Department of the Army
Pamphlet 40–506

Medical Services

The Army Vision Conservation and Readiness Program

Headquarters
Department of the Army
Washington, DC
2 June 2003

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SUMMARY of CHANGE

DA PAM 40–506
The Army Vision Conservation and Readiness Program

This administrative revision, dated 2 June 2003--

- Provides updated publications references in the text (paras 1-9c(5)(b), 3-4c(1)(d), 3-5b, and 3-6b(2)).

- Updates the publications listed in appendix A.

- Corrects the list of references in the sample standing operating procedure in appendix C and in the sample standing regulation in appendix D.

This pamphlet is a health-related publication developed to provide guidance on establishing, maintaining, and enhancing a vision conservation and readiness program. It supersedes, updates, and encompasses the information previously addressed by TB MED 506, Occupational Vision. It also provides information on vision hazards, eye safety, environmental vision, and visual readiness for military and civilian employees of the Department of the Army and--

- Outlines potential members of the Vision Conservation and Readiness Team and their areas of expertise and responsibility (para 1-7).

- Describes the elements of occupational vision required for visual performance, eye safety, and environmental comfort (paras 1-6 a-c).

- Explains occupational vision in relation to vision screening (para 3-3), vision performance standards (para 3-4), soldier visual readiness (para 3-5), and worksite evaluation (para 3-7).

- Describes vision safety via engineering controls (para 4-2), administrative controls (para 4-3), and protective equipment (para 4-4).

- Describes hazards to vision from mechanical (para 4-5), chemical (para 4-10), biological (para 4-16), and radiant energy (paras 4-21, 4-24, and 4-31) injury agents.

- Describes protective measures for mechanical (para 4-7), chemical (para 4-13), biological (para 4-19), and radiant energy hazards (paras 4-23 and 4-29).

- Describes medical management of ocular injuries for mechanical (para 4-8), chemical (para 4-14), biological (para 4-20), and radiant energy hazards (para 4-30).

- Outlines environmental vision in relation to atmospheric elements (para 5-2), illumination and lighting (para 5-3), and special devices and systems (para 5-4).

- Describes the types of vision conservation site surveys (paras 6-2 and 6-3), reporting (para 6-4), and staff assistance visits (para 6-6).

Headquarters
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Medical Services

The Army Vision Conservation and Readiness Program

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the Secretary of the Army

History. This publication is an administrative revision. The portions affected by this administrative revision are listed in the summary of change.

Summary. This pamphlet provides guidance on establishing, maintaining, and enhancing a vision conservation and readiness program. The policies and procedures regarding vision conservation and readiness are in accordance with provisions in Army Regulation 40–5, Department of Defense Instruction 6055.1, and current professional standards.

Applicability. This pamphlet applies to Department of the Army installations and activities worldwide. This includes the ActiveArmy, the U.S. Army Reserve, the Army National Guard of the United States, and personnel of other Services attached to Army units. This also includes Department of the Army civilian employees and civilians under contract to the Department of the Army who perform tasks in eye hazardous jobs or areas or who may be required to deploy. This pamphlet also addresses the visual environment of all workers. When required, exceptions may be made for military unique equipment, systems, and operations. Portions of this publication may not be applicable during mobilization or anytime the U.S. Army adopts a state of readiness for actual or imminent armed conflict. However, protective measures will be applied to prevent injury to the maximum extent possible in the theater of operations to preserve the fighting strength.

a. This pamphlet remains applicable to Department of the Army personnel deployed on either humanitarian or peacekeeping missions where the degree of readiness and maintenance of mission effectiveness depends on preventing eye injuries and maintaining visual efficiency. Safety provisions remain in place subject to the availability of protective equipment.

b. Portions of this pamphlet may not apply in theaters of operation where hostile fire exists or is expected to exist:

(1) Illumination considerations will be within the constraints of available lighting sets, ambient lighting, and combat lighting discipline.

(2) If industrial safety eyewear is not immediately available in the deployment area, ballistic laser protective spectacles, special protective eyewear cylindrical system, or military eye protection system when fielded are considered appropriate protection.

Proponent and exception authority. The proponent of this pamphlet is the Office of The Surgeon General. The proponent has the authority to approve exceptions to this pamphlet that are consistent with controlling law and regulation. The proponent may delegate this approval authority, in writing, to a division chief within the Office of The Surgeon General in the grade of colonel or the civilian equivalent.

Suggested improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Headquarters, Department of the Army, ATTN: DASG–HS, 5109 Leesburg Pike, Falls Church, VA 22041–3258.

Distribution. This publication is available in electronic media only and is intended for command levels A, B, C, D, and E for the Active Army, the Army National Guard of the United States, and the U.S. Army Reserve.

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*This pamphlet supersedes DA Pam 40–506, dated 20 July 2001.

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Chapter 1
The Army Vision Conservation and Readiness Program

1–1. Purpose
The purpose of this pamphlet is to ensure military, civilian, and contract employees of the U.S. Army, U.S. Army Reserve (USAR), and Army National Guard of the U.S. (US) have the visual performance, optical devices, and ocular health necessary to perform their assigned activities in a safe and efficient manner.

1–2. References
Required and related publications and referenced forms are listed in appendix A.

1–3. Explanation of abbreviations and terms
Abbreviations and terms used in this pamphlet are explained in the glossary.

1–4. Background
a. Operation Desert Shield/Storm (ODS) after-action reports and data indicated that 27 percent of the military were not vision ready (did not have the visual acuity (VA) to meet requirements). Of those who needed a spectacle correction, 44 percent were not optically ready (did not have the necessary spectacles or protective mask inserts (PMIs) needed for deployment). This lack of vision and optical readiness resulted in over one million military spectacles and PMIs being ordered. The orders overloaded optical fabrication laboratories. Some forward units had to rely on host country vision examinations and optical services while in theater. Some units even purchased nonprescription sunglasses prior to deployment from the continental United States.

b. In recent conflicts, according to G. Treister in Ocular Casualties in the 6 Day War, American Journal of Ophthalmology, 68:669–675, 1969, the incidence of eye injury has risen to 10–13 percent of all casualties even though the eyes comprise only 0.54 percent of the frontal silhouette area of the body.

c. The 1989 Eye Injury Program Evaluation Study (unpublished) reported 2,380 minor eye injuries per 100,000 active duty military personnel per year in the Army.

d. Ninety percent of eye injuries are preventable through effective Vision Conservation and Readiness Programs (VCRPs) according to Prevent Blindness America.

1–5. Mission
a. The VCRP promotes and optimizes vision, optical, and eye (VOE) health readiness.

(1) Vision readiness—personnel have the visual ability required to perform their mission safely and efficiently.

(2) Optical readiness—personnel have the appropriate serviceable optical devices (for example, spectacles and PMIs) needed to function safely and effectively.

(3) Eye health readiness—personnel have a current ocular health evaluation. Any conditions that may compromise safety or effectiveness have been addressed.

b. The VCRP further assures a safe and healthful working environment and applies to garrison, field training, and deployment. The VCRP is consistent with the Department of Defense (DOD) Military Readiness Strategic Plan (MRSP), Military Health System (MHS) Strategic Plan (SP), MHS Information Management/Information Technology (IM/IT) SP, and Force Health Protection (FHP)(Public Law 105–85). In host countries, local national employees may be included in the VCRP.

c. The current VCRP is not the traditional Occupational Vision Program (OVP) practiced in the past. The traditional OVP focused on civilian employees performing industrial-based work with very little emphasis on the military and their working environments (that is, the garrison, the field, and the deployed area to include the battlefield). A redefined OVP is now an element of the VCRP for both military and civilian personnel.

1–6. VCRP elements
The VCRP consists of three program elements: occupational vision, eye safety, and environmental vision.

a. Occupational vision.

(1) *Goal.* The goal of occupational vision is to ensure that military and DOD civilian employees have the necessary VOE readiness to work safely, efficiently, and comfortably.

(2) *Major scope of occupational vision.*

(a) Job vision standards for effective visual performance (such as VA, binocularity, depth perception, and color vision).

(b) Vision screening and examination.

(c) VOE readiness.

(d) Special optical devices (night vision devices (NVD) such as night vision goggles (NVG) and industrial safety spectacles).

b. Eye safety.

(1) *Goal.* The goal of eye safety is to eliminate eye injuries through—

(a) Evaluating (characterizing) work sites in garrison, field, and deployed areas.

(b) Engineering and administrative controls of hazards where possible.

(c) Providing personal eye protection equipment.

(d) Training and education.

(2) *Scope.* The major scope of eye safety is to—

(a) Identify mechanical, chemical, biological, and radiation eye hazards.

(b) Report, analyze, and evaluate eye injuries.

(c) Provide effective countermeasures against eye hazards by implementing—

1. Engineering controls (abatement).

2. Administrative controls (policies and signs).

3. Personal protective equipment (PPE) use (such as protective safety eye wear).

c. Environmental vision.

(1) *Goal.* The goal of environmental vision is to evaluate and provide solutions for environmental factors that may reduce visual efficiency and/or ocular health. Examples are illumination, radiation, and workplace ergonomics.

(2) *Scope.* The major scope of environmental vision is to—

(a) Evaluate workplace illumination.

(b) Advise on the use of NVDs and other special optical devices.

(c) Provide guidance on the visual effects of laser/microwave.

(d) Address visual aspects of video display terminal (VDT) ergonomics.

(3) *Environmental vision considerations.*

(a) NVDs are increasingly essential in night combat operations and present a unique visual environment.

(b) Laser and microwave radiation introduce hazards on the modern battlefield, such as thermal injury, glare, and flash blindness potential.

(c) Illumination is a factor affecting safety, comfort, and productivity.

(d) The proliferation of VDTs has produced a new generation of visual demands.

(e) Other special devices may require evaluation.

1–7. Functional integration and multidiscipline matrix

The VCRP is designed to operate as an integrated, multidiscipline program. Open communication is essential for program success. An integrated installation/division level Vision Conservation and Readiness Team (VCRT) should include a vision conservation and readiness officer (VCRO) or vision conservation coordinator (VCC), a local occupational health (OH) program coordinator, a worksite hazard evaluation coordinator, and a safety officer. The VCRT should also include emergency room, outpatient clinic, and troop medical staff when available.

a. VCRO/VCC. The VCRO or VCC is the subject matter consultant and primary proponent of vision conservation and readiness at the local level. The VCRO will be an optometrist or ophthalmologist who is specifically trained in a U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM)-approved vision conservation and readiness course and appointed on orders (when appropriate) by the Installation Medical Authority (IMA) or other command authority. At large installations, an assistant VCRO may be appointed. When an optometrist or ophthalmologist is unavailable, another health care provider, trained in vision conservation, may serve as the VCC. The VCC will coordinate the local program and consult with the first VCRO in the chain of command. The VCRO/VCC will—

(1) Be responsible for managing vision conservation and readiness at the installation or unit level.

(2) Implement protocols for vision screening, referral criteria, emergency procedures, and education programs and coordinate VOE care to eligible individuals.

(3) Coordinate the eye injury surveillance program. This includes the collection of data pertaining to eye injury using the Eye Injury Reporting System (EIRS) or other similar system. The data are used to enhance the local VCRP. Copies of the data will be sent monthly to the Tri-Service Vision Conservation and Readiness Office (TVCRO) at USACHPPM.

(4) Make recommendations, as needed, on special situations encountered by other professionals.

b. Local OH program coordinator. The lead professional should be an Occupational Health Nurse (OHN), a preventive medicine physician, a preventive medicine/OH-trained Physician Assistant (PA) or public health professional. The VCRO/VCC will coordinate vision screenings, referrals for vision examinations, and ocular surveillance programs with the local OH program coordinator.

c. Worksite hazard evaluation coordinator. The lead professional should be an industrial hygienist (IH) or safety officer. The main activity is to survey and characterize work sites, recognize and evaluate eye hazards, document hazards and locations, and provide recommendations on hazard controls.

d. Safety officer. The primary role of this professional is to be aware of all potentially hazardous conditions, implement engineering and administrative controls on eye hazards, and implement the PPE program. The PPE program

refers to approving and issuing eye protection and ensuring wearing compliance. The safety officer also provides safety-related education and collects accident and injury data per Army Regulation (AR) 385–40, including that which pertains to eye injury.

e. Others. Emergency room, outpatient clinic, and troop medical clinic staff should be included as VCRT members when available.

1–8. Organization and function—DA level

a. USACHPPM. The USACHPPM has a Tri-Service Vision Conservation and Readiness Program (TVCRP). The TVCRP provides consultative services to DOD elements on vision conservation and readiness matters.

(1) *Policy, doctrine, and standards development/revision.* The TVCRP develops and interprets policies for The Surgeon General on vision conservation and readiness issues and provides expertise and direction to vision conservation and readiness programs to enable current operations and future planning. When appropriate, USACHPPM TVCRP members represent the DOD on committees responsible for national standards.

(2) *Studies, research, surveillance, and metrics.*

(a) The USACHPPM studies and research involve analyzing VOE trends, identifying populations at risk, developing countermeasures, targeting education audiences, developing policy and doctrine, and optimizing resources. These studies and research also provide guidance for automation development.

(b) The EIRS is an on-going eye injury monitoring initiative. The EIRS captures eye injury data in participating DOD units. The USACHPPM TVCRP gathers EIRS data, investigates cases involving severe or unusual eye injuries, identifies trends, and recommends cost-effective preventive measures.

(3) *Education and training.* The USACHPPM TVCRP conducts a variety of courses and lectures based on the current needs of vision conservation, readiness, and the professionals who work on VCRTs.

(a) Vision Conservation and Readiness Course (VCRC)—designed to train installation/unit level professionals.

(b) EIRS Course—designed to train participants in eye injury surveillance data collection. This training promotes vision conservation in the military treatment facility (MTF) and standardizes methodology in data collection and analysis.

(c) Spectacle Request Transmission System/Vision and Optical Readiness (SRTS/VISOR) Workshop—designed to train participants in the use of SRTS/VISOR.

(d) Vision conservation and readiness lectures—designed to discuss vision and readiness issues. These lectures are tailored to the vision and readiness requirements of the requestor.

(e) Education, policies, and information materials—designed to assist the local VCRT. Media available includes brochures, videos, fact sheets, news releases, public service announcements, and World Wide Web page (currently http://chppm-www.apgea.army.mil/dcpm/vcp/vcp.htm).

(4) *Automation.* The USACHPPM TVCRP is the Action Office for the Department of Defense Vision Services (DVS) Functional Process Improvement (FPI) Work Group. The DVS FPI promotes, coordinates, and provides leadership to the planning, implementation, and execution of functional process improvements within the following five major areas:

(a) Vision readiness of DOD health system beneficiaries.

(b) Vision conservation and prevention of eye injuries.

(c) Clinical vision and eye health services delivery.

(d) Resource management pertaining to vision services.

(e) Vision services information management including, but not limited to, development of the Defense Vision Information Services (DVIS).

(5) *Staff Assistance Visit (SAV).* The USACHPPM Tri-Service Vision Conservation and Readiness Staff (TVCRS) performs staff assistance visits (SAVs) upon request of local commands when resources permit. The SAV is a consultation service rather than an inspection. With input from the local VCRT, the USACHPPM TVCRS guides evaluation of the local VCRP and suggests possible solutions for local administrative and technical difficulties.

(6) *General consultation.* The USACHPPM TVCRP assists local programs with information and guidance in all aspects of the VCRP. Appendix B provides guidelines for VCRP evaluation.

(7) *Special developmental programs.* The USACHPPM TVCRP is involved with developmental programs such as VOE criteria and classification, protective masks, eye protection systems, and field optometry sets.

b. The United States Army Center for Health Promotion and Preventive Medicine, Europe (USACHPPM–EUR). The USACHPPM–EUR VCRP is managed by an active duty U.S. Army optometrist. The program provides—

(1) *Policy and doctrine.* The USACHPPM–EUR VCRP develops policies and doctrine for U.S. Army, Europe (USAREUR) on vision conservation and readiness issues unique to the European theater of operations and are consistent with those developed by USACHPPM–Main.

(2) *Studies and research.* The USACHPPM–EUR VCRP conducts studies, research, and data evaluations in coordination with USACHPPM–Main.

(3) *Training.* The USACHPPM–EUR VCRO sponsors the European VCRC. The USACHPPM–Main TVCRP normally provides instructors for this training.

(4) *Automation.* The USACHPPM–EUR VCRO is the Europe Action Office for the VISOR, EIRS, and VOE readiness.

(5) *SAV.* The USACHPPM–EUR VCRO performs SAVs upon request of local commands when resources permit. The SAV format will be tailored to local needs.

(6) *General consultation.* The USACHPPM–EUR VCRP assists local programs with information and guidance in all aspects of the VCRP.

(7) *Special developmental programs.* The USACHPPM–EUR VCRO develops VCRP doctrine and programs unique to the needs of the European theater of operations.

1–9. Organization and function—unit/installation level

a. The unit/installation commanders will provide appropriate eye protection to subordinate military, DA civilian employees, and local national employees working in eye-hazardous jobs/areas.

b. The local IMA or other appropriate authority will appoint a VCRC-trained optometrist or ophthalmologist as the VCRO. This individual will coordinate the VCRP on the installation and be the resident authority on vision conservation for the installation. The VCRO should become thoroughly familiar with the responsibilities of the other professionals involved in the program. The VCRO at the installation level should be actively involved in understanding and reviewing all phases of the local VCRP.

(1) When appropriate, the Chief, Optometry and/or Ophthalmology will assist the IMA in the selection of a VCRO.

(2) When no optometrist or ophthalmologist is available, the Chief, Preventive Medicine will assist the IMA in selecting a VCC. The most qualified professional available should be designated as the VCC to coordinate the local program. The VCC will interact with the first VCRO in the medical chain of referral.

c. The VCRO/VCC will oversee the implementation of all vision conservation elements at the installation or unit level. Areas of primary emphasis are—

(1) *Occupational vision.* Establish local vision screening, inspections, and recall protocols for—

(a) Military and deployable DA employees to determine if they are VOE ready.

(b) Military and DA employees who have a crucial requirement for optimum vision (for example, pilots and emergency vehicle operators).

(c) Preplacement, periodic, and termination vision screening for workers in potentially eye-hazardous job positions for which eye protection is required. This screening is normally performed as part of the OH examination.

(d) Evaluation of the vision performance needed for special optical devices.

(e) Vision screening of VDT workers.

(f) Vision and ocular assessment of designated personnel in laser, radio frequency radiation (RFR), and ionizing radiation environments.

(2) *Eye safety.*

(a) Ensure worksite analysis characterizes/describes the workplace, the worker, and the work-related eye hazards.

(b) Promote appropriate engineering controls, administrative controls, and PPE use.

(c) Provide workers with education about appropriate eye protection, fit and maintenance of protective eyewear, and the benefits of vision conservation consistent with Occupational Safety and Health Administration (OSHA) mandates.

(3) *Environmental vision.*

(a) Conduct worksite analysis for appropriate illumination to ensure optimum job performance.

(b) Advise unit commanders and personnel on special optical device (such as NVDs) use and the ocular effects of directed energy sources.

(4) *Advice and education.* Provide advice and education on matters concerning the VCRP to commanders, IMA, and employees.

(5) *Medical management.*

(a) Assists local IMA in establishing local policies and protocols on work-related emergency/urgency care.

(b) Provide care for work-related eye injuries when within the professional scope of practice of the VCRO.

(c) Provide education about the management of occupational eye injuries and disease.

(6) *Injury surveillance.* Use a method such as the EIRS to record and report eye injuries. The eye injury data collected will be sent to the USACHPPM–Main TVCRP each month. The VCRT will develop intervention strategies, where necessary, based on the data received.

d. The VCRT will assist the VCRO/VCC in accomplishing the local VCRP mission.

e. Supervisors will ensure eye safety practice requirements are included in the employee's job description. Supervisors will ensure the eye safety compliance of contract workers as stated in the labor contract and will document and report any noncompliance to the safety office and the contracting officer's representative (COR). Such noncompliance will constitute a breach of contract.

f. The Contracting Office will ensure safe practice requirements are included in all labor contracts.

g. Supervisors will discipline noncompliant workers in accordance with civilian, military, and local regulations or policies. Reassignment to non-eye hazardous work or termination may be required in some instances.

h. Workers will wear appropriate safety eyewear, comply with safety standards, and report any unsafe conditions or practices to their supervisor that might cause eye injuries.

Chapter 2
Management of the Army Vision Conservation and Readiness Program

2–1. Introduction

An effective VCRP requires administrative and resource commitment from major commands. A similar commitment, as well as efficient administrative and management procedures, must be established at the installation level. Each installation shall have a local regulation or standing operating procedure (SOP) that delineates the scope of the VCRP and identifies responsibilities. (See apps B, C, and D.) The organizational elements identified in this section have a direct impact on the administration of the VCRP.

2–2. Commander

The commander—

a. Establishes and implements safety and health procedures as mandated by DOD Instruction (DODI) 6055.1; Executive Order 12196; Title 29, Code of Federal Regulations (CFR), Part 1910 (29 CFR 1910); 29 CFR 1960; and Public Law (PL) 105–85.

b. Promotes a VCRP per this pamphlet.

c. Promotes awareness of vision conservation on the installation by use of command emphasis letters, media presentations, and other information mechanisms.

d. Provides resources (budget, staffing, and space) for the VCRP and support equipment as specified in AR 385–10.

e. Ensures vision readiness of all active duty and deployable DA civilian personnel.

f. Ensures that all military and DA civilian personnel receive vision screening appropriate for their job requirements and exposure to potential eye hazards. Also ensures individuals identified as requiring comprehensive vision examinations are appropriately referred. (See para 3–6 regarding examination provisions.)

g. Ensures that all personnel follow proper work practices, use protective equipment, and receive proper instruction and training in the use, care, and maintenance of PPE.

h. Ensures that unit alpha rosters are maintained of all personnel assigned and professional filler system (PROFIS) to the unit with military occupational specialties (MOS) and deployability status.

