

TECHNICAL BULLETIN

**OCCUPATIONAL AND ENVIRONMENTAL HEALTH
OCCUPATIONAL VISION**

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OCCUPATIONAL AND ENVIRONMENTAL HEALTH

OCCUPATIONAL VISION

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CHAPTER 1

GENERAL

1-1. Purpose. *a.* This Technical Bulletin Medical (TB MED) provides guidance to all Department of Army (DA) personnel concerned with the implementation, operation and enforcement of the occupational vision program which includes vision screening and industrial eye protection. The relationship between visual performance of employees and their productivity, efficiency and freedom from accidents has been demonstrated repeatedly. An effective occupational vision protection program in the work environment enhances the reduction of ocular injuries, thus allowing for an overall reduction of disabling injuries and lost time. Commanders should be familiar with the benefits of an effective occupational vision program as it relates to job performance, the reduction of accidents, increased productivity, lowered waste and the improved general well-being of the employee.

b. In accordance with Executive Order 12196, 29 CFR 1960, 29 CFR 1910 and AR 40-5, the recommendations and guidance contained herein are consistent with professional standards in the field of occupational health.

Note: The words "he," "his," and "him" as used in this bulletin are intended to include both masculine and feminine genders.

1-2. Scope. This TB MED contains information on vision and occupational eye protection that is applicable to all DA and DLA (military and civilian) personnel. In addition, this document provides guidance for health care personnel, safety managers, and other individuals employed by DA concerned with implementing an effective occupational vision program.

1-3. General facts. *a.* Vision is defined as the faculty of sight, the ability to see. Vision, usually referred to as visual acuity, can be scaled from good to poor. It is the ability of the eye to focus light rays on the proper receptors, the ability of the visual pathway to transmit impulses to the brain's seeing center, and the ability of the brain to integrate the impulses. Two-thirds of this transmission process cannot be altered or controlled, but the remaining one-third can be altered by means of lenses or other forms of vision therapy.

b. Visual performance is closely related to the success of an individual on the job, is important for quality and quantity of production, and enhances overall efficiency.

c. Visual ability is a complex process that involves the relationship of physiological, physical and psychological factors. These three basic elements are intimately interlocked and shall be considered when comparing vision and job performance.

(1) Physiological factors depend upon adequate function of the visual sensory processes and include refraction, accommodation, convergence, photochemical mechanism of the retina, sensitivity of the cellular makeup of the retina, and the integrity of the visual neural pathways.

(2) Physical factors are the characteristics of the visual task and the environment in which an object is viewed. These include the visibility factors of size, brightness, contrast, time, and color.

(3) Psychological factors are generally in the area of perception. Perception is a process comparable with discrimination, differentiation, and observation, and depends upon awareness of one's self and one's world.

d. The effects of age can have a marked influence upon an individual's visual ability. This generally becomes noticeable around 40-45 years of age. The greatest influence is the increased density of the crystalline lens and its diminished flexibility. This increased density of the lens requires greater brightness and contrast to perform at the same visual efficiency as at age 20. In addition, there is a decreased resistance to glare and ability to detect peripheral movement.

1-4. References. A listing of references is contained in appendix A.

1-5. Definitions. The definitions in appendix B are provided as guidance to personnel who may not be familiar with ophthalmic terminology, but are responsible for effective implementation of the occupational vision program. Additional definitions of ophthalmic terms are in American National Standards Institute (ANSI) Standard Z87.1-1979.

CHAPTER 2

OCCUPATIONAL VISION PROGRAM

2-1. Essential elements of an occupational vision program. The essential elements that shall be followed to insure an effective occupational vision program are:

a. Determination of degree of eye hazard for each job or work area.

b. Analysis of job classes to determine the required visual skills (visual acuity, depth perception, muscle balance, and color perception) necessary for optimal job performance.

c. Development of a local guide listing vision standards and eye-protection requirements for each job title.

d. Vision screening to determine whether workers possess the visual skills indicated by the job analysis include:

(1) Replacement and annual job-related, vision screening examinations of personnel employed in occupations with laser, microwave, or high intensity light hazards (identified as the *Required Category*).

(2) Preplacement and biennial vision screening for workers in all other potentially eye hazardous occupations (identified as the *Required Category*).

(3) Elective periodic vision screening for employees in noneye-hazardous occupations may be provided, resources permitting, not more frequently than triennially (identified as the *Voluntary Category*).

e. Referral of employees not possessing the desired visual skills for a complete professional clinical vision evaluation and recommended therapy. Military personnel shall obtain the examination at appropriate medical treatment facilities (MTF). Civilian employees in the required category, who require a prescription change (as determined by vision screening) or have not previously worn prescription glasses, shall be provided this service at Government expense, either at the appropriate MTF or through reimbursement (AR 40-3 and AR 40-5). Those civilian employees in the voluntary category shall obtain such examinations at their own expense as shall civilian employees in

the required category who do not meet the criteria for examinations at Government expense.

f. Supervision of eye protection (industrial safety eyewear) and eye hygiene by an occupational optometrist or physician, safety personnel, and by supervisors.

g. First aid and immediate care, plus followup care, of occupational eye injury and disease.

h. Worker health education with respect to proper eye protection and the benefits of an occupational vision program. Worker education should be developed by a multidisciplinary team to include supervisors, the occupational health nurse, occupational health physician, occupational optometrist, industrial hygienist, safety personnel, and other concerned disciplines.

i. Periodic surveys of work areas to:

(1) Promote adequate illumination by the occupational optometrist, industrial hygienist and safety manager.

(2) Evaluate other aspects of the work environment to insure safe, comfortable and efficient visual performance.

j. Review of contact lens usage. Contact lenses, of themselves, do not provide eye protection in the industrial sense and shall not be worn in a hazardous environment without appropriate covering protective eyewear.

2-2. Management of an occupational vision program. An efficient occupational vision program requires that effective administrative and management procedures be established at the installation level. Each installation shall have a local standing operating procedure (SOP) or local regulation to establish the scope of the occupational vision program and identify responsibilities (app C). SOP or regulations shall be reviewed periodically and appropriate revisions made to reflect any changes in the goals and scope of the program. The administrative procedure shall be as simple as possible to allow for effective operation and the free exchange of information among the key organizational elements involved. The following organi-

zational elements have direct impact into the administrative phases:

a. Civilian Personnel Office (CPO).

(1) Prepares the job-title list (app D) not to include the vision standard and eye protection columns.

(2) Utilizes the job-vision standards as an aid to employee placement on the installation.

(3) Schedules civilian personnel for periodic vision screening in coordination with supervisors and the MTF.

(4) Insures that all new employees have baseline vision assessments.

b. US Army Medical Center (MEDCEN)/US Army Medical Department Activity (MEDDAC) (Preventive Medicine Activity (PVNTMED) Actv), Occupational Health Service (OHS), Occupational Optometry).

(1) Performs, with assistance from the Safety Office, surveys to identify eye-hazardous occupations and processes that involve environmental hazards such as chemicals, radiation, fumes, dusts, vapors, or mists.

(2) Maintains a complete inventory of all work areas and eye hazards at the installation utilizing a job-title list (app D). The supporting occupational optometrist analyzes each job to determine the desired visual skills (para 2-1b) and classifies all jobs under one of six vision standards (para 3-2a). These standards represent the degree of visual skill desired for efficient job performance. For those installations without occupational optometry support to accomplish the inventory and other details, the assistance of occupational vision specialists is available upon request. Requests should be submitted to Commander, US Army Health Services Command, ATTN: HSPA-P, Fort Sam Houston, TX 78234.

(3) Coordinates the vision screening of all employees as directed in paragraph 2-1d and records of findings on the appropriate test record card (app E).

(4) Insures that personnel screened meet the visual standards for their particular job. A special set of transparent overlays can be used to process the test record card (app E). Variation from the standards may sometimes be professionally determined by the occupational optometrist or physician.

(5) Insures that civilian and military personnel not possessing the required visual skills are referred for a complete eye examination (see para 2-1e).

(6) Insures that verification of prescription

and proper fitting of industrial safety glasses are accomplished.

(7) Insures that record of vision test and prescriptions are kept in the employees' medical records.

(8) Reports the total number of employees screened and referred, the number of personnel employed in eye-hazardous areas, number of eye injuries, and the number of industrial safety spectacles issued as part of the occupational vision program in the Army Occupational Health Report, DA Form 3076 (AR 40-5).

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

c. Safety office.

(1) Conducts, with the assistance of medical and industrial hygiene personnel, surveys to identify eye-hazardous jobs and processes involving physical hazards such as flying objects or high pressure air. This information shall be incorporated in the job-title list developed by the Civilian Personnel Office and in the inventory of eye hazards maintained by the MEDCEN/MEDDAC PVNTMED Actv (app D).

(2) Validates the need for and identifies employees who require industrial safety spectacles. This validation will be used by the OHS and the eye practitioners to determine which employees are eligible for complete eye examinations.

(3) Assists OHS, occupational optometrist, and supervisory personnel in determining the correct type of protective eyewear required for an employee exposed to eye hazards.

(4) Monitors the eye protection part of the program and makes recommendations for program improvement when necessary.

(5) Motivates the supervisors, in coordination with occupational health personnel, so they shall require employees to wear protective eyewear.

(6) Monitors the industrial safety spectacle procurement program. Insures that the spectacles are ordered and delivered in a timely manner and are of high quality.

(7) Monitors the posting and maintenance of signs and posters stressing eye safety.

d. Purchasing and contracting office. Negotiates contracts for the purchase of prescription and non-stock listed plano industrial safety eyewear and for spectacle maintenance service when necessary. This office should:

(1) Consult with appropriate occupational specialists when formulating the optical contract.

(2) Insure that eyewear is procured and

delivered to the user in a timely manner (2 to 3 weeks).

e. Branch/division chiefs and other supervisors.

(1) Coordinate the scheduling of employees for vision screening with the CPO and OHS.

(2) Follow the installation's SOP for submitting purchase requests for industrial safety glasses to the Purchasing and Contracting Office.

(3) Insure employees are not placed in eye-hazardous jobs without proper protection.

(4) Obtain and keep a stock of plano protective eyewear for use by visitors and employees not routinely requiring prescription eyewear.

(5) Direct all personnel having difficulties or complaints from use of industrial safety glasses to the OHS or the Optometry Clinic.

(6) Enforce the wearing of safety eye protection and safety discipline per CPR 700 (change 14), 751.A.

(7) Insure that all personnel follow proper work practices, use protective equipment and engineering control measures, and receive proper instruction and training when indicated.

f. Installation Property Office.

(1) Maintain a stock of plano protective eyewear for distribution to the various division property officers.

(2) Expedite the procurement and delivery of all safety eyewear (new and repaired) from optical manufacturers.

g. Commanders.

(1) Establish and implement safety and health procedures as mandated by DODI 6055.1, AR 40-5, Executive Order 12196, and 29 CFR 1960.

(2) Insure that all civilian and military personnel will be given time to undergo medical surveillance for occupational exposure to potential hazards; i.e., vision screening.

(3) Authorize the procurement of protective equipment for the Occupational Vision Program as contained in AR 385-32. Industrial protective eyewear will meet the standards of ANSI Z87.1-1979.

(4) Insure that all personnel follow proper work practices, use protective equipment and engineering control measures, and receive proper instruction and training when indicated.

h. Workers.

(1) Participate in the occupational vision program as outlined in this bulletin.

(2) Utilize safety equipment and engineering controls as mandated by 29 CFR 1910.133 and local directives.

(3) Insure that protective equipment used with a particular instrument, machine or process remains accessible.

(4) Report any unsafe practices or areas to the supervisor and/or safety specialist so that proper protective intervention may be instituted.

(5) Keep protective eyewear clean, properly fitted, and in serviceable condition.

(6) Be familiar with general first aid practices and competent in ocular first aid procedures for eye hazards.

(7) Insure that eye lavages are accessible and functioning (app F).

(8) Must be aware of the difference between industrial safety eyewear and "street type" eyewear (app G). Only industrial safety eyewear shall be worn in eye-hazardous areas.

CHAPTER 3

VISION REQUIREMENTS AND ILLUMINATION

3-1. Vision-screening equipment. *a.* Vision-testing devices can basically be divided into two classifications: office testing equipment and multiphasic visual screening equipment. Office testing equipment would not be appropriate for use in the industrial/occupational environment because of its complexity and the time required to perform the various procedures.

b. Industrial vision screening requires equipment that can be utilized by trained technicians without definitive clinical background, can be administered to large numbers of employees in a minimum amount of time, and provides reliable information that can be used to refer employees for a more detailed vision evaluation by the occupational optometrist or physician. Multiphasic vision-screening equipment has been developed by a number of optical equipment manufacturers. The equipment is portable in nature and provides a battery of tests to measure the following primary visual skills:

- (1) Visual acuity for distance and near.
- (2) Lateral phorias for distance and near.
- (3) Vertical phorias for distance and near.
- (4) Depth perception.
- (5) Color perception.
- (6) Peripheral vision.

c. The following types of multiphasic test equipment are readily available:

- (1) Telebinocular.[®]
- (2) The T/O Vision Tester.[®]
- (3) Ortho-Rater.[®]
- (4) Sight Screener.[®]
- (5) Armed Forces Vision Tester.[®]

[®] Telebinocular is a registered trademark of Keystone View Co., Davenport, IA.

[®] T/O Vision Tester is a registered trademark of Titmus Optical Co., Petersburg, VA.

[®] Ortho-Rater is a registered trademark of Bausch and Lomb, Rochester, NY.

[®] Sight Screener is a registered trademark of American Optical Corporation, Southbridge, MA.

[®] Armed Forces Vision Tester is a registered trademark of Bausch and Lomb, Rochester, NY.

Use of trademarked names does not imply endorsement by the US Army, but is intended only to assist in identification of a specific product.

3-2. Vision requirements on the job. *a.* Vision screening is generally performed by using one of the screening devices mentioned in paragraph 3-1c. The data are recorded on the appropriate test record card. A plastic template (app E) may be used to separate vision standards into one of six recommended job-vision standards. The categories were designed and developed after extensive research by Tiffin and his coworkers at Purdue University. The standards were developed factually from a study of more than 4,000,000 individuals on thousands of different jobs. Experience has revealed that individuals who achieve a passing score on the visual requirements set forth by these job-vision standards are generally more likely to perform efficiently and safely on the job. These standards were developed primarily as a basis for referral of personnel to their personal eye-care practitioners when, during pre-placement and periodic vision screening, gross visual anomalies are revealed. Certain jobs might not fit into any of the categories provided; when that occurs, a new standard should be developed by the occupational optometrist ((7) and (8) below). Many personnel have duties that are not reflected in their job titles. Therefore, it is important to determine the nature of all an individual's duties before establishing a vision requirement as set forth in Office of Personnel Management (OPM) Regulations. Where any conflict may be found to exist between these standards and OPM Regulations, the latter should be used. These standards do not apply to visually handicapped individuals who are, or will be, under the direction of the installation physician.

(1) *No. 1 Standard.* Corrected visual acuity, each eye, at near 20/30, at distance 20/50; normal muscle balance for near; no restrictions on color vision and depth perception. This covers jobs primarily concerned with "paper work" and should apply to clerical occupations and those administrative occupations requiring a considerable amount of desk work.

(2) *No. 2 Standard.* Corrected visual acuity, each eye, at near 20/40, at distance 20/30; normal muscle balance for distance; normal depth perception; normal color vision. This covers jobs requiring the operation of moving vehicles such as

driving trucks and automobiles, and operating cranes, forklifts and tractors.

(3) *No. 3 Standard.* Corrected visual acuity, each eye, at near 20/20, at distance 20/40; normal muscle balance for near; normal depth perception; normal color vision. This covers jobs involving inspection for surface defects and fine tolerance. It is applicable to assembly jobs involving small parts such as watches and radio tubes.

(4) *No. 4 Standard.* Corrected visual acuity, each eye, at near 20/30, at distance 20/40; normal muscle balance for near; normal depth perception; normal color vision. This covers jobs involving machines in which the operating parts are within arm's reach.

(5) *No. 5 Standard.* Corrected visual acuity, each eye, at near and distance 20/30; normal muscle balance for near; normal depth perception; normal color vision. This covers the skilled trades requiring good near and distance vision, such as plumbers, millwrights, electricians, and supervisors.

(6) *No. 6 Standard.* Corrected visual acuity, each eye, at near and distance 20/50; unrestricted muscle balance; no restriction on color vision and depth perception. This involves jobs of the relatively unskilled type such as porters, warehousemen, and laborers.

(7) *Standard (Special).* The special category indicates a unique set of vision standards. Refer to US Civil Service Commission Handbook X-118 for these standards.

