d.). Hazardous waste operations and emergency response. 29 C.F.R. § 1910.120.

10-11 Forsberg, K., & Keith, L. H. (1999). Chemical protective clothing performance index (2nd ed.). John Wiley & Sons.

10-12 American Industrial Hygiene Association. (2005). Guideline for the decontamination of chemical protective clothing and equipment (AIHA Guideline 6).

10-13 Occupational Safety and Health Administration. (n.d.). Heat stress (Instruction TED 01-00-015).

10-14 Navy and Marine Corps Public Health Center. (2024). Prevention and treatment of heat and cold stress injuries (NEHC-TM-OEM 6260.6A).

10-15 Department of the Navy, Bureau of Medicine and Surgery. (2023) Manual of naval preventive medicine, Chapter 3: Prevention of heat and cold stress injuries (ashore, afloat, and ground forces) (NAVMED P-5010).

10-16 Google. (2025, December 15). *Gemini Enterprise* [Large language model]. https://gemini.google.com

APPENDIX 10-A

Table 10A-1

PPE Resources*	
Resource Description	**Resource/Comments**
Chemical Protective Clothing Selection	AIHA (2025). *Chemical Protective Clothing, 3rd edition*. Edited by D. A. Newcomer & R. N. Phalen. Fairfax, VA: American Industrial Hygiene Association. This comprehensive resource covers fundamentals, design, testing, and program development for OEHS professionals, updated with new materials and testing. Forsberg, K. and Keith, L. H. Chemical Protective Clothing: Performance Index, 2nd ed. Cincinnati, Ohio: ACGIH®, 1999. Reports protective clothing chemical resistance data, listing over 10,500 chemical permeation tests on CPC exposed to 860 chemicals and mixtures of chemicals. It also contains over 3,000 chemical degradation tests. A "Chemical Permeation Index Number" is provided to assist individuals who are not familiar with the concepts of breakthrough times, permeation rates and degradation. Zero (0) is the best selection of protective clothing for the specific chemical or chemical mixture and 5 represents the worst selection.
Internet Sources of Glove Selection and General PPE Guidance	Ansel Chemical Resistance Guide
	Permeation/Degradation Resistance Guide for Ansell Chemical Resistant Gloves, 8th Edition
	Recommendations for Chemical Protective Clothing: A Companion to the NIOSH Pocket Guide to Chemical Hazards
	ChemRest Guide to Chemical Resistant Best Gloves
	MSC Industrial Supply, Safety Product Selector Tool

PPE Resources*	
Resource Description	**Resource/Comments**
Internet Sources of Glove Selection and General PPE Guidance	MAPA Spontex, Inc. Glove Selection Tool
	Argonne National Laboratory Glove Selection Guide
	Permeation Guide for DuPont™ Tychem® Protective Fabrics
	National Institute for Occupational Safety and Health (NIOSH): Indexed Dermal Bibliography (1995-2007), NIOSH Publication No. 2009–153: Cincinnati, Ohio: NIOSH, 2009. Includes 229 references on occupational skin exposures to chemicals, including health effects surveillance, exposure characterization, hazard identification, risk assessment, risk control/ management and personal protective equipment.
	National Institute for Occupational Safety and Health (NIOSH): Preventing Allergic Reactions to Natural Rubber Latex in the Workplace. NIOSH Publication No. 97-135: Cincinnati, Ohio: NIOSH, 1997. Discusses prevention of allergic reactions to latex rubber in the workplace.
Resources on Dermal Exposure	ACGIH®: TLVs and BEIs® Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: ACGIH, 2012. Lists compounds regarded as skin hazards
	National Institute for Occupational Safety and Health (NIOSH): NIOSH Pocket Guide to Chemical Hazards, NIOSH Publication No. 2005-149 Lists compounds regarded as skin hazards.
	NIOSH Skin Permeation Calculator Estimates the log of the octanol-water K_{ow} partition coefficient, which indicates a chemical's solubility in a nonpolar phase versus a polar phase. The most skin penetrating chemicals have a log K_{ow} between 1 and 3.

PPE Resources*	
Resource Description	**Resource/Comments**
Resources on Dermal Exposure	NIOSH Safety and Health Topic Website: Skin Exposure & Effects Provides an overview of occupational skin exposure.
	OSHA 29CFR 1910.1000, Table Z-1 Lists compounds regarded as skin hazards.
	NMCFHC Department of the Navy Technical Guidance on Occupational Sensitizers for Industrial
Resources on Eye Protection	OSHA Fact Sheet - Eye Protection against Radiant Energy during Welding and Cutting in Shipyard Employment
	OSHA Shipbreaking Eye and Face Protection
	OSHA Eye and Face Protection E-Tool
	CDC Workplace Safety & Health Topics – Eye Safety
The following resources are provided for informational purposes only. This list is not exhaustive and does not constitute an endorsement by the DoD or DON. The accuracy of content on external sites has not been verified and should be used with professional discretion.	