2–3. Civilian personnel office (CPO)

The CPO—

a. Provides the VCRT with a job-title list of civilian employees on the installation (updated annually). This list will be used by the VCRT to identify employees who require vision screening and eye protection.

b. Identifies DA civilian employees who may be deployable to a peacekeeping or hostile action zone and provides this information to the VCRT.

c. Verifies employee job descriptions include the requirement to properly wear and maintain PPE when hazardous work conditions exist. If this factor is not in the current job description, ensure inclusion in a revision of the job description.

d. Uses the job-vision standards (see para 3–4) to determine eligibility and effective placement of employees.

e. Assists supervisors with reclassification or disciplinary actions, as necessary.

2–4. Local military personnel office

Provides unit alpha rosters to the VCRT for the military personnel assigned to activities and units on the installation. The roster shall include the MOS in which the soldiers are working. The deployment status will be included when available. The list should be updated at least annually, or more frequently where units have a high rate of personnel change or high rate of deployment.

2–5. Vision Conservation and Readiness Team

The VCRT—

a. Performs surveys to identify eye-hazardous occupations and processes. This includes worksite environmental hazards that may produce mechanical, chemical, radiation, or biological eye injuries. The main responsibility for maintaining hazard inventories rests with IH and safety.

b. Maintains a complete and current inventory of all work areas, eye hazards associated with the work areas, and

vision performance requirements at the installation/location using a job-title list. In Europe, this inventory is maintained by OH teams at area support groups (ASG) and MTFs. The civilian job-title list is maintained and provided by CPO. The military job-title list is obtained from the military personnel office.

c. Monitors eye injuries and recommends corrective action for identified hazards to safety and local command offices.

d. Coordinates the vision screening of all employees and ensures that the results are recorded in the official health record. Ensures military and civilian personnel not demonstrating the required visual performance are referred for a comprehensive vision examination.

e. Ensures verification of prescription industrial safety eyewear and proper fitting of all industrial safety eyewear.

f. Ensures vision test and prescription information is kept in employee medical records. Maintains current eyewear prescription of deployable DA civilian employees.

g. Maintains a database of the total number of employees screened, the screening results, the number of personnel employed in eye-hazardous areas, the number of eye injuries, and the number of industrial safety spectacles issued as part of the VCRP.

h. Provides technical input and assistance to the employee health hazard education program.

i. Reports VCRP status to command.

2–6. Safety officer

The safety officer—

a. Works in coordination/consultation with the VCRT to establish and update annually a local job-title list of all military and civilian jobs on the installation.

b. Conducts surveys, in coordination/consultation with the VCRT, to identify eye-hazardous jobs, processes, and areas. This information shall be incorporated into the CPO job-title list, the military job-title list, and the inventory of eye hazards maintained by IH. Validates the need for and identifies employees who require protective eyewear.

c. Assists the OH office, VCRO/VCC, and supervisory personnel in determining the appropriate type of protective eyewear required.

d. Assists unit safety officer in developing and monitoring unit eye protection safety programs.

e. Monitors the industrial safety spectacle procurement program. Ensures that the spectacles are ordered and delivered in a timely manner and meet national standards marking requirements.

f. Monitors use of eye protection by military, civilian, and contract employees in work areas and, when necessary, recommends program improvements.

g. Coordinates with commanders, CPO, and COR as appropriate to resolve eye safety violations.

h. Provides education to employees and supervisors on eye safety techniques and devices.

i. Motivates supervisors to ensure employees wear protective eyewear.

j. Monitors eye injury trends to guide intervention measures.

k. Implements controls (such as administrative and engineering) appropriate to the hazards in the workplace.

l. Provides a means of rewarding and/or recognizing individuals whose eye(s) are protected from injury by wearing PPE in an accident. This may be accomplished via a locally developed program or adopting an established program (such as the Wise Owl Club of Prevent Blindness America).

2–7. Logistics officer

The logistics officer—

a. Consults technical specialists in safety, OH, and vision care when formulating, modifying, and terminating any ophthalmic services contracts.

b. Ensures timely procurement (that is, not to exceed 15 working days) and delivery of safety-related ophthalmic services and materials.

c. Modifies or terminates VCRP-related ophthalmic contracts and related procurement documents if the vendor does not meet the needs of the VCRP.

d. Ensures labor contracts include the requirement to use PPE and sound safety practice as performance requirements for contracted workers.

e. Ensures the COR is familiar with eye safety compliance required of the contract workers.

f. Ensures a stock of nonprescription protective eyewear (meeting the current American National Standards Institute (ANSI) Z87.1 standard) is available for distribution to unit supply. This stock will include several sizes to accommodate variations in facial structure.

g. Monitors the distribution of Special Protective Eyewear Cylindrical System (SPECS) and Ballistic Laser Protective Spectacles (BLPS) (and Military Eye Protection System (MEPS) when available) from the central issue facilities and other designated issue facilities.

2–8. Supervisors

Supervisors—

a. Ensure all job descriptions include the requirement to use safe practices and appropriate safety equipment.

b. Use the job-vision standards (see para 3–4) as an aid to employee/job selection. Schedule military and appropriate civilian employees for periodic vision screening in coordination with the VCRP.

c. Remove an employee from the eye-hazardous work/area if his/her vision does not meet required vision standards until the employee's vision can be brought up to the standards or a waiver is granted.

d. Ensure employees placed in eye-hazardous jobs have proper eye protection.

e. Obtain and keep a stock of nonprescription protective eyewear for use by employees whom do not require prescription eyewear and visitors. This eyewear must meet the current ANSI Z87.1 standard.

f. Ensure prescription safety eyewear is provided in a timely manner. Appropriate safety goggles worn over civilian glasses may be used temporarily or the worker can be temporarily placed in a non-eye hazardous work area while prescription safety eyewear is being procured.

g. Ensure that active duty and deployable civilians have the required number and type of eyewear needed for deployment.

h. Ensure all personnel receive instruction and training in safety practices and in the use and care of the protective eyewear.

i. Ensure personnel demonstrate knowledge in safety practices and in the use and care of the protective eyewear. (See chap 4.)

j. Enforce the proper wear of safety eye protection and practice of safety discipline. Use current Civilian Personnel Laws and Regulations or Uniform Code of Military Justice as enforcement tools when needed.

k. Ensure that all employees participate in the aspects of the VCRP appropriate to their job.

l. Direct all personnel having difficulties or complaints from use of industrial safety eyewear to the VCRT for evaluation and/or resolution of the problem.

m. Document and report all safety violations and noncompliances with PPE wear requirements to the safety officer.

n. Take appropriate action, which may include reassignment or removal from Federal service, for any employee who will not wear required PPE.

2–9. Employees (military, civilian, and contract)

Employees—

a. Participate in the VCRP as it is outlined in this document.

b. Properly use safe practices, safety equipment, PPE, engineering controls, and administrative controls as mandated by 29 CFR 1910.133 and local directives. Safe practice includes—

(1) Understanding how to perform their work in a safe manner.

(2) Knowing the difference between industrial safety eyewear (ANSI Z87.1) and standard eyewear (ANSI Z80.1).

(3) Ensuring appropriate protective equipment is readily available for use with hazardous instruments, machines, processes, or areas.

(4) Keeping protective eyewear clean, properly fitted, and in serviceable condition.

(5) Using appropriate industrial safety eyewear and protective equipment in eye-hazardous areas and tasks.

c. Undergo training in the principles and practices of first responder if working in an eye-hazardous area.

d. Report unsafe practices or eye hazards to the supervisor and/or safety specialist for timely protective intervention.

e. Advise supervisor of need for safety eyewear or need for modification of processes or procedures.

2–10. Performance improvement

All levels of command should maintain an ongoing performance improvement program. As a minimum, the program should include—

a. Evaluating user/participant input and implementing input determined to have merit.

b. Reporting of eye injuries.

c. Developing intervention plans based on injury trend analysis.

d. Implementing intervention strategies.

e. Monitoring the effectiveness of intervention strategies.

f. Ensuring appropriate and timely pre-employment, periodic, and termination physicals or screenings are performed.

g. Ensuring timely vision care services as applicable.

h. Ensuring effective training is provided in the use and maintenance of protective devices and safety practices.

i. Verifying the accuracy of prescription eyewear and optical inserts.

j. Ensuring timely acquisition and delivery of safety eyewear to the worker.

k. Monitoring safety eyewear use and compliance.

2–11. Program evaluation/development

A VCRP evaluation may be performed using appendix B, Vision Conservation and Readiness Program Management Evaluation Guide. This guide has been established for help in evaluating the status of the VCRP and is not intended as an inspection tool since programs may vary by location and local needs. Appendix B may also be used for developing a new program.

Chapter 3
Occupational Vision

3–1. Definition

Occupational vision is the VCRP element that promotes work safety, efficiency, and comfort for military and civilian employees.

3–2. Occupational vision elements

Occupational vision must provide at least—

a. Vision screening program/policy.

b. VOE elements of soldier readiness processing (SRP).

c. Vision performance standards.

d. Encouragement of periodic comprehensive vision examinations.

e. Worksite evaluation.

3–3. Occupational Vision Screening Program

The key purpose of vision screening is to assess individual visual performance in relation to job vision requirements. (Vision screening is not a substitute for comprehensive vision examinations.)

a. A vision screening program provides periodic evaluation of the visual performance status of DOD employees. The standards are based on visual demands of the work undertaken and may include but not necessarily be limited to—

(1) VA.

(2) Accommodation/convergence.

(3) Depth perception.

(4) Color vision (for some specific jobs).

b. Glaucoma screenings are not part of routine VCRP vision screening. The diagnosis of glaucoma requires evaluation beyond that of a screening program.

c. Vision screening frequency varies with the employee status (that is, active duty or civilian, vision hazards to which exposed, and type of work).

(1) *All employees.* Preemployment vision screenings, preplacement vision screenings when appropriate, and termination vision screenings for all employees working in eye-hazardous jobs or areas will be performed.

(2) *VDT worker*. A VDT worker is an employee that uses a VDT for official work at least 20 hours per week. Each worker is given a preemployment or preplacement vision screening. VDT use is not classified as an eye-hazardous activity and, therefore, does not require any periodic screening. Vision screenings are normally part of the routine OH examination/screening. Based on availability of resources, more frequent vision screenings may be performed.

(3) *Laser workers.* Laser workers are those individuals who routinely work in laser environments using class 3b or class 4 laser systems (ANSI Z136.1) or medical lasers (ANSI Z136.3). Examples of these personnel are those who work in research, development, testing, and evaluation (RDTE) of laser systems; laser maintenance; or an operating room where a medical laser is in use. All others are considered incidental workers (see app E).

(a) Laser workers will have an ocular and visual history, VA, color vision test, and a central visual fields test (Amsler Grid or similar test) at preplacement and termination. Visual acuity, color vision test, and central fields tests are to be performed on each eye separately.

(b) Incidental laser workers will have each eye screened for VA. This screening is part of the preemployment physical. Note: Anyone with a confirmed or suspected, unprotected exposure to a class 3b or more powerful laser will have a diagnostic vision examination as soon as possible (no later than 24 hours) by an eye care professional. (See app E.)

d. Vision screening results will be placed in the individual's health record. The record will reflect the purpose of the vision screening, the results, and any required followup. The record should document the following:

(1) *Demographic information:*

(a) Employee's name.

(b) Social security number.

(c) Organization/Unit.

(d) Duty position or occupation.

(e) Job vision standard.

(f) Eye protection requirement (if any).

(g) Reason for screening (preemployment, preplacement, problems, or termination).

(2) *Clinical information:*

(a) Vision screening test results.

(b) Evaluation of screening results.

(c) Disposition (such as, cleared for duty, refer for further evaluation, or release).

e. The type of vision screening required depends on a number of factors.

(1) *Civilian personnel.*

(a) Preemployment vision screenings. Performed at or just prior to employment to provide a baseline visual performance measurement and to assist in appropriate job placement. This is part of the preemployment physical.

(b) Preplacement vision screenings. Performed when there is a major change of job duties or change to a new job that has a significant change of duties. (Permanent change of station with no significant change of duties does not require an additional screening.)

(c) Termination vision screenings. Performed at or just prior to separation from Government employment for employees who have worked in an eye-hazardous job or area.

(d) Periodic vision screenings. Performed at time periods appropriate to the type of work being performed, hazard exposures, and any surveillance requirements. Civilian personnel working in eye-hazardous areas will be screened at least every 3 years. Workers experiencing visual problems may receive screening as needed. The local OH specialist may conduct more frequent screenings, if needed, to meet the goals of their program.

(e) Vision screenings for laser workers. (See app E.)

(2) *Military personnel.*

(a) Preemployment. This is part of the entrance physical examination. Army Regulation 40–501 is the standard used to determine eligibility for entrance into the Army. Department of the Army Pamphlet (DA Pam) 611–21 designates vision standards for various MOS and Army Occupational Codes.

(b) Annual vision screening. This screening will be performed for VOE readiness (see para 3–5).

(c) Significant change of duty. (Permanent change of station or job with no significant change of duties does not require an additional screening.)

f. The physical exam section and the Occupational Health Clinic (OHC) will use a commercially produced industrial vision screener or other clinical vision screening methods capable of testing the functions listed below. Vision screening instruments will be operated according to the manufacturer's instructions.

(1) Distance VA.

(2) Intermediate VA (when applicable).

(3) Near VA.

(4) Binocularity (muscle balance) at distance.

(5) Binocularity (muscle balance) at near.

(6) Color vision.

(7) Depth perception.

(8) Confrontation visual fields (optional).

g. When selecting new screening equipment, give priority consideration to equipment with automated data processing capability.

3–4. Vision standards

a. Job vision standards.

(1) Table 3–1 outlines the vision screening standards that are currently accepted for use at most Army installations. While these standards are applied to both eyes, the VA screening should include both monocular (one eye at a time) and binocular (both eyes) testing. Job vision standards have also been developed for VDT workers and individuals requiring good color vision. For civilian employees, vision requirements determination (including performance demands and protective devices) is the responsibility of the supervisor writing the job description. Waiver of a standard is allowable if it will not adversely affect the safety of the individual or fellow workers. These standards are for job performance only. Driving, flying, and other tasks may have more stringent requirements.

(2) The vision requirements for some jobs may not fit into the established vision standard categories. When that occurs, a new standard should be developed locally by the VCRT and in consultation with the USACHPPM TVCRP. Reason(s) for locally developed standards must be documented.

(3) Waiver of a vision standard may be granted by the IMA when recommended by the VCRT if the waiver will not create a safety hazard to the individual or fellow workers.

b. Other standards.

(1) *Color vision.* A color vision deficiency may affect a worker's ability to perform his/her job in a safe and efficient manner. This will depend upon the type and degree of color deficiency and the color discrimination necessary to perform the particular work tasks. In general, the greatest aid to the color deficient employee is to inform the worker of the deficiency and to advise him/her as to how the defect will affect his/her visual judgment. A color-deficient worker may perform most tasks as well as a worker with normal color vision. Color deficiency is not a sole disqualifier for a job without first evaluating the specific job tasks in relation to the individual's color deficiency. Certain jobs have color demands that are not waiverable (such as pilots, electronics repair, and chemists). Color vision deficiency is not correctable. A difference in color vision perception between the right and left eye or a reduction in performance over time is a cause for referral to an eye care provider. In the general population, 8 percent of males and 0.5 percent of females have some degree of color deficiency.

(2) *Visual fields.* This test measures the effective vertical and horizontal (height and width) size of the visual field. If an undocumented visual field loss is noted in the course of vision screening or an employee complains of visual field loss, immediately refer the employee to an eye care professional for evaluation.

c. Disposition.

(1) Military and civilian employees who do not meet the minimum requirements for their particular job vision standard will—

(a) Be referred for a comprehensive vision examination (unless previously documented and waived and no significant change in degree has occurred). (Example: an employee with amblyopia having 20/40 acuity in the left eye 2 years ago and 20/40 now would not be referred. A worker with amblyopia having 20/40 acuity in the left eye 2 years ago and 20/80 now would be referred.) Employees will also be referred for a comprehensive vision examination if replacement of prescription PPE is needed and the prescription is more than 2 years old, or if the current prescription gives worse VA (by 1 or more acuity lines) than previously documented. Comprehensive vision examinations are a personal health responsibility and are done at the expense of the civilian employee.

(b) Notify their supervisors immediately. A duty change may be required if remaining in current job duties presents a safety hazard to the individual or fellow employees, pending resolution of vision problems.

(c) Be reassigned/reclassified when the visual requirements cannot be waived or improved to meet standards.

(d) Undergo medical board evaluation in accordance with AR 40–400 and appendix C. This requirement is for military personnel who are not waiverable or reassignable.

(2) Monocular vision means having useful vision in only one eye and thus will not pass screening requirements. Monocular individuals are often fully capable of performing their work safely and effectively. Evaluate monocular individuals on a case-by-case basis. If a waiver is considered, the potential risk of injury to the employee and coworkers will be a major factor. Care must be taken to protect the eye with best vision. Protective eyewear will be furnished to active duty and retired military personnel who have vision in only one eye under the provisions of AR 40–63. Industrial safety spectacles are strongly recommended for monocular civilian employees who work in non-eye hazardous occupations. Such eyewear for civilian employees will not be provided at Government expense when the employee does not work in an eye-hazardous job/area.

d. Government drivers license. Periodic vision screening for military and civilian employees will be required in accordance with AR 600–55. If professional judgement indicates a safety hazard, OH and safety offices will be notified.

3–5. Readiness preparation

Vision ready means a person or force is VOE ready to deploy and perform a mission. Each installation and/or unit will have a VCRP that will measure the deployment readiness of military (including the USAR and ARNGUS) and deployable DA civilian personnel. Vision readiness elements require a minimum of—

a. Vision readiness screening at least annually. (Vision screening is not a substitute for a comprehensive vision examination.)

b. Comprehensive vision examination when the vision screening standards are not met by the employee (AR 40–400 and app C).

c. Inspections at the unit level, such as part of TA–50 or SRP inspections, to verify each person possesses their own required type and number of eyewear. These inspections will be done at least annually; however, quarterly inspections are recommended.

d. Providing necessary eyewear to bring eyewear possession to the minimum level required for those individuals who need prescription eyewear per AR 40–63. Required eyewear may include the following:

(1) Two pair of clear spectacles.

(2) One pair of sunglasses when deploying to arctic, desert, or other high ultraviolet (UV) exposure environments.

(3) One pair of PMIs.

(4) Prescription lens carriers for BLPS, Sun/Wind/Dust (SWD) goggle, and similar eyewear.

(5) Special protective eyewear (such as industrial safety spectacles) may also be required.

(6) Government-issued contact lenses, when applicable.

e. Ensuring the ability to quickly order required eyewear for these individuals on short notice. Each location should have a record, such as in VISOR, of the following for its military and deployable DA civilian employees:

(1) Optical device needs by individual.

(2) Special optical and protective needs by individual.

(3) Current spectacle prescription and frame specifications where applicable.

(4) Government-issued contact lens prescription.

3–6. Comprehensive vision examinations

When an employees' visual performance is less than expected for safe and effective job performance, a comprehensive vision examination (not a vision screening) is indicated. The examination should bring the individual to optimum visual performance for his/her job. A comprehensive vision examination is recommended for all employees every 2 to 3 years even if vision screening is passed.

a. The employee should provide his/her vision care specialist with a brief description of the visual demands of their work. This allows the provider to optimize vision prescriptions for the visual needs of the employee.

b. Obtaining comprehensive vision examinations is considered a personal health responsibility. Comprehensive vision examinations are normally performed by an optometrist or ophthalmologist.

(1) Civilian employees, USAR, and ARNGUS will obtain comprehensive vision examinations through their personal health insurance program or at their own expense.

(2) Active duty military will obtain comprehensive vision examinations through their medical care channels, normally the local MTF. Certain USAR and ARNGUS personnel who are activated for extended periods of time may be authorized medical care at the local MTF under the provisions of AR 40–400 and appendix C.

c. When prescription safety eyewear and/or optical inserts are required, it is the responsibility of the employee (civilian and military) to provide a current prescription to the VCRT member/office responsible for ordering eyewear.

d. Comprehensive vision examinations may be provided for civilian employees, USAR, and ARNGUS working in eye-hazardous jobs or areas at Government expense when the local command determines it is beneficial to the Government. If this comprehensive vision examination indicates that further testing or follow-up is required, the patient will be referred for this care at the employee's expense.

3–7. Worksite evaluation

Worksite evaluations will be performed on a regular basis by members of the Safety Office staff (AR 385–10) and IH section. Ideally hazardous worksites should be evaluated annually, but at large installations/locations this may need to be done on a rotating schedule so that each worksite is evaluated at least once every 3 years. Other members of the VCRT may join the Safety Office or IH staff in performing these evaluations or perform independent evaluations. See chapter 6 for a description of a site evaluation.

Table 3–1
Vision standards

	Corrected visual acuity			Muscle balance				
Vision standard	**Distant**	**Near**	**Intermed**	**Distant**	**Near**	**Intermed**	**Depth perception**	**Color vision**
1	20/50	20/30	—	—	Normal	—	—	—
2	20/30	20/40	—	Normal	—	—	Normal	Normal
3	20/40	20/20	—	—	Normal	—	Normal	Normal
4	20/40	20/30	—	—	Normal	—	Normal	Normal
5	20/30	20/30	—	—	Normal	—	Normal	Normal
6	20/50	20/50	—	—	—	—	—	—
VDT	20/30	20/25	20/25	—	—	Normal	—	—

Table 3–1
Vision standards—Continued

NVD	20/30	20/30	—	—	—	—	—	—

Legend for Table 3-1:

1 - Clerical and administrative occupations requiring a considerable amount of desk work (also see VDT).

2 - Occupations involving operation of moving vehicles (examples: driving trucks and automobiles, piloting aircraft, operating cranes, forklifts, and tractors).

3 - Jobs involving inspection for surface defects and fine tolerance.

4 - Jobs involving machines in which the operating parts are within arm's reach.

5 - Skilled trades requiring good near and distant vision (examples: plumbers, millwrights, aircraft mechanics, electricians, and supervisors).

6 - Jobs of relatively unskilled type (examples: porter, warehouseman, laborer).

VDT - Jobs requiring at least 20 hours of work per week at a video display terminal (VDT). (VDT work is not an eye hazard.)

NVD - Jobs requiring NVD use are tested to best correctable visual acuity without the NVD.

Color Vision - Special requirements exist for those who must possess excellent color discrimination (examples: electricians, pilots, aircraft mechanics, electronics repairers).