(8) *Standard (Color).* An asterisk after a job title entry indicates that a color vision standard is required. Refer to US Civil Service Commission Handbook X-118 for these standards.

b. Although a color deficiency is a visual abnormality, it may or may not affect a worker's ability to perform his job in a safe and efficient manner. This would depend upon the degree of color defect, the worker's ability to compensate for the defect, and the types of color discriminations necessary to perform the particular work tasks. Approximately 8 percent of the male population and 1 percent of the female population have color vision deficiencies. These deficiencies are of a congenital or pathological/acquired origin. Congenital deficiencies are stable and do not become progressively worse. Those of pathological origin may be either progressive or stable, depending upon the state of the disease process. If the origin of the color deficiency is not known, the worker should be referred to an optometrist

or ophthalmologist for further evaluation. Although aids are available for persons with color deficiencies, they are of rather limited use and do not justify routine referral. In general, the greatest aid is to inform the color-deficient worker of his deficiency and to advise him as to how the defect will affect his visual judgment. A color-deficient worker may perform most tasks as well as a worker with normal color vision. A color deficiency should not be the sole disqualifier for a job without first evaluating the specific job tasks in relation to the individual's color defect.

c. In an industrial vision-screening program, it is expected that a certain percentage of employees tested will be found to need corrective glasses, perhaps for the very first time. Some workers who normally wear spectacles will show a need for a different correction. A few who will pass all tests may still benefit from optical aids; for example, while performing certain critical tasks. In all cases, however, the key purpose of testing is to measure individual visual skills in relation to individual vision requirements of specific jobs.

d. Vision screening shall be a part of the larger occupational vision program that has as its aim prevention of visual difficulties that may preclude a person from performing satisfactorily in his environment. Emphasis shall continually be made to inform employees that a screening is not a complete visual analysis, only a preliminary evaluation by a battery of tests.

e. Useful vision in only one eye (Amblyopia, One-Eyedness, Monocular Vision) generally refers to an individual who has so-called normal visual acuity in one eye and reduced visual acuity in the other eye, even when wearing the best refractive correction. Studies of workers in industry have shown that these individuals are not handicapped and are fully capable of performing their work. However, it is obvious that great care shall be taken to protect the nonamblyopic eye or so-called "normal" eye. Industrial-thickness lenses shall be furnished active duty and retired military personnel who have useful vision in only one eye. Such lenses shall be obtained under the provisions of AR 40-63. Eyewear for military personnel and civilian employees engaged in eye-hazardous occupations shall be obtained under the provisions of AR 385-32. Industrial-thickness safety spectacles are strongly recommended for monocular civilian employees who work in noneye-hazardous occupations. Such eyewear shall be obtained by the individual at his own expense.

3-3. Illumination. *a.* inadequate or excess lighting contributes to inefficient and uncomfortable visual performance. This often contributes to creating hazardous environments both on and off the job. The National Safety Council estimates that insufficient lighting is the sole cause of 5 percent of industrial accidents.

b. No single procedure or formula will solve all lighting problems. Many factors need to be taken into consideration and the relative importance of these factors can vary widely, depending upon the seeing requirements imposed by a particular set of circumstances.

c. In 1974, the General Services Administration (GSA) implemented illumination standards that are generally adequate for most working environments (41 CFR 101-20.116-2). During working hours, overhead lighting shall be reduced to no more than:

- (1) 50 footcandles at work stations.
- (2) 30 footcandles in work areas.
- (3) 10 footcandles in nonworking areas (but not less than 1).

d. These standards may need to be supplemented with auxiliary lighting when certain critical tasks are undertaken or when the workforce is made up of older individuals who require higher light levels. Reference should be made to the Illuminating Engineering Society's (IES) Lighting Handbook for guidance on special task requirements. Hospitals (interpreted as medical and dental care facilities) are exempt from most provisions of the aforementioned policy. Department of Defense guidelines, however, require that illumination levels at a work task not exceed those recommended in the IES Lighting Handbook.

e. In addition to illuminance, there are many other less tangible factors associated with poor illumination which can be important contributing causes of accidents. These include direct and reflected glare, harsh shadows, excessive visual fatigue, delayed eye adaptation, individual differ-

ences due to age and refractive errors, and other physiological and psychological variables.

(1) Direct glare may be introduced by a light source within the field of view. To reduce direct glare, the following steps may be taken:

- (a) Decrease the brightness of the light sources.
- (b) Reduce the area of intense brightness causing glare.
- (c) Increase the angle between the glare source and the line of vision.
- (d) Increase the brightness of the area surrounding the glare source.

(2) Reflected glare or veiling glare is frequently more annoying than direct glare because it is close to the line of vision and the eye cannot avoid it. It is usually caused by glossy or specularly reflecting surfaces within the field of view or by improper location of light sources. Reflected glare can be minimized by using matting type surfaces, reducing the brightness of the light source, or changing the position of the lighting equipment or the task, so the reflected image is away from the worker. See appendix H for discussion of eye effects of video display devices.

f. The effects of age on accommodation, pupil diameter and other physiological factors usually have marked influences upon visual ability. Other effects of age include decreasing ability to detect movement in peripheral vision, decreased resistance to disabling glare and high luminance, and contrast thresholds. All of these effects point to the need for considering age when developing lighting recommendations. Higher levels of illumination are helpful in providing increased retinal stimuli so that the visual sensory processes can function more efficiently.

g. Adequate illumination and appropriate use of color go hand-in-hand. It is much wiser, and no more costly, to paint with colors developed through scientific studies than to select them at random (TM 5-807-7).

CHAPTER 4

EYE PROTECTION AND EYE HAZARDS

Section I. EYE PROTECTION

4-1. Eye protective devices. *a.* Suitable eye protection shall be provided and worn where machines or operations present the hazards of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.

b. While eyeglasses used by the general public and industrial safety glasses worn by workers may look alike, the similarity is deceiving. Ordinary lenses can shatter into eye-destructive slivers. Impact-resistant lenses now required by the Food and Drug Administration (FDA) for all street-wear eyeglasses and sunglasses provide less than the protection afforded by industrial safety glasses. Design, construction, testing, and uses of devices for eye and face protection are prescribed in the American National Standards Institute (ANSI) Code for Occupational and Industrial Eye and Face Protection, Standard Z87.1-1979, or later revisions thereof.

c. Eye protection shall meet the following minimum requirements:

(1) Provide adequate protection against the particular hazards for which they were designed.

(2) Reasonably comfortable when worn under the designated conditions.

(3) Fit snugly and not unduly interfere with the movements of the wearer.

(4) Easily cleanable.

(5) Capable of being disinfected.

(6) Durable.

(7) Kept clean and in good repair.

(8) Made of noncombustible or slow-burning materials.

(9) Distinctively marked as industrial safety wear with the manufacturer's name or trademark on the lenses and the Z87 logo on the frame.

d. Industrial protective spectacles consist of two lenses and a special frame constructed according to ANSI Standard Z87.1-1979. Any combination of street-wear frames or lenses with industrial protective lenses or frames is not in compliance with OSHA requirements or applicable

ANSI standards. Industrial protective frames may be manufactured of metal, plastic or a combination of both. In addition, the retainer groove shall be specifically constructed to hold the lenses securely. Plastic frames are preferred when electrical, chemical or explosive hazards are involved. Metal frames are preferred when an employee is working in high temperatures because plastic tends to soften creating a loss of spectacle adjustment.

e. An industrial safety lens is a lens used in protective eyewear that provides a degree of impact resistance. The standards that industrial safety lenses shall meet are more rigid than the standards required for ordinary street wear. Considerable confusion has existed concerning the differences between the FDA requirements for ordinary street-wear spectacles and for industrial eye-protection standards (ANSI Z87.1-1979). Appendix G contains a table demonstrating these differences. Industrial safety lenses are available in the following materials to achieve the required impact resistance:

(1) Heat treated crown-glass.

(2) Laminated crown-glass.

(3) Chemical hardened crown-glass.

(4) Plastic.

(a) Polycarbonate.

(b) CR-39.®

f. As stated previously, there are several requirements to be taken into consideration when selecting eyewear for use on the job. The following describes and illustrates several types of occupational eyewear. There are many more than are listed, but the illustrations will give an idea of what is available in occupational eye protection.

(1) *Industrial safety spectacles.* These are similar in construction to regular eye glasses, and are normally used as general purpose occupational eyewear. Spectacles shall be made with ANSI ap-

® CD-39 is a registered trademark of Pittsburgh Plate Glass Co., Chemical Division, Pittsburgh, PA.

proved lenses and frames and are designed to give protection against missiles, harmful radiation, or both, and may be fitted with side shields (fig. 4-1).

(2) *Nonconductor and nonflammable spectacle.* These are types of spectacle goggles, but the frame and temple pieces are made of materials that are neither a conductor of electricity nor are they flammable. They shall be worn by persons working around electrical circuits or in flammable or explosive atmospheres. They may be fitted with side shields.

(3) *Chipping goggles.* These goggles are designed to protect the eye from particles flying from any direction. The lenses shall meet industrial standards established by ANSI Z87.1-1979. They are designed with a protective eyecup shaped to conform to the configuration of the face. The eyecup is normally perforated to allow air to pass through to prevent fogging. The frames are made to have low heat and electrical conductivity (fig. 4-2).

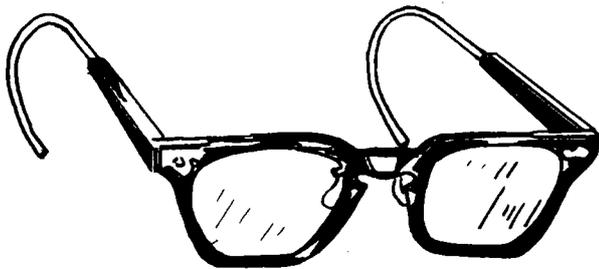
(4) *Wire screen goggles.* These goggles are made to provide a protective screen for the eyes.

The lenses are wire screens shaped to give unobstructed vision to the wearer. They are used when ordinary goggles might become covered with steam causing a restriction of the wearer's view.

(5) *Chemical goggles.* These goggles are used to protect the eyes against hazards involved in chemical handling operations. The eyecups are ventilated and baffle plates are fitted within the eyecups to prevent splashed chemicals from penetrating the ventilation perforations (fig. 4-3).

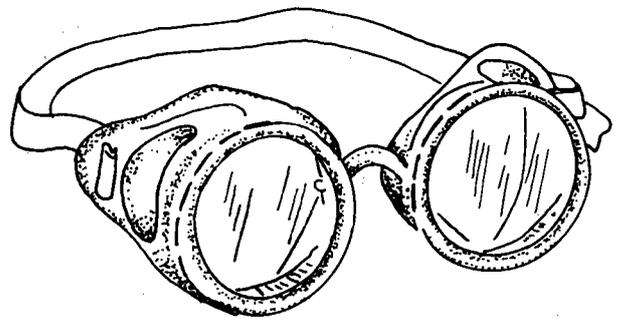
(6) *Welding goggles.* These goggles are made to give protection from flying sparks, scale, metal splashes and harmful light rays. They are designed with eyecups that protect the eyes from all sides. The lenses are available in different shades to reduce the effects of infrared and ultraviolet rays (figs. 4-4 and 4-5).

(7) *Combustion (foundry) goggles.* These goggles are used around foundry melting furnaces and forging operations. They are similar to welding goggles except they are better insulated



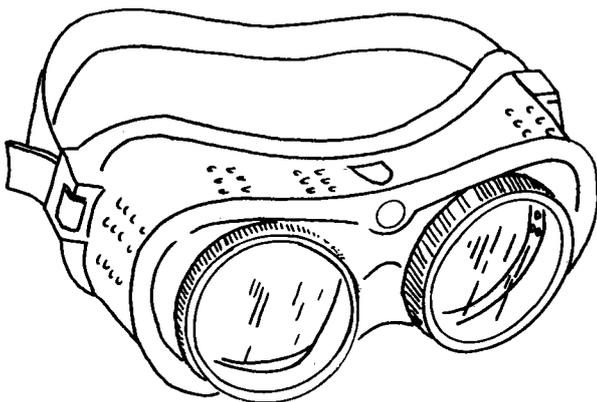
MED 506-1

Figure 4-1. Industrial safety spectacles.



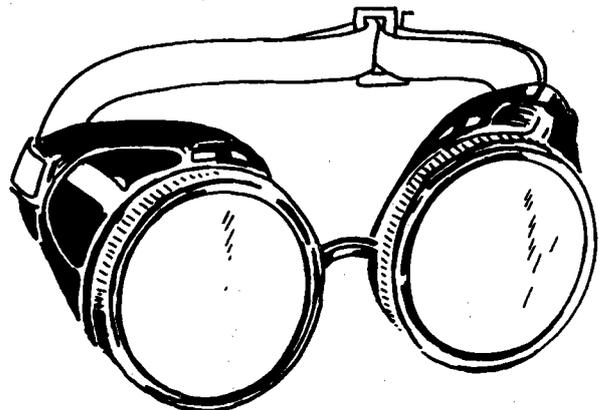
MED 506-3

Figure 4-3. Chemical goggles.



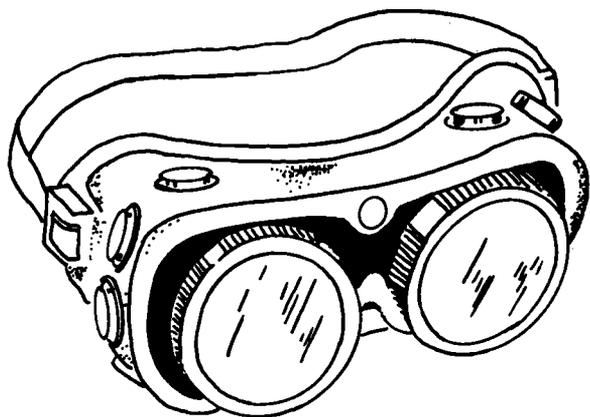
MED 506-2

Figure 4-2. Chipping goggles.

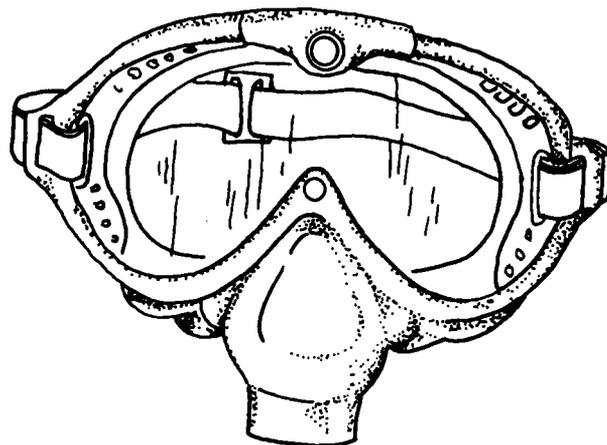


MED 506-4

Figure 4-4. Welder's goggles.



MED 506-5

Figure 4-5. Welder's mask goggles.

MED 506-7

Figure 4-7. Vent goggles.

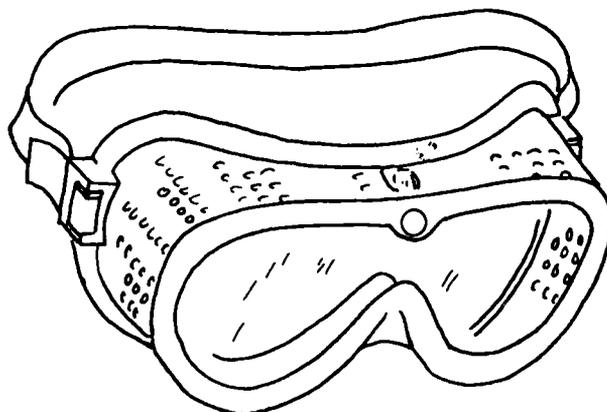
against excessive heat. These goggles may be equipped with both filter and cover lenses.

(8) *Gastight goggles.* These goggles are used where irritating or injurious smoke, fine dusts and mists may be hazardous to a worker's eyes. The frames are molded in rubber or plastic which will fit snugly around the eyes and nose to provide an airtight pocket.

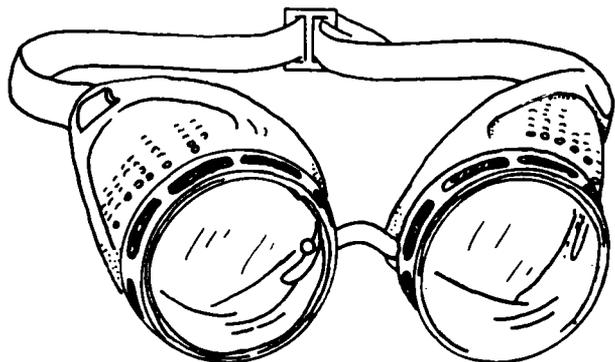
(9) *Miscellaneous goggles.* Other types of protective goggles are available depending on the protection required (figs. 4-6 through 4-11).

(10) *Face shields.* Face shields give protection to the eyes and face from small flying particles and sprays of hazardous liquids. Such devices shall only be worn over suitable basic eye protection devices. Face shields are available in various sizes, strengths and light-filtering capacities. Face shields shall not be less than 0.040 inch nominal thickness.

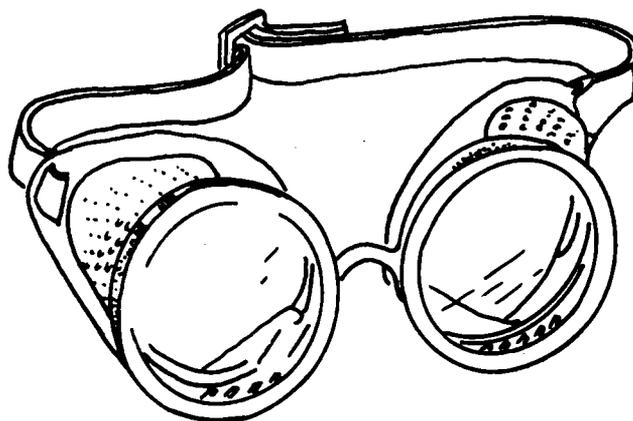
(11) *Screen masks.* These masks provide face and head protection against flying metal, chips, rivet heads, and similar hazards encountered in



MED 506-8

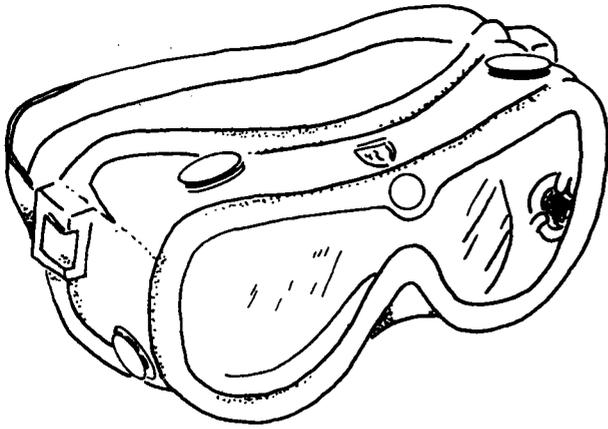
Figure 4-8. Flexible mask impact goggles.