Chapter 4
Eye Safety—Ocular Hazards, Protection, and First Aid

Section I
Introduction

4–1. Background

The Occupational Safety and Health Act (OSHA) requires employers to provide a safe and healthy work environment. Protection of the employee in potentially eye-hazardous work is cost effective. The primary categories of hazards to the eye are mechanical, chemical, biological, and radiant energy. The protective methods are engineering controls, administrative controls, and PPE. The most effective program of eye safety will remove the hazard(s) from the work process or the employee from the process area. When the hazards cannot be removed the use of PPE is required. If injury occurs, first aid and definitive followup care for the injured employee are required.

4–2. Engineering controls

Engineering controls are physical modifications of an operation or activity that either totally eliminate (preferred) or reduce the eye-hazardous aspect of an operation. The following are some controls that may be used.

a. Automate the operation. Redesign the operation so that the tasks can be performed by an automated process in an area away from the employee (such as use of robotic manufacturing processes). In this manner, the employee may safely observe the operation for accuracy and function of the equipment.

b. Modify the work area. If the operation cannot be fully or even partially automated, modify the actual operation or activity to reduce its hazardous nature. For example, placing a clear shield over the wheel of a grinder reduces the potential for material to fly into the face of the operator.

4–3. Administrative controls

Administrative controls are instructions, directions, or rules that inform employees about safety procedures to be used in eye-hazardous operations or activities. These controls inform the employee about protective measures that minimize the risk of injury. In some cases, these controls may require modified work schedules or job rotations, or may prohibit the performance of the activity. The control requirements may be included as part of the employee job description, SOPs, and contract requirements. These documents should include expected hazards, protective mechanisms to be used, and disciplinary actions for noncompliance.

4–4. Personal protective equipment

a. When engineering and administrative controls cannot eliminate an ocular hazard, the use of PPE is required. PPE will be provided by the employee's unit. To meet the minimum general requirements per 29 CFR 1910.133, PPE will—

(1) Provide adequate protection against the particular hazard(s) for which they were designed.
(2) Be reasonably comfortable when worn under the designated conditions.
(3) Fit snugly and shall not unduly interfere with the movements of the wearer.
(4) Be durable.
(5) Be capable of being disinfected.
(6) Be easily cleanable.
(7) Be kept clean and in good repair.

b. In addition to the 29 CFR 1910 requirements, the protectors must—

(1) Meet current ANSI Z87.1 standards.

(2) Have distinctive marks that will allow identification of the device as approved PPE.

(3) Be appropriate to the hazard.

(4) Minimally obstruct vision.

(5) Include instructions on use, cleaning, and adjustment of the equipment.

c. The types of eye protection to be provided by the employee's unit include—

(1) Nonprescription eyewear meeting ANSI Z87.1 requirements for employees who do not require prescription eyewear.

(2) Prescription eyewear meeting ANSI Z87.1 requirements for employees who require prescription eyewear and who are exposed to eye hazards on a regular basis. Single vision, bifocal or trifocal (flat top, round top, or double segments) will be provided as appropriate.

(3) Plano (nonprescription) protectors may be worn over nonindustrial safety spectacles where exposure to the eye hazards does not exceed 10 hours per week on a regular basis, and the protector does not cause a safety problem or is unduly uncomfortable.

d. Industrial safety eyewear lenses must meet or exceed the requirements of ANSI Z87.1.

(1) All industrial safety lenses must be made of polycarbonate material unless the power of the lenses exceeds 4.0 diopters or another lens material is prescribed by a vision care provider as medically indicated.

(2) When the use of polycarbonate is not appropriate, other plastic lens material, such as CR–39, will be used. Since the impact resistance of glass is less than polycarbonate and usually less than CR–39, glass lens materials will be approved only in extremely rare conditions when the vision care provider determines no other material is satisfactory. If industrial safety eyewear cannot be prescribed with polycarbonate or CR–39 lenses, the employee must be notified of the change in lens material at the time of ordering. The VCRO and the installation safety officer must approve the use of glass lens material in a written memorandum, note the reason for the change, and file the memorandum in the individual's OH medical record.

e. Tinted lenses may be required under certain circumstances.

(1) When tinted lenses are required for job performance in eye hazardous areas, they will—

(a) Provide adequate filtering of the hazardous wavelengths; and

(b) Be in the form of a flip-up lens covering an ANSI Z87.1 device; or

(c) Be in a lens and frame combination meeting ANSI Z87.1.

(2) Tinted lenses are approved by the VCRT for specific worksites or hazards and will not be worn indoors unless designed for a specific indoor radiation hazard.

f. Photochromic lenses in industrial safety eyewear may only be used in outdoor locations where movement into and out of buildings or other facilities does not occur. The relatively slow rate of change in photochromic lenses presents a hazard to workers moving indoors or into other areas with lower illumination levels. When photochromic lenses are authorized but cannot be obtained in polycarbonate lens material, the employee must be made aware that the lens material is less than optimum for impact protection. All employees wearing photochromic lenses will be advised of the potential hazard when moving from an area of full illumination to one of reduced illumination. For these reasons, photochromic lenses should rarely be authorized. It is the responsibility of the supervisor to ensure safe use of photochromic lenses (that is, outdoor wear only). Local policy may be established to totally prohibit photochromic lenses. When an employee is authorized to wear photochromic lenses, the employee will bear the additional cost over that of standard clear lenses, unless they are mission necessary. When tinted lenses are mission necessary for outdoor use, the preferred method is one pair of tinted/sun glasses in addition to the employees clear spectacles.

g. Variable focus lenses (progressive addition lenses or no-line bifocals) in an eye-hazardous environment are not normally authorized because of peripheral distortions, difficultly in properly measuring lens alignment, and additional costs. Employees who are successfully wearing variable focus lenses and have good safety records may be allowed to obtain ANSI Z87.1 variable focus lenses. All others will be required to wear standard bifocal or trifocal lenses. When an employee is authorized to wear variable focus lenses, the employee will bear the additional cost over that of standard bifocals or trifocals (to include remakes if necessary). Local policy may be established to not offer variable focus lenses.

h. When a single power lens will not correct the worker for distance and near tasks, multifocal lenses are the correction of choice. Reading glasses will not be allowed as safety eyewear meeting ANSI Z87.1, because when the employee removes the reading glasses to walk or look across the room the PPE is no longer in place and the employee is not protected.

i. Eyeglass frames for safety eyewear will meet ANSI Z87.1 requirements. In addition—

(1) Metal frames will not be used in work where there is an electrical hazard.

(2) Spring-loaded hinges may be used on a frame if the frame and hinge combination meet ANSI Z87.1 requirements.

Section II
Mechanical Hazards, Protection, and First Aid

4–5. Mechanical hazards characteristics

a. Mechanical agents are normally described as being—

(1) Large (greater than 2 millimeter (mm) in diameter) or small (2 mm or less in diameter).

(2) Blunt (edges that rip or tear tissue) or sharp (edges that make a smooth cut in living tissue).

(3) Fast-moving (such as metal flakes from a grindstone).

(4) Slow-moving (such as a fist or finger while playing sports).

(5) Stationary (such as a door, cabinet edge, or protruding object).

(6) Any combination of (1) through (5), above.

b. Mechanical hazards are agents that are likely to cause—

(1) A penetrating laceration (puncture).

(2) A nonpenetrating laceration (cut).

(3) An abrasion (scratch or scrape).

(4) A contusion (damage from pressure exerted by the material).

4–6. Common mechanical hazard sources

a. Large and small particle injury is typically caused by the following or similar activities:

(1) Chiseling, hammering—a piece of material breaks off the tool or the material being hit and is propelled into the eye.

(2) Woodworking—a piece of wood or sawdust is propelled by a saw or chisel.

(3) Grinding—particles from the item being ground or part of the grinding wheel. Failure to keep the tool rest plate adjusted to not more than 1/8 inch from the grinding wheel (29 CFR 1910) may allow material to slip between the wheel and the tool rest causing the wheel to stop suddenly with a resulting catastrophic explosion of the wheel causing serious eye and head injury from parts of the stone wheel.

(4) Nailing—a nail is propelled into the eye or a piece of the nail or hammer is broken loose and propelled into the eye.

(5) Drill or lathe use—material rarely flies directly from the lathe or drill to the eye. Typically, shavings of metal fall on the hand and are wiped into the eye when the worker wipes perspiration from the face with the back of the hand.

(6) Sports activities—sports equipment or body parts impact the eye in the course of participation in the sport.

(7) Bungee, elastic, or shock cords—an end slips loose while the other end is attached to secure tarpaulins, tent flaps, or similar materials. The end of the cord hits the eye.

(8) Automobile accidents—various materials from the vehicle may come in contact with the eye. Glass propelled into the eye from the windshield and mirrors is a common injury agent.

(9) Warehousing—banding straps (plastic or metal) on packages may impact the eye when the straps are cut.

(10) Stationary objects—injury to the eye occurs when the worker falls on or walks into stationary objects.

(11) Line trimmers and lawn maintenance equipment—may propel dirt, vegetation, or other materials into the eye of the worker or individuals nearby.

(12) Explosives—using or being near simulators or munitions being detonated (actual munitions explosions in the case of combat). The material injuring the eye will vary depending on the material adjacent to the worker when the explosion occurs (most common is shrapnel, rock, dirt, and vegetation).

(13) Compressed air—when used for cleaning, the line pressure will be reduced to 30 pounds per square inch (psi) or an OSHA-approved reduction nozzle will be used to prevent injury from air-propelled objects.

(14) Other mechanical operations.

b. Common sources of blunt mechanical injury are—

(1) Body parts—primarily due to sports used for either training or recreation but occasionally due to assault, fights, or accidents.

(2) Tools—occurs when a tool slips while in use or is laid in a place where it subsequently falls and hits the eye of the worker.

(3) Sports participation—occurs when the player is struck by the ball, bat, racket, or in collision with another player (see body parts). The most common sports injuries to Army personnel currently come from basketball. In the past, racket sports (that is, such as racquetball, squash, and tennis) have produced large numbers of serious eye injuries. In most sports eye injuries, the injuring agent is a body part (for example, elbow, fist, finger, or fingernail), bat, ball, or racket used to play the sport. A relatively new source of injury is the use of paint ball guns in both the recreation and training environments. The participant is hit by a ball that splatters paint on his/her goggles. Blunt trauma occurs when the goggles are removed for cleaning and another shot hits the eye. In addition to the blunt trauma from the ball, a chemical injury may occur from the paint inside the ruptured paint ball.

(4) Stationary objects and furniture—occurs when the employee inadvertently bumps or falls into or onto a fixed object.

c. Common sources of sharp mechanical injury are—

(1) Glass shards—from broken windows in buildings and vehicles and broken glass lenses.

(2) Cutting tools—from the tool being pulled toward the user and the tool slips from the material being cut and is pulled into the eye. May also occur when a knife or similar weapon is used in assault.

(3) Metal pieces—turnings from lathes and drill presses that get propelled or rubbed into the eye.

4–7. Mechanical hazard PPE

a. Industrial protective eyewear. In the industrial environment, ANSI Z87.1 is the primary standard recognized by OSHA for protective eyewear. This standard reflects protection against most mechanical, chemical, and radiant energy hazards. Protective devices must meet the specific impact and strength requirements stated in ANSI Z87.1. The following is a synopsis of the current ANSI Z87.1–1989 (R–1998) specifications:

(1) *Primary eye protectors.*

(a) Industrial safety spectacles are primary eye protectors. These spectacles will have Z87 or Z87.1 imprinted in the frame front and temples and will have the manufacturer's logo imprinted on the lens (usually in the upper, lateral, outside edge of each lens). ANSI Z87.1 and the USACHPPM TVCRP highly recommend side protection (side shields) be used at all times where protective eyewear is required. The side shields should be made of smooth, clear (untinted) material. Fixed side shields are highly recommended, but removable side shields may be approved for use by the VCRT on a case-by-case basis.

(b) Goggles are primary eye protectors. Goggles will have Z87 or Z87.1 imprinted in the body of the goggle and the manufacturer's logo imprinted on the lens. The two primary goggle types are—

1. Impact goggles that perform the same protective role as industrial safety spectacles; and

2. Chemical splash goggles that provide the same impact protection as the impact goggle but also have indirect venting to prevent fluids from entering the eye.

(2) *Secondary eye protectors.* Face shields are considered secondary eye protectors to be worn over industrial protective spectacles or goggles to provide additional protection to the eyes, face, and neck. These face shields will have Z87 or Z87.1 and the manufacturer's logo imprinted on the top sides. Face shields do not, by themselves, provide adequate protection to the eyes for either impact or chemical hazards.

b. Sports recreational eyewear. The American Society for Testing and Materials (ASTM) provides recommended eye protection strength standards for several sports.

(1) *Racket sports—ASTM F803.* Although a lensless protector is approved by ASTM, the lensless protector will not be used for racket sports on Army installations. Proper use of protectors with lenses meeting ASTM standards will be a requirement for play in Army indoor racket sports facilities.

(a) Eye guards with lenses are available in both prescription and nonprescription styles.

(b) Eye cages/lensless eye guards will not be used. A high velocity ball may compress enough to partially penetrate the cage and impact the front of the eye, or a finger may pass through the gap in the protector and injure the eye.

(c) Do not use industrial safety glasses as a substitute for ASTM racket sport protectors. These glasses do not provide adequate protection for racket sports.

(2) *Paint ball—ASTM F1776.* Protectors meeting this standard will be used for paint ball games/training on Army installations.

(3) *Alpine skiing—ASTM F659.* Protectors meeting this standard will be used when skiing on military installations or during official ski training.

(4) *Youth baseball programs—ASTM F910.* Protectors meeting this standard will be used for youth baseball programs on Army installations.

4–8. Mechanical injury emergency care

Do not put pressure on an injured eye. Pressure may cause catastrophic damage to internal ocular tissues. Always assume that there has been penetration of the globe with a mechanical eye injury until proven otherwise. An optometrist or ophthalmologist should determine the extent of ocular tissue penetration in all but the most obvious cases. In the case of multiple injuries, the attending health care provider will determine which injuries take priority for care.

a. Some mechanical trauma to ocular tissues are—

(1) Foreign bodies—parts of the mechanical injury agent remain imbedded in the ocular tissues.

(a) Superficial foreign body. The foreign object rests on or penetrates less than the complete thickness of one tissue (such as corneal foreign body).

(b) Penetrating foreign body. The foreign object passes through one or more ocular tissues.

(2) Lacerations—cut to one or more ocular tissues.

(3) Contusions—compression injury to the tissues, usually from blunt trauma.

(a) Ocular adnexa—superficial ocular tissue is bruised and may have hemorrhaging (ecchymosis or black eye).

(b) Globe—potential for internal globe damage to the retina, choroid, ciliary body, iris, or lens of the eye. Damage may include hemorrhaging, retinal detachment, lens displacement, or cataract. Retinal detachment may occur at the time of initial trauma or months later.

(c) Orbit—blow-out fracture of the orbit may occur when the orbital tissues are compressed and the resulting force ruptures the floor or wall of the bony orbit of the eye, often entrapping orbital tissues including extraocular muscle tissue.

(4) Abrasions—disruption of superficial layers of ocular tissues without complete penetration.

(a) Lids and adjacent skin tissues.

(b) Cornea and conjunctiva.

(5) Avulsed eye—the eyeball (globe) is pushed completely out of the orbit.

b. Care of mechanical trauma patients includes—

(1) Immediate stabilization and transport to emergency care for—

(a) Penetrating foreign bodies.

(b) Lacerations except those known to be superficial.

(c) Marked contusions of the orbit tissues and globe, especially where hemorrhaging inside the eye is noted.

(d) Avulsed eye. Do not attempt to push the eye back into the orbit. Cover the eyes with a moist dressing (preferably sterile gauze and normal saline) and move the patient by litter, face up in the reclined position, for emergency treatment.

(2) Immediate evaluation by an eye care specialist (optometrist or ophthalmologist) for—

(a) Superficial foreign bodies.

(b) Partial thickness lacerations.

(c) Abrasions, especially corneal.

(d) Contusions, other than marked.

(e) Other severe injury.

c. Many conditions may be treated by local medical care professionals. Care must be exercised to ensure that the nature of the injury is not beyond the scope of care of the provider. When the eyelids are lacerated, repair should be done by an ophthalmologist or plastic surgeon experienced in eyelid repair. The position of the lids on the surface of the eye is critical to tear film application, and even small amounts of scar tissue in the wrong place can prevent effective lid function.

d. Long-term medical follow-up may be required for trauma to the eye. The eye care provider will determine the type and duration of the followup care.

Section III
Chemical Hazards, Protection, and First Aid

4–9. Introduction

A chemical hazard is any chemical agent foreign to the eye that reacts with the ocular tissue and results in injury or damage. Liquids are the most common form of chemical agent, but gaseous and solid chemical agents may also produce injury to the eye. Acid and alkali burns produce the most severe injuries. Alkali burns are the most devastating and represent a true ocular emergency. Most other chemicals are irritants that normally cause superficial injury to the eye tissues. The best initial emergency care for chemical injuries is immediate flushing of the eye(s) with water. Do this before and, if possible, while transporting the injured individual to medical care. Minimum flushing time is 15 minutes. Some chemical injuries require extended flushing.

4–10. Chemical hazard characteristics

a. Chemical hazard agents are likely to cause—

(1) Penetration of ocular tissues by infiltration through the tissues.

(2) Chemical burns of ocular tissues.

(3) Irritation of ocular tissues.

b. Chemical agents likely to produce injury to ocular tissues are—

(1) Alkali (most severe).

(2) Acid.

(3) Surfactants (detergents).

(4) Petroleum products.

(5) Crowd control/military agents.

(6) Pyrotechnics (such as particles and smoke from flares and sparklers).

4–11. Chemical hazard sources

a. Alkali is the chemical agent most harmful to ocular tissues. Common sources of alkali are—

(1) Electrolyte in nickel-cadmium (Ni-Cad) rechargeable batteries—exposure occurs during electrolyte servicing and, on rare occasions, when the battery explodes during a runaway charging cycle.

(2) Chemical reagents in laboratories and manufacturing processes—injury occurs when a chemical splashes from the dropping of a container, an explosive chemical reaction, or materials are handled improperly.

(3) Cleaning agents in some manufacturing processes and removing scale from the heat exchanger tubes in large industrial heating plant furnaces—injury occurs when the chemical splashes into the eyes while being applied to the surfaces or pipes to be cleaned.

(4) Cleaning agents in some radiator repair facilities— injury occurs when the chemical used in a hot tank to boil scale out of radiator tubes splashes into the eyes when the radiator is placed in or removed from the tank.

(5) Home cleaning products such as drain cleaners and oven cleaners—injury occurs when the chemical is applied to the areas requiring cleaning and splashes into the eyes.

b. Acid is the most common chemical injury agent and is found predominantly as—

(1) Electrolyte in rechargeable storage batteries—injury occurs when electrolyte splashes while filling batteries or the battery explodes during recharging or "jump starting" a vehicle.

(2) Chemical reagents in laboratories and manufacturing processes—injury occurs when a chemical splashes from the dropping of a container, an explosive chemical reaction, or materials are handled improperly.

(3) Cleaning agents—injury occurs when the agent splashes into the eye while cleaning work areas or in custodial activities.

(4) Acid core in solder used to prepare copper pipe for lead soldering in plumbing and radiator repair—injury occurs as the acid core in solder splashes when the solder is being heated.

(5) Curing agent on the surface of new concrete—injury occurs when the acid splashes during the application process.

c. Surfactants (detergents) may splash into the eyes while applying to a surface to be cleaned. Some detergents also contain alkali in mild concentrations.

d. Petroleum products such as fuels and lubricants may splash into the eyes during the refueling process or while lubricating machinery.

e. Crowd control/military-unique agents may splash into the eyes during simulated exercises, crowd control actions, or combat.

f. See appendix F for additional chemicals found in the workplace.

4–12. Mechanism of chemical ocular injuries

Almost all chemicals have the potential to cause eye injury if the concentration is high or the volume is excessive. The most hazardous chemicals commonly producing eye injury are—

a. Alkali. Alkalis combine with the fatty component of the cornea and pass through the corneal barrier into the anterior chamber of the eye. Usually, alkali produces a sustained reaction with ocular tissues. In higher concentrations, the cornea may be penetrated within 5 seconds. Once the alkali has penetrated the cornea, injury to the interior structures of the eye continue with no effective way to prevent the action.

b. Acid. Acid will normally precipitate the protein of the ocular tissues and set up a self-limiting barrier. The superficial tissues may be severely injured but the injury is rarely deep. The few exceptions to deep penetration are in heavy metal and hydrofluoric acids. These acids may penetrate the protein barrier, especially in higher concentrations.

c. Surfactants. The typical injury is a modification of the tear film layer of the eye either by dilution or mild chemical reaction. The most common injury is mild to moderate irritation of the cornea and conjunctiva with no severe long-term sequelae.

d. Petroleum products. Mild to moderate irritation of the ocular tissues occurs when petroleum products splash onto the ocular tissues.

e. Other chemicals. Most other chemicals produce irritation of ocular tissues.

4–13. Eye protection against chemical injury

a. Chemical splash goggles will be worn when chemical splash potential exists. These goggles will meet ANSI Z87.1 standards and provide—

(1) Same strength and marking requirements as impact goggles.

(2) Indirect venting to prevent chemical contact with the eye.

(3) Protection against chemical, biological, or impact hazards.

b. Face shields (a secondary protector) provide additional impact and chemical splash protection to the eyes, face, and neck when worn over chemical splash goggles. Face shields will not be used alone instead of chemical splash goggles.

c. Contact lenses are not considered protective devices and must be covered by primary protectors meeting ANSI

Z87.1 standards. Contact lenses should not be worn under respirators, in areas of potential hazard from chemical splash. **Contact lenses will not be worn** during basic training, field exercises, gas chamber exercises, deployments, or combat. Exception: Contact lenses may be worn in field exercises, deployments, and combat for certain duties or evaluation programs approved by the Office of The Surgeon General.

4–14. Chemical eye injury emergency care

Chemical burns caused by alkalis, acids, or other nonmechanical substances demand immediate first aid attention.

a. Immediately assist the victim to the nearest eyewash station. Flush the eyes with water for a minimum of 15 minutes. Extended flushing is required for chemicals that are more concentrated or hazardous such as alkali. Flush before and, if possible, while transporting the injured individual to an optometrist or ophthalmologist to be seen (see app G).

b. Do not try to neutralize the chemical agent with anything other than water. If desired, litmus paper may be used to test the tears periodically during the flushing process to determine if the chemical has been diluted to essentially neutral pH.

c. Do not apply a bandage until the eye care specialist has completed a vision examination because flushing cannot continue and there is potential for tissue adhesions and chemical agent trapped under the eye lids.

Note. Training workers in using eyewash units and assisting a chemically-injured individual is critical to effective use of eyewash devices.

4–15. Special chemicals

a. Mustard agent (H, HD, or HT). Mustard agent is a blister agent. Typical effects of exposure to the eye are "burning sensation" of the eyes, swelling of the eyelids, and marked blinking. Pupil miosis (constriction) may also occur (U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry). Suitable respirators are to be worn in areas of potential exposure to mustard agent. Where the VA of the employee is reduced to the point that they cannot safely perform their work without spectacles, optical inserts will be provided for use in the respirators. Infrequent visitors may use contact lenses under a full faceplate respirator only if accompanied by an escort. Currently, employees with potential exposure to mustard agent are enrolled in the unit or installation respiratory protection program. See DA Pam 40–173 for current personnel categories and medical surveillance requirements.

b. Nerve agents (GA, GB, GD, and VX). Individuals with potential exposure to nerve agents are assigned specific personnel categories based on potential of exposure. Medical surveillance requirements are based on these personnel categories (DA Pam 40–8).

c. Military/crowd control chemicals. Treatment of individuals exposed to military/police-related chemicals is the same as for other chemicals (flushing eyes with copious amounts of water). Additional care must be taken to ensure the health care providers and decontamination team members are not contaminated while providing care.

Section IV
Biological Hazards, Protection, and First Aid

4–16. Introduction

Biological hazard agents are any of the bacterial, viral, or fungal agents to which an individual may be exposed. The unique difference between eye exposure to other hazards and exposure to biological hazards is that there is rarely any pain or noticeable physical injury to the eye on initial biological exposure unless the tissue is injured by another agent at the same time. The primary injury hazard occurs after exposure and incubation/infection times are reached.

4–17. Biological hazard sources

Biological hazards are primarily found in medical facilities, medical research facilities, and at the scene of accidents involving human injury. Those most likely to be exposed are—

a. Health care providers—conducting medical procedures or testing samples where body fluids may splash into the eyes.

b. Emergency medical teams—responding to emergency situations where injury has released blood or body fluids.

c. Law enforcement officers—attending to victims of accidents, crimes, or being spit upon or bitten by infected individuals.

d. Firemen—dealing with burn victims and related injuries.

e. Victims and perpetrators of assault—exposure to blood or body fluids due to injury.

4–18. Biological hazards of primary concern

The following biological hazards/diseases are of most concern when exposed to ocular tissues:

a. Human Immunodeficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS).

b. Hepatitis B.

c. Other diseases.

(1) Viral conjunctivitis.
(2) Bacterial conjunctivitis.

4–19. Protective devices

a. Protection may be accomplished in medical and research facilities by—

(1) Applying routine infection control procedures for medical facilities.

(2) Using a face shield protector. Unless an impact hazard exists, the device may be a thin acetate barrier with clips that attach to a normal eyeglass frame or a regular ANSI Z87.1 face shield (used as an additional protector in industry). Wrap-around type ANSI Z87.1 protectors with no side vents worn with chemical splash goggles also provide good protection from biological spray.

b. Protection in other potentially hazardous areas includes—

(1) Safety eyewear with side shields.
(2) Non-ANSI Z87.1 eyewear with side shields or wraparound design.
(3) Face shields (see *a*(2), above).

4–20. Biological injury emergency care

Biological injury is most likely to occur when the ocular tissues have been abraded or lacerated and then been in contact with biological pathogens. Those exposed should be treated by—

a. Initial care (flushing eyes with water for at least 15 minutes).

b. Eye care professional evaluation.

c. Eye care professional prescribes appropriate medications to prevent the contaminant from further infecting the eye or body.

Section V
Ionizing Radiant Hazards and Protection

4–21. Introduction

Ionizing radiation is capable of producing ionization (radioactive) changes in ocular tissues. Included are charged alpha and beta particles, nonparticulate radiation such as gamma and x-rays, and neutrons, which are uncharged elementary particles.

a. Ionizing radiation sources include—

(1) Nuclear reactors.
(2) Atomic/nuclear bomb blasts.
(3) Medical procedures such as diagnostic nuclear medicine/x-ray procedures and cancer therapy treatment.
(4) Industrial and military materials or devices that produce radiation.

b. Degree of injury will be determined by—

(1) Type of radiation (alpha, beta, gamma).
(2) Energy level of the source.
(3) Tissue absorption characteristics for the specific radiation at the output energy and frequency levels.
(4) Distance between the source and the tissue.
(5) Duration of the exposure.
(6) Number of repeated exposures (cumulative effect).

c. Ionizing radiation effects include—

(1) Deterioration of ocular tissues.
(2) Destruction of ocular tissues.
(3) Cataract formation.
(4) Other long-term effects.

4–22. Risk levels and monitoring requirements for ionizing radiation

a. There is low risk of overexposure in peacetime if PPE is used and safety precautions are followed. The risk may increase during nuclear conflicts or during accidents involving nuclear materials or radiation devices.

b. Individuals who have the potential to receive a dose to the eyes in excess of Federal health and safety standards will be enrolled into a dosimetry program in accordance with AR 11–9. This is an occupational standard however and does not apply to tactical scenarios.

c. Allowable dose rates are published in DA Pam 40–18.

4–23. Ionizing radiation protection

Ionizing radiation protection is provided by—

a. Time, distance, and shielding.
b. An effective training program.

Section VI
Nonionizing Radiant Hazards, Protection, and Medical Management

4–24. Introduction

Nonionizing radiation is electromagnetic energy for which the quantum energy is insufficient to ionize matter. The nonionizing radiation spectrum is divided into spectral bands and includes UV, visible, infrared (IR), and radio frequency (RF).

a. Nonionizing radiation sources include—

(1) Celestial objects such as the sun.
(2) High intensity lights.
(3) Lasers.
(4) Welding.
(5) Electric arcing.
(6) Blast furnaces.
(7) Germicidal lamps.
(8) Radars.
(9) Radios.

b. Degree of injury will be determined by—

(1) Wavelength of the radiation.

(2) Total energy absorbed, which is based upon the duration of the exposure, the number of exposures, and the incident field strength.

(3) Tissue absorption characteristics for the specific radiation at the output energy and frequency levels.

(4) The incident field strength, which decreases with increasing distance between the source and the tissue (inverse square of the distance).

(5) Duration and number of exposures, which are important for cumulative effects such as photochemical effects.

c. Nonionizing hazards to vision include—

(1) Ocular tissue irritation and burns.
(2) Ocular tissue destruction.
(3) Cataract formation.
(4) Other long-term effects.

d. Risk levels and monitoring requirements for exposure to nonionizing radiation are—

(1) There is low risk of overexposure in peacetime if PPE is used and safety precautions are followed. The risk may increase during conflicts, especially if directed energy weapons are used.

(2) Safety procedures are designed to prevent exposure to nonionizing radiation in excess of permissible exposure limits. These procedures are monitored for compliance.

(3) Emitting devices and their associated safety devices are monitored through preventive maintenance to ensure they function properly.

4–25. UV radiation hazards

a. UV spectrum. UV radiation hazards occur in any or all of the three defined UV bands in the electromagnetic spectrum:

(1) UV–A: 380–315 nanometers (nm).
(2) UV–B: 315–280 nm.
(3) UV–C: less than 280 nm.

b. UV hazards sources. UV hazards sources include—

(1) Welding operations (the most common source of UV injury).
(2) Germicidal lamps and high power welding (source of UV–C).

(3) Overexposure to the sun. The exposure may be direct, reflected (for example, from sand, snow, or water) or a combination of exposure routes.

(4) Tanning salons (simulated sun conditions can produce UV eye injury).

(5) Laser exposure. Some lasers (primarily medical) emit radiation in the UV segment of the electromagnetic spectrum (not a common source of UV injury). Note: Some medications increase skin sensitivity to UV radiation.

c. UV effects/injury characteristics. The UV injury symptoms consist of pain and a "scratchy, sand in the eyes" sensation for cornea and conjunctiva. Onset of symptoms is from 30 minutes to 15 hours after exposure depending on the length of exposure and intensity of the source. Most common ocular injuries produced by UV–A and UV–B are—

(1) Erythema (sunburn) of the eyelids.
(2) Photokerititis (sunburn of corneal epithelium).
(3) Photoconjunctivitis (sunburn of conjunctival epithelium).
(4) Skin cancer and cataracts may be long-term effects of exposure.

4–26. IR radiation hazards

a. IR radiation hazards are from heat-producing devices.

b. Common sources of IR radiation include—

(1) Large furnaces such as those used in the steel production industry.
(2) Heating plants where large boilers heat very large or multiple buildings.
(3) Laser devices.
(4) Glass blowing used for both decorative work and custom glassware for experiments in laboratories.

c. IR effects/injury characteristics are—

(1) Short-term IR injury is primarily to the eyelids and cornea.
(2) Long-term IR injury affects the crystalline lens in the eye (cataracts).

4–27. Laser hazards

a. Introduction. Laser devices are a special case of radiant energy delivery to the eye (see app E). The output and wavelength vary depending on the medium being used in the laser. In recent years, more wavelengths and power outputs have been developed including tuneable lasers in which one laser can emit radiation in multiple wavelengths.

b. Sources. Laser hazard sources include—

(1) Military laser systems.
(2) Medical lasers in health care facilities.
(3) Lasers in industry.
(4) Lasers in research.

c. Laser effects/injury characteristics. Depending on the wavelength, power level, and exposure, lasers may produce veiling glare, flash blindness, corneal injury, or retinal injury. Since laser emissions cover a large part of the electromagnetic spectrum, injuries will be—

(1) The same types of injury described in paragraph 4–25*c* for UV and IR when the lasers are low to moderate power.

(2) In higher power/short pulse (microsecond (ms) or less) lasers emitting a wavelength that affects retinal tissues (400–1400 nm), there is an injury mechanism known as thermoacoustic shock. Thermoacoustic shock occurs when—

(a) The retinal tissue is rapidly heated.
(b) A subsequent violent expansion (vaporization) occurs in the tissues and fluids where the beam is focused.
(c) A hole is "blasted" in the adjacent tissues (usually the retina and choroid).
(d) Adjacent tissue is destroyed and often hemorrhaging occurs when adjacent blood vessels are damaged.
(e) Significant drop in VA may occur. Acuity may or may not return to normal depending on the location and severity of the injury.

(3) Injury to the cornea, crystalline lens, and eyelids may also occur.

d. Reporting requirements. The unique nature of laser energy, definitions of laser type, classification of employees using lasers, and laser incident require unique reporting requirements. See appendix E and Technical Bulletin—Medical (TB MED) 524.

4–28. Radio frequency radiation

a. RFR hazards can exist near manmade sources.

b. Common sources of RFR include—

(1) Radar.
(2) Radio.
(3) Satellite Communication Terminals.
(4) High Power Microwave Generators.
(5) Electronic Countermeasure Systems.
(6) Shortwave Diathermy.

c. RFR exposure causes tissue heating, which long-term can affect the crystalline lens in the eye (cataracts). RFR can also affect medical implants and other electronic life-support equipment. Electromagnetic interference (EMI) is a growing concern in hospitals with the every increasing reliance upon electronic equipment and the increased presence of RFR sources in the form of personal communication devices.

4–29. Nonionizing radiation eye protection

a. Introduction. When selecting radiant energy protective devices, ensure absorptive lenses are appropriate to the wavelength and power output of the radiation source. An opaque helmet and/or absorptive face shield are used where high temperature sources exist.

b. Welding. ANSI Z49.1 will be used in conjunction with ANSI Z87.1 requirements for the selection of protective goggles and helmets for welding and cutting operations (see app H). These standards address—

(1) Helmet characteristics.

(2) Shade selection for lenses. Optical density (light attenuating ability) and tint of the lens must be appropriate for welding type and radiation intensity.

(3) Welding goggles and hand shields.

(4) Additional eye protection guidance.

(a) In addition to protecting the eyes from optical radiation, ANSI Z87.1 protection must be worn under the helmet because of the tendency to lift the helmet to inspect welds.

(b) Helmets with photosensing lenses are recommended to be worn for large-scale arc welding operations to minimize the time the helmet has to be lifted for inspection of welds (also see app H).

c. Solar.

(1) Appropriate tint in sunglasses and UV blocking characteristics on all lenses should be determined by the eye care practitioner.

(2) Optimize for the environmental conditions.

(3) Absorptive lenses can affect color perception. Therefore, training should be conducted using the same or similar tint to that used in actual missions.

d. Laser. ANSI Z136.1 is the applicable standard for safe laser use except for lasers used in health care facilities (see app E). ANSI Z136.3 is the standard for lasers used in health care facilities. Laser protective goggles provide the best protection when other protective measures are not adequate. Spectacles with laser lenses and opaque side shields are acceptable. Laser protective eyewear is required when using class 3b and 4 lasers but only in a few specific instances for the other classes of lasers. Laser protective eyewear will—

(1) Have **optical density** (OD) appropriate to the power output of the laser.

(2) Be **wavelength**-specific to the spectral output of the laser.

(3) Have lenses marked with optical density and wavelength.

(4) Be inspected after multiple exposures to laser emissions and replaced when necessary.

e. RFR. There is no suitable PPE for RFR exposure.

4–30. Treatment for radiant energy injuries

a. Immediate treatment for radiant energy injury addresses the symptoms and usually consists of—

(1) Alleviating the pain with cold compresses for erythema (sunburn) of external tissues such as the eyelids prior to evacuation.

(2) Administering pain medications (none that would inhibit clotting) at the MTF by health care providers.

(3) Prescribing antibiotics to prevent secondary infections.

(4) Referring known laser injury or exposure immediately to a military optometrist or ophthalmologist for a same-day evaluation even if no injury is immediately apparent. (A civilian eye care specialist may be used if no military care is available within 24 hours.)

(5) Reporting laser injury or exposure through appropriate channels per appendix E.

b. Followup care should be provided.

(1) An eye care specialist may be required to treat or observe internal ocular tissues depending on the degree of injury. If the macula (area of best vision) has not been damaged, the prognosis for return of a majority of visual function is good.

(2) A retinal specialist may be required to treat intraocular hemorrhage due to its seriousness. See appendix E for referral protocol for laser injuries.

Section VII
Thermal Hazards, Protection, and Medical Management

4–31. Introduction

Thermal hazards addressed in this document are those that are direct contact heat hazards that cause burns. The IR radiation hazards from heat and other sources are covered in paragraph 4–26.

a. Common sources of thermal injury include—

(1) Hot liquids such as boiling water and grease used in cooking.

(2) Heated objects such as solder, welding spatter, and hot curling irons.

(3) Hot gases from flames and steam.

(4) Open flames and fires.

b. Sources of thermal injury in field exercises and combat include—

(1) Explosion of improperly used immersion heaters. (This is the most common source of thermal injury in the Army.)

(2) Flash from munitions and munitions simulators.

(3) Fire from fuel ignition.

4–32. Thermal eye protection

Thermal eye protection measures are—

a. Avoidance of the hazard.

b. Protective eyewear appropriate to the type of hazard(s).

c. Chemical splash goggles combined with a face shield where there is a risk of hot fluid splash.

4–33. Treatment for thermal injuries

The treatment for thermal injuries is consistent with the treatment for any burn such as those identified in paragraph 4–30.

Chapter 5
Environmental Vision

5–1. Introduction

Environmental vision is the assessment, evaluation, monitoring, and management of external/physical conditions that affect visual performance. These conditions may include the effects of tools and equipment used in work, work station physical design, illumination, and weather. Environmental factors affect efficiency, safety, and comfort. The environment may be natural, artificial, or both.

5–2. Atmospheric elements affecting vision

a. Temperature and humidity.

(1) Optical surfaces (such as lenses or windshields) have reduced clarity with fogging and dust accumulation.

(a) Fogging often occurs with—

1. Low temperatures in most humidity levels.

2. Medium to high temperatures in high humidity levels.

3. Any temperature for eyewear worn by someone doing strenuous exercise.

4. Sudden change to a higher temperature environment.

(b) Dust accumulation often occurs with—

1. Low humidity conditions.

2. High temperature conditions.

(2) The low humidity that normally occurs at high altitudes or arid locations often causes drying of the ocular tissues. Most people adapt to this condition within 2 to 3 weeks. This drying also occurs in air conditioned rooms and aboard aircraft flying at high altitudes. Contact lens wearers may experience difficulty wearing their lenses in low humidity conditions.

b. Dusty, dirty, smoky, and polluted environments.

(1) *Ophthalmic lenses.*

(a) Dust and dirt on lenses reduce the clarity of images seen through the lenses.

1. Spectacles—the lens surfaces are affected.

2. Sighting devices—may be on the external lens surfaces or internal lens surfaces if the device is poorly sealed.

3. Safety eyewear (such as face shields and goggles)—may accumulate on the optical surfaces.

(b) Dust and dirt on ocular tissues may produce irritation, minor abrasions or cause a secondary infection if pathogens are in the dust.

(2) *Optical performance.*

(a) Light reflecting from dust particles on lenses produces glare.

(b) Lenses, especially polycarbonate, scratch easily in dusty environments if not cleaned carefully. However, the increased protection provided by polycarbonate lenses outweighs the negative factor of the scratching.

(3) *Contact lenses.*

(a) Difficulty cleaning the lenses.

(b) Increases risk of abrasion to the cornea.

(c) Increases risk of infection due to abrasions and poor lens hygiene.

(d) Makes contact lens wear more difficult and uncomfortable.

(e) Increases incidence of deposits on the lenses from tears and other ocular secretions.

Note. Contact lens wear under military protective masks is not allowed since the lenses cannot be removed when prolonged wear of the mask is necessary.

c. Wind/air movement. The movement of wind and air—

(1) Dries the ocular tissues by evaporation of tears.

(2) Promotes irritations of the cornea and conjunctiva.

(3) Carries chemical pollutants.

(4) Adversely affects the wear of contact lenses.

5–3. Illumination and lighting

a. General. Appropriate lighting promotes a safe work environment and improves visual efficiency and comfort. Illumination surveys may be performed by an IH, VCRO, OHN, safety officer, or other qualified individual who is familiar with illumination instruments, measurements, and standards. Lighting evaluations reflect the quality, quantity, and location of natural and artificial lighting. Lighting surveys must also consider the vision and lighting requirements of tasks and the visual capabilities of the employees. Problems may occur with either insufficient or excessive illumination levels.

b. Illumination terms. The technical terms listed below are taken from the Textbook of Military Medicine, Part III, Vol 2, chapter 8. This textbook contains additional illumination terms and information.

(1) *General illumination.* Ambient light that normally illuminates a broad work or living area.

(2) *Supplemental task lighting.* Lighting that is added to general illumination at a work site to increase the visibility of objects or tasks.

(3) *Quantity of illumination.* The amount of light emitted by a light source falling on a surface or work station is called illuminance and is measured in units called Lux (1 lumen/m^2). The foot-candle (1 lumen/ft^2) is a term for illumination used mainly in the U.S. Illumination should match the visual demands of the task. Detailed work (such as reading machinist's calipers) requires more illumination than gross tasks (such as operating a forklift).

(4) *Level of illumination.* The Illuminating Engineering Society (IES) Handbook and other references provide guidelines for illumination. Recommended minimum levels of illumination should not be confused with optimal levels of illumination that allow for maximum worker safety and productivity. Older workers often need higher illumination levels than younger workers due to changes in the pupil diameter, clarity of ocular tissues, and accommodative ability. Table 5–1 provides recommended illumination levels based on several references on lighting.

(5) *Direct lighting.* Direct lighting (light that falls directly on the task) is the most efficient type of illumination. However, direct lighting often produces shadows and glare that may interfere with visual efficiency.

(6) *Indirect lighting.* Indirect lighting (light that reflects off adjacent ceilings or walls) produces a more comfortable visual work environment. However, indirect lighting is less efficient than direct lighting.

c. Energy conservation requirements. Title 41, CFR, Section 101–20.107, mandates maximum illumination levels for an energy conservation program in U.S. Government facilities. Installations should use the CFR-mandated illumination levels unless that level jeopardizes worker performance, safety or health. See table 5–1 for comparison of the CFR-mandated maximum illumination levels based on energy conservation versus the visual performance and comfort-based recommendations from several references on illumination. Worker safety takes precedence over energy conservation requirements; thus, illumination of work areas and surfaces will be based on safety and performance. The VCRT should determine local supplemental lighting requirements.

d. Color perception.

(1) The human visual system is composed of two primary sets of sensors in the retina. They are described as rods and cones. Rods are primarily responsible for vision during dim and dark illumination conditions. Cones are primarily responsible for vision during bright and light illumination conditions. The color perceived is either the color of a light source when looking at the source itself or the color of light reflected from an object when an object is illuminated. Visual acuity and visual field both vary with the illumination level.

(2) Color rendering (color subtraction) is the color perceived by the eye when light reflects from an object. Good color rendering means the perceived or measured color is similar to that produced when the object is lighted by the sun. Poor color rendering means the object color appears distinctly different than if it were illuminated by the sun. Illumination sources may distort color perception, increase visual fatigue, and reduce productivity. As a general rule, lamps with higher efficiency tend to have poorer color-rendering properties (table 5–2).

(a) Incandescent light has good color-rendering properties but is less energy efficient than many other sources. These lamps may be used for general or supplemental task lighting.

(b) Fluorescent lights are the most commonly used lights in workplaces and emit a broad spectrum of light, giving them excellent color-rendering properties. They may be used for general or task lighting.

(c) Mercury high intensity discharge (HD) vapor and metal halide lamps, often used in gymnasiums and large

industrial bays, are very efficient light sources but may cause a mild distortion of color perception. These lamps are good for general illumination but may require supplemental lighting.