MED 506-6

Figure 4-6. Air conditioned goggles.

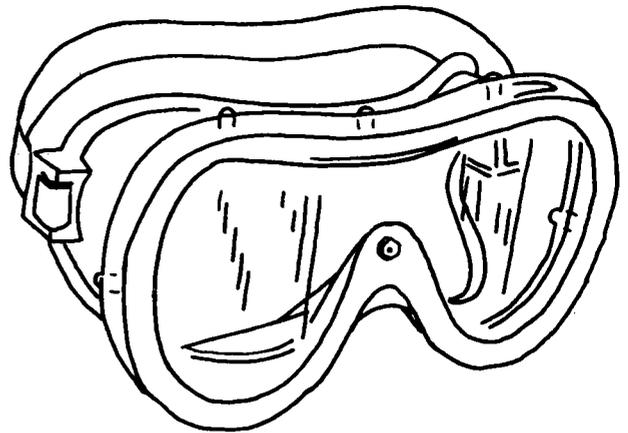
MED 506-9

Figure 4-9. Dust goggles.



MED 506-10

Figure 4-10. Chemical goggles.



MED 506-11

Figure 4-11. Splash goggles.

general furnace work. The facepiece is made up of a rigid wire screen.

(12) *Welder's helmets.* These helmets, masks or shields will protect welders from excessive heat, injurious radiation, metallic splashes, flying particles and other welding hazards.

(13) *Side shields.* A recurring problem frequently involves the wearing of side shields. Side shields should be worn when there is a danger of flying particles being propelled into the eye from the side or around the edges of the spectacle frame. Glasses with side shields shall not be worn while operating Army vehicles on public or installation roads. Unfortunately, side shields add additional weight, may restrict peripheral vision, and are cosmetically unattractive for some who wear their industrial safety spectacles for full-time wear. However, where side shields are required, ANSI Standard Z87.1-1979 states they shall be worn and shall not be easily detachable. In particular, snap-on or clip-on types of side shields are not acceptable unless secured. See appendix I for further guidance for selecting the proper type of eye protection.

g. Industrial protective lenses are generally classified into three types:

(1) *Clear Lenses:*

(a) Plano provide protection against flying objects for those employees not requiring corrective lenses.

(b) Corrective-protective lenses manufactured to refractive specifications for an individual requiring visual correction.

(2) *Absorptive lenses* are available to protect against flying objects and glare, and/or a narrow band of injurious radiation. They are pro-

vided in a series of shades generally from 1.7-3 (see app J) and are available with or without a corrective prescription. Sun lenses and photochromic lenses are in the absorptive lens class. Both are approved for industrial use; however, only for outdoor wear. Special-purpose tints used for indoor tasks shall be static (nonphotochromic) and fit for a specific task; i.e., welding, glass-blowing, etc.

(3) *Filter lenses* are a special type of absorptive lens that provides protection from flying objects and injurious radiation. Filter lenses are generally provided in a series of shades from 4-14 (see app J) and are available with or without a corrective prescription.

h. The increased use of laser technology in the military environment dictates that a greater understanding of eye protection shall be acquired. Appropriate protective lenses are vital for proper eye protection. The following factors shall be considered when selecting protective eyewear for laser use:

- (1) Wavelengths of laser output.
- (2) Optical density of protective eyewear at laser output wavelength.
- (3) Visible light transmission requirement.
- (4) Radiant exposure or irradiance at which laser safety eyewear damage occurs.
- (5) Comfort when wearing protective eyewear.
- (6) Need of prescription to correct refractive error.
- (7) Need for peripheral vision.

For additional laser protective eyewear information, contact the local occupational optometrist or

write to the US Army Environmental Hygiene Agency, ATTN: HSE-RL, Aberdeen Proving

Ground, MD 21010, and request a copy of Technical Guide No. 081, *Laser Protective Eyewear*.

Section II. EYE HAZARDS

4-2. Identification of eye hazardous areas and operations. *a.* Any material, flying object, gas, vapor, fume, liquid or radiation that has the potential for causing harm or damage upon entering the eye would be a potential eye hazard. The following is a list of potentially eyehazardous occupations and processes that should be considered in an occupational vision program. This is certainly not an all-inclusive list since each installation will have its own requirements.

- (1) Grinding and drilling.
- (2) Metal chipping.
- (3) Molten metal handling.
- (4) Drop-hammer forming.
- (5) Acid handling.
- (6) Punch-press operations.
- (7) Sand blasting.
- (8) Riveting.
- (9) Machine operations.
- (10) Welding, soldering.
- (11) Cleaning solvents.
- (12) Salvage operations.
- (13) Power mowers, trimmers.
- (14) Blowing compressed air.
- (15) Indoor racket sports.

An area should be considered eye-hazardous when several of the aforementioned operations are located in close proximity to one another, when there is a possible risk of people visiting or walking through an area, or when employees working at adjacent operations are in danger of eye injury.

b. The identification of eye-hazardous areas and operations in an industrial environment is a major phase of establishing an effective industrial eye-protection program. A thorough knowledge of machine operations, the types of chemicals used, and other potential eye hazards is a must. The identification process is usually the responsibility of the safety staff and/or the industrial hygiene personnel. However, it is important to include the occupational optometrist, when assigned, in the identification process on a regular basis. This will afford him a thorough understanding of the unique visual requirements that the employee often encounters from a vision as well as an eye-protection standpoint. This is important when the eye practitioner is prescribing an industrial lens correction in a clinical setting.

c. In the work environment, it is also important

to insure that abrasive wheels have proper shielding and work rest adjustments, welding operations are properly screened, and compressed air used for cleaning purposes is maintained at the proper pressure. Work rests on grinding machines shall be kept adjusted closely to the wheel with a maximum opening of one-eighth inch. This will prevent the work from being jammed between the wheel and the rest, which may cause wheel breakage (29 CFR 1910.215). Arc welding operations shall be completely enclosed with approved screens to protect personnel in the immediate vicinity from ultraviolet radiation (29 CFR 1910.252(e)(2)(iii)). Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi, and then only with effective chip guarding and personal protective equipment (29 CFR 1910.242).

d. Once the operations have been identified, a decision shall be made whether to declare an entire building eye-hazardous, a section of that building or only isolated equipment. Once that determination is made, dedicated enforcement becomes essential. Judicious placement of appropriate caution signs stipulating the requirement to wear appropriate eye protection is of utmost importance.

4-3. Nonmechanical eye-hazardous substances. *a.* Literally thousands of chemicals are employed in industry today. Many of these chemicals are known to have harmful effects on the eye. Most do so by direct contact with the external ocular tissue, while some cause internal ocular damage through systemic absorption. Almost every substance can and may produce mild irritation of the cornea and conjunctiva (external ocular tissue) after continuous exposure. Even water, because of its hypotonicity, produces a stinging sensation and temporary redness when instilled in the normal eye. The real concern is with those chemical substances which pose a significant threat to the integrity of the external ocular structures when they remain in contact with the eye and the adnexa for any appreciable time. In spite of the well established protective measures, such injuries still occur with great regularity. They are one of the principal causes of loss of vision in industry.

b. Whenever entering a shop, section or other activity, an individual should be aware of the

potential hazards that exist while working with certain materials. Appendix K is a brief listing of selected areas and potential eye-hazardous substances that may be in use. During visits, an inventory of chemicals in the area should be obtained and information elicited as to what is done to prevent possible injury or damage to the eye. A more complete listing can be found in the Medical Surveillance Guide which is available from the US Army Environmental Hygiene Agency and in *Occupational Diseases, A Guide to Their Recognition*, Department of Health, Education, and Welfare Publication No. 77-181, available from the Government Printing Office.

4-4. Ocular emergencies. *a.* Improper first-aid treatment or lack of prompt treatment can have serious consequences. Lack of prompt and proper treatment often results in greater vision loss than any other single cause. Industrial injuries may occur in remote plant locations far removed from a primary care source. In these cases, the injury is first handled by fellow employees. It is important for these individuals to have an understanding of the importance of proper and prompt handling of the injured eye. Many ocular injuries are of a relatively minor nature, but even these can be compounded into serious conditions with improper handling. There are certain types of eye injuries that must be treated in some fashion without delay. The possible causes of an ocular injury should be evaluated in each industrial area and the supervisor or safety representative identify those potential injuries. All personnel in the work area shall be trained in proper first aid for eye emergencies.

b. The following information is provided to acquaint you with the more common ocular emergencies and their initial first-aid and treatment. Appendix F provides basic guidance on the use of emergency eye-wash fountains.

(1) *Chemical trauma.* Chemical burns caused by alkalis, acids, or other nonmechanical substances demand immediate first aid attention. Personnel should be familiar with the guidance printed on warning labels of all substances and be prepared to handle ocular emergencies caused by these substances. The occupational health staff shall work with supervisors in planning for and handling emergency care.

(a) *Alkali burns.* Strong alkalis have a tendency to produce a sustained reaction with ocular tissues. Progressive damage to the eye will continue until the alkali is either removed by irrigation or neutralized. Immediate treatment is copious irrigation of the eyes with water for at

least 20-30 minutes in the work area before seeking medical care. The patient should be placed in the care of an ophthalmologist as soon as practical; however, irrigation *shall not* be interrupted until there is assurance that the alkali has been completely neutralized. It may be necessary to continue the irrigation for hours.

(b) *Acid burns.* Acid burns have a better prognosis than many other types of chemical burns. Acid burns do not penetrate the eye as do burns from alkali. Acid burns cause almost instantaneous local tissue destruction at the point of contact and do not penetrate the underlying tissue as readily as alkalis. Immediate treatment consists of prompt and thorough irrigation. The eyelids should be held open. Continue irrigation for 20 minutes in the work area before seeking medical care. After the irrigation has been initiated and the patient somewhat stabilized, the patient should be transported to an ophthalmologist as soon as possible. If eye irrigation can be performed in the ambulance, it will be possible to get the patient into the hands of an ophthalmologist that much sooner. Because of the danger of adhesions, it is usually better to delay applying a bandage until the ophthalmological examination has been completed.

(c) *Other chemical burns.*

1 Refrigerant gases are also caustic to ocular tissues. Sulfur dioxide is used in some cooling plants, or may be encountered as a pollutant from chemical or industrial processes. Sulfur dioxide burns should be treated the same as acid burns. Other refrigerant gases include Freon-12 and Freon-14. Freon-12 and Freon-14 are insoluble in water, so water irrigation is useless.

2 Tear gas is frequently used in riot control. The concentration used in riot control produces irritation, lacrimation, and blepharospasm. Recovery usually occurs in a short span of time. However, if a tear gas explosion accidentally occurs at short range, it is possible that the high velocity of the material at short range could cause the material to penetrate the eye with severe damage to lid and eyeball. Emergency treatment consists of irrigation with water.

3 Indelible pencil (aniline pencil) injuries are extremely dangerous. Aniline dye may cause blindness in a matter of days unless properly identified and treated.

(2) *Mechanical trauma.* Mechanical trauma of the eyeball is an all too common event. Snowballs, baseballs, handballs, hockey pucks, racket sports, etc., are common causes of blunt ocular trauma (app L). Small metallic or carbon par-

ticles and glass are common causes of foreign bodies in the eye. However, there is no end to the variations of mechanical trauma which you may encounter.

(a) *Lacerations and contusions.* Lacerations of the eyelids may appear very serious but, if the eyeball is not involved, there will be no impairment of the patient's vision. However, lacerations of either the cornea or sclera may produce loss of sight. When the eyelids are lacerated and the eyeball is not involved, bleeding may be controlled by application of a pressure dressing. However, if the eyeball itself is lacerated, pressure *shall not* be applied to the eye because internal fluids (aqueous and vitreous humor) may be displaced and irreparable damage done to the eye. The patient should be placed on his back immediately. Both eyes can be covered with a loose dressing to minimize movement of the injured eye. The patient should then be gently placed on a litter for transport to a hospital.

(b) *Corneal abrasion.* A common form of corneal abrasion may be caused by overwearing contact lenses. If a patient has worn the contact lenses beyond the normal wearing time, shortly after removing the lenses, a severe pain may develop in one or both eyes. The typical clinical picture is pain, lacrimation, and blepharospasm. The eye will usually reveal diffuse corneal staining when viewed with the aid of magnification and a black light. The patient should see his ophthalmologist or optometrist for followup care, and before he resumes the use of his contact lenses. Any type of foreign body may cause a corneal abrasion. Foreign body trauma constitutes a large percentage of all the ocular injuries seen in industry.

(c) *Hemorrhage.* Sometimes the eye will receive a blow which does not produce an abrasion but which may produce hemorrhaging in the interior of the eye. Bleeding in the anterior chamber (hyphema) is sometimes evident. A difference in pupil size between the injured and noninjured eye is also often apparent. Although all cases of blunt injury should be referred to a physician, immediate treatment consists of making the patient as comfortable as possible after removing any dirt or foreign particles from the lids or eye. If there is considerable swelling of the eyelids, cold compresses should be applied to the affected area. If an eye is extruded after a severe injury, do not attempt to push it back in. Cover the eyes with a moist dressing and move the patient by litter for emergency treatment.

(3) *Foreign bodies.*

(a) *Deep.* Deep penetrating foreign bodies or foreign bodies which have penetrated in or around the structure of the eyeball are not always easy to diagnose. It is possible for a tiny particle of metal propelled at high speed to enter the eyeball or orbital structures with only a suspicion of its existence. An X-ray series of the skull is the easiest way to ascertain the presence of these particles. If a large wound exists, place the patient on his back immediately and apply loose dressings to both eyes. Ready the patient for transport by litter for surgical help. Under no circumstances should you try to remove an imbedded or penetrated foreign body. If a protruding foreign body exists, such as a pencil, a toothpick, a spear of glass, etc., again do not attempt to remove it. Instead place a cone of paper cup over that eye and tape the cup in place with scotch or plastic tape. Apply a loose dressing to the other eye as well before transporting the patient, in order to minimize eye movement.

(b) *Superficial.* The treatment for superficial foreign bodies depends on the type of material present on the eye. A general rule is to irrigate the eye in an attempt to dislodge the particulate material. Inert foreign bodies, such as coal, glass, plastic, aluminum and lead frequently require no immediate treatment if they are producing no discomfort. Reactive foreign bodies include iron, steel, copper, wood, and thorns. Removal procedures include irrigation, topical anesthesia, and use of a moistened cotton-tipped applicator or other implement. The cornea should not be stained before the foreign body is removed. If it is concluded that the material is imbedded firmly in the tissue, refer the patient to a health practitioner who is knowledgeable in the ocular procedures required. An antibiotic and sometimes an analgesic may be ordered by the attending physician. Usually a firm dressing over the injured eye is indicated to help healing and to reduce discomfort. Sometimes superficial foreign bodies lodge on the undersurface of the eyelids. Eversion of the lower lid to examine the conjunctiva is relatively simple. To evert the upper lid, have the patient look down at his feet, grasp the eyelashes with thumb and finger of one hand and pull the lid gently away from the eyeball. At the same time, place an applicator stick horizontally midway across the outer surface of the lid, and pull the lid up and over the applicator. This will expose most of the conjunctival surface of the upper lid. Irrigation or use of a moistened cotton-tipped applicator will facilitate removal of any material which may be lightly imbedded in the conjunctiva.

(4) *Radiation trauma.* Ocular radiation injuries may be incurred from many sources: Furnaces, X-ray equipment, welding equipment, radioactive materials, radar transmitters, and the sun.

(a) *Ultraviolet (UV) radiation.* UV radiation may be encountered from the sun or sun lamps, damaged mercury vapor lamps, electric welders or similar equipment. "Snow blindness" is a term used for ultraviolet radiation damage to the eyes caused by solar UV reflecting from large snow fields. Usually, UV damage has a latent period of several hours (just like a sunburn), and results in a keratoconjunctivitis. The threshold dose for UV injury to ocular tissues is less than that of skin (sunburn); however, it may be cumulative. Immediate treatment is symptomatic, and usually consists of alleviating the pain with cold compresses. Certain drugs may be used to further alleviate pain and to prevent secondary complications. Most of the radiation burns seen as emergencies are due to UV.

(b) *Infrared (IR) radiation.* IR radiation may be encountered from furnaces, heat lamps, electric heating coils, etc. Damage to the eye is usually deeper than that seen with UV burns. Although not encountered as an ocular emergency, prolonged exposure to IR radiation may result in cataract. The so-called "glass-blower's cataract" is an occupational hazard of glass workers, for example, occurring several years after chronic exposure to IR radiation. Eclipse burns of the retina may be seen as an emergency caused by gazing at the sun or a solar eclipse. This sudden loss of central vision was thought to be due to the concentration of infrared on the macular area of the retina. New data indicates the loss of central vision is due to a photochemical injury from the short wave component of the sun's radiance and not an infrared burn. Permanent blindness of the affected retinal area may result. Prognosis and treatment depends on the extent and severity of the burn; treatment is usually palliative. The threshold dose for ocular damage due to IR is below that for skin tissue.

(c) *X-Rays and gamma rays.* The type of lesion experienced depends on the voltage of the X-ray machine and the portion of the eye affected. Soft x-rays (8-75 KV) may cause keratoconjunctivitis. The threshold for soft X-rays is about 1000 r. Hard x-rays (100-1000 KV) will cause cataracts after a dose of about 500-800 r, and they will also cause keratitis after a latent period of several weeks. The burns described in this para-

graph are usually not in the province of first aid therapy.

(d) *Heat (flame) burns.* If a person is burned about the face or eyelids from a fire, the eyelids usually close rapidly to protect the eyeballs. An actual burn of the ocular tissue should be treated in the same manner as thermal burns elsewhere on the body. The eyes may be covered with a sterile moist dressing before transporting the patient for specialized care.

(e) *Visible light.* Most authorities agree that visible light in the blue end of the spectrum does not ordinarily damage the eye; however, some cases of retinal burns due to extremely high doses of visible light have been reported.

c. Once prompt first aid has been administered, all eye injuries necessitate two primary requirements. The first is a detailed recording of facts about the case. The second requirement is the recording of uncorrected and corrected visual acuity before treatment is initiated. This is of utmost importance for medical-legal protection for the injured employee, the employee providing first aid, and for the employer. If the patient's visual acuity cannot be obtained prior to treatment because of the nature of the injury, this should be noted on the individual's medical record. The following identifies traumatic ocular emergencies into three basic groups.

(1) *Group I—true emergencies.* Therapy should be instituted immediately for:

(a) Chemical burns of the eye.

(b) Penetrating injuries of the globe (cornea or sclera).

(2) *Group II—urgent conditions.* Therapy should be instituted promptly (within several hours) for:

(a) Corneal erosion, ulcer or abrasion.

(b) Corneal foreign body.

(c) Eyelid laceration.

(d) Hyphema.

(e) Acute vitreous hemorrhage.

(f) Acute retinal tear or detachment.

(g) Thermal and radiant burns of the eye.

(3) *Group III—less urgent conditions.* Therapy should be instituted as soon as feasible for:

(a) Corneal rust deposit.

(b) Fractures about the orbit.

(c) Lacerations of the conjunctiva.

(d) Subluxations of the lens.

4-5. Optical radiation surveillance. a. AR 40-5, AR 40-6, and AR 40-583 require that personnel whose assignment carries significant risk of exposure to potentially hazardous nonionizing radiation re-

ceive eye evaluations before and after the assignment.

b. In the past, periodic eye examinations have been performed by the Laser Microwave Ocular Effects Team (LMOET) from the US Army Environmental Hygiene Agency and by eye practitioners (optometrists and ophthalmologists) at installations throughout the world. LMOET has, to date, collected ocular examination data on several thousand individuals over a period of more than 6 years. Results of the study have been negative; i.e., no evidence has been demonstrated revealing eye damage from the low levels of exposure encountered in well-controlled working and environmental conditions. As a result, the required vision program now includes thorough preplacement and termination eye examinations,

and annual periodic eye examinations during the assignments consisting of screening examinations by Ortho Rater or other available vision-screening equipment. Additional ophthalmoscopic and/or slit lamp examinations will be performed if indicated by abnormal findings obtained in the screening examinations. Investigations of known or suspected exposures in excess of applicable radiation standards shall remain per AR 40-46 and AR 40-583.

4-6. Technical assistance. Requests for technical assistance in conducting occupational vision surveys or establishing occupational vision programs shall be submitted through command channels to Commander, US Army Health Services Command, ATTN: HSPA-P, Fort Sam Houston, TX 78234.



APPENDIX A

REFERENCES

- Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program.
- DODI 6055.2, Personal Protective Equipment.
- AR 1-35, Basic Policies and Principles for Interservice, Interdepartmental, and Interagency Support.
- AR 5-1, Army Management Doctrine.
- AR 40-1, Composition, Mission, and Functions of the Army Medical Department.
- AR 40-2, Army Medical Treatment Facilities, General Administration.
- AR 40-3, Medical, Dental, and Veterinary Care.
- AR 40-4, Army Medical Department Facilities/Activities.
- AR 40-5, Health and Environment.
- AR 40-14, Control and Recording Procedures for Occupational Exposure to Ionizing Radiation.
- AR 40-46, Control of Health Hazards from Lasers and Other High Intensity Optical Sources.
- AR 40-63, Ophthalmic Services.
- AR 40-501, Standards of Medical Fitness (para 10-23).
- AR 40-583, Control of Potential Hazards to Health from Microwave and Radio Frequency Radiation.
- AR 230-2, Personnel Policies and Procedures.
- AR 310-2, Identification and Distribution of DA Publications and Issue of Agency and Command Administrative Publications.
- AR 340-18-9, Maintenance and Disposition of Medical Functional Files.
- AR 351-3, Professional Training of Army Medical Department Personnel.
- AR 385-10, Army Safety Program.
- AR 385-30, Safety Color Code Markings and Signs.
- AR 385-32, Protective Clothing and Equipment.
- AR 385-40, Accident Reporting and Records.
- AR 385-80, Nuclear Reactor Health and Safety Program.
- AR 600-85, Alcohol and Drug Abuse Prevention and Control Program.
- AR 611-101, Commissioned Officer Specialty Classification System.
- AR 611-112, Manual of Warrant Officer Military Occupational Specialties.
- AR 611-201, Enlisted Career Management Fields and Military Occupational Specialties.
- AR 735-11, Accounting for Lost, Damaged, and Destroyed Property.
- DA Pamphlet 385-3, Protective Clothing and Equipment.
- DA Pamphlet 570-557, Staffing Guide for US Army Medical Department Activities.
- DA Pamphlet 600-8, Military Personnel Officer Management and Administrative Procedures.
- DA Pamphlet 600-17, A Commander's, Supervisor's, and Physician's Guide to Alcohol and Alcoholism.
- TB MED 6, Occupational Health and Safety in Dental Clinics.

TB MED 81, Cold Injury.

TB MED 223, Respiratory Protective Program.

TB MED 279, Control of Hazards to Health from Laser Radiation.

TB MED 507, Prevention, Treatment and Control of Heat Injury (formerly TB MED 175).

TB MED 521, Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma-Beam Equipment (formerly TB MED 62).

TB MED 523, Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound (formerly TB MED 270)

TM 5-807-7, Color For Buildings.

TM 8-215, Nuclear Handbook for Medical Service Personnel.

Public Law (PL) 79-658, Health Programs for Government Employees, as amended.

PL 91-596, Occupational Safety and Health Act of 1970.

Executive Order 12196, Occupational Safety and Health Programs for Federal Employees.

Title 10, Code of Federal Regulations (CFR), part 20, Standards for Protection Against Radiation.

Title 20 CFR, chapter 1, Office of Workers' Compensation Programs, Department of Labor.

Title 21 CFR, section 801.410, Use of Impact-Resistant Lenses in Eyeglasses and Sunglasses.

Title 29 CFR, Part 1910, Occupational Safety and Health Standards.

Title 29 CFR, Part 1960, Safety and Health Provisions for Federal Employees.

Title 41, CFR, Chapter 101-20.116, Conservation of Energy by Executive Agencies.

USAEHA Technical Guide No. 001, Medical Surveillance Guide (with appendixes G and H).

USAEHA Technical Guide No. 081, Laser Protective Eye.

American National Standards Institute (ANSI) Standard Z80, Ophthalmic Lens Standards.

ANSI Standard Z87.1, Practice for Occupational and Educational Eye and Face Protection, 1979.

ANSI Standard Z136.1, Safe Use of Lasers, 1976.

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APPENDIX B

DEFINITIONS

Accommodation. The eye's ability to change in power and, therefore clearly focus on objects at various distances.

Amblyopia. A reduction of visual acuity that is not correctable by refractive means and is not attributed to obvious pathology.

Ametropia. The refractive condition that exists, when accommodation is relaxed, where parallel rays of light do not focus on the retina, specifically:

a. *Myopia.* When parallel rays of light entering the eye, with accommodation relaxed, focus in front of the retina. *Syn.* nearsightedness.

b. *Hyperopia.* When parallel rays of light entering the eye, with accommodation relaxed, focus behind the retina. *Syn.* farsightedness.

c. *Astigmatism.* A condition in which light from a single point is not focused as a point but as two lines at different distances from the point source.

Cataract. Partial or complete loss of transparency of the crystalline lens of the eye or its capsule.

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 at an object nearer than 20 feet.

Diopter. A unit of measurement, generally of lens power. It is equal to the reciprocal of the focal length in meters.

Glare. Light out of place or brightness within the field of vision which interferes with vision, causes discomfort, annoyance, or eye fatigue.

Illuminance. The density of luminous flux impinging upon an opaque surface. (The amount of light falling upon a surface.)

Illumination. The process by which light is made to be incident on a surface.

Impact-resistant lenses (dress safety). Spectacle lenses meeting the construction standards of the Food and Drug Administration (FDA), Title 21, Code of Federal Regulations (CFR), Section 801.410, Use of Impact-Resistant Lenses in Eyeglasses and Sunglasses (see app G).

Industrial safety spectacles. Spectacles meeting construction standards of the ANSI Standard Z87.1-1979 and adopted by the Occupational Safety and Health Administration (OSHA), Title 29 CFR, Section 1910.133, Eye and Face Protection (see app G).

Keratoconjunctivitis. Inflammation involving both the cornea and the conjunctiva.

Light. Visually evaluated radiant energy. That portion of the electromagnetic spectrum capable of giving rise to the sensation of vision.

Lumen. The unit of luminous flux (emitted light).

Luminance. The flow of light from an emitting, transilluminated, or reflecting surface. (The amount of light given off by a surface.)

Luminous flux. The time rate of flow of light, usually designated in lumens.

Multiphasic health screening. Health screening for two or more disease entities.

Optical density (D_γ). A logarithmic expression for the attenuation produced by an attenuating medium, such as an eye protection filter.

Phoria. The direction or orientation of one eye, its line of sight, or some other reference axis or meridian, in relation to the other eye, manifested in the absence of an adequate fusional stimulus.

Presbyopia. A reduction in accommodative ability occurring normally with age and necessitating a plus lens addition for satisfactory seeing at near point.

Refraction. The altering of the pathway of light from its original direction as a result of passing obliquely from one medium to another of different index of refraction. The act or process of determining the refractive and muscular state of the eyes. See Ametropia.

Screening. To evaluate systematically in order to help determine suitability.

Screening (vision). Generally done with a stereoscopic-type instrument for measuring visual acuity, phorias, stereopsis, and color perception.

Shall. Indicates a requirement that is necessary or essential to meet the currently accepted standards of protection or Federal rules and regulations.

Should. Indicates an advisory recommendation that is to be applied when practicable.

Stereopsis. The perception of depth or three-dimensional space resulting from binocular vision.

Units of illumination.

a. *Footcandles (fc).* The illumination on a surface 1 square foot in area which there is a uniformly distributed flux of 1 lumen.

b. *Lux (lx).* The metric equivalent of footcandles, equal to 1 lumen per square meter.

Visibility. The state or degree of being visible. Many factors influence the state of visibility, but the following five are the most important:

a. *Size.* Angular size or visual angle subtended 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 objects in visual space.

d. *Time.* The time required for perception of details in visual work.

e. *Color of object.* Visibility based on color of light reflected from an object.

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 nervous elements, and the interpretative faculty of the brain. Clinically, it is usually measured with a Snellen chart in terms of the Snellen fraction. This method is calibrated on a standard resolution threshold of 1 minute of arc.

APPENDIX C
SAMPLE REGULATIONS FOR THE ESTABLISHMENT AND
FUNCTION OF AN OCCUPATIONAL VISION PROGRAM

Section I. SAMPLE STANDING OPERATING PROCEDURE

STANDING OPERATING
PROCEDURE NO. _____

COMMAND
PREPARING OFFICE/AGENCY
LOCATION

Occupational and Environmental Health

OCCUPATIONAL VISION
(Effective Date)

1. PURPOSE. To establish a comprehensive Occupational Vision Program that is applicable to all employees of the installation to assure the proper utilization and preservation of eyesight.
2. REFERENCES.
 - a. AR 40-5, Health and Environment.
 - b. AR 385-32, Protective Clothing and Equipment.
 - c. TB MED 506, Occupational Vision.
3. OBJECTIVE.
 - a. To assure periodic vision-testing of all personnel to determine their visual skills, and refer for corrections if needed.
 - b. To provide eye protection to all military and civilian employees working in occupations classified as eye hazardous.
4. APPLICABILITY. This directive includes all segments of _____ (installation).
5. RESPONSIBILITIES.
 - a. Medical Service.
 - (1) Maintain a complete inventory of all work areas and eye hazards at the installation utilizing a job-title list.
 - (2) Designate applicable vision standard for specific occupations.
 - (3) Coordinate with Safety Office in determining the occupations requiring safety spectacles.
 - (4) Screen vision of new employees before job placement. Screen vision of all personnel as recommended by TB MED 506 and AR 40-5.

(5) Rescreen referred employees as needed.

(6) Refer all personnel in need of further professional eye care to the appropriate facility.

(7) Assure that verification of prescription and proper fitting of safety eyewear is accomplished by qualified personnel.

(8) Conduct education sessions, in conjunction with safety personnel and supervisors, to instruct personnel in the proper use and care of protective eye wear.

b. Safety Office.

(1) Assists the Occupational Health Service in preparing a list of eye-hazardous occupations and areas requiring vision protection.

(2) Advise the medical services of revisions to list, as required on the basis of injury experience, the hazards involved and the new activities or processes that may be incorporated in the installation's mission.

c. Purchasing and Contracting Office.

(1) Purchase prescription and non-stock listed plano individual safety eyewear as required.

(2) Insure that eyewear is procured and delivered to the user in a timely manner (2 to 3 weeks).

d. Personnel Office.

(1) Schedule personnel for vision screening in coordination with supervisors and the Medical Service.

(2) Utilize the job-vision standards as an aid to the employee utilization program of the installation.

e. Division Chief, Supervisor, and Commander.

(1) Prepare the necessary documents to procure industrial safety spectacles for employees.

(2) Coordinate with Personnel and the Medical Service in the scheduling of employees to be screened.

(3) Enforce the wearing of protective eyewear.

(4) Insure that personnel are not placed in eye-hazardous jobs without proper protection.

(5) Brief new personnel on the importance of safety devices for eye protection and the importance of maintaining these devices in a clean and serviceable condition.

f. Installation Property Office.

(1) Maintain a stock of plano protective eyewear for distribution to the various division property officers.

(2) Expedite requisitioning/procurement and delivery of required safety eyewear.

g. Workers.

(1) Participate in the occupational vision program as outlined in TB MED 506.

(2) Utilize safety equipment and engineering controls as mandated by 29 CFR 1910.133 and local directives.

(3) Insure that protective equipment used with a particular instrument, machine or process remains accessible.

(4) Report any unsafe practices or areas to the supervisor and/or safety specialist so that proper protective intervention may be instituted.

(5) Keep protective eyewear clean, properly fitted, and in serviceable condition.

(6) Be familiar with general first-aid practices and competent in ocular first-aid procedures for eye hazards.

(7) Insure that eye lavages are accessible and functioning (Appendix F, TB MED 506).

(8) Must be aware of the difference between industrial safety eyewear and "street-type" eyewear (appendix G, TB MED 506). Only industrial safety eyewear will be worn in eye-hazardous areas.

- 6. RECESSIONS.
- 7. CONCURRENCE.

(Post Surgeon) (Comptroller)

(C, Civ Personnel) (Post Safety Officer)

- 8. APPROVED: (If applicable)

or

(Command Line - If applicable)

Section II. SAMPLE LOCAL REGULATION

(INSTALLATION) REG _____

COMMAND
PREPARING OFFICE/AGENCY
LOCATION(INSTALLATION) REGULATION
NUMBER _____

Medical Services

OCCUPATIONAL VISION PROGRAM

Issue of further supplements to this regulation by subordinate commanders is prohibited, unless specifically approved by HQ, _____.

1. PURPOSE. This regulation insures a comprehensive Occupational Vision Program that is applicable to all personnel of this installation.
2. SCOPE. The ability to use one's vision effectively and with safety depends upon an efficient vision program that includes:
 - a. Periodic determination of employees' visual capacity and referral of those with defective vision for professional eye care.
 - b. Determination of visual acuity necessary for a particular occupation, and utilization of this determination for job placement.
 - c. Insuring that adequate lighting is available for each occupational activity.
 - d. Insuring the availability and utilization of both environmental and personal measures necessary for maximal eye safety.
 - e. Continuing health education program pointing out the benefits of the Occupational Vision Program and stimulating cooperation of all concerned.

3. GENERAL.

a. Commanders at every echelon shall insure that each physical operation is analyzed by safety or other technically qualified personnel to determine inherent and manmade hazards to the eye. Standing operating procedures (SOP) will reflect the result of such operating analyses by including a requirement for the use of protective clothing and equipment, and including safety spectacles (prescription and plano) to prevent injury. Continuous studies will be conducted to maintain maximum safety standards.

b. Items of protective clothing and equipment required to comply with safety regulations and procedures shall be furnished to military and civilian personnel. The cost of personal safety equipment shall be borne by the installation or activity to which these personnel are assigned.

c. A desire for eye protection and a will to wear industrial safety glasses shall be stimulated among personnel by an educational program to include informal discussion, educational films, and the use of posters. Safety awards may increase motivation. Habitual nonuse of safety glasses and safety precautions in eye-hazardous areas shall be considered grounds for disciplinary action.

d. Contact lenses, of themselves, do not provide eye protection in the industrial sense and shall not be worn in a hazardous environment without appropriate covering safety eyewear.

e. All personnel having useful vision in only one eye shall be identified and advised to wear industrial thickness lenses 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.