(d) High-pressure sodium (HPS) lamps are used in warehouses and some industrial manufacturing bays. They produce a golden, bright, relatively narrow spectrum light with its maximum intensity centered around 589 nm. These lamps are well suited for general illumination but should not exceed 50 fc. These lamps should not be used in areas where tasks require good color discrimination. Supplemental task lighting is usually required.

(e) Low-pressure sodium lamps, the most efficient lamps currently made, are often used to illuminate highways and parking lots. The intense yellow light produced has a very narrow spectrum (consisting of a double wavelength at 589.0 and 589.6 nm) that significantly distorts perception of many colors. These sodium lamps reduce the visibility of the standard black and yellow safety warning markings and may pose a safety hazard. Low-pressure sodium lamps will not be used in manufacturing operations.

(3) Either inadequate or excessive lighting may contribute to inefficient visual performance and decreased visual comfort. The National Safety Council estimates that insufficient lighting is the sole cause of 5 percent of industrial accidents. No single procedure or formula will solve all lighting problems. Some of the factors that may contribute to visual discomfort are direct glare, reflected glare, and shadows. The VCRT should determine the local supplemental lighting requirements.

(a) Direct glare. Direct glare comes from uncontrolled light sources (light sources without reflectors or diffusers) or from light sources that allow the worker to view the light source directly. The adverse effects associated with direct glare may be reduced by—

1. Restricting the light sources by using appropriate reflectors, diffusers, blinds, or louvers.

2. Decreasing the brightness of the light sources.

3. Directing the glare source away from the line of sight of the employee.

4. Increasing the brightness of the area surrounding the glare source. A ratio of 3:1 or 1:3 between task and background illumination has been found to be comfortable for most people.

(b) Reflected glare. Reflected glare (veiling glare) occurs when there is a reflection from a highly polished surface (such as desk tops, VDT screen, or glossy paper) and may cause significant visual discomfort. Reflected glare may be minimized by—

1. Moving the light source.

2. Changing the angle of the work plane to minimize reflection.

3. Using matte-type surfaces that minimize reflection.

4. Using polarized filters (for example, clip-on over prescription spectacles).

(c) Harsh shadows. Intense artificial lighting and direct sunlight produce harsh shadows. Visual discomfort occurs when the task falls in the line of the shadow. The shadows may be minimized or removed by—

1. Adding supplemental lighting on the task.

2. Reducing the intensity of general area lighting.

3. Adding diffusers to the general lighting.

4. Using screens or draperies or tinting windows to block sunlight.

(d) Physiological or anatomical factors of the employee. Several physiological and anatomical factors may affect the way illumination and other elements of the environment modify visual performance. As the worker ages, physiological changes occur that affect visual performance. These changes may include smaller pupils, cataracts, decreased accommodation, reduced ability to detect movement in the periphery, more noticeable glare, and reduced contrast sensitivity.

1. Reduced pupil size. Reduced pupil size allows less light to the retina and, therefore, often requires increased illumination.

2. Insufficient accommodation. In the normal eye, there is a focusing mechanism (accommodation) to allow focus change from distant to near objects. This focusing ability is reduced in some individuals making it difficult to see near objects clearly (such as books, documents, correspondence, VDT screens, and fine detail).

3. Cataracts. Some individuals develop cataracts in the lens of the eye by trauma from mechanical or chemical agents, systemic diseases, systemic medications, or aging. This is characterized by the tissue becoming opaque. If the cataract is in the periphery of the lens, increased illumination will reduce the pupil size and help with clarity. If the cataract is in the center of the lens, often reduced illumination in the work area will produce a larger pupil size and allow the worker to see around the cataract.

Note. Increased illumination will assist the aging worker in most of these factors except central cataract. Periodic comprehensive vision examinations usually provide additional information and spectacles (when necessary) that will enhance work performance. These examinations are the responsibility of the employee.

5–4. Special devices and systems

a. Protective mask. Use of the protective mask ("gas mask") presents some unique visual conditions. Training in the mask is very important. This will ensure that the soldier/worker will understand and be ready to cope with the change

in visual environment produced by wear of the mask and be able to perform critical tasks in that environment. The wearer should understand that—

(1) The lateral (side) and vertical fields of view are reduced.

(2) The head must be rotated or tilted more than usual to see in all directions.

(3) When PMIs are required for clear vision, the visual environment is restricted by the lens diameter.

(4) Bifocal wearers will find the area available for reading to be smaller than with their regular bifocal spectacles.

b. Tinted lenses and sunglasses. Any optical device placed in front of the eyes will have an effect on the image seen by the eye. Even plain clear lenses block 4–6 percent of visible light. Any tint will modify the way the environment is seen. Tinted lenses enhance or detract from visual performance depending on the combined optical characteristics of the eye and target. Whenever possible, individuals should train with the optical devices they will use in combat or on the job, or with devices that have very similar tint characteristics. The most commonly used military tints are neutral density gray and laser protective tints/filters (often green).

(1) *Neutral density (gray).* This tint is the standard gray sunglass lens provided in military and aviator spectacles. Color rendition remains fairly close to the normal perception of the eye but with reduced, overall illumination level. Standard lenses (N–31) transmit 31 percent of light. Aviator lenses (N–15) transmit 15 percent of light.

(2) *Laser protective tints/filters.* Laser protective tints/filters are designed to protect users from specific wavelengths. A common color is green, which enhances green colors but markedly attenuates red and mildly attenuates yellow, blue, and brown.

c. BLPS. BLPS consist of multiple spectacle assemblies available in clear, sunglass (neutral gray), 2-wavelength laser protection (green), and 3-wavelength laser protection (brown/dark orange). Laser protection is provided by dye absorber technology. BLPS accommodates a prescription lens carrier for soldiers requiring corrective lenses. All four spectacle assemblies are ballistic protective and are capable of defeating a 5.8 grain, T–37 shaped fragment simulating projectile at 650 feet per second. BLPS are available in only one size. The lens tint effects on color vision are—

(1) *Clear.* This lens transmits approximately 95 percent of light and has no effect on the color of objects.

(2) *Gray.* This filter acts as a sunglass. This filter has minimal effect on the color of objects.

(3) *Green.* This filter is designed to protect users from specific wavelengths. This filter markedly attenuates red and mildly attenuates yellow, blue, and brown. Green is enhanced.

(4) *Brown (dark orange).* This filter is designed to protect users from specific wavelengths. This filter markedly attenuates all colors, especially blue.

d. SPECS. This system provides ballistic, solar, and laser protection for individuals who do not wear corrective lenses. The SPECS system consists of a lens carrying browbar, interchangeable spatula and cable temples, a nosepiece, and four interchangeable lenses. The temples are capable of pantoscopic tilt adjustment for maximum fit, comfort, and acceptance. The interchangeable lenses are available in clear, sunglass (neutral gray), 2-wavelength laser protection (green), and 3-wavelength laser protection (brown/dark orange). All lenses are ballistic protective and are capable of defeating a 5.8 grain, T–37 shaped fragment simulating projectile at 650 feet per second. SPECS are available in two sizes (regular and large). SPECS affects color vision in a manner similar to BLPS.

e. NVDs.

(1) NVDs present a unique visual environment to the operator. The current devices produce—

(a) A relatively narrow field of view.

(b) An isochromatic (shades of a single color) green phosphorus picture.

(c) An image with reduced clarity (best corrected VA of 20/25 to 20/40 in most devices).

(d) Significant reduction in depth perception.

(e) Less effective with reduced night illumination (such as no moon or artificial lighting, under tree canopies, and overcast skies).

(f) Very limited depth of focus requiring adjustments for clear viewing within 10 feet.

(2) Corrective spectacles/lenses may be used with NVDs to obtain optimum VA. Aviators required to use vision correction during flight duties must wear vision correction with NVDs.

(3) NVD training should be conducted to familiarize the user with the NVD's uses, capabilities, and limitations.

(4) Ground transportation drivers who use NVDs must—

(a) Demonstrate at least 20/30 best VA at distance without the NVDs.

(b) Exercise speed discipline when using NVDs.

1. Do not exceed 25 miles per hour (mph) under optimum conditions (such as full-moon illumination).

2. Do not exceed 10 mph under limited conditions (such as quarter-moon or less illumination). Speed should be reduced with decreasing illumination and visibility to provide at least 5 seconds of reaction time to obstacles.

(5) Special warning: Aviators have a special set of problems with NVDs. They have a decreased ability to determine distance, elevation or contour. They are not able to see wires through NVDs.

(6) Table 5–3 lists some of the current NVDs.

f. VDTs. Computer screens/monitors are often called VDT screens. Anyone using a computer for 20 or more hours of their official work per week is considered a VDT worker. Many studies have concluded that there are no health

effects to the eyes or other parts of the body (including the fetus during pregnancy) for VDT users. The main problems encountered with VDTs are related to visual performance and work station ergonomics (design for function and comfort). Conditions such as carpal tunnel syndrome or stress are beyond the purview of this pamphlet. Contact Commander, USACHPPM, 5158 Blackhawk Road, Aberdeen Proving Ground, MD 21010–5403, for further technical guidance.

(1) *VDT-related visual discomfort factors.* VDT workers may experience—

(a) Visual discomfort, including fatigue.

(b) Eyestrain.

(c) Burning sensation of the eyes.

(d) Dry eyes.

(e) Blurring of the monitor screen.

(f) Intermittent double vision.

(g) Distance blurring after using the VDT.

(h) Headaches.

(i) Neckache.

(j) Backache.

(2) *VDT-related discomfort symptoms.* These symptoms may be partially due to vision conditions such as—

(a) Uncorrected or improperly corrected refractive errors that may produce blur, headache, or discomfort.

(b) Accommodative (focusing) problems or presbyopia.

(c) Binocular coordination problems.

1. Eyes may tend to point outward, away from the expected line of sight, exceeding normal posture (exophoria).

2. Eyes may tend to point inward, inside the expected line of sight (esophoria).

3. One eye may point too far above or below the expected line of sight resulting in a vertical imbalance.

(3) *Common VDT vision symptoms solutions.* Suggested solutions include the following:

(a) Ensure work station is ergonomically correct.

(b) Perform an alternate work task (for example, filing or making phone calls) for 15 minutes after every 2 hours of VDT use to help relieve many eye discomfort symptoms.

(c) Occasionally looking at objects more than 10 feet away from the VDT screen to relax the focusing and converging systems of the eyes.

(d) Have a comprehensive vision examination by an eye care professional. The eye care professional should be familiar with the functional needs of VDT users and prescribing glasses to meet those visual needs. To assist the eye care professional in prescribing the most effective eyewear, the following information should be provided:

1. The distance from the eyes to center of the VDT screen.

2. The distance from the eyes to the keyboard.

3. The distance from eye level to the top of the VDT screen.

4. The location of the document holder and its distance from the eyes.

5. Special visual demands such as type of work performed, materials used, illumination, monitor size, and print size.

(4) *Visual ergonomics.* VDT workers may experience vision-related symptoms due to the design of their computer work station. (Also contact Commander, USACHPPM, 5158 Blackhawk Road, Aberdeen Proving Ground, MD 21010–5403, for further technical guidance.)

(a) Improper illumination or glare from surrounding illumination sources.

(b) Reflected glare from light striking the VDT screen at such an angle that a second image appears on the screen.

(c) Background or contrast glare from general illumination that is overly bright.

(d) Incorrect distance from the eyes to the VDT screen (16–22 inches is normal but may need to be modified for font size, screen size, and binocularity).

(e) Improper visual angle in reference to line of sight.

(5) *Solutions to visual ergonomic problems.*

(a) Reflected glare may be reduced by—

1. Moving the location of the VDT work station.

2. Adjusting the angle of the VDT screen.

3. Modifying the light source (reduce wattage or place shade to block light on screen) or changing light diffusers to parabolic louvers.

4. Using an antireflection screen to reduce the annoying effects of reflected glare from overhead lights. Such a screen should only be used after all other potential solutions have been tried. However, this screen has no effect on direct or contrast glare. Antireflective screens also reduce the contrast and resolution of the screen and make it more difficult to read.

(b) Background or contrast glare may be reduced by—

1. Increasing or decreasing the ambient (overall) lighting to provide a comfortable contrast between the VDT screen and the surrounding area. (A 3:1 ratio or 1:3 ratio of background to screen is comfortable for most people.)

2. Using curtains or blinds to help control the glare from nearby windows during different times of the day.

(6) *Contour sharpness.* The sharpness of the images displayed on the monitor depends on the matrix (a pixel size of 0.28 or smaller is recommended). Older low-resolution monitors may need to be replaced.

(7) *Screen color*. Generally, no particular color or combination of colors on the screen has proven more effective or comfortable than any other for all workers. Individual preferences can make a difference. Dark letters on a light background works better for most users. However, a low density colored background with brighter text letters may be more comfortable for some workers. If the colors are fixed (such as green letters on a black background), try adjusting the brightness or contrast controls for more comfortable images. In some instances with single color monitors (monochrome), individuals have reported a change in the colors of other viewed objects after using the computer for an extended period of time (after image). This "after image" is temporary and will fade with time. If it persists for a long period of time (several hours) or distorts your color vision after computer use, change to another color of monitor (monochrome) or modify the background colors of your monitor if you have a color monitor.

(8) *Flicker effect.* The normal eye has the ability to detect flickering of light sources beyond the conscious ability to "see" the source. This ability is more noticeable to the peripheral retina than in the central part of the retina. The flickering does not physically hurt the eyes but it is distracting for some people. To minimize awareness of this effect, the VDT screen and the document holder should be placed near the center of the field of view. A monitor with a refresh rate of 72 hertz (Hz) or higher will usually minimize this effect.

(9) *Physical ergonomic requirements.* The effective ergonomic design of VDT work stations for the rest of the body can improve visual comfort and productivity. Work spaces should meet the physical and visual needs of the employee. The ability to easily modify the work station is critical to work station design flexibility.

(a) Screen height and angle should be adjustable. The top of the monitor should never be above eye level. For most people, the center of the screen should be located 5 to 15 degrees below the straight ahead position. Bifocal wearers may require a lower screen position. Large monitors and flat screens may require special consideration to screen position.

(b) The employee's chair should be comfortable and fully adjustable. The chair should also have adequate lower back and arm support to reduce associated ergonomic problems.

(c) Keyboards and other input devices should be located so that the arms are relaxed and approximately horizontal to the floor.

(d) Document holders should be designed to place the work material next to the screen to avoid postural and visual fatigue, glare, flicker, and the constant need for the eyes to change focus.

Note. No two stations or two employees are exactly alike. Generally, a wholesale solution such as buying a single type of glare screen for everyone is not effective. Evaluate each individual employee who presents symptoms as a separate problem to be solved. Contact a VCRT member for assistance with VDT problems.

Table 5–1
Recommended task illumination in foot-candles (fc)

Task/Activity/Area description	Illuminating Engineering Society[1]	41 CFR 101–20.107[2]
Auto parking areas	10–20 fc	6–10 fc
Corridor, stairs, elevator boarding area, walk surfaces	10–20 fc	1–5 fc
Loading dock	20 fc	21–30 fc
Storage areas (medium), non-work areas Gymnasium, Assembly (course)	10–20 fc	6–10 fc
Shipping preparation	20–50 fc	21–30 fc
Work areas - general	20–50 fc	30 fc
Work station surface, food preparation, assembly, and manufacturing (medium), Drafting/drawing - fine detail	50–100 fc	50 fc
Assembly (fine), Fine inspection	100–200 fc	———
Machine work (fine detail), inspection - very fine	200–500 fc	———

Notes:

[1] 1. Lighting Handbook, Illuminating Engineering Society of North America, 8th ed., 1993

[2] 2. Title 41, Code of Federal Regulations, Section 101–20.107, Energy Conservation.

Table 5–2
Lamp efficiencies, color renditions, and uses

Luminaire type	Lumens / watt	Color rendition	Use
Incandescent	17 - 23	very good	Task and general lighting
Fluorescent	70 - 80	excellent	Task and general lighting
Mercury vapor	44 - 55	good	Warehouse, manufacturing area
Metal halide	80 - 90	good	Warehouse, manufacturing area
High-pressure sodium	115	poor	Parking lot, storage area
Low-pressure sodium	170	very poor	Parking lot, highway

Table 5–3
Current night vision devices

Model	Approximate date fielded	Description/Generation	Best VA
AN/PVS–5A, B, & C	1974	NVG Binocular/2d gen	20/50
AN/AVS–6	1985	NVG Binocular/3d gen	20/40
AN/AVS–6(V)1A	1995	NVG Binocular/3d gen	20/25
AN/AVS–9	1996	NVG Binocular/3d gen	20/25
AN/PVS–7B	1987	NVG Binocular/3d gen	20/40
AN/PVS–7D	1997	NVG Binocular/3d gen	20/25
AN/VVS–2	1977	Driver's sight Binocular/2d gen	20/40
AN/PVS–14	1997	NVG Monocular/3d gen	20/25
AN/VAS–5	1999	Driver's Visual Enhancer Thermal	—

Chapter 6
Site Survey

6–1. Introduction

A site survey evaluates and characterizes employees, their tasks, and workplace in relation to their visual system. When applicable, the VCRT may survey a recreational site (for example, racquetball court). The survey identifies occupational vision, eye safety, and environmental factors that may adversely impact visual and overall efficiency. The survey documents the identified problems to be corrected. The survey includes evaluation of the effectiveness and appropriateness of current protective measures and worksite visual environment characteristics. When existing protective measures or worksite visual environmental controls are inadequate, outdated, or non-existent, appropriate measures will be adopted. An inventory of eye hazards, individuals at risk, visual environment characteristics, and protective devices required will be maintained. This inventory will be included in the Health Hazard Inventory (HHI) maintained by IH or in safety inventories.

6–2. Essentials of a vision conservation site survey

a. A site survey should be designed to evaluate both hazardous and nonhazardous locations. Consider the following when evaluating a worksite:

(1) Identify the characteristics of the worksite.

(a) What are the location characteristics?

(b) What are the occupational factors?

1. Job vision requirements.

2. Special occupational vision requirements.

3. Readiness considerations.

4. Job activities that may be eye hazardous.

(c) What are the eye safety factors?

1. What mechanical, chemical, radiant energy or biological ocular hazards exist?

2. Have engineering controls been implemented (that is, what safety interventions are in place that prevent or reduce exposure to eye hazards)?

3. Are administrative controls adequate and appropriate (that is, are buildings, areas, tasks, and equipment having eye-hazardous characteristics posted with appropriate signs, and are related regulations and SOPs in place)?

4. Is PPE appropriate to the ocular hazard(s) and readily available?

5. Are there any unsafe practices being used by management or employees?

(d) What are the environmental vision factors?

1. Illumination: Is the lighting the appropriate type? Does it provide a comfortable illumination level? Is supplemental lighting necessary and available?

2. VDT working environment: What illumination factors may affect the VDT employee(s)? What visual ergonomics may affect the VDT employee(s)? What illumination factors or visual ergonomics improvements may be necessary?

3. Special environmental factors (such as UV, IR, microwave, and lasers).

(e) What other factors or issues are involved?

(2) Identify the characteristics of the work.

(a) Have eye-hazardous tasks been identified (mechanical, chemical, biological, or radiant)?

(b) Is PPE required in addition to administrative and engineering controls for eye hazards?

(c) Is the PPE appropriate for the eye hazard(s)?

(3) Identify the characteristics of the employees.

(a) What are the visual demands on the employees?

1. Do the visual performance and optical devices used by the employees meet the visual demands of the job?

2. Are there any special visual performance problems with an individual employee or group of employees?

(b) What are the personal protective needs of the employees?

1. Are required PPE available to the employees at the worksite?

2. Are the employees using the provided PPE?

3. Are the employees maintaining the PPE in a clean and serviceable condition?

b. Where eye safety equipment is involved—

(1) Who is responsible for acquisition, replacement, training, and maintenance of safety equipment?

(2) What general use safety equipment is available?

(3) Is the safety equipment in serviceable condition?

(4) What PPE is in place?

(5) Is the PPE appropriate for the job(s)?

(6) Is there appropriate PPE for visitors to the worksite?

(7) Are general safety procedures and PPE being used appropriately?

6–3. Types of surveys

There are four types of site surveys that may be conducted at any installation:

a. Periodic survey. This type of survey includes a representative sample of the locations, areas, buildings, or operations identified as eye hazardous. Survey sites will be selected (at least one-third of the installation each year) to ensure all eye-hazardous locations are visited within a 3-year evaluation period. The HHI database and safety inventory should be updated based on the survey results. Where engineering controls are missing or inadequate, a request for resolution will be routed through the safety office for implementation.

b. Problem-oriented survey. This survey responds to a specific vision question or accident/incident. This survey may be requested by the safety office, preventive medicine, supervisors, or employees (typically through their supervisor). Evaluation of the specific operation, task, or incident will be made.

c. Mission change survey. The mission of an installation or facility may change. This is especially true in times of mobilization, downsizing, mission realignment, or workforce outsourcing. A mission change survey is conducted when the functions/operations in a specific building or location changes. This survey provides a baseline determination of operations/tasks in the locations that are eye hazardous and identifies what protective measures are needed. Several surveys may be required over an extended period of time if major mission changes occur. After the baseline is determined, the areas, buildings, and operations become part of the eye hazard inventory in the periodic survey.

d. Familiarization survey. A familiarization survey involves visiting of a variety of installation eye-hazardous areas to provide an understanding of the types of missions and hazards that exist on the installation. This also allows personnel to become acquainted with the individual(s) performing this survey. When a VCRO/VCC or VCRT member is newly assigned or appointed, he/she should visit a representative sampling of the eye-hazardous areas on the installation within the first 3 months of assignment.

6–4. Survey reporting

Survey reporting is not required at the DA level. Reporting is strongly encouraged locally to measure the program status over time. Reporting requirements may be established locally.

a. Periodic survey report. A periodic survey report should be prepared annually as a summary of the areas visited. The areas meeting requirements and standards as well as areas requiring corrective action will be identified. Recommendations should be specific enough to allow corrective action with minimal or no consultation with the surveying officer(s). Copies should be distributed to the Commander, Safety Office, the Chief of Preventive Medicine, VCRT members, and a courtesy copy to the USACHPPM TVCRO. In Europe, a courtesy copy should be sent to USACHPPM–EUR, Occupational Health Program, Vision Conservation and Readiness Consultant. Where the corrective actions can be implemented at the supervisory level, copies of the pertinent portion of the survey may be given to the supervisor. Other copies may be distributed as deemed appropriate.

b. Problem-oriented evaluation report. A report should be prepared to address the problem(s) and make recommendation(s). Copies of this report should be sent to the supervisor of the site involved, Commander, Safety Office, Chief of Preventive Medicine, and VCRT members.

c. Mission change survey report. A mission change survey report should be prepared as a summary of the areas visited. The areas meeting requirements and standards as well as areas requiring corrective action will be identified. Recommendations should be specific enough to allow corrective action with minimal or no consultation with the surveying officer(s). Distribution of copies is the same as the problem-oriented evaluation report in paragraph *b* above.

d. Familiarization survey. No formal report is required. However, the VCRO/VCC should keep a record of the sites visited and observations made during the visits.

6–5. Secured area survey

a. Reports and actions accomplished in secured areas will meet security procedures.

b. Certain installations may have areas that require a higher security clearance than normally possessed by the VCRO/VCC. If potential eye injury in a restricted area is limited to one or two small operations, the staff of the secured area may be able to "sanitize" the area, which allows the VCRO/VCC to view items within his or her security clearance limits. If large secured areas must be visited, it may be necessary for the VCRO/VCC to have a security clearance that allows evaluation in these areas.

6–6. Staff assistance visit

When a VCRT cannot solve the problem(s) locally, an SAV may be requested from USACHPPM. In most cases the SAV will be a problem-oriented visit. Requests should be made through the chain of command through the U.S. Army Medical Command (MEDCOM) to the USACHPPM TVCRO. The request for an SAV in Europe should be made through USACHHPM–EUR.

Appendix A
References

The ANSI publications listed in sections I and II below are available at http://www.ansi.org. Obtain TB MED publications at http://chppm-www.apgea.army.mil/tbm.htm.

Section I
Required Publications

American National Standards Institute (ANSI) Z49.1
Safety in Welding, Cutting, and Allied Processes. (Cited in paras 4–29*b* and B–1*b*(1).)

ANSI Z87.1
American National Standard Practice for Occupational and Educational Eye and Face Protection. (Cited in paras 2–7*f*, 2–8*e*, 2–9*b*(2), 4–4*b*(1), 4–4*c*(1), 4–4*c*(2), 4–4*d*, 4–4*e*(1)(*b*), 4–4*e*(1)(*c*), 4–4*g*, 4–4*h*, 4–4*i*, 4–7*a*, 4–7*a*(1)(*a*), 4–13*a*, 4–13*c*, 4–19*a*(2), 4–29*b*, 4–29*b*(4)(*a*), C–2, and H–3.)

ANSI Z136.1
American National Standard for the Safe Use of Lasers. (Cited in paras 3–3*c*(3), 4–29*d*, B–1*b*(3), E–2, and E–5.)

ANSI Z136.3
American National Standard for the Safe Use of Lasers in Health Care Facilities. (Cited in paras 3–3*c*(3), 4–29*d*, B–1*b*(4), E–2, and E–5.)

ANSI Z358.1
American National Standard for Emergency Eyewash and Shower Equipment. (Cited in paras B–1*b*(5) and G–1.)

AR 40–5
Preventive Medicine. (Cited in paras B–1*a*(3), C–2, and D–2.)

AR 40–63/NAVMEDCOMINST 6810.1/AFR 167–3
Ophthalmic Services. (Cited in paras 3–4*c*(2) and 3–5d.)

AR 40–400
Patient Administration. (Cited in paras 3–4*c*(1)(*d*), 3–5*b*, 3–6*b*(2), and C–2.)

AR 40–501
Standards of Medical Fitness. (Cited in para 3–3*e*(2)(*a*) and C–2.)

AR 385–10
The Army Safety Program. (Cited in paras 2–2*d*, 3–7, B–1*a*(4), and C–2.)

AR 385–40
Accident Reporting and Records. (Cited in para 1–7*d*.)

DA Pam 611–21
Military Occupational Classification and Structure. (Cited in para 3–3*e*(2)(*a*).)

TB MED 524
Control of Hazards to Health from Laser Radiation (formerly TB MED 279). (Cited in para 4–27*d*.)

29 CFR 1910
Occupational Safety and Health Standards. (Available at http://www.access.gpo.gov/nara/cfr/index.html.) (Cited in paras 2–2*a*, 2–9*b*, 4–4*a*, 4–4*b*, 4–6*a*(3), B–1*a*(1), C–2 and D–2.)

Section II
Related Publications

A related publication is merely a source of additional information. The user does not have to read it to understand this publication. Obtain ASTM standards listed below at http://www.astm.org. Obtain DOD instructions listed below at http://www.dtic.mil/whs/directives.

ANSI Z80.1
American National Standard for Ophthalmics—Prescription Ophthalmic Lenses—Recommendations

ANSI Z80.3
American National Standard for Ophthalmics—Nonprescription Sunglasses and Fashion Eyewear—Requirements

ANSI Z80.5
American National Standard for Ophthalmics—Requirements for Ophthalmic Frames

AR 11–9
The Army Radiation Safety Program

AR 25–400–2
The Army Records Information Management System (ARIMS)

AR 600–55
The Army Driver and Operator Standardization Program (Selection, Training, Testing, and Licensing)

ASTM Standard F659
Skier Goggles and Faceshields

ASTM Standard F803
Standard Specification for Eye Protectors for Selected Sports

ASTM Standard F910
Standard Specification for Face Guards for Youth Baseball

ASTM Standard F1776
Standard Specification for Eye Protective Devices for Paintball Sports

DA Pam 40–8
Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX

DA Pam 40–18/DLAI 1000.30
Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation

DA Pam 40–173
Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT

DODI 4000.19
Interservice and Intragovernmental Support

DODI 6055.1
Department of Defense Safety and Occupational Health (SOH) Program

Determining Visual Standards for Industrial Jobs by Statistical Methods
Tiffin, Joseph and Wirt, S.E., Transactions of the American Academy of Ophthalmology, 50(72), 1945.

Executive Order 12196
Occupational Safety and Health Programs for Federal Employees. (Available at http://www.archives.gov/federal_register/executive_orders/disposition_tables.html.)

Eyes and Industry
Kuhn, Herwig S., 1950. St. Louis: Mosby.

IES Lighting Handbook, 9th Edition, 2000
Obtain from the Illuminating Engineering Society, 120 Wall Street, Floor 17, New York, NY 10005.

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41 CFR 101–20.107
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41 CFR 101–20.116
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Section III
Prescribed Forms
This section contains no entries.

Section IV
Referenced Forms

DA Form 3076
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Appendix B
Vision Conservation and Readiness Program Management Evaluation Guide

The purpose of this guide is to assist the local Vision Conservation and Readiness Team (VCRT) to improve its Vision Conservation and Readiness Program (VCRP). This guide is not designed for program inspection. The following factors will help in evaluating the overall local VCRP.

B–1. References available to the VCRT

a. Primary.

(1) Title 29, Code of Federal Regulations 1910.133, Occupational Safety and Health Standards.
(2) DODI 4000.19, Interservice and Intragovernment Support.
(3) AR 40–5, Preventive Medicine.
(4) AR 385–10, Army Safety Program.
(5) DA Pam 40–506, The Army Vision Conservation and Readiness Program.

b. Support.

(1) American National Standards Institute Standard (ANSI) Z49.1, Safety in Welding, Cutting, and Allied Processes.
(2) ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection.
(3) ANSI Z136.1, For Safe Use of Lasers.
(4) ANSI Z136.3, For Safe Use of Lasers in Health Care Facilities.
(5) ANSI Z358.1, Emergency Eyewash and Shower Equipment.
(6) American Society for Testing and Material (ASTM) Standard F803, Eye Protectors for Use by Players of Racket Sports (current version).

B–2. Applicability

a. Does the installation have the following eye hazards?

(1) Mechanical (for example, flying objects).
(2) Chemical.
(3) Biological.
(4) Radiant energy (for example, welding, laser, or microwave).

b. Does the installation have operations that require eye protection?
c. Does the installation have sporting activities that require eye protection?
d. Does the installation have work areas needing special illumination?
e. Does the installation have individuals that are likely to be deployed on combat or peacekeeping missions?

B–3. Policy/regulation

a. Does the installation have an up-to-date vision conservation and readiness regulation or policy?

(1) Did the commander sign the vision conservation and readiness regulation or policy?
(2) Does the local regulation or policy include managerial and labor responsibilities?
(3) Does the local regulation or policy include the provision of command resources to support the VCRP?
(4) Is there a fixed schedule (normally annually) to review the local regulation or policy?

b. Does the installation have a written standing operating procedure (SOP) describing the operation of the VCRP?

(1) Does the local SOP include managerial and labor responsibilities?
(2) Does the local SOP require reporting (for example, OSHA 200 log) of all injuries and incidents where PPE prevented eye injuries?
(3) Does the local SOP address medical management of eye injuries during duty and nonduty hours?
(4) Does the local SOP address risk assessment for eye hazards?
(5) Is there a fixed schedule (normally annually) to review the SOP?

c. Does the installation have a written policy or SOP covering a safety eyewear program?
d. Does the command have a designated (put on orders) vision conservation and readiness officer (VCRO) or a vision conservation coordinator (VCC)?
e. Does the command have a chartered VCRT?
f. If there is a VCRT, do team members participate in design and development of protocols to identify potential eye hazards and appropriate countermeasures?

g. Do VCRT members review and approve program design and/or modifications, SOP development, and contracts pertaining to the program?

h. If the installation has deployable individuals or units, do the installation and tenant units have a Memorandum of Agreement to meet the readiness requirements?

i. Is there an established program that recognizes workers when use of safety eyewear has prevented eye injury (Wise Owl Club of Prevent Blindness America or similar program)?

j. Is there an established program that recognizes units, supervisors, and individuals that maintain good eye safety compliance?

k. Is there an established SOP to provide visitors with safety eyewear in eye hazardous areas?

l. Does the command encourage periodic (for example, annual, biennial, or triennial) review and propose necessary update of the VCRP by external elements?

m. Does the Civilian Personnel Office (CPO) have a standard policy to include compliance to eye safety as part of the job description?

n. Does the purchasing and contracting office have a standard policy to include compliance to eye safety as part of the contract requirement?

B–4. VCRP staffing

a. Who is responsible for managing the VCRP?

b. What program or office does the VCRO or VCC work for (optometry, ophthalmology, safety, industrial hygiene, occupational health (OH), or preventive medicine)?

c. What is the professional training of the VCRO/VCC?

d. Who are the other members of the VCRT?

(1) Optometrist/ophthalmologist.
(2) OH physician.
(3) OH nurse.
(4) OH technician.
(5) Safety officer.
(6) Safety specialist.
(7) Industrial hygienist.
(8) Industrial hygienist technician.
(9) Others.

e. How many hours are dedicated monthly to support the VCRP?

f. Is the VCRT sufficiently staffed to allow an effective program to function? If "no," what affects such staffing?

B–5. VCRT resource management: funding, equipment, supplies, and services

a. Does the command provide adequate funding to allow the VCRT to operate an effective program? Sources of funding: (for example, Occupational Safety and Health Budget).

b. Is there an interservice support agreement (ISA) to provide comprehensive vision examination and/or optical services (DODI 4000.19)? What is the date of the ISA?

c. What is the annual cost of the VCRP?

(1) Equipment.
(2) Supplies.
(3) Nonprescription safety eyewear.
(4) Prescription safety eyewear.

(a) Who provides comprehensive vision examinations for individuals requiring prescription safety eyewear?
(b) Who pays for the comprehensive vision examination (individual, installation, unit or contract)?
(c) Who is the supplier of prescription safety eyewear?
(d) Who pays for the safety eyewear (individual, installation, unit, contract, co-payment or other)?
(e) What is the reimbursement process for prescription safety eyewear?

B–6. Eye hazard recognition/assessment

a. Who performs the worksite evaluation to identify eye hazards?

(1) Safety.
(2) Industrial hygiene.
(3) Occupational health.
(4) Optometry.
(5) Other.

b. Worksite eye injury review.

(1) Is there a current list of employees/jobs that require eye protection?

(2) Are installation eye injury statistics maintained?

(3) Are previous worksite eye injuries reviewed prior to a worksite visit?

c. Are new or modified processes reviewed for eye hazards before being implemented?

B–7. Workplace ocular safety and visual environment evaluation

a. Is there an overall ocular safety and visual environment management plan implemented?

b. Does the VCRT review the overall ocular safety and visual environment management plan periodically (for example, annually) for effectiveness?

c. Are eye hazards entered into the Health Hazard Inventory Module (HHIM) of Defense Occupational Health Readiness System (DOHRS)?

d. Are engineering controls used to eliminate eye hazards and eye hazardous operations where possible?

(1) Is there a maintenance plan for engineering controls?

(2) Are engineering controls monitored for effectiveness in controlling or reducing workplace eye hazards?

e. Are administrative controls used to eliminate eye hazards and eye hazardous operations where engineering controls are not possible?

(1) Are administrative control procedures in place?

(2) Do employees observe the administrative control procedures?

(3) Are administrative control procedures monitored for effectiveness in controlling or reducing workplace eye hazards?

f. Have treatment protocols been established for eye injuries?

g. Did a VCRT member conduct studies and document illumination problems where applicable?

B–8. Incident investigation and reporting

a. How many eye injuries have occurred on the installation within the last year, and what is the rate per 1000?

b. Are incidents involving eye injuries and near-misses investigated promptly?

c. Has the eye injury rate increased in specific locations or on the overall installation?

d. Where eye injury rates have decreased, have the techniques used been evaluated for applicability to other areas or operations?

e. Is there a mechanism in place for reviewing and developing a plan(s) of action to resolve eye hazard protection deficiencies?

B–9. Communication

a. Does the VCRT meet periodically to consult with team members on matters concerning vision conservation and readiness?

b. Does the VCRT consult with any professionals who may not have representation on the team (see list in paragraph B–4*d*) on matters concerning vision conservation and readiness?

c. Does the VCRT consult with worksite supervisors and/or employees on matters concerning vision conservation and readiness to include identifying potential eye hazards?

d. Does the VCRT keep up with the external regulations and policies that may impact its mission?

B–10. Training and leadership development

a. VCRP leadership.

(1) Has the VCRO attended the Vision Conservation and Readiness Course?

(2) Have VCRT members and the VCC (when assigned) attended the Vision Conservation and Readiness Course?

(3) Do VCRT members have the training to recognize, assess, evaluate, and recommend controls relating to eye hazards?

(4) Is the technical expertise of the VCRT adequate for input on designs, SOPs, and contracts?

b. Workforce.

(1) Are workers trained in the proper wear and maintenance of safety eyewear/devices upon issue and annually thereafter?

(2) Is the workforce trained in the proper use of the eye wash stations?

(3) Is the workforce trained in first responder treatment and/or management protocols for eye injuries?

(4) Is the workforce trained in preventive measures to reduce the incidence of eye injury?

(5) Is the workforce's training documented in accordance with recordkeeping requirements?

(6) Is the workforce aware of safety practice recognition programs such as the Wise Owl Club?

Appendix C
Sample Standing Operating Procedure or Instruction

C–1. Purpose of the local regulation or SOP
Each installation will have a local regulation or SOP that delineates the scope of the VCRP and identifies responsibilities.

C–2. Content sample
See figure C–1 for sample text. The procedure number, preparing office/agency, effective date, installation, and signatures shown here are for illustration purposes only.

STANDING OPERATING
PROCEDURE NO. (40-000)
PREPARING OFFICE/AGENCY LOCATION

Occupational and Environmental Health

VISION CONSERVATION AND READINESS PROGRAM
(Effective Date)

1. PURPOSE. To establish a comprehensive Vision Conservation and Readiness Program that is applicable to all employees of the installation to assure they have the visual ability required to perform their mission safely and efficiently.

2. REFERENCES.

a. AR 40-5, Preventive Medicine.
b. AR 40-400, Patient Administration.
c. AR 40-501, Standards of Medical Fitness.
d. AR 385-10, Army Safety Program.
e. DA PAM 40-506, The Army Vision Conservation and Readiness Program.
f. Public Law (PL) 105-85, National Defense Authorization Act for Fiscal Year 1998.

3. OBJECTIVE. To assure periodic vision screening of all personnel to determine their visual skills, and refer for corrections if needed.

4. APPLICABILITY. This standing operating procedure (SOP) includes all segments of (Ft. Name and State).

5. RESPONSIBILITIES.

a. Commander.

(1) Establishes and implements safety and health procedures as mandated by DODI 6055.1, Executive Order 12196, title 29, Code of Federal Regulations (CFR) 1960, Part 1910, and PL 105-85.

(2) Establishes a Vision Conservation and Readiness Team (VCRT) per DA PAM 40-506. The team leader should be a vision conservation and readiness officer (VCRO) or vision conservation coordinator (VCC).

(3) Promotes awareness of vision conservation on the installation by use of command emphasis letters, media presentations, and other information mechanisms.

(4) Provides resources (budget, staffing, and space) for the VCRP and support equipment as specified in AR 385-10.

(5) Ensures vision readiness of all active duty and deployable Department of the Army (DA) civilian personnel.

(6) Ensures that all military and DA civilian personnel receive vision screening appropriate for their job requirements and exposure to potential eye hazards. Also ensures individuals identified as requiring comprehensive vision examinations are appropriately referred.

Figure C–1 (PAGE 1). Sample local-level standing operating procedure or instruction for the Vision Conservation and Readiness Program

(7) Ensures that all personnel follow proper work practices, use protective equipment, and receive proper instruction and training in the use, care, and maintenance of personal protective equipment (PPE).

b. Civilian Personnel Office (CPO).

(1) Provides the VCRT with a job-title list of civilian employees on the installation (updated at least annually). This list will be used by the VCRT to identify employees who require vision screening and eye protection.

(2) Identifies DA civilian employees who may be deployable to a peacekeeping or hostile action zone and provides this information to the VCRT.

(3) Verifies employee job descriptions include the requirement to properly wear and maintain PPE when hazardous work conditions exist. If this factor is not in the current job description, ensures inclusion in a revision of the job description.

(4) Uses the job-vision standards in DA Pam 40-506 to determine eligibility and effective placement of employees.

(5) Assists supervisors with reclassification or disciplinary actions, as necessary.

c. Local military personnel office. Provides unit alpha rosters to the VCRT for the military personnel assigned to activities and units on the installation. The roster shall include the Military Occupational Specialties (MOS) in which the soldiers are working. The deployment status will be included when available. The list should be updated at least annually, or more frequently where units have a high rate of personnel change or high rate of deployment.

d. VCRT.

(1) Performs surveys to identify eye-hazardous occupations and processes. This includes worksite environmental hazards that may produce mechanical, chemical, radiation, or biological eye injuries. The main responsibility for maintaining hazard inventories rests with industrial hygiene (IH) and safety.

(2) Maintains a complete and current inventory of all work areas, eye hazards associated with the work areas, and vision performance requirements (vision standards) at the installation/location using a job-title list. The civilian job-title list is maintained and provided by CPO. The military job-title list is obtained from the military personnel office.

(3) Monitors injuries and recommends corrective action for identified hazards to safety and local command offices.

(4) Coordinates the vision screening of all employees and ensures that the results are recorded in the official health record. Ensures military and civilian personnel not demonstrating the required visual performance are referred for a comprehensive vision examination.

Figure C–1 (PAGE 2). Sample local-level standing operating procedure or instruction for the Vision Conservation and Readiness Program—Continued

(5) Ensures verification of prescription industrial safety eyewear and proper fitting of all industrial safety eyewear.

(6) Ensures vision test and prescription information is kept in employee medical records. Maintains current eyewear prescription of deployable DA civilian employees.

(7) Maintains a database of the total number of employees screened, the screening results, the number of personnel employed in eye-hazardous areas, the number of eye injuries, and the number of industrial safety spectacles issued as part of the VCRP.

(8) Provides technical input and assistance to the employee health hazard education program.

(9) Reports VCRP status to command.

e. Safety officer.

(1) Works in coordination/consultation with the VCRT to establish and update annually a local job-title list of all military and civilian jobs on the installation.

(2) Conducts surveys, in coordination/consultation with the VCRT, to identify eye-hazardous jobs, processes, and areas. This information shall be incorporated into the CPO job-title list, the military job-title list, and the inventory of eye hazards maintained by IH. Validates the need for and identifies employees who require protective eyewear.

(3) Assists the occupational health (OH) office, VCRO/VCC, and supervisory personnel in determining the appropriate type of protective eyewear required.

(4) Monitors the industrial safety spectacle procurement program. Ensures that the spectacles are ordered and delivered in a timely manner, and meet national standards marking requirements.

(5) Monitors use of eye protection and safe practices by military, civilian and contract employees in work areas and, when necessary, recommends program improvements.

(6) Coordinates with commanders, CPO, and contracting officers representative (COR) as appropriate to resolve eye safety violations.

(7) Provides education to employees and supervisors on eye safety techniques and devices.

(8) Motivates supervisors to ensure employees wear protective eyewear.

(9) Monitors eye injury trends to guide intervention measures.

(10) Implements controls (such as administrative and engineering) appropriate to the hazards in the workplace.

Figure C–1 (PAGE 3). Sample local-level standing operating procedure or instruction for the Vision Conservation and Readiness Program—Continued

(11) Provides a means of rewarding and/or recognizing individuals whose eye(s) are protected from injury by wearing PPE in an accident. This may be accomplished via a locally developed program or adopting an established program (such as the Wise Owl Club of Prevent Blindness America).

f. Logistics officer.

(1) Consults with technical specialists in safety, OH, and vision care when formulating, modifying, and terminating any ophthalmic services contracts.

(2) Ensures timely procurement (that is, within 15 working days) and delivery of safety-related ophthalmic services and materials.

(3) Modifies or terminates VCRP-related ophthalmic contracts and related procurement documents if the vendor does not meet the needs of the VCRP.

(4) Ensures labor contracts include the requirement to use PPE and sound safety practice as performance requirements for contracted workers.