4. RESPONSIBILITIES.

a. The Commander is responsible for the establishment and implementation of occupational health activities at _____ and other activities for which the Commander has occupational health activity responsibilities.

b. The Commander, MEDCEN/MEDDAC, is charged with the overall supervision of occupational health activities at _____ and other activities for which the Commander, MEDCEN/MEDDAC, has occupational health activity responsibility.

c. The Chief, Optometry Service, shall:

(1) Classify all work activities under one of six vision standards developed for this purpose. These standards represent the degree of visual skill desired for efficient job performance.

(2) Coordinate with the installation safety and preventive medicine/OHS personnel in determining occupations requiring industrial safety spectacles.

(3) Screen vision of new employees before job placement or as soon after employment as possible. Screen vision of all personnel, as required. Periodic screening shall be scheduled each month alphabetically; however, facilities should be available at any time at the request of an individual.

(4) Determine whether personnel screened meet the visual standards for their particular job.

(5) Fit civilian and military personnel requiring plano safety glasses, and enter measurements on record. Transfer these measurements to DD Form 771 (Eyewear Prescription), and forward in triplicate through appropriate channels for supply action.

(6) Insure that military personnel are provided professional eye care.

(7) Refer eligible civilian employees not possessing desirable visual capabilities for professional eye examinations.

(8) Receive completed prescriptions from optometrists/ophthalmologists and order new glasses as appropriate.

(9) Rescreen referred employees as needed.

(10) Coordinate with Preventive Medicine to conduct lighting surveys as required.

(11) In conjunction with the Installation Safety Director, conduct surveys to insure installation and utilization of proper eye safety equipment; e.g., eye lavage.

d. The Chief, Preventive Medicine/OHS shall:

(1) Report the total number of personnel screened and referred, the number of personnel employed in eye-hazardous areas, and the number of safety spectacles issued as part of the occupational vision program on DA Form 3076 (Army Occupational Health Report) in accordance with AR 40-5.

(2) Maintain an inventory of eye-hazardous jobs, in coordination with safety, and update routinely.

(3) Conduct lighting surveys as required.

(4) Provide health education programs for workers with the participation of safety personnel and the supervisor.

e. The Installation Safety Director shall:

(1) Conduct, with the assistance of industrial hygiene personnel, surveys to determine which jobs and areas are to be classified as "eye hazardous" and provide the results to preventive medicine/OHS personnel.

(2) Coordinate with the Chief, Optometry Service, and respective supervisors in determining the correct types of protective eyewear required for employees exposed to eye hazards.

(3) Monitor the protective phase of the program, provide posters and signs, and make applicable recommendations for improvement.

(4) In conjunction with Optometry Service, carry on surveys insuring the acquisition and utilization of appropriate eye-safety equipment; e.g., eye lavage.

f. The Chief, Civilian Personnel, shall:

(1) Refer new employees to Optometry Service for vision screening before job placement.

(2) Coordinate with Preventive Medicine in scheduling periodic vision screening for employees.

g. Division/Branch Chiefs and other supervisors shall:

(1) Coordinate with Preventive Medicine in scheduling employees to be screened.

(2) Assist Optometry Service and the Safety Office in selecting the types of protective eyewear required for various eye-hazardous jobs.

(3) Forward completed prescription order forms for employees needing prescription changes between screenings.

(4) Enforce the wearing of safety eye protection and safety discipline.

(5) Brief new personnel on safety devices for eye protection; e.g., how to use these devices, and their importance in maintaining good vision. Also the importance of maintaining the eye-protection devices in a clean and serviceable condition.

(6) Insure that employees are not placed in eye-hazardous jobs without proper protection.

(7) Acquire, post, and maintain signs and posters stressing eye safety.

(8) Advise civilian and military personnel who are issued safety-type eyewear to see the installation optometrists for proper fitting, adjustment, etc. Direct personnel having unusual difficulties or complaints from the use of safety glasses to Optometry Service.

h. Property Book Officer shall:

(1) For individuals requiring prescription safety spectacles:

(a) Prepare DA Form 2765-1 (Request for Issue or Turn-In).

(b) Authenticate DD Form 771 (signature block of approving authority), and attach duplicate copies of this form to the purchase request.

(c) Forward DA Form 2765-1 and DD Form 771 through proper supply channels to the Medical Supply Officer.

(d) Maintain appropriate records of issue IAW AR 385-32.

(2) For individuals requiring plano safety spectacles:

(a) Prepare DA Form 2765-1.

(b) Authenticate DD Form 771 (signature block of approving authority), and attached duplicate copies of this form to the purchase request.

(c) Maintain a stock of all-plastic plano safety glasses to provide appropriate safety eyewear over employees' personal spectacles until prescription safety spectacles are received.

(d) Provide all visitors entering eye-hazardous areas with appropriate safety eyewear.

i. Accountable Property Offices shall:

(1) Logistics Division shall establish procurement procedures in accordance with current installation regulations for prescription safety glasses, and issue prescription safety glasses to division property officers, who, in turn, shall issue them to employees.

(2) Supply Division, DIO, shall establish procurement procedures in accordance with current regulations for obtaining plano safety glasses for distribution to division property officers, who, in turn, shall issue them to employees.

5. REFERENCES.

- a. AR 40-5, Health and Environment.
- b. AR 385-32, Protective Clothing and Equipment.
- c. TB MED 506, Occupational Vision.

(ATZR-MRH-CS)

The proponent of this local regulation is _____
Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Commander, (_____ major command _____), ATTN: _____, (location) _____.

FOR THE COMMANDER:

DISTRIBUTION:

Section III. SAMPLE APPENDIX TO LOCAL REGULATION

APPENDIX

EYE-HAZARDOUS AREAS

In the eye, minor injury which would be insignificant elsewhere on the body may result in the total loss of vision. The Vision Conservation Program consists of the identification of eye-hazardous areas, engineering controls, personal protection and education of workers in eye-hazardous areas. The use of industrial safety glasses in hazardous areas is required.

a. Location. The following buildings have eye hazardous work areas and should be posted for required use of eye protection:

DIO:	Bldgs 2035, 2036, 2037, 2179, 2182, 2188, 2189, 2187, 2243, 2250, 2251, 2252, 2254, 2255, 2258, 2262, 2263, 2292, 2293, 2294, 2295, 2296, 2300, 2355, 2358, 2361
DFAE:	Bldgs 1935, 1945, 1948, 2950, 1953
DPCA:	Bldgs 443, 477, 1700, 1731, 1732, 2751, 3381
DPT:	Bldgs 314, 315, 316, 326, 327, 342, 747
XYZ:	Bldgs 1509, 1645, 2454, 2464, 2466, 2487, 2475, 2493, 3372, 3313, 3362, 3457, 3463
FSAB:	Bldgs 58, 840, 2434, 4222, 4110, 4231, 4250
Other:	RAH, 2916, 100th, S&S, 3477, 3482, 3495, 3496, See composite listing for additional areas.

b. Operations. Metal cutting, tire inflation, power equipment, welding.

c. Potential Exposures. Flying projectiles, ultraviolet, infrared and intense visible radiations.

d. Protective Equipment. Safety glasses, goggles, face shields.

e. Medical Examination. Vision testing.

f. Frequency of Examination.

(1) Preplacement and annual job-related, vision screening examinations of personnel employed in occupations with high intensity light hazards.

(2) Preplacement and biennial vision screening for workers in all other potentially eye hazardous occupations.

APPENDIX D
VISION STANDARDS AND EYE PROTECTION REQUIREMENTS
(BY OCCUPATION)

Section I. GENERAL SCHEDULE POSITIONS

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
A			
Accountant -----	1	No	500
Accounting (Clerk and Technician) -----	1	No	510
Actuary -----	1	No	1510
Administrative Assistant -----	1	No	341
Administrative Librarian -----	1	No	1410
Administrative Officer -----	1	No	341
Adviser in Education -----	1	No	1720
Aerial Observer* -----	Special	No	456
Aeronautical Marine Information Specialist -----	3	No	1361
Agricultural Commodity Grader (all specializations) -----	5	No	1980
Agricultural Commodity Market Reporter (all specializations) -----	1	No	1147
Agricultural Economist -----	1	No	110
Agricultural Management Specialist -----	1	No	475
Agricultural Research Technician -----	5	No	404
Agronomist -----	5	No	471
Air Traffic Control Specialist (all specializations)* -----	Special	No	2152
Aircraft Pilot -----	Special	No	2181
Airplane Pilot -----	Special	No	2181
Airspace System Inspection Pilot -----	Special	No	2181
Animal Husbandman -----	5	No	487
Anthropologist -----	5	No	190
Appraiser -----	5	No	1171
Archaeologist -----	5	Yes	193
Architect -----	5	No	808
Archives (Aid, Specialist and Technician) -----	1	No	1421
Archivist -----	1	No	142
Art Specialist -----	5	No	1056
Assistant Hospital Housekeeping Officer -----	5	No	673
Astronomer -----	5	No	1330
Astrophysicist -----	5	No	1330
Audiologist -----	5	No	665
Audio-Visual Production Officer -----	5	No	1071
Audio-Visual Production Specialist -----	5	No	1071
Automated Laboratory Machine Technician -----	5	No	649
Automotive Equipment Dispatcher -----	1	No	2151
Automotive Transportation Administrator -----	1	No	2150
Automotive Transportation Specialist -----	1	No	2150
Autopay Assistant -----	5	No	625
B			
Biological Aid* -----	5	Yes	404
Biological Laboratory Technician* -----	5	Yes	404
Biological Technician* -----	5	Yes	404
Biologist (all specializations)* -----	5	Yes	401

See footnotes at end of section I.

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
Boiler Inspector -----	5	Yes	1899
Botanist* -----	5	No	430
Budget Analyst (also supervisory) -----	1	No	560
Budget and Accounting Officer -----	1	No	504
Budget Officer -----	1	No	560
Building and Grounds Manager -----	5	No	1641

C

Cadet Hostess -----	1	No	1666
Calculating Machine Operator -----	1	No	355
Card Punch (Operator and Supervisor) -----	1	No	356
Cardiac Catheterization Technician -----	5	No	649
Cargo Scheduler (also supervisory) -----	1	No	2144
Cartographer -----	3	No	1370
Cartographic (Aid and Technician) -----	3	No	1371
Cash Clerk/Teller -----	1	No	530
Cemetery (Administrator and Superintendent) -----	1	No	1630
Chemist* -----	3	Yes	1320
Claims Clerk -----	1	No	998
Classification (Assistant and Clerk) -----	1	No	203
Clerk (various positions) -----	1	No	300
Clerk-Dictating Machine Transcriber -----	1	No	300
Clerk-Stenographer -----	1	No	300
Clerk-Typist -----	1	No	300
Clinical Psychologist -----	1	No	180
Closed Microphone Reporter -----	1	No	319
Clothing Designer* -----	5	No	062
Coding Clerk -----	1	No	357
Cold-Type Composing Machine Operator -----	4	No	324
Color Designer -----	3	No	1001
Commissary Officer -----	1	No	1144
Commissary Store Manager -----	1	No	1144
Communications Control Technician -----	5	No	392
Communications Equipment Operator -----	4	No	300
Communications Management Specialist (also supervisory) -----	5	No	391
Communications Manager -----	5	No	391
Communications Operator (various positions) -----	4	No	300
Communications Relay Operator -----	4	No	300
Communications (Specialist and Technician) -----	5	No	393-392
Community Shelter Program Officer -----	1	No	301
Community Shelter Program Specialist -----	1	No	301
Computer (Aid and Technician) -----	5	No	335
Computer Equipment Analyst -----	5	No	334
Computer Operator (various positions) -----	5	No	332
Computer (Programmer and Specialist) -----	1	No	334
Computer Systems Analyst -----	1	No	334
Conservation Agronomist -----	1	No	471
Construction Analyst -----	5	No	828
Construction and Maintenance Representaitve -----	5	Yes	1640
Construction and Maintenance Superintendent -----	5	Yes	1640
Construction Inspection Aid -----	5	Yes	809
Construction Inspector -----	5	Yes	809
Construction Representative -----	5	Yes	809
Construction Superintendent -----	5	Yes	1640
Consulting Public Health Nurse -----	5	No	615
Contact Representative -----	1	No	962
Contract (Administrator and Negotiator) -----	1	No	1102
Contract (Price Analyst and Specialist) -----	1	No	1102
Contract Termination Specialist -----	1	No	1102
Contract Industrial Relations Specialist (also supervisory) -----	5	No	246
Correctional Officer* -----	Special	No	007
Corrective Therapist -----	5	No	635

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
Corrective Therapy Assistant -----	5	No	636
Cotton Technologist -----	1	No	1384
Counseling (Aid and Assistant) -----	1	No	186
Counseling Psychologist -----	1	No	180
Criminal Investigator (also supervisory) -----	5	No	1810, 1811
Cryptoanalyst -----	3	No	1541
Cryptographic Equipment Operator -----	4	No	300
Cytology Technician (also supervisory) -----	3	No	646

D

Dairy Husbandman -----	5	No	487
Dental Assistant -----	5	Yes	681
Dental Hygienist -----	3	Yes	682
Dental Laboratory (Aid and Technician) -----	3	Yes	683
Dental Officer -----	3	Yes	680
Department Manager -----	1	No	1144
Detective (also supervisory) -----	5	No	083
Dietitian (all Specializations) -----	1	No	630
Digital Computer Systems Administrator -----	1	No	330
Director, Community Shelter Program -----	1	No	301
Document Analyst -----	1	No	1397
Draftsman -----	5	No	1021
Dry Cleaning Plant (Manager and Superintendent) -----	5	No	1658

E

Economist -----	1	No	110
Editor -----	1	No	1082
Editorial (Assistant and Clerk) -----	1	No	1087
Education (Aid, Officer and Technician) -----	5	No	1702
Educational (Assistant and Specialist) -----	5	No	1720
Educational Therapist -----	5	No	639
Educational Therapy Assistant -----	5	No	636
Electric Accounting Machine Operator -----	4	No	359
Electric Accounting Machine Program Supervisor -----	4	No	362
Electric Accounting Machine Project Planner (also supervisory) -----	4	No	362
Electric Accounting Machine Supervisor -----	4	No	359
Electrocardiograph Technician -----	5	No	649
Electroencephalograph Technician -----	5	No	649
Electronics Technician* -----	3	Yes	856
Employee Development (Assistant, Clerk, Specialist) -----	1	No	203
Employee Management Cooperation Specialist -----	1	No	200
Employee Relations (Assistant, Clerk, Specialist) -----	1	No	203
Engineer* -----	5	Yes	800
Engineering Aid* -----	5	Yes	802
Engineering Draftsman* -----	3	No	818
Engineering Psychologist -----	5	No	180
Engineering Technician* -----	5	Yes	802
Entomologist -----	5	No	414
Environmental Health (Aid and Technician) -----	5	Yes	698
Equal Opportunity (Officer and Specialist) -----	1	No	160
Equipment Specialist -----	5	No	1670
Exhibits Specialist -----	5	No	1010

F

Facilities Maintenance Specialist -----	5	Yes	1642
Farm Credit Examiner -----	1	No	570
Farm Credit Examining Officer -----	1	No	570
Fiber Technologist -----	3	No	1384
Financial (Assistant, Economist, and Manager) -----	1	No	1160, 110, 505
Fingerprint Clerk -----	5	No	072
Fingerprint Examiner -----	3	No	072

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
Fire Chief*	Special	Yes	081
Fire Communications Operator*	Special	No	081
Fire Control Aid*	Special	Yes	456
Fire Control Officer*	Special	Yes	456
Fire Control Staff Officer*	Special	Yes	456
Fire Control Technician*	Special	Yes	456
Fire Dispatcher*	Special	No	456
Firefighter (all specializations, also supervisory)*	Special	Yes	081
Fire Prevention Technician*	Special	Yes	456
Fire Protection (Inspector and Specialist)*	Special	Yes	081
Fishery Biologist (all specializations)	5	No	482
Fishery Marketing Specialist	5	No	1147
Flight Engineer	Special	No	2181
Flight Instructor (all specializations)	Special	No	2181
Flight Test Pilot	Special	No	2181
Food Technologist	5	Yes	1382
Foreign Affairs Analyst	1	No	130
Foreign Affairs Officer	1	No	130
Forest Products Technologist	5	No	1380
Forester (all specializations)	5	No	460
Forestry Aid	5	Yes	462
Forestry Research Technician	5	No	462
Forestry Technician (Special for arduous and hazardous)	5	Yes	462
Freight Classification Specialist	1	No	2131
Freight Rate (Assistant and Specialist)	1	No	2131
Freight Classification Assistant	1	No	2131
Funeral Director	5	No	050

G

General Biological Science Series	5	No	401
General Education and Training Series	5	No	1701
General Health Science Series	5	No	601
Geneticist	3	No	440
Geodesist	5	No	1372
Geodetic Aid	5	No	1374
Geodetic Technician	5	No	1374
Geographer	1	No	150
Geologist	5	Yes	1350
Geophysicist	5	No	1313
Group Aid	5	No	186
Group Leader	5	No	186
Guard	5	No	085
Guard Supervisor	5	No	085

H

Health Aid	5	Yes	699
Health Physicist	5	No	1360
Health Technician	5	Yes	699
Hearing Examiner	5	No	935
Heart-Lung Machine Technician	5	No	649
Helicopter Pilot	Special	No	2181
Histopathology Technician (also supervisory)	5	No	646
Historian	1	No	170
Home Economist	5	No	493
Horticulturist (all specializations)	5	No	437
Hospital Administration Specialist	1	No	670
Hospital Administrative Assistant	1	No	670
Hospital Administrative Officer	1	No	670
Hospital Director	1	No	670
Hospital Housekeeping Assistant	5	No	670

<i>Job title</i>	<i>standard Vision</i>	<i>Eye protection</i>	<i>GS series</i>
Hospital Housekeeping Officer -----	1	No	673
Hospital Housekeeping Program Specialist -----	1	No	673
Hostess -----	6	No	1666
Housekeeper -----	6	No	1666
Housekeeping Aid -----	6	No	1666
Housemother -----	1	No	1173
Housing Management Assistant -----	1	No	1173
Housing Management Officer -----	1	No	1173
Housing Project Assistant -----	1	No	1173
Housing Project Manager -----	1	No	1173
Human Biologist -----	5	No	401
Hydroelectric Power Plant Trainee -----	5	Yes	S/A† ARMY
Hydrologic Aid -----	5	No	1316
Hydrologic Technician -----	5	No	1316
Hydrologist (also supervisory) -----	5	No	1315
Hyperbaric Chamber Technician -----	5	No	649

I

Illustrator (all specializations) -----	3	No	1020
Industrial Engineering Technician -----	5	Yes	895
Industrial Hygienist -----	5	Yes	690
Industrial Property Clearance Specialist -----	1	No	1103
Industrial Property Management Specialist -----	1	No	1103
Industrial Specialist -----	5	Yes	1150
Industry Economist -----	1	No	110
Inhalation Therapy Technician -----	5	No	649
Insurance Examiner (all specializations) -----	1	No	1163
Intelligence Operations Specialist -----	5	No	132
Intelligence Research Specialist -----	5	No	132
Interior Decorator -----	5	No	1001
International Economist -----	1	No	110
International Relations Officer -----	1	No	131
International Trade Specialist -----	1	No	1140
Investigator (also supervisory) -----	5	No	1810, 1811
Investment Company Examiner -----	1	No	570
Investment Company Examining Officer -----	1	No	570

K

Kidney Machine Technician -----	5	No	649
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L

Labor Economist -----	1	No	110
Laboratorian -----	5	Yes	645
Landscape Architect -----	5	No	807
Land Surveyor -----	5	No	1373
Laundry and Dry Cleaning Plant Manager -----	1	No	1658
Laundry and Dry Cleaning Plant Superintendent -----	1	No	1658
Laundry Plant (Manager and Superintendent) -----	1	No	1658
Legal Assistant -----	1	No	900
Legal Instruments (Clerk, Examiner) -----	1	No	963
Librarian (also supervisory) -----	1	No	1410
Library Aid -----	1	No	1411
Library Director (all specializations) -----	1	No	1410
Library Technician (also supervisory) -----	1	No	1411
Licensed Practical Nurse -----	4	No	621
Loan Assistant -----	1	No	1165
Loan Specialist (all specializations) -----	1	No	1165
Logistics Management Officer -----	1	No	346
Logistics Management Specialist (also supervisory) -----	1	No	346
Lookout* -----	Special	No	456

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
M			
Mail Clerk -----	1	No	305
Maintenance Representative -----	5	Yes	1640
Maintenance Superintendent -----	5	Yes	1640
Management Agronomist -----	1	No	471
Management (Analysis Officer and Analyst) -----	1	No	343
Management Assistant (also supervisory) -----	1	No	344
Management Clerk (also supervisory) -----	1	No	344
Manual Arts Therapist -----	5	Yes	637
Manual Arts Therapy Assistant -----	5	Yes	636
Marine Cargo (Assistant and Specialist) -----	5	Yes	2161
Marine Information Specialist -----	1	No	1361
Mathematical Statistician -----	1	No	1529
Mathematician -----	1	No	1520
Mathematics (Aid and Technician) -----	1	No	1521
Matron -----	6	No	1666
Medical Aid -----	5	No	622
Medical Laboratory Aid -----	5	No	645
Medical Machine (Aid and Technician) -----	5	No	649
Medical Officer (all specializations) -----	5	No	602
Medical Radiology Technician (all specializations) -----	5	No	647
Medical Record Librarian -----	1	No	669
Medical Record Technician -----	5	No	675
Medical Technician (also supervisory) -----	5	No	645
Medical Technologist (also supervisory) -----	5	No	644
Messenger (also supervisory) -----	1	No	302
Messenger (motor vehicle operator) -----	Special	No	302
Metallurgist -----	5	Yes	1321
Meteorological (Aid and Technician) -----	5	No	1341
Meteorologist -----	5	No	1340
Microbiologist -----	5	No	403
Military Personnel Clerk(also supervisory) -----	1	No	204
Military Personnel Management Positions -----	1	No	205
Military Personnel Technician (also supervisory) -----	1	No	204
Mortuary Officer -----	1	No	050
Motion Picture Production Specialist -----	5	No	1071
Motor Vehicle Dispatcher -----	1	No	2151
Museum Aid -----	5	No	1016
Museum Curator (all specializations) -----	5	No	1015
Museum (Specialist and Technician) -----	5	No	1016
Music Specialist -----	5	No	1015
Mycologist (all specializations) -----	5	No	431

N

Navigator -----	Special	No	2181
Nuclear Medicine (Aid and Technician) -----	5	No	642
Nurse (all specializations, also supervisory)* -----	5	No	610
Nursing (Aid and Assistant) -----	5	No	621
Nurse, occupational -----	5	Yes	610

O

Occupational Therapist (also supervisory) -----	5	Yes	631
Occupational Therapy Assistant* -----	5	Yes	636
Oceanographer -----	5	No	1360
Office Draftsman -----	3	No	1021
Office Machine Operator (all positions) -----	4	No	300
Office Service Manager-Supervisor -----	5	No	342
Operating Room Nursing Assistant -----	5	No	621
Operations Research Analyst -----	1	No	1515
Optometrist, Clinical -----	5	No	662

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
Optometrist, Industrial -----	5	Yes	662
Orthotic-Prosthetic Aid -----	4	Yes	667
Orthotist -----	4	Yes	667
Orthotist-Prosthetist -----	4	Yes	667
Outdoor Recreation Planner -----	1	No	023
P			
Packaging Specialist (also supervisory) -----	4	Yes	2032
Park (Aid and Technician)* -----	Special	No	026
Parasitologist* -----	5	No	
Passenger Rate Assistant -----	1	No	2133
Passenger Rate Specialist (also supervisory) -----	1	No	2133
Patent Adviser (all specializations) -----	1	No	1221
Pathology Aid -----	5	No	646
Pathology Technician (also supervisory) -----	6	No	646
Payroll (Clerk and Technician) -----	1	No	544
Personnel (Assistant and Clerk) -----	1	No	203
Personnel Management Specialist -----	1	No	200
Personnel Officer -----	1	No	200
Personnel Psychologist -----	1	No	180
Personnel Staffing Specialist -----	1	No	200
Pharmacist (also supervisory)* -----	5	No	660
Pharmacologist* -----	5	No	405
Pharmacy (Aid and Technician)* -----	5	No	661
Photographer (all specializations)* -----	5	No	1060
Photographic Technologist* -----	5	No	1386
Physical Science (Aid and Technician) -----	5	No	1311
Physical Scientist -----	5	No	1311
Physical Therapist (also supervisory)* -----	5	No	633
Physician's Assistant -----	5	No	603
Physicist -----	5	No	1310
Physiologist -----	5	No	413
Plant (Pathologist and Physiologist)* -----	5	No	434, 435
Podiatrist -----	5	Yes	668
Policeman and Policewoman* -----	5	No	083
Position Classification Specialist -----	1	No	200
Poultry Husbandman -----	5	No	487
Printing Assistant -----	5	No	1654
Printing Officer -----	5	No	1654
Printing Specialist (also supervisory) -----	5	No	1654
Procurement (Agent and Analyst) -----	1	No	1102
Procurement (Assistant and Clerk) -----	1	No	1102, 1106
Procurement Officer -----	1	No	1102
Production Control Aid -----	1	No	1152
Production Controller -----	1	No	1152
Program (Analysis Officer and Analyst) -----	1	No	345
Property Disposal Specialist -----	1	No	1104
Property Marketing Specialist -----	1	No	1104
Property Utilization Specialist -----	1	No	1104
Prosthetist -----	5	Yes	667
Psychiatric Nursing Assistant -----	5	No	621
Psychologist -----	5	No	180
Psychology (Aid and Technician) -----	5	No	181
Public Health Nurse -----	5	No	615
Public Information Officer -----	1	No	1081
Public Information Specialist (all specializations) -----	1	No	1081
Public Utilities (Assistant and Specialist) -----	1	No	1130
Pulmonary Function Technician -----	5	No	649
Purchasing Agent (also supervisory) -----	1	No	1105
Q			
Quality Assurance Specialist -----	5	Yes	1910
Quality Inspection Specialist -----	3	Yes	1960

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
R			
Radio Astronomer -----	5	No	1330
Radio Operator -----	4	No	300
Radio Production Specialist -----	1	No	1071
Range Aid -----	5	No	455
Range Conservationist -----	5	No	454
Range Research Technician -----	5	No	455
Range Scientist -----	5	Yes	454
Range Technician -----	5	No	455
Realty Officer (also supervisory) -----	1	No	1170
Realty Specialist (also supervisory) -----	1	No	1170
Recreation (Aid, Assistant and Specialist) -----	3	No	189
Regional Economist -----	1	No	110
Reporting Stenographer -----	1	No	312
Research Agronomist -----	5	No	471
Research Chemist -----	5	Yes	1320
Research Entomologist -----	5	No	414
Research Forester -----	5	No	460
Research Public Health Nurse -----	5	No	615
Restoration Technician -----	5	No	664
S			
Safety Engineer -----	5	Yes	803
Safety Manager -----	5	Yes	018
Safety (Specialist and Technician) -----	5	Yes	018, 019
Salary and Wage Administration Specialist -----	1	No	200
Sales Store (Checker and Clerk) -----	4	No	2091
Sanitarian -----	5	No	688
Sanitation Inspector (all specializations) -----	5	No	1860
Savings and Loan Examiner -----	1	No	570
Savings and Loan Examining Officer -----	1	No	570
Secretary (all specializations) -----	1	No	318
Security Administration (Specialist or Officer) -----	1	No	080
Shop Superintendent (Medical and Hospital) -----	5	Yes	1601
Shorthand Reporter -----	1	No	312
Smokeyumper* -----	Special	Yes	456
Social Science Analyst -----	1	No	101
Social Science Program Specialist -----	1	No	101
Social Service Representative -----	1	No	187
Social Services (Aid and Assistant) -----	1	No	186
Social Work (Aid, Assistant and Associate) -----	1	No	186, 187
Social Work Program Specialist -----	1	No	185
Social Worker -----	1	No	185
Sociologist (also supervisory) -----	1	No	184
Soil Conservation (Aid and Technician) -----	5	No	458
Soil Conservationist -----	5	No	457
Soil Scientist -----	5	No	470
Space Scientist -----	5	No	1330
Speech Pathologist -----	1	No	665
Speech Pathologist and Audiologist -----	1	No	665
Sports Specialist -----	1	No	030
Staff Curator -----	1	No	1015
Staffing (Assistant and Clerk) -----	1	No	203
Statistical (Assistant and Clerk) -----	1	No	1531
Statistician (all specializations) -----	1	No	1530
Steward -----	6	No	1667
Supply Cataloger -----	1	No	2050
Supply (Clerk and Technician) -----	1	No	2005
Survey Statistician -----	1	No	1530
Surveying (Aid and Technician) -----	5	No	817

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>GS series</i>
T			
Tank-Truck Operator* -----	2	No	456
Technical Information Officer -----	1	No	1412
Technical Information Specialist (also supervisory) -----	1	No	1412
Technical Writer and Editor -----	1	No	1083
Telephone Operator -----	1	No	382
Teletypist (also supervisory) -----	4	No	300
Television Production Specialist -----	5	No	1071
Textile Technologist -----	5	No	1384
Theater Specialist -----	5	No	1054
Therapeutic Recreation Specialist -----	5	No	188
Therapy (Aid and Assistant) -----	5	No	636
Trade (Assistant and Specialist) -----	1	No	1140
Traffic Management Specialist (also supervisory) -----	1	No	2130
Traffic Manager -----	1	No	2130
Training Administrator -----	1	No	1712
Training Instructor (also supervisory) -----	1	No	1712
Training (Specialist and Technician) -----	1	No	1712, 1702
Translator -----	1	No	1045
Transportation Industry Analysis Officer -----	1	No	1135
Transportation Industry Analyst (also supervisory) -----	1	No	1135
Travel Assistant (also supervisory) -----	1	No	2132
Travel Clerk -----	1	No	2139

U

Urban Planner -----	1	No	020
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V

Veterinary Medical Officer -----	5	No	701
Visual Information Officer -----	1	No	1084
Visual Information Specialist (all specializations) -----	1	No	1084
Vocational Development Specialist -----	1	No	1715
Vocational Rehabilitation Specialist -----	1	No	1715

W

Wildlife Biologist (all specializations) -----	5	No	486
Writer -----	1	No	1082
Writer-Editor -----	1	No	1082

Z

Zoologist* -----	5	No	410
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* Refer to paragraph 3-2a(8)

† Single-Agency Qualification Standard

Section II. WAGE GRADE POSITIONS

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>WG series</i>
A			
Airborne Instrumentations Analyzer -----	5	No	8355
Aircraft Attendant -----	6	No	8862
Aircraft Brake Inspector -----	3	Yes	8261
Aircraft Brake Repairman -----	4	Yes	8260
Aircraft Components Inspector Supervisor -----	3	Yes	8703

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>WG series</i>
Crater	2	Yes	4621
Crating Inspector	5	Yes	4622
Crusher Operator	4	Yes	5505
Cryromatic Equipment Installer	4	Yes	2513
Cryromatic Equipment Repairman	3	Yes	2513
Crystal (Cutter, Etcher, Dicer)	3	Yes	2702, 2703
Crystal (Finisher, Inspector)	3	Yes	2704, 2705
Crystal (Lapper, Orienter, Technician)	3	Yes	2706-2708
Custodial Equipment Repairman	4	Yes	4808

D

Debris Working, Marine	6	Yes	5930
Deck Equipment Operator	2	Yes	5905
Deckhand	5	Yes	5906
Derrickboat Operator	2	No	5907
Die Sinker	5	Yes	3428
Diesel Engine Repairman	4	Yes	5804
Diesel Tender Operator	2	No	5715
Dipper Dredge Operator	2	No	5908
Diver	5	No	6208
Dockhand	2	Yes	5931
Dockmaster	5	Yes	5932
Door Closer Repairman	4	Yes	5364
Dot Etcher	3	Yes	4422
Dough Mixer	4	No	7406
Drifter, Offset	3	No	4404
Drawbridge Operator	2	No	5430
Dredging Equipment Operator	2	No	5909
Drill Equipment Repairman	4	Yes	5827
Drill Operator	4	Yes	5729
Drill Press Operator	4	Yes	3409
Drop Hammer Operator	4	Yes	3802
Dry Cleaner	4	No	7307
Dunnage Maker	4	Yes	4611

E

Electric-Bridge Crane Operator	2	No	5712
Electric Cable Splicer	5	Yes	2810
Electrical Inspector	3	Yes	2804
Electrical Installer	5	Yes	2805
Electrical Repairman	4	Yes	2805
Electrical Installer, Marine	5	Yes	2802
Electrical Repairman, Marine	4	Yes	2802
Electrical Line Worker	5	Yes	2806
Electrical Motor Repairman	4	Yes	2807
Electrical Worker, Power House	5	Yes	2808
Electrical Worker, Studio	5	Yes	2803
Electron Tube Maker	3	Yes	2603
Electronic Equipment Inspector	3	Yes	2615
Electronic Equipment Maker	3	Yes	2614
Electronic Equipment Installer	5	Yes	2614
Electronic Equipment Repairer	3	Yes	2614
Electronic Fire Control Systems Inspector	3	Yes	2618
Electronic Fire Control Systems Maker	3	Yes	2617
Electronic Fire Control Systems Installer	5	Yes	2617
Electronic Fire Control Systems Repairman	3	Yes	2617
Electronic-Mechanical Communications Equipment Installer and Repairman	5	Yes	2619
Electronic Test Equipment Maker and Repairman	3	Yes	2602
Electronic Test Equipment Operator	4	Yes	2607
Electroplater	5	Yes	3711
Elevator Operator	6	No	5438

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>WG series</i>
Elevator Installer and Repairman	5	Yes	5313
Embroiderer	3	No	3118
Engine Lathe Operator	4	Yes	3411
Engine Parts Coater	4	Yes	8674
Engineer, Diesel	2	Yes	5911
Engineer, Diesel Electric	2	Yes	5912
Engineer, Equipment Inspector	3	Yes	5802
Engineer, Equipment Operator	2	Yes	5716
Engineer, Equipment Repairman	4	Yes	5803
Engineer, Steam	2	Yes	5913
Engineer, Steam-Electric	2	Yes	5914
Expenditure Order Writer	1	No	6706
Experimental Aircraft Engine Test Mechanic	4	Yes	8689
Experimental Aircraft Test Mechanic	4	Yes	8880
Experimental Rocket Engine Inspector	3	Yes	8686
Experimental Rocket Engine Tester	4	Yes	8685
Experimental Rocket Facility Mechanic	4	Yes	8687
Explosives Detonator	5	Yes	5504
Explosives Gage and Weighing Machine Operator	4	Yes	6513
Explosives Operator	5	Yes	6502