(5) Ensures the COR is familiar with eye safety compliance required of the contract workers.

(6) Ensures a stock of nonprescription protective eyewear (meeting the current ANSI Z87.1 standard) is available for distribution. This stock will include several sizes to accommodate variations in facial structure.

(7) Monitors the distribution of Special Protective Eyewear Cylindrical System (SPECS) and Ballistic Laser Protective Spectacles (BLPS) from the central issue facilities and other designated issue facilities.

g. Supervisors.

(1) Ensure all job descriptions include the requirement to use safe practices and appropriate safety equipment.

(2) Use the job-vision standards in DA Pam 40-506 as an aid to employee/job selection. Schedule military and civilian employees for periodic vision screening in coordination with the VCRP.

(3) Remove an employee from the eye-hazardous work/area if his/her vision does not meet required vision standards until the employee's vision can be brought up to the standards or a waiver is granted.

(4) Ensure employees placed in eye-hazardous jobs have proper eye protection.

(5) Obtain and keep a stock of nonprescription protective eyewear for use by employees whom do not require prescription eyewear and visitors. This eyewear must meet the current ANSI Z87.1 standard.

4

Figure C–1 (PAGE 4). Sample local-level standing operating procedure or instruction for the Vision Conservation and Readiness Program—Continued

(6) Ensure prescription safety eyewear is provided in a timely manner. Appropriate safety goggles worn over civilian glasses may be used temporarily or the worker can be temporarily placed in a non-eye hazardous work area while prescription safety eyewear is being procured.

(7) Ensure that active duty and deployable civilians have the required number and type of eyewear needed for deployment.

(8) Ensure that eyewash stations are accessible and functioning properly.

(9) Ensure all personnel receive instruction and training in safety practices and in the use and care of the protective eyewear.

(10) Ensure personnel demonstrate knowledge in safety practices and in the use and care of the protective eyewear.

(11) Enforce the proper wear of safety eye protection and practice of safety discipline. Use current Civilian Personnel Regulations or Uniformed Code of Military Justice as enforcement tools when needed.

(12) Ensure that all employees participate in the aspects of the VCRP appropriate to their job.

(13) Direct all personnel having difficulties or complaints from use of industrial safety eyewear to the VCRT for evaluation and/or resolution of the problem.

(14) Document and report all safety violations and noncompliances with PPE wear requirements to the safety officer or COR as appropriate.

(15) Reassign or terminate an employee when the employee will not wear required PPE.

h. Employees (military, civilian, and contract).

(1) Participate in the VCRP as it is outlined in this SOP.

(2) Properly use safe practices, safety equipment, PPE, engineering controls, and administrative controls as mandated by 29 CFR 1910.133 and local directives. Safe practices include--

(*a*) Understanding how to perform their work in a safe manner.

(*b*) Knowing the difference between industrial safety eyewear (ANSI Z87.1) and standard eyewear (ANSI Z80.1).

(*c*) Ensuring provided protective equipment is readily accessible for use with hazardous instruments, machines, processes, or areas.

(*d*) Keeping protective eyewear clean, properly fitted, and in serviceable condition.

Figure C–1 (PAGE 5). Sample local-level standing operating procedure or instruction for the Vision Conservation and Readiness Program—Continued

(e) Using appropriate industrial safety eyewear and protective equipment in eye-hazardous areas and tasks.

(3) Undergo training in the principles and practices of first responder if working in an eye-hazardous area.

(4) Report unsafe practices or eye hazards to the supervisor and/or safety specialist for timely protective intervention.

(5) Advise supervisor of need for safety eyewear or need for modification of processes or procedures.

i. Performance improvement. All levels of command should maintain an ongoing performance improvement program. As a minimum, the program should include the following:

(1) Evaluating user/participant input and implementing input determined to have merit.

(2) Reporting of eye injuries.

(3) Developing intervention plans based on injury trend analysis.

(4) Implementing intervention strategies.

(5) Monitoring the effectiveness of intervention strategies.

(6) Ensuring appropriate and timely pre-employment, periodic, and termination physicals are performed.

(7) Ensuring timely vision care services as applicable.

(8) Ensuring effective training is provided in the use and maintenance of protective devices and safety practices.

(9) Verifying the accuracy of prescription safety eyewear and optical inserts.

(10) Ensuring timely acquisition and delivery of safety eyewear to the worker.

(11) Monitoring safety eyewear use and compliance.

6. CONCURRENCE.

John Jones, COL, MC
(Installation Medical Authority)

Sally Smith
(Comptroller)

Bob Brown
(C. Civ Personnel)

Anne Anderson
(Post Safety Officer)

7. APPROVAL: (If applicable) or (Command Line - if applicable)

6

Figure C–1 (PAGE 6). Sample local-level standing operating procedure or instruction for the Vision Conservation and Readiness Program—Continued

Appendix D
Sample Local Regulation

D–1. Purpose of the regulation

Each installation shall have a local regulation or SOP that delineates the scope of the VCRP and identifies responsibilities.

D–2. Sample text for installation Vision Conservation and Readiness Teams

Figure D–1 is a sample regulation that is designed to guide the format of a local regulation and show examples of common responsibilities. Each installation will need to modify this sample to meet the local needs and staffing of the installation.

(INSTALLATION) REG FSR 40-000

COMMAND
PREPARING OFFICE/AGENCY
LOCATION

Issue of further supplements to this regulation by subordinate commanders is prohibited unless specifically approved by HQ, (Ft. Name and State) (installation).

1. PURPOSE. This regulation establishes and defines a comprehensive Vision Conservation and Readiness Program (VCRP) for (installation name).

2. SCOPE. This regulation applies to all personnel on this installation.

3. BACKGROUND. The ability to use one's vision effectively and with safety depends upon an efficient vision program that includes--

a. Determining visual acuity necessary for a particular occupation and using this determination for job placement and retention.

b. Determining periodically employees' visual capacity and making referrals for professional eye care of those employees with defective vision.

c. Ensuring that adequate lighting is available for each occupational activity.

d. Ensuring the availability and use of both environmental and personal protective measures necessary for maximal eye safety.

e. Continuing health education program pointing out the benefits of the VCRP and stimulating cooperation of all concerned.

f. Ensuring eye injuries and incidents are reported.

4. GENERAL.

a. Commanders at every echelon will ensure that each physical operation is analyzed to determine eye hazards. Standing operating procedures (SOPs) will reflect a requirement for the use of protective clothing and equipment including safety eyewear (prescription and nonprescription) to prevent injury. Continuous monitoring will be conducted to maintain maximum safety standards.

b. Items of protective clothing and equipment required to comply with safety regulations and procedures will be furnished to military and civilian personnel. The cost of required personal safety equipment will be borne by the installation or activity to which these personnel are assigned. If upgrades to basic safety eyewear are allowed, additional costs will be borne by the employee.

1

Figure D–1 (PAGE 1). Sample installation-level standing regulation for the Vision Conservation and Readiness Program

c. A desire to obtain and use eye protection and industrial safety eyewear will be stimulated among personnel by an educational program to include informal discussion, educational films, and the use of posters. Safety awards may be used to increase motivation. Nonuse of safety eyewear and safety precautions in eye-hazardous areas will be considered grounds for disciplinary action.

d. Contact lenses do not provide eye protection in the industrial sense and will not be worn in a hazardous environment without appropriate covering safety eyewear. Contact lens wear under military protective masks is not allowed since the lenses cannot be removed when prolonged wear of the mask is necessary.

e. All personnel having useful vision in only one eye will be identified and encouraged to wear industrial safety eyewear regardless of job assignment. It is pointed out that the protective lenses provided are still subject to breakage and unusual risk should not be taken.

5. RESPONSIBILITIES.

a. The installation Commander is responsible for the establishment and implementation of occupational health (OH) activities at (Ft. Name and State) and other activities for which the Commander has OH activity responsibilities.

b. The medical treatment facility (MTF) Commander, U.S. Army Medical Center (MEDCEN)/ medical department activity (MEDDAC), is charged with the overall supervision of OH activities at (Ft. Name and State) and other activities for which the MTF Commander, MEDCEN/MEDDAC, has OH activity responsibility.

c. The Vision Conservation and Readiness Team (VCRT) will--

(1) Classify all work activities under one of the vision standards developed for this purpose (see DA Pam 40-506). These standards represent the degree of visual skill desired for efficient job performance.

(2) Coordinate with the installation safety office in determining occupations requiring industrial safety spectacles.

(3) Ensure vision screening of new employees before job placement or as soon after employment as possible. Screen the vision of all personnel, as required. Periodic screening will be scheduled each month alphabetically; however, screening should be available at the request of an individual.

(4) Determine whether personnel screened meet the visual standards for their particular job.

(5) Ensure vision readiness screening for active duty military is conducted (soldier readiness processing (SRP)).

(6) Ensure that military personnel not possessing desired visual capabilities are referred to the appropriate MTF clinic for professional eye care.

Figure D–1 (PAGE 2). Sample installation-level standing regulation for the Vision Conservation and Readiness Program—Continued

(7) Refer eligible civilian employees not possessing desired visual capabilities for comprehensive vision examinations.

(8) Ensure complete prescription information is entered into employee medical record and that new eyewear is ordered as appropriate.

(9) Provide follow-up screening for referred employees as needed.

(10) Conduct lighting surveys as required.

(11) In conjunction with the Installation Safety Director, conduct surveys to ensure installation and use of proper eye safety equipment (for example, eyewash stations and safety eyewear).

(12) Provide education on various vision safety topics to military and civilian employees and, where appropriate, to dependents.

d. The Chief, Optometry Service will--

(1) Provide guidance to the VCRT on questions related to optics, safety eyewear, illumination, and vision subjects related to safety in the workplace.

(2) Ensure professional vision care is provided to active duty personnel.

(3) Assist units with their vision readiness screening programs. This may include--

(*a*) Having optometry staff perform actual screening.

(*b*) Training medical technicians that support individual units in proper vision screening techniques.

(4) Assist other members of the VCRT in performing illumination and safety characterization of the workplace.

(5) Assist the contracting office in determining the optical requirements, quality assurance requirements, and product delivery times to be specified in contracts for prescription safety eyewear.

e. The Chief, Preventive Medicine/OH will ensure--

(1) Vision screening is provided to installation civilian employees for the purpose of job placement and other surveillance or job-related needs as determined by regulations governing hazard exposure or as determined by the VCRT.

(2) Periodic vision screening, when required, is performed on military and civilian employees on the installation.

Figure D–1 (PAGE 3). Sample installation-level standing regulation for the Vision Conservation and Readiness Program—Continued

(3) An occupational health nurse (OHN) or technician is involved with characterization of the worksite and periodic evaluation of worksite vision safety conditions.

(4) Coordination with other members of the VCRT on vision safety and visual efficiency matters.

(5) Reporting of the total number of personnel screened and referred and the number of prescription safety eyewear issued as part of the occupational vision program on DA Form 3076 (Army Occupational Health Report) in accordance with AR 40-5 and other reports as required.

f. The OHN will--

(1) Have/be a representative on the VCRT.

(2) Perform all types of OH vision screenings as required.

(3) Be involved with characterization of the worksites and periodic evaluation of worksite vision safety conditions.

(4) Coordinate with other members of the VCRT on vision safety and visual efficiency matters.

g. The industrial hygienist will--

(1) Have/be a representative on the VCRT.

(2) Perform all types of OH vision screenings as required.

(3) Maintain and routinely update an inventory of eye-hazardous jobs and areas, in coordination with safety.

(4) Keep the VCRT updated on the vision hazards that are on the installation and field sites.

(5) Perform or assist in the performing of illumination measurements.

h. The Safety Office will--

(1) Assign a member of its staff to the VCRT where possible.

(2) Provide guidance to the VCRT on vision safety matters if a member of the safety staff is not on the VCRT.

(3) Coordinate with the VCRT, the procurement system and respective supervisors to ensure the proper type, quality, and quantity of safety eyewear are provided to employees in a timely manner.

(4) Monitor compliance with wear of vision safety equipment and use of safe practices. Provide posters and signs, make applicable recommendations, and use rewards when possible or disciplinary measures when necessary to promote safe work practices.

Figure D–1 (PAGE 4). Sample installation-level standing regulation for the Vision Conservation and Readiness Program—Continued

(5) Assist the VCRT in characterization surveys of the workplace and field sites in relation to vision hazards and vision demands in the work environment.

i. The Chief, Civilian Personnel, will--

(1) Refer new employees for vision screening prior to job placement.

(2) Coordinate scheduling of required periodic vision screenings with Preventive Medicine/OH.

(3) Ensure that eye safety compliance is included in job descriptions of new employees and in the revised job descriptions of incumbents.

(4) Coordinate with supervisors to enforce eye safety disciplinary actions.

j. Division and branch chiefs and other supervisors will--

(1) Coordinate scheduling of required periodic vision screenings with Preventive Medicine/OH.

(2) Submit prescription safety eyewear orders within 1 day of obtaining all necessary prescription information and coordinate with the VCRT and the procurement system to ensure the proper type and quality of safety eyewear are provided to employees in a timely manner.

(3) Enforce the wearing of safety eye protection and the use of proper safety procedures.

(4) Brief new personnel on safety devices for eye protection, to include how to use them, care for them, and clean them, and their importance in maintaining good vision.

(5) Ensure that individuals are not allowed in an eye hazardous area or job without proper eye protection. When workers do not have serviceable safety eyewear, provide temporary safety eye protection and, if necessary, temporarily place the worker in non-eye hazardous work.

(6) Acquire, post, and maintain signs and posters stressing eye safety.

(7) Direct personnel having difficulties or complaints with their safety eyewear or vision to the VCRT for assistance and/or vision screening. Safety eyewear that needs adjusting should be brought by the wearer to the installation eye clinic for proper fitting or repair.

(8) Document and communicate with the COR about any unsafe practice or noncompliance of eye safety of the contract workforce.

k. Logistics/Procurement System will--

(1) Maintain a supply of plano (nonprescription) safety eyewear in adequate sizes at the installation for immediate issue to

Figure D–1 (PAGE 5). Sample installation-level standing regulation for the Vision Conservation and Readiness Program—Continued

personnel who require safety eyewear but do not require prescription eyewear.

(2) Develop and maintain a method for the procurement of prescription safety eyewear that is user friendly and results in rapid receipt of the safety eyewear. Prescription safety eyewear will be obtained and issued to the distribution point within 15 working days of receiving the procurement order. Orders for prescription safety eyewear will not be held and "batched" but will be processed daily on a priority basis so as to expedite the process.

(3) Maintain a log or database of all orders for prescription safety eyewear that includes patient identification, unit or activity information, date procurement order received, date completed safety eyewear received from vendor, and date issued to distribution point.

(4) Monitor the procurement time for prescription safety eyewear and take necessary action, to include changing vendor(s), to maintain at least a 90 percent compliance rate with the 15 working day delivery time.

6. REFERENCES.

a. AR 40-5, Preventive Medicine.

b. 29 CFR 1910, Occupational Safety and Health Standards.

c. DA PAM 40-506, The Army Vision Conservation and Readiness Program.

The proponent of this local regulation is: (Occupational Safety and Health Office), (Ft. Name and State). .Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Commander, (major Army command), ATTN: (Name) (Occupational Safety and Health, . DSN Phone Number).

FOR THE COMMANDER:

DISTRIBUTION:

Figure D–1 (PAGE 6). Sample installation-level standing regulation for the Vision Conservation and Readiness Program—Continued

Appendix E
Light Amplification by Stimulated Emission of Radiation (Laser)

E–1. Laser

a. The word *laser* is an acronym for Light Amplification by Stimulated Emission of Radiation. A laser is a device that produces a beam of radiant energy that is monochromatic (of a single wavelength) and coherent (all of the electromagnetic wave is spatially in phase).

b. Depending on the design of the laser, radiation may occur in many different parts of the electromagnetic spectrum. Some lasers are tuneable, meaning the same device may produce several different wavelengths of emitted light.

E–2. Classification of lasers

Lasers are divided into classifications based on wavelength, output power, pulsed or continuous output, and exposure duration. The technical definitions are beyond the scope of this document but may be found in ANSI Z136.1 and ANSI Z136.3. For the purposes of this document, the classes of lasers are described from the standpoint of potential injury to the eye.

a. Class 1 lasers are considered eye-safe under the viewing conditions for which the laser was intended, because the output beam is considered to be incapable of causing radiation damage. They are exempt from control measures or forms of medical surveillance.

b. Class 2 lasers are low-power devices (< 1.0 milliwatt (mW)) that emit only visible radiation (400–700 nm). Because the duration of the normal blink reflex is 0.25 seconds and 1 mW is not injurious at that duration, class 2 lasers are considered to be eye-safe unless a person makes a deliberate attempt to look into the beam for a period longer than 0.25 seconds. Class 2a lasers are about the same as class 2 lasers, except the beam is not intended to be viewed.

c. Class 3 lasers are medium-power devices and are subdivided into two subclasses. Class 3 lasers usually do not present a combustion (fire) hazard.

(1) Class 3a lasers are generally not hazardous to vision when viewed directly but may be hazardous when collected and directed into the eye with a magnifying device such as binoculars.

(2) Class 3b lasers produce sufficient power to produce eye injuries when viewed directly or by specular reflection (reflected off a relatively smooth object).

d. Class 4 lasers are high-power devices. They are hazardous to the eyes when there is direct or specular reflection exposure. Some very high-power class 4 lasers can be hazardous even when the beam is reflected from diffuse surfaces. Some class 4 lasers can present a combustion hazard if used improperly.

Note. All fielded laser rangefinders and designators are class 3b or 4. None of the current devices is hazardous to the skin and do not pose a combustible hazard. All lasers, regardless of classification or risk, are potentially capable of causing eye injuries if used improperly. Most laser pointers used by lecturers are classified as 2 and 3a laser devices.

E–3. Classification of laser workers

a. Laser workers are those individuals who routinely work in a laser environment having class 3b and 4 lasers and therefore have a higher risk of accidental overexposure. Laser workers include those who regularly perform laser research, development, testing and evaluation (RDTE); individuals who work with or near medical lasers found in operating rooms; and workers who perform routine laser maintenance. **Laser workers have a moderate to high risk potential for laser injury.**

b. Incidental laser workers are those individuals whose work makes it possible, but unlikely, that they will be exposed to laser energy that is sufficient to damage the eye. Incidental workers include operators of fielded laser equipment, individuals who oversee laser use on approved laser ranges, and soldiers who participate in force-on-force laser-training exercises. **Incidental laser workers are considered to have low risk potential for laser injury.**

Note. Laser workers and incidental laser workers are essentially equivalent to laser personnel and incidental personnel as defined in ANSI Z136.1 and laser personnel and incidental health care personnel as defined in ANSI Z136.3.

E–4. Protective measures required

a. Laser workers are required to wear wavelength-specific laser protective goggles whenever a class 3b or 4 laser is in use. In addition, the optical density (OD) of the filtering lenses must be capable of reducing the power of the incident laser beam to a level safe to view. Refer to MIL–HDBK 828A to find the wavelength and optical density requirements for laser eye protection when using military laser equipment. In addition to PPE, laser work areas should

be set up in accordance with procedures outlined in ANSI Z136.1 unless the laser safety officer (LSO) establishes other criterion based on the specific laser and laser operation.

b. Incidental laser workers do not require laser protective goggles unless the LSO, the installation safety officer, or the installation VCRO deem it necessary.

Note. Filters and some materials used in laser protective equipment tend to darken and crack with time (long-term storage). They also may provide less protection after repeated exposure to laser emission. The LSO or a designated representative should inspect the equipment periodically for integrity of the protective devices and lenses as well as the ability to filter the laser radiation (ANSI Z136.1).

E–5. Laser medical surveillance/assessment

Medical assessments will be performed for individuals involved with lasers per ANSI Z136.1 and Z136.3.

a. Laser workers (laser personnel). If the worker's distance VA is 20/20 in each eye, color vision test is normal, central visual fields normal via Amsler grid test or similar macular integrity test, and medical history is normal for the eyes, no further examination is required. Any deviation from the acceptable normals will be evaluated to determine the reason. This may be done by ocular funduscopic examination or other tests as deemed appropriate by the eye care professional.

b. Incidental laser personnel (incidental health care personnel). Visual acuity testing will be conducted during the pre-employment physical.

c. Suspected or confirmed laser accident or incident. Documentation of the injury will include a history of the event and a thorough vision and ocular examination. The examination is required to include ocular history, distance VA, Amsler grid (or similar central visual field) test, slit lamp examination, ocular fundus evaluation through dilated pupil, ocular fundus photographs that depict the extent of injury or lack of injury, and photographs of any external or anterior segment injury. If ophthalmic photographic capabilities are not available, then a detailed representation of the finding may be hand-drawn or the patient will be referred to the nearest MTF (or authorized local civilian provider) that has such capabilities.

E–6. Emergency care for laser injury

Exposure to laser radiation may occur in almost any portion of the electromagnetic spectrum. Suspected or actual acute exposure to lasers will follow the procedure below.

a. Any soldier or DOD employee who is known or suspected of having been overexposed to laser radiation, must be examined by an optometrist or ophthalmologist at the nearest MTF within 24 hours of being injured (immediate examination). If a military eye care professional or MTF is not reasonably available then a civilian source may be used. See paragraph E–5*c* for required examination items.

b. Individuals with confirmed exposure will be examined by a retinal specialist.

E–7. Reporting

a. Once the optometrist or ophthalmologist suspects or confirms an acute laser overexposure incident, he/she will notify—

(1) The division/installation LSO.

(2) The division/installation radiation protection officer (RPO).

(3) The Tri-Service Laser Incident Hotline (DSN 240–4784 or commercial 210–536–4784 or 1–800–473–3549) (e-mail: laser.safety@hedo.brooks.af.mil).

(4) The USACHPPM Laser/Optical Radiation Program (DSN 584–3932/2331 or commercial 410–436–3932/2331 or 1–800–222–9698) (e-mail: laserincident@amedd.army.mil).

(5) The USACHPPM Tri-Service Vision Conservation and Readiness Program (TVCRP) Manager (DSN 584–2714 or commercial 410–436–2714) (e-mail: laserincident@amedd.army.mil). After normal duty hours, contact the USACHPPM personnel via the staff duty officer (DSN 584–4375 or commercial 410–436–4375 or 1–800–222–9698).

b. Information to be reported will include—

(1) Patient name, grade, and SSN.