F

Fat (Renderer, Maker)	4	No	7409, 6202
Film Assembly-Stripper	4	No	4405
Film Cleaning Machine Operator	4	No	3916
Film Searcher	4	No	3918
Film Slitting Machine Operator	4	No	3915
Finisher	3	Yes	3144
Fire Control Instrument Inspector	3	Yes	2612
Fire Control Instrument Maker	4	Yes	2613
Fire Control Instrument Installer	5	Yes	2613
Fire Control Instrument Repairman	4	Yes	2613
Fire Extinguisher Servicer	4	Yes	4803
Fireman-Watertender	5	No	5915
Fire Protection Equipment Repairman	3	Yes	5809
Fish Facility Operator	4	No	5432
Flame Cutter	4	Yes	3702
Flight Line Mechanic	4	Yes	8875
Floor Coverer	5	Yes	3124
Floor Layer	5	Yes	3609
Fluid System Components Inspector	3	Yes	8256
Fluid System Components (Repairman Servicer, Worker)	4	Yes	8253-8255
Food Services Worker	6	No	7408
Forgings Heating Operator	4	Yes	3810
Forgings Inspector	3	Yes	3813
Fork-Lift Operator	2	No	5704
Foundry Worker	4	Yes	3708
Fuel Distributing Systems Operator	4	Yes	5413
Fumigating and Decontaminating Equipment Operator	4	Yes	5422
Furnace Operator, Popping Plant	4	Yes	5431
Furnace Tender, Foundry	6	Yes	3710
Furniture Repairman	4	Yes	4613

G

Galvanizer	4	Yes	3718
Gantry Crane Operator	2	No	5717
Gardener	4	No	3562
Garden Equipment Repairman	4	Yes	4804
Gas Appliances Repairman	4	Yes	5308
Gasoline Motor Repairman	4	Yes	5319
Gasoline Distribution Equipment Repairman	4	Yes	5314

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>WG series</i>
Gear Cutting Machine Operator	4	Yes	3432
General Utilities, Operating Engineer	5	Yes	5406
Glassblower	4	Yes	3204
Glazer	4	Yes	3203
Grading Equipment Operator	2	Yes	5718
Grinding Machine Operator	4	Yes	3424
Grinder, Optical Elements	4	Yes	4006
Ground Maintenance Worker	4	Yes	3504
Guided Missile Mechanical Inspector	3	Yes	6613
Guided Missile Mechanical Installer	5	Yes	6612
Guided Missile Mechanical Repairman	4	Yes	6612
Gun Stock Maker and Finisher	4	Yes	4623

H

Heat Treater	4	Yes	3712
Heating Equipment Repairman	4	Yes	5309
Heavy Duty Earth Hauling Equipment Operator	2	No	5719
Helicopter Mechanic	4	Yes	8872
Honing and Lapping Machine Operator	4	Yes	3425
Hospital Worker (include dispensary)	5	No	7502
Hyacinth Removal Plant Operator	4	No	5916
Hydraulic Equipment Repairman	4	Yes	5328
Hydraulic Transmission Inspector	3	Yes	8267
Hydraulic Transmission Repairman	4	Yes	8266
Hydroelectric Powerhouse Mechanical Equipment Repairman	4	Yes	5324
Hydromechanical Fuel Control Inspector	3	Yes	8271
Hydromechanical Fuel Control Repairman	4	Yes	8270

I

Ice Cream Maker	4	No	7410
Incinerator Operator	4	Yes	5403
Industrial Instrument Inspector	3	Yes	3310
Industrial Instrument Repairman	3	Yes	3305
In-Flight Refueling Equipment Inspector	3	Yes	8258
In-Flight Refueling Equipment Repairman	4	Yes	8257
Insect and Rodent Controller	5	Yes	5425
Instrument Maker and Repairman	3	Yes	3412

J

Janitor	6	No	3566
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K

Kitchen and Bakery Equipment Repairman	4	Yes	5310
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L

Laboratory, Worker	4	Yes	7502
Laborer	6	Yes	3502
Landing Gear Inspector	3	Yes	8263
Landing Gear Repairman	4	Yes	8262
Laundry and Dry Cleaning Equipment Inspector	5	Yes	5321
Laundry and Dry Cleaning Equipment Repairman	4	Yes	5317
Laundry, Making, Classifier and Sorter	4	No	7302
Laundry Mender	3	Yes	7308
Laundry Operator, Receiver, Skipper	4	No	7351, 7303
Laundry Worker	4	No	7304
Layout Worker	4	No	3420
Leadburner	4	No	3716
Leather Products Inspector	3	No	3122
Leather Worker	4	No	3102
Lens Coater	3	No	4009

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>WG series</i>
Lenstype Operator -----	4	Yes	4407
Lock and Dam Maintenance and Repairman -----	4	Yes	5318
Lock and Dam Operator -----	4	No	5426
Locksmith -----	3	Yes	5311
Locomotive Electrical Systems Repairman -----	4	Yes	6102
Locomotive Engineer, Fireman -----	2	Yes	6004, 6005
Locomotive Inspector -----	3	Yes	6103
Locomotive Repairman -----	4	Yes	6104
Loftsman -----	4	Yes	6206
Lumber Carrier Operator -----	2	No	5720
Lumber Handler -----	6	Yes	6902

M

Machine Tool Inspector -----	3	Yes	3433
Machine Tool Operator -----	4	Yes	3431
Machine Parts Inspector -----	3	Yes	3413
Machinist, General -----	4	Yes	3414
Magnastripe Applying Machine Operator -----	4	No	3917
Maintenance Inspector -----	5	Yes	4705
Maintenance Supervisor -----	5	Yes	4704
Make-up Worker -----	5	No	3902
Map Mounter -----	4	No	4409
Marine Equipment Inspector -----	3	Yes	6210
Marine Equipment Repairman -----	4	Yes	6203
Marker and Cutter -----	4	Yes	3113
Mason -----	5	Yes	3603
Master-Mate, Hopper Dredge -----	5	No	5917
Master-Mate, Large Survey Boats, Towboats, and/or Tugs -----	5	No	5918
Master-Mate, Pipeline Dredge -----	5	No	5919
Master-Mate, Snagboat -----	2	No	5929
Materials and/or Products Tester -----	4	Yes	5439
Materials Segregator and Classifier -----	4	Yes	6212
Mattress Repairman -----	4	Yes	3114
Meat Cutter -----	4	Yes	7407
Mechanical Equipment Processor -----	4	Yes	7006
Mechanical Equipment Processing Inspector -----	5	Yes	7007
Mechanical Training Devices Fabricator -----	4	Yes	8890
Medical Equipment Repairman -----	4	Yes	4805
Mess Attendant -----	6	No	7408
Metal Furniture Maker and Repairman -----	4	Yes	3811
Metal Surface Treater -----	3	Yes	3719
Metallizer -----	4	Yes	3707
Metal Products Inspector -----	3	Yes	3805
Meteorological Instrument Repairman -----	4	Yes	3303
Microphotography Worker -----	3	No	4430
Milling Machine Operator -----	4	Yes	3415
Millwright -----	4	Yes	5315
Mimeograph Operator -----	4	No	4412
Mine Control Systems Repairman -----	4	Yes	2605
Mobile Equipment Body and Fender Repairman -----	4	Yes	3809
Mobile Equipment Greaser -----	4	Yes	5806
Model Maker (Metal, Plastic, Wood) -----	4	Yes	3403, 4303, 4614
Molder -----	4	Yes	3714
Molder, Materials -----	4	Yes	3608
Monotype Casting Machine Operator and Repairman -----	4	Yes	4410
Monotype Keyboard Operator -----	4	Yes	4411
Mortuary Attendant -----	5	No	7503
Motion Picture Developing Machine Operator -----	4	No	3913
Motion Picture Negative Worker -----	3	No	3912
Motion Picture Printing Machine Operator -----	4	No	3914
Motion Picture Film Inspector and Reclaimer -----	4	No	3909
Motion Picture Sound Transmission Installer and Repairman -----	4	Yes	2616
Motorcycle Repairman -----	4	Yes	5811

TB MED 506

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>WG series</i>
Motor Grader Operator -----	2	Yes	5721
Motor Vehicle Operator -----	2	No	5702
Mounter -----	5	Yes	4409
Mud Jack Operator -----	4	Yes	5711
Multigraph Operator -----	4	No	4424
Munitions Destroyer -----	4	Yes	6505
Munitions Handler -----	4	Yes	6511
Munitions Maker -----	4	Yes	6516
Musical Instrument Repairman -----	4	Yes	4802
Musical Instrument Inspector -----	3	No	4811

N

Nailing Machine Operator -----	4	Yes	4615
Nautical Instrument Repairman -----	3	Yes	3307
Negative Engraver -----	3	Yes	4413

O

Office Appliance Inspector -----	3	No	4813
Office Appliance Repairman -----	4	Yes	4806
Oiler and Greaser -----	4	Yes	5323
Operating Engineer, Gas Systems -----	4	Yes	5404
Operating Engineer, Oxygen and/or Acetylene Gas -----	4	Yes	5433
Optical Element Inspector -----	4	Yes	4013
Optical Etcher -----	3	Yes	4012
Optical Instrument Assemblyman -----	3	No	4008
Optical Instrument Repairman -----	3	Yes	3306

P

Package Machine Operator -----	4	Yes	5440
Packer -----	4	Yes	7002
Packing Inspector -----	3	Yes	7003
Paint Miller -----	4	Yes	4105
Painter -----	4	Yes	4102
Pantograph Engraving Machine Operator -----	4	No	4432
Paperhanger -----	4	No	4103
Paper Processing Machine Operator -----	4	No	5437
Parachute Inspector -----	3	No	3120
Parachute Packer -----	4	No	3121
Parachute Repairman -----	3	No	3115
Parts and Equipment Steam Cleaner Operator -----	6	Yes	5417
Patternmaker (Metal, Wood) -----	4	Yes	4616
Personal Servicer -----	6	No	7606
Pest Controller -----	5	Yes	5026
Photo Composition Machine Operator -----	4	No	4431
Photoengraver -----	3	No	4425
Photocopying Machine Operator -----	4	No	4427
Photographic, Equipment Repairman -----	3	Yes	3308
Photographer, Offset -----	5	No	4414
Photostat Operator -----	4	No	4429
Pier Facilities Workman -----	5	Yes	6207
Pile Driver Operator, Floating Plant -----	5	Yes	5920
Pillow Renovator -----	4	No	3116
Pilot -----	2	No	5921
Pipecoverer -----	4	Yes	4203
Pipefitter -----	5	Yes	4204
Pipefitter, Marine -----	5	Yes	4205
Pipelineman -----	4	Yes	5922
Planer Operator -----	4	Yes	3421
Plasterer -----	5	Yes	3605
Plastic Materials Inspector -----	3	Yes	4903
Plastic Materials Maker -----	4	Yes	4902
Plastic Molder -----	4	Yes	4351

<i>Job title</i>	<i>Vision standard</i>	<i>Eye protection</i>	<i>WG series</i>
Plastic Worker	4	Yes	4352
Plastic Working Inspector	3	Yes	4353
Plate Grainer	4	No	4415
Plate Maker	4	Yes	4416
Plater, Optical Elements	3	No	4007
Plumber	5	Yes	4206
Pneumatic Accessories Inspector	5	Yes	8273
Pneumatic Accessories Repairman	4	Yes	8272
Pneumatic Tool Operator	4	Yes	5732
Polisher, Optical Elements	3	Yes	4005
Powder and Explosives Inspector	3	Yes	6507
Powder Operator	4	Yes	6504
Powerhouse Equipment Repairman	4	Yes	5327
Power Plant Operator	4	No	5407
Power Saw Operator	4	Yes	3422
Power Saw Operator, Wood	4	Yes	4617
Powdered Ground Equipment Inspector	5	Yes	5858
Powered Ground Equipment Repairman	4	Yes	5857
Press Operator	4	No	3812
Press Operator, Offset	4	Yes	4417
Press Operator, Printing	4	Yes	4406
Presser	4	No	7306
Printing Plant Equipment Repairman	4	Yes	4418
Processor	4	No	7004
Processing Inspector	3	No	7005
Production Estimator	4	No	6704
Production Expediter	4	Yes	6705
Production Machine Operator	4	Yes	3429
Production Planner	4	No	6703
Profiling Machine Operator	4	No	3426
Projective Equipment Operator	5	No	3910
Property Handler	6	No	3905
Property Handler (Drapery, Wardrobe)	6	No	3906, 3907
Protective and Safety Equipment Fabricator and Repairman	4	Yes	4816
Protective and Safety Equipment Inspector	3	No	4817
Public Address Equipment Operator	4	No	2902
Punch Press Operator	4	Yes	3803

Q

Quarry Drilling Machine Operator	4	Yes	5502
Quarterboat Utilities Operator	2	No	5927
Quartermaster	5	No	5923

R

Radar Equipment Inspector	3	No	2606
Radar Equipment Installer	5	Yes	2604
Radar Equipment Repairman	4	Yes	2604
Radio Equipment Inspector	3	No	2609
Radio Equipment Installer	5	Yes	2608
Radio Equipment Repairman	4	Yes	2608
Radio Telephone Equipment Repairman	4	Yes	2610
Radio Transmitter Operator	4	No	2903
Railroad Car Repairman	5	Yes	6105
Railroad Track Maintencenceman	6	Yes	6106
Refrigeration and Air Conditioning Equipment Inspector	5	Yes	5322
Refrigeration and Air Conditioning Equipment Operator	4	No	5415
Refrigeration and Air Conditioning Equipment Repairman	4	Yes	5306
Relief Map Model Maker	4	Yes	4426
Relief Model Reproducionist	4	Yes	4408
Revetment Worker	4	No	5924
Rider, Horse	2	No	7704
Rigger	4	Yes	5722

<i>MOS</i>	<i>Title</i>	<i>Vision standard</i>	<i>Eye protection</i>
63G	Fuel and Electrical Systems Repairman -----	4*	Yes
63H	Automotive Repairman -----	4*	Yes
63J	Quartermaster Equipment Repairman -----	4*	Yes
63Z	Mechanical Maintenance Supervisor -----	3*	Yes
64C	Motor Transport Operator -----	2*	No
64Z	Transportation Senior Sergeant -----	2*	No
65B	Locomotive Repairman -----	4*	Yes
65C	Locomotive Electrician -----	4*	Yes
65D	Railway Car Repairman -----	4*	Yes
65E	Airbrake Repairman -----	4*	Yes
65G	Railway Section Repairman -----	4*	Yes
65H	Locomotive Operator -----	2†	Yes
65J	Trainman -----	6†	Yes
65K	Railway Movement Coordinator -----	4†	No
65Z	Railway Senior Sergeant -----	4*	No
67N	Utility Helicopter Repairman -----	3*	Yes
67U	Medium Helicopter Repairman -----	3*	Yes
67V	Observation Helicopter Repairman -----	3*	Yes
67W	Aircraft Quality Control Supervisor -----	3*	Yes
67X	Heavy Lift Helicopter Repairman -----	3*	Yes
67Y	Attack Helicopter Repairman -----	3*	Yes
67Z	Aircraft Maintenance Senior Sergeant -----	3*	Yes
68B	Aircraft Power Plant Repairman -----	3*	Yes
68D	Aircraft Power Train Repairman -----	3*	Yes
68F	Aircraft Electrician -----	3†	Yes
68G	Aircraft Structural Repairman -----	3†	Yes
68H	Aircraft Pneudraulics Repairman -----	4†	Yes
68J	Helicopter Missile Systems Repairman -----	4†	Yes
68K	Aircraft Components Repair Supervisor -----	4†	Yes
71B	Clerk Typist -----	1*	No
71C	Stenographer -----	1*	No
71D	Legal Clerk -----	1*	No
71E	Legal Reporter -----	1*	No
71G	Medical Records Specialist -----	1*	No
71L	Administrative Specialist -----	1*	No
71M	Chaplain's Assistant -----	1*	No
71N	Traffic Management Coordinator -----	1*	No
71P	Flight Operations Coordinator -----	5*	No
71Q	Journalist -----	1*	No
71R	Broadcast Journalist -----	1*	No
71S	Attaché Specialist -----	1*	No
72C	Central Office Switchboard Operator -----	1†	No
72D	Cryptographic Center Specialist -----	1†	No
72E	Telecommunications Center Specialist -----	1†	No
72G	Data Communications Switching Team Specialist -----	1†	No
72H	Central Office Operations Specialist -----	1†	No
73C	Finance Specialist -----	1*	No
73D	Accounting Specialist -----	1†	No
73Z	Finance Senior Sergeant -----	1*	No
74B	Card and Tapewriter -----	1*	No
74D	Computer/Machine Operator -----	1*	No
74F	Programmer Analyst -----	1*	No
74Z	Data Processing NCO -----	1*	No
75B	Unit Clerk -----	1*	No
75C	Personnel Management Specialist -----	1*	No
75D	Personnel Records Specialist -----	1*	No
75E	Personnel Actions Specialist -----	1*	No
75Z	Personnel Senior Sergeant -----	1*	No
76D	Materiel Supplyman -----	1†	No
76J	Medical Supplyman -----	1*	No
76P	Stock Control Supplyman -----	1*	No
76V	Storage Supplyman -----	1*	No
76W	Petroleum Supply Specialist -----	6†	Yes

MOS	Title	Vision standard	Eye protection
76X	Subsistence Supplyman -----	1†	No
76Y	Unit/Organization Supplyman -----	1†	No
76Z	Senior Supply Sergeant -----	1*	No
81B	Construction Draftsman -----	3†	No
81C	Cartographer -----	1†	No
81E	Illustrator -----	1†	No
81Z	Topographic Engineering Supervisor -----	1†	No
82B	Construction Surveyor -----	5†	No
82C	Field Artillery Surveyor -----	3†	No
82D	Topographic Surveyor -----	3†	No
83E	Photo and Layout Specialist -----	1†	Yes
83F	Photolithographer -----	1†	Yes
84B	Still Photographic Specialist -----	5†	No
84C	Motion Picture Specialist -----	5†	No
84F	Audio/TV Specialist -----	5†	No
84T	TV/Radio Broadcast Operations Chief -----	5†	No
84Z	Public Affairs/Audiovisual Chief -----	5†	No
91B	Medical Specialist -----	2*	No
91C	Clinical Specialist -----	5†	No
91D	Operating Room Specialist -----	5†	No
91E	Dental Specialist -----	5†	Yes
91F	Psychiatric Specialist -----	1*	No
91G	Behavioral Science Specialist -----	1*	No
91H	Orthopedic Specialist -----	1*	Yes
91J	Physical Therapy Specialist -----	1*	No
91L	Occupational Therapy Specialist -----	1†	Yes
91N	Cardiac Specialist -----	1†	No
91P	X-Ray Specialist -----	5*	No
91Q	Pharmacy Specialist -----	3†	No
91R	Veterinary Specialist -----	1†	No
91S	Environmental Health Specialist -----	5†	Yes
91T	Animal Specialist -----	4†	No
91U	ENT Specialist -----	5†	No
91V	Respiratory Specialist -----	1†	No
91W	Nuclear Medical Specialist -----	1†	No
91Y	Eye Specialist -----	5†	No
92B	Medical Laboratory Specialist -----	3†	Yes
92C	Petroleum Laboratory Specialist -----	1†	Yes
92D	Chemical Laboratory Specialist -----	3†	Yes
93E	Meteorological Observer -----	5†	No
93F	Field Artillery Meteorology Crewman -----	4†	No
93H	Air Traffic Control Tower Operator -----	4†	No
93J	Air Traffic Control Radar Controller -----	4†	No
94B	Food Service Specialist -----	5†	No
94F	Hospital Food Service Specialist -----	6†	No
95B	Military Police -----	2*	Yes
95C	Correction Specialist -----	2*	No
95D	Assistant Special Agent -----	2†	No
96B	Intelligence Analyst -----	3†	No
96C	Interrogator -----	3†	No
96D	Image Interpreter -----	3†	No
96H	Aerial Sensor Specialist (OV-ID) -----	3†	No
96Z	Intelligence Senior Sergeant -----	3†	No
97B	Counter-Intelligence Agent -----	5†	No
97G	Area Intelligence Agent -----	5†	No
98C	EW/SIGINT Analyst -----	5†	No
98G	EW/SIGINT Voice Interceptor -----	5†	No
98J	EW/SIGINT Noncommunications Interceptor -----	5†	No
98Z	EW/SIGINT Chief -----	5†	No
00B	Diver -----	5†	No
00C	Dog Trainer -----	6*	No
00P	Special Duty Assignment (DMOS) -----		
00E	Recruiter and Career Counselor -----	1*	No

<i>MOS</i>	<i>Title</i>	<i>Vision standard</i>	<i>Eye protection</i>
971A	Counterintelligence Technician -----	5*	No
972A	Area Intelligence Technician -----	5*	No
982A	Traffic Analysis Technician -----	5*	No
983A	Emanations Analysis Technician -----	5*	No
988A	Voice Intercept Technician -----	5*	No
021A	Club Manager -----	5*	No
031A	Bandmaster -----	5*	No
051A	Morse Intercept Technician -----	1*	No
052A	Non-Morse Intercept Technician -----	1*	No
053A	Special Identification Technician -----	1*	No

COMMISSIONED OFFICERS

<i>SSI</i>	<i>Title</i>	<i>Vision standard</i>	<i>Eye protection</i>
11A	Infantry, General -----	5	Yes
11B	Light Infantry -----	5	Yes
11C	Mechanized Infantry -----	5	Yes
12A	Armor -----	5	Yes
13A	Cannon Field Artillery -----	5	Yes
13B	Light Missile Field Artillery -----	5	Yes
13C	Heavy Missile Field Artillery -----	5	Yes
13D	Field Artillery Target Acquisition -----	5	Yes
14A	Air Defense Artillery, General -----	5	Yes
14B	SHORAD -----	5	Yes
14C	NIKE-HERCULES Missile Air Defense Artillery -----	5	Yes
14D	HAWK Missile Air Defense Artillery -----	5	Yes
14E	SAFEGUARD Ballistic Missile Air Defense Artillery -----	5	Yes
14F	Guided Missiles Systems -----	5	Yes
14G	Air Defense Artillery Command and Control -----	5	Yes
21A	Combat Engineer -----	5	Yes
21B	Construction Engineer -----	5	Yes
21C	Engineer Management -----	5	Yes
21D	Topographic Engineer -----	5	Yes
25A	Combat Signal -----	4	Yes
25B	Communications Center -----	4	No
25C	Tactical Telephone-Digital Communications -----	3	Yes
25D	Radio Systems -----	3	Yes
25E	Area Signal Center -----	4	No
26A	Fixer Telecommunications Center -----	4	No
26B	Telecommunications Center -----	4	No
26C	Telephone-Digital Communications -----	3	Yes
26D	Fixed Radio Systems -----	3	Yes
27A	Communications-Electronics Engineering -----	4	No
27B	Communications-Electronics Systems -----	4	No
27C	Radio Frequency Engineering -----	4	No
28A	Audiovisual Instructional Technology -----	4	No
28B	Audiovisual Officer -----	4	No
28C	Audiovisual Production Officer -----	4	No
31A	Law Enforcement -----	2	Yes
31B	Correctional -----	4	No
31C	Criminal Investigation -----	5	No
31D	Physical Security -----	2	No
35A	Tactical Intelligence -----	5	No
35B	Strategic Intelligence -----	5	No
35C	Tactical Surveillance -----	5	No
36A	Counterintelligence -----	5	No
36B	Area Intelligence -----	5	No
37A	Electronic Warfare-Cryptologic Tactical Operations -----	4	No
37B	Strategic Signal Intelligence -----	4	No

See footnotes at end of section III.

<i>SSI</i>	<i>Title</i>	<i>Vision standard</i>	<i>Eye protection</i>
37C	Signal Security	4	No
37D	Electronic Warfare-Cryptologic	4	No
41A	Personnel Management	1	No
41B	Recruiting and Induction	1	No
41C	Race Relations/Equal Opportunity	1	No
42A	Personnel Administration	1	No
42B	Postal Officer	1	No
42C	Army Band	4	No
42D	Psychological Assistant	1	No
42E	Recreation Services	1	No
43A	Club Manager	1	No
44A	Finance and Accounting	1	No
44B	Accounting	1	No
44C	Disbursing	1	No
45A	Comptroller	1	No
46A	Information Officer	1	No
46B	Broadcast Officer	1	No
47A	Education Administrator	1	No
47B	Military Educator	5	No
40A	Security Assistance	1	No
48B	Psychological Operations	1	No
48C	Attaché	1	No
48D	Civil Affairs	1	No
48E	Unconventional Warfare	1	No
48F	Civil Military Operations	1	No
48G	Politico-Military Affairs	1	No
49A	Operations Research/Systems Analysis	5	No
51A	Research and Development Coordinator	5	No
51B	Test and Evaluation	5	Yes
51C	Experimental Test Pilot	2	No
52A	Nuclear Weapons and Effects Staff	5	No
52B	Nuclear Research	4	No
53A	Computer Systems Software and Analysis	1	No
53B	Computer Operations	1	No
53C	Management Information Systems	1	No
54A	Operations and Force Development Staff	1	No
54B	Aviation Staff	5	No
55A	Judge Advocate	1	No
55B	Military Judge	1	No
55C	Patent Lawyer	1	No
56A	Command and Unit Chaplain	1	No
56B	Family Life Chaplain	1	No
56C	Hospital Chaplain	1	No
56D	Clinical Pastoral Educator	1	No
60A	Executive Medical	1	No
60B	Nuclear Medical	1	No
60C	Preventive Medicine	5	No
60D	Occupational Medicine	5	Yes
60E	General Medicine	5	No
60F	Pulmonary Disease	5	No
60G	Gastroenterologist	5	No
60H	Cardiologist	5	No
60J	Obstetrician and Gynecologist	5	No
60K	Urologist	5	No
60L	Dermatologist	5	No
60M	Allergist/Clinical Immunologist	5	No
60N	Anesthesiologist	5	No
60P	Pediatrician	5	No
60Q	Pediatric Cardiologist	5	No
60R	Child Neurologist	5	No
60S	Ophthalmologist	5	No
60T	Otorhinolaryngologist	5	No
60U	Child Psychologist	5	No
60V	Neurologist	5	No

SSI	Title	Vision standard	Eye protection
60W	Psychiatrist	5	No
60Z	Hematologist	5	No
61A	Nephrologist	5	No
61B	Medical Oncologist	5	No
61C	Endocrinologist	5	No
61D	Rheumatologist	5	No
61E	Clinical Pharmacologist	5	No
61F	Internist	5	No
61G	Infectious Disease	5	No
61H	Family Physician	5	No
61J	General Surgeon	5	No
61K	Thoracic Surgeon	5	No
61L	Plastic Surgeon	5	No
61M	Orthopedic Surgeon	5	No
61N	Flight Surgeon	5	No
61P	Physiatrist	5	No
61Q	Therapeutic Radiologist	5	No
61R	Diagnostic Radiologist	5	No
61S	Radiologist	5	No
61T	Anatomic Pathologist	5	Yes
61U	Pathologist	5	Yes
61V	Clinical Pathologist	5	Yes
61W	Peripheral Vascular Surgeon	5	No
61Z	Neurosurgeon	3	Yes
63A	Dental	3	Yes
63B	General Dental	3	Yes
63C	Oral Medicine	3	Yes
63D	Peridontist	3	Yes
63E	Endontist	3	Yes
63F	Prosthodontist, Fixed	3	Yes
63G	Prosthodontist, Removable	3	Yes
63H	Preventive Dentistry/Dental Public Medicine	3	Yes
63K	Pedodontist	3	Yes
63M	Orthodontist	3	Yes
63N	Oral Surgeon	3	Yes
63P	Oral Pathologist	3	Yes
63R	Executive Dental Officer	5	No
64A	Veterinary Services	1	No
64B	Veterinary Laboratory Medicine	3	Yes
64D	Veterinary Pathologist	3	Yes
64E	Veterinary Microbiologist	3	Yes
64F	Veterinary Comparative Medicine	3	Yes
65A	Occupational Therapist	5	Yes
65B	Physical Therapist	5	No
65C	Hospital Dietitian	1	No
66A	Nurse Administrator	5	No
66B	Community Health Nurse	5	No
66C	Psychiatric/Mental Health Nurse	5	No
66D	Pediatric Nurse	5	No
66E	Operating Room Nurse	5	No
66F	Nurse Anesthetist	5	No
66G	Obstetric and Gynecologic Nurse	5	No
66H	Medical Surgical Nurse	5	No
66J	Clinical Nurse	5	No
67A	Health Care Administrator	1	No
67B	Field Medical Assistant	1	No
67C	Health Services Comptroller	1	No
67D	Biomedical Information Systems	1	No
67E	Patient Administration	1	No
67F	Health Services Personnel Manager	1	No
67G	Health Services Manpower Control	1	No
67H	Health Services Plans, Operations, Intelligence and Training	1	No
67J	Aeromedical Evacuation	1	No
67K	Health Services Materiel	1	No

<i>SSI</i>	<i>Title</i>	<i>Vision standard</i>	<i>Eye protection</i>
67L	Health Facilities Planning -----	1	No
68A	Microbiologist -----	3	No
68B	Nuclear Medical Science Officer -----	1	Yes
68C	Biochemist -----	3	Yes
68D	Parasitologist -----	3	Yes
68E	Immunologist -----	1	Yes
68F	Clinical Laboratory -----	3	Yes
68G	Entomologist -----	5	Yes
68H	Pharmacy Officer -----	5	No
68J	Physiologist -----	5	No
68K	Optometrist -----	5	Yes
68L	Podiatrist -----	5	Yes
68M	Audiologist -----	5	Yes
68N	Environmental Science -----	5	Yes
68P	Sanitary Engineer -----	5	Yes
68Q	Military Community Oral Health Manager -----	5	Yes
68R	Social Worker -----	5	No
68S	Psychologist -----	5	No
68T	Health Services Research Psychologist -----	5	No
68U	Behavioral Science Associate -----	5	No
70A	Logistics Management -----	1	No
71A	Aviation Materiel Management -----	1	No
72A	Communications Electronics Materiel Management -----	3	No
73A	Missile Materiel Management -----	1	No
74A	Chemical Officer -----	3	Yes
75A	Munitions Materiel Management, General -----	1	Yes
75B	Conventional Munitions Materiel Management -----	1	Yes
75C	Nuclear Weapons Materiel Management -----	1	Yes
75D	Explosives Ordnance Disposal -----	5	Yes
76A	Armament Materiel Management -----	1	No
77A	Tank/Ground Mobility Materiel Management -----	1	No
77B	Tank Automotive Materiel Management -----	1	No
77C	Ground Support Materiel Management -----	1	No
77D	Motor Officer -----	5	No
81A	Petroleum Management -----	1	No
82A	Food Management, General -----	1	No
82B	Subsistence -----	1	No
82C	Food Adviser -----	1	No
82D	Commissary -----	1	No
83A	General Troop Support Materiel Management, General -----	1	No
83B	General Troop Support Materiel Management -----	1	No
83C	Parachute Maintenance and Aerial Supply -----	1	No
86A	Traffic Management -----	1	No
87A	Marine and Terminal Operations -----	1	No
87B	Cargo Officer -----	5	No
87C	Dredge Master -----	5	No
87D	Dredge Engineering Officer -----	1	No
87E	Marine Materiel Management Officer -----	5	Yes
88A	Highway Transportation -----	5	No
88B	Railway Transportation -----	5	No
88C	Railway Maintenance of Way Superintendent -----	1	Yes
88D	Railway Signal Maintenance Supervisor -----	1	Yes
88E	Railway Maintenance Management -----	1	Yes
88F	Railway Supply Management -----	1	No
91A	Maintenance Management -----	3	No
92A	Supply Management, General -----	1	No
92B	Supply Management -----	1	No
92C	Storage Officer -----	1	No
93A	Logistics Services Management, General -----	1	No
93B	Property Disposal -----	1	No
93C	Laundry and Bath -----	1	Yes
93D	Memorial Activities -----	1	No
93E	Army Exchange -----	1	No
95A	Transportation Management -----	1	No

<i>SSI</i>	<i>Title</i>	<i>Vision standard</i>	<i>Eye protection</i>
97A	Procurement Management -----	5	No
97B	Procurement -----	1	No
97C	Production -----	1	No

* Refer to paragraph 3-2a (8).

† Normal color vision.

‡ Class 1—Must have 20/20 visual acuity uncorrected in each eye, far and near; normal color perception; normal depth perception.

Class 1A—Distant visual acuity uncorrected to 20/50, correctable to 20/20 each eye.

Class 2—Distant visual acuity uncorrected to 20/100, correctable to 20/20 each eye.

Class 3—Distant visual acuity uncorrected to 20/200, correctable to 20/20 each eye.

APPENDIX E

SAMPLE TEST RECORD CARD AND TEMPLATES

Test record cards and plastic templates are available from the companies listed in paragraph 3-1c. A sample test record card is shown in figure E-1. Sample plastic templates used to separate the vision standards into one of the six recommended job-vision standards are shown in figures E-2 through E-7.

CARD 1		BAUSCH & LOMB OCCUPATIONAL VISION TESTS WITH THE ORTHO-RATER		Rx - 0 FAR VISUAL PERFORMANCE PROFILE																
NAME _____ NO. _____ DEPT. _____ JOB _____ AGE _____ M _____ F _____ EXP _____ NONE ALL- BI- FAR IRRE- JOB SAFETY WAYS FOCAL NEAR GULAR SPECIAL DATE _____ TESTER _____ CLERK _____ EXAM. IN LAST YEAR _____ CHANGE IN RX _____ NOTE: _____		PHORIA	VERTICAL	X	1	2	3	4	5	6	7	8	9							
		PHORIA	LATERAL	X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
		ACUITY	BOTH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
		ACUITY	RIGHT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
		ACUITY	LEFT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			DEPTH	0	1	2	3	4	5	6	7	8	9							
			COLOR	0	1	2	3	4	5	6										
		PHORIA	VERTICAL	X	1	2	3	4	5	6	7	8	9							
		PHORIA	LATERAL	X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
		ACUITY	BOTH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
		ACUITY	RIGHT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
		ACUITY	LEFT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			DEPTH	0	1	2	3	4	5	6	7	8	9							
			COLOR	0	1	2	3	4	5	6										
			NEAR																	
			BOTH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			RIGHT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			LEFT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

BAUSCH & LOMB INCORPORATED
ROCHESTER, N. Y.
CATALOGUE NO. 71-21-62 PRINTED IN U.S.A.

MED 506-12

Figure E-1. Sample test record card.

CARD		OCCUPATIONAL