(2) Unit name.

(3) Hospital providing care and registration number.

(4) Exposure date and source.

(5) Duty being performed at the time of the incident.

(6) Summary of symptoms and evaluation.

(7) Any followup information.

c. The installation RPO, with the help of the safety office, will secure the laser in question. (**Do not send the laser equipment to maintenance for repairs.**) The USACHPPM Laser/Optical Radiation Program will initiate a technical evaluation of the incident and of the laser equipment involved and will render a technical report as soon as possible after the incident. The U.S. Army Medical Research Detachment of the Walter Reed Army Institute of Research (USAMRD–WRAIR) Ocular Hazards Division, in cooperation with the USACHPPM TVCRP, will coordinate the

initial and followup care of the patient and will render a report on the patient's status and prognosis. The USAMRD–WRAIR Ocular Hazards Division maintains the Laser Accident and Incident Registrar and will forward copies of the reports to the USACHPPM TVCRP Manager.

Appendix F
Selected Areas and Potentially Eye-Hazardous Substances

F–1. Workplace chemical hazards
Chemical agents in the workplace can be harmful to ocular tissue.

F–2. Potential sources
Table F–1 is a selected list of areas and chemicals found in the workplace that are potentially harmful to the eyes.

Table F–1
Selected areas and potential eye-hazardous substances

Shop/Area	Substance	Form	Action/Effect
Roads and grounds	Acridine	V	Conjunctivitis Corneal damage
	Calcium cyanamide	D	Eye irritant
	Calcium oxide	D	Eye irritant
	Carbon disulfide	V/L	Eye irritant Optic nerve damage
	Cobalt & compounds	D	Corneal irritant
	Cresol	V/L	Eye irritant
	Ethylene dibromide	V/L	Eye irritant
	Ethylene dichloride	V/L	Eye irritant
	Fluorine & compounds	G/F/M/V	Eye irritant
	Furfural	V/L	Eye irritant
	Selenium & compounds	D/V/L	Eye irritant Conjunctivitis Palpebral edema
Metal	Ammonia	D/V/L	Blepharospasms Corneal ulcers Blindness
	Fluorine & compounds	G/F/M/L	Eye irritant
	Phosphorus & compounds	D	Eye irritant
	Sulfur dioxide	V	Eye irritant
	Trichloroethylene	V/L	Eye irritant
	Zinc & compounds	F/D/L	Eye irritant
Entomology	Ammonia	G	Blepharospasms Palpebral edema Corneal ulcers Blindness
	Cresol	V/L	Eye irritant
	Ethylene dibromide	V/L	Eye irritant
	Ethylene dichloride	V/L	Eye irritant
	Ethylene oxide	L/G	Eye irritant
	Fluorine & compounds	G/F/M/V	Eye irritant
	Methylene chloride	L/V	Eye irritant

Table F–1
Selected areas and potential eye-hazardous substances—Continued

	Mercury	V	Loss of vision
	Naphtha	L/V	Eye irritant
	Phosphorus & compounds	D	Eye irritant
	Toluene	V	Eye irritant
	Xylene	V	Eye irritant
	Zinc & compounds	F/D/V	Eye irritant
Refrigeration	Ammonia	G	Blepharospasms Palpebral edema Corneal ulcers Blindness
	Bromine & compounds	V/G	Eye irritant
	Ethyl chloride	L/G	Eye irritant
	Methylene chloride	L/V	Eye irritant
	Sulfur dioxide	V	Eye irritant
Paint	Acetone	L/V	Eye irritant
	Ammonia	G	Blepharospasms Palpebral edema Corneal ulcers Blindness
	Arsenic	D/F	Conjunctivitis
	Benzene	L/V	Eye irritant
	Carbon disulfide	L/V	Eye irritant Optic nerve damage
	Diacetone alcohol	V	Eye irritant
	Methyl alcohol	L/V	Eye irritant Central field loss Blurred vision Blindness
	Mercury	V	Loss of vision
	Naphtha	L/V	Eye irritant
	Toluene	V	Eye irritant
	Trichloroethylene	L/V	Eye irritant
	Turpentine	L/V	Eye irritant
	Xylene	V	Eye irritant
	Zinc & compounds	F/D/V	Eye irritant
Hospital	Acetone	L/V	Eye irritant
	Benzene	L/V	Eye irritant
	Dioxane	L/V	Eye irritant
	Ethyl alcohol	V	Eye irritant
	Formaldehyde	G	Eye irritant
	Hydrogen peroxide	L/M	Damage to eye
	Toluene	V	Eye irritant
	Xylene	V	Eye irritant
Printing plant	Acetone	L/V	Eye irritant
	Benzene	L/V	Eye irritant

Table F–1
Selected areas and potential eye-hazardous substances—Continued

	Methyl alcohol	L/V	Eye irritant Central field loss Blurred vision Blindness
	Trichloroethylene	L/V	Eye irritant
	Zinc & compounds	V/F/D	Eye irritant
Sewage Treatment	Chloride of lime	D	Conjunctivitis Blepharitis Corneal ulcer
	Chlorine	L/G	Eye irritant
	Hydrogen sulfide	G	Eye irritant
Water Plant	Chloride of lime	D	Conjunctivitis Blepharitis Corneal ulcer
	Chlorine	L/G	Eye irritant
	Fluorine & compounds	G/F/V/M	Eye irritant
	Hydrazine	L/V	Eye irritant Chemical burning
	Ozone	G	Eye irritant
	Phosphorus & compounds	D	Eye irritant
Petroleum, oils, and lubricants	Dimethylhydrazine	L/V	Eye irritant
	Ethylene dibromide	L/V	Eye irritant
	Ethylene dichloride	L/V	Eye irritant
	Fluorine & compounds	G/F/V/M	Eye irritant
	Gasoline	L/V	Eye irritant
	Hydrogen peroxide	M/G	Eye irritant
	Kerosene	L/V	Eye irritant
	Methyl alcohol	L/V	Eye irritant Central field loss Blurred vision Blindness
	Xylene	V	Eye irritant
Battery	Hydrogen chloride	G/M	Eye irritant
	Sulfuric acid	L/V	Eye irritant Progressive damage

Legend for Table F-1:
V—vapor; L—liquid; M—mist; D—dust; F—fume; G—gas

Appendix G
Emergency Eyewash and Shower Specifications

G–1. Source of requirements
Requirements for eyewash stations are detailed in ANSI 358.1 (1998), Emergency Eyewash and Shower Equipment.

G–2. Specifications for standards and equipment
Table G–1 following summarizes emergency eyewash and shower standards and equipment.

Table G–1
ANSI requirements for eyewash stations

Device	Flow rate	Duration	Functional testing	Inspection frequency
Primary devices:				
Eye/face wash units, plumbed	3.0 gpm*	Continuous (15 min minimum)	Per manufacturers instructions but at least weekly.	Annually to verify ANSI Z358.1, section 7 compliance.
Eyewash, plumbed	0.4 gpm* steady flow rate	Continuous (15 min minimum)	Per manufacturers instructions but at least weekly.	Annually to verify ANSI Z358.1, section 5 compliance.
Eyewash, self-contained	0.4 gpm* initially and after 12.5 min of use.	15 min minimum	Per manufacturers instructions.	Annually to verify ANSI Z358.1, section 5 compliance.
Supplemental devices (These devices do not replace eye/face or eyewash units):				
Personal eyewash unit	No rate requirement.	None	None	Per manufacturer instruction.
Drench hose	3.0 gpm*	15 min	Per manufacturers instructions but at least weekly.	Annually to verify ANSI Z358.1, section 8 compliance.

Other major requirements:
Water used in units must be potable and flow to both eyes simultaneously.
The nozzles must be protected from airborne contaminants.
Plumbed units must be attached to a line providing 30 pounds per square inch water pressure at a temperature appropriate to the hazard and environment.
Units must require no more than 10 seconds to reach and must be immediately adjacent to the hazard in the case of strong acids or caustics.
The valve must be able to be activated within 1 second and remain on without further use of the hands.
The unit will be well-marked, easily accessible, pose no hazard to the user, and be at a specified height and distance from obstructions.
NOTE: Obtain a copy of the standard for testing requirements and equipment, installation detail, and other information outside the scope of this summary.

Notes:
* gpm—gallons per minute

Appendix H
Welding

H–1. Primary types of welding

a. Oxy-Acetylene welding/cutting. A mixture of acetylene and oxygen gases is used primarily for cutting metal but may also be used for welding of limited-stress joints on a variety of metals.

b. Arc welding (shield metal arc welding). An electrical arc is produced that deposits metal from an appropriate rod to the metals to be joined. The intensity of illumination and heat produced by the arc varies with the rod material, the materials being joined, and the amperage applied to the rod.

c. Gas metal arc welding. Also known as metal inert gas (MIG) welding, gas metal arc welding combines a wire electrode feeding through a hand piece that also directs an inert gas on the weld line. This minimizes corrosion at the weld.

d. Gas tungsten arc welding. Also known as tungsten inert gas (TIG) or Heli-arc welding, gas tungsten arc welding uses a process similar to MIG welding but is much cleaner in both the work environment and weld.

H–2. Protective equipment for the eyes

a. Goggles. Goggles are primarily worn for gas welding, brazing, and cutting.

b. Helmet. A helmet is primarily worn for arc welding because the helmet provides both radiation protection for the eyes and mechanical protection for the face. A helmet also provides secondary mechanical protection for the eyes, but industrial safety eyewear is still required to be worn under the helmet. For occasional welding, a fixed tint, simple helmet is adequate and relatively inexpensive. For heavy use, some helmets are equipped with a photosensing lens that darkens the lens when the arc is struck (expensive but often worth the cost for increased production efficiency). Select the helmet based on use patterns versus cost.

H–3. Suggested lens tints for various welding operations

Darker lens tints are used for heavier (thicker) work (ANSI Z87.1), as follows.

a. Oxy-Acetylene.

(1) Brazing—Shades 3 to 4.

(2) Cutting—Shades 3 to 6.

(3) Welding—Shades 4 to 8.

b. Arc, Rod, MIG, and TIG: Shades 10 to 14.

Glossary

Section I
Abbreviations

AIDS
Acquired Immune Deficiency Syndrome

AMEDDC&S
Army Medical Department Center and School

ANSI
American National Standards Institute

AR
Army regulation

ARNGUS
Army National Guard of the United States

ASG
area support group

ASTM
American Society for Testing and Materials

BLPS
Ballistic Laser Protective Spectacles

CFR
Code of Federal Regulations

COR
contracting officer's representative

CPO
Civilian Personnel Office

DA
Department of the Army

DA Pam
Department of the Army pamphlet

DOD
Department of Defense

DODI
Department of Defense instruction

DOHRS
Defense Occupational Health Readiness System

DVIS
Defense Vision Information Services

DVS
Defense Vision Services

EIRS
Eye Injury Reporting System

EMI
electromagnetic interference

fc
foot-candle

FHP
Force Health Protection

FPI
Functional Process Improvement

HD
high intensity discharge

HHI
health hazard inventory

HHIM
Health Hazard Inventory Module

HIV
Human Immunodeficiency Virus

HPS
high pressure sodium

Hz
hertz

IES
Illuminating Engineering Society

IH
industrial hygiene (hygienist)

IM/IT
Information Management/Information Technology

IMA
Installation Medical Authority

IR
infrared

ISA
interservice support agreement

laser
Light Amplification by Stimulated Emission of Radiation

LSO
laser safety officer

MEDCEN
U.S. Army Medical Center

MEDCOM
U.S. Army Medical Command

MEDDAC
medical department activity

MEPS
Military Eye Protection System

MHS
Military Health System

MIG
metal inert gas

mm
millimeter

MOS
military occupational specialty

mph
miles per hour

MRSP
Military Readiness Strategic Plan

ms
microsecond

MTF
military treatment facility

mW
milliwatt

Ni-Cad
nickel-cadmium

nm
nanometer (10^{-9} meters)

NVD
night vision device

NVG
night vision goggle

OD
optical density

ODS
Operation Desert Shield; Operation Desert Storm

OH
occupational health

OHC
Occupational Health Clinic

OHN
Occupational Health Nurse

OPM
Office of Personnel Management

OSHA
Occupational Safety and Health Administration; Occupational Safety and Health Act

OV
occupational vision

OVP
Occupational Vision Program

PA
Physicians' Assistant

PL
public law

PMI
protective mask insert

PPE
personal protective equipment

PROFIS
Professional Filler System

psi
pounds per square inch

RDTE
research, development, testing, and evaluation

RF
radio frequency

RFR
radio frequency radiation

RPO
radiation protection officer

SAV
staff assistance visit

SOP
standing operating procedure

SP
strategic plan

SPECS
Special Protective Eyewear Cylindrical System

SRP
Soldier Readiness Program/Processing

SRTS
Spectacle Request Transmission System

SWD
sun/wind/dust

TB MED
U.S. Army Technical Bulletin—Medical

TIG
tungsten inert gas

TVCRO
Tri-Service Vision Conservation and Readiness Office (at USACHPPM)

TVCRP
Tri-Service Vision Conservation and Readiness Program (at USACHPPM)

TVCRS
Tri-Service Vision Conservation and Readiness Staff (at USACHPPM)

USACHPPM
U.S. Army Center for Health Promotion and Preventive Medicine

USACHPPM–EUR
U.S. Army Center for Health Promotion and Preventive Medicine—Europe

USACHPPM–Main
U.S. Army Center for Health Promotion and Preventive Medicine

USAMRD
U.S. Army Medical Research Detachment

USAR
United States Army Reserve

USAREUR
U.S. Army Europe

UV
Ultraviolet

VA
visual acuity

VCC
vision conservation coordinator

VCRC
Vision Conservation and Readiness Course

VCRO
vision conservation and readiness officer (at installation level)

VCRP
Vision Conservation and Readiness Program (at installation level)

VCRT
Vision Conservation and Readiness Team (at installation level)

VDT
video display terminal

VISOR
Vision and Optical Readiness

VOE
vision, optical, and eye health

W
watt (amp X voltage)

WRAIR
Walter Reed Army Institute of Research

Section II
Terms

Accommodation
The ability of the eye to clearly focus on objects at various distances by changing power. The power change is due to changes in muscular tension that reshapes the crystalline lens inside the eye.

Ambient
As applied to lighting, the general illumination in an area.

Amblyopia
A reduced visual acuity that is not correctable by refractive means and is not attributable to obvious pathology. Amblyopia generally occurs in only one eye but has been known to occur bilaterally. It often occurs in conjunction with strabismus. This term is synonymous with "lazy eye."

Cataract
Partial or complete loss of transparency of the crystalline lens (and/or its capsule) of the eye.

Characterize
The process of evaluating the nature of the worker (to include warfighters), work place (to include field environment), and work activities (to include military operations) in relation to safety and environmental factors that may or may not adversely affect worker safety and/or efficiency.

Comprehensive Vision Examination
Evaluation of the visual system, which permits diagnosis and treatment of vision disorders, ocular pathology, and related systemic conditions. A refraction is one part of a comprehensive vision examination.

Contract Vision Care
When an optometrist or ophthalmologist provides comprehensive vision care services through a contract-for-services arrangement. The vision care may be for comprehensive vision examinations and/or treatment of ocular injury. These providers are not active duty or civilian employees of the Federal Government. They do not have the decision authority on any provisions of the VCRP.

Contrast
The manifestation or perception of a difference between two objects or between an object and its background.

Convergence
The turning inward of the eyes to view an object nearer than 20 feet.

Diopter
A unit of measurement of lens power. It is equal to the reciprocal of the focal length of the optical device or system measured in meters. Also see prism diopter.

Employee
Any person employed or otherwise permitted or required to work by an Army command including civilian, contract, and military personnel.

Ergonomics
Evaluation and design of workplaces, environments, jobs, tasks, equipment, and processes in relationship to human form capabilities and interactions in the workplace.

Eye care professional
An optometrist or ophthalmologist.

Foot-candle
The illumination on a surface 1 square foot in area in which there is a uniformly distributed flux of 1 lumen.

Glare
Relatively harsh bright light within the field of vision that interferes with vision and causes discomfort, annoyance, or eye fatigue.

Health Care Provider
An individual credentialed through the MTF to provide definitive patient care with minimal or no direct supervision. The individual is independently licensed by a State licensing authority.

Illuminance
The density of luminous flux impinging upon a surface (that is, the amount of light falling upon a surface).

Illumination
The process by which light is made to be incident on a surface. Units of illumination are foot-candle and lux.

Impact-resistant lenses
a. Industrial safety—spectacle lenses meeting the impact standards of the Z87.1 Standard of the American National Standards Institute (ANSI).
b. Dress safety—spectacle lenses meeting the impact standards of the Z80.1 Standard of the American National Standards Institute. Formerly, dress safety spectacles met the construction standards of the Food and Drug Administration (FDA), 21 CFR 801.410, Use of Impact-Resistant Lenses in Eyeglasses and Sunglasses.

Industrial safety spectacles
Spectacles meeting the ANSI Z87.1 construction standards for frames and lenses and adopted by the Occupational Safety and Health Administration (OSHA), 29 CFR 1910.133.

Installation Medical Authority (IMA)
The officer with the ultimate responsibility for health care on an installation. In most instances the IMA will be the MTF Commander at fixed installations and the division surgeon in field units.

Ionizing radiation
Radiation that produces ions in compounds and elements, especially when radioactive emissions result.

Light
Visually evaluated radiant energy. That portion of the electromagnetic spectrum capable of giving rise to the sensation of vision.

Local National
Citizen of a host country hired by the U.S. Government.

Lumen
The unit of luminous flux (emitted light).

Luminaires
Light fixtures and other devices providing illumination to an area.

Luminance
The flow of light from an emitting, transilluminated, or reflecting surface (that is, the amount of light given off by a surface).

Luminous flux
The time rate of flow of light, usually designated in lumens.

Lux
The metric equivalent of foot-candles, equal to 1 lumen per square meter.

Military Treatment Facility (MTF)
Any medical care facility operated by the military medical system from major medical centers to aid stations.

Nonionizing radiation
Radiation that does not produce ionization of compounds or elements (see ionizing radiation).

Ocular and/or visual condition
Any condition that prevents visual function within the normally expected capabilities for the work in which the employee is engaged. The condition may be refractive, muscle coordination/control, or pathologic in nature.

Optical density (OD)
A logarithmic expression for the attenuation produced by a medium, such as an eye protection filter.

Periodic
Recurring at intervals such as once a year, once every 2 years, once every 3 years, and so forth.

Plano or nonprescription eyewear
Eyewear that contains plano or nonprescription lenses.

Plano or nonprescription lenses
Ophthalmic lenses that contain zero or no dioptric power.

Prescription eyewear
Eyewear that contains prescription lenses.

Prescription lenses
Ophthalmic lenses that contain dioptric power other than zero. Such lenses are used to place the visual image on the retina of the eye to improve vision.

Prism diopter
The unit used to measure the deviation of the eye from the standard position of rest at a given distance. Each unit is the amount of power causing an image to be displaced one centimeter at one meter distance.

Professional ocular services
Services requiring unique knowledge/expertise normally found among opticians, ocular technicians, ophthalmic technicians, optometry technicians, optometrists, or ophthalmologists.

Readiness
As related to vision, the employee has the visual performance, ocular health, and optical devices necessary to perform his/her mission in a safe and effective manner in garrison and deployed settings.

Refraction
The process of determining the refractive state (eyewear prescription) of the eye. A refraction is one part of a comprehensive vision examination.

Screening
A limited evaluation or limited examination. Also see vision screening.

Strabismus
The ocular condition where coordinated, binocular viewing of images does not occur even in the presence of strong fusional stimulus. Strabismus is usually accompanied by amblyopia.

Visibility
The state or degree of being visible. Many factors influence the state of visibility, but the following six are the most important:

a. Size. Angular size or visual angle subtended at the eye by an object.
b. Brightness. The quality and amount of light reflected, transmitted, or emitted from a surface.
c. Contrast. The ability to differentiate between an object and its surround in visual space.
d. Time. The time required for perception of details in visual work.
e. Color. Visibility based on color of light reflected from an object.
f. Movement. The speed at which an object moves relative to the eye.

Vision
The ability of the eye to focus light rays on the receptors within the eye, the ability of the visual nerve pathway to transmit impulses to the area of the brain that processes visual stimuli, and the ability of the brain to integrate and interpret those impulses.

Vision conservation coordinator (VCC)
An individual, normally in the Occupational or Preventive Medicine program, who is given the responsibility of coordinating the Vision Conservation Program on an installation in the absence of a vision conservation and readiness officer (VCRO). This individual has attended (or is scheduled to attend the next offering of) the Vision Conservation and Readiness Course and is familiar with the DOD Vision Conservation and Readiness Program.

Vision conservation and readiness officer (VCRO)
An optometrist, ophthalmologist, or other physician who has demonstrated expertise in vision and ocular care, who has completed the Vision Conservation and Readiness Course (or is scheduled to attend the next offering), and has been appointed as the installation VCRO by appropriate authority. The individual serves as a local authority and point of contact for visual safety/performance matters.

Vision Conservation and Readiness Program (VCRP)
The organized program designed to prevent eye injuries, to promote visual efficiency, and monitor vision readiness in DOD employees. Implementation is at the DOD, Service, major Army command, installation, and/or subordinate site level.

Vision Conservation and Readiness Team (VCRT)
The Vision Conservation and Readiness Team normally includes the VCRO or VCC, safety officer, OHN, IH, and other individuals as deemed necessary on a given facility.

Vision examination
This term is synonymous with eye exam. See Comprehensive vision examination.

Vision screening
A limited evaluation to determine current vision readiness status and need for professional ocular services.

Visual acuity
Acuteness or clearness of vision (especially of form vision) that is dependent on the sharpness of the retinal focus, the sensitivity of the nerve elements, and the interpretative faculty of the brain. Clinically, it is usually measured with a Snellen chart in terms of the Snellen fraction (for example, 20/20 and 20/40).

Section III
Special Abbreviations and Terms
This section contains no entries.

Index

This index is organized alphabetically by topic and by subtopic within a topic. Topics and subtopics are identified by paragraph number.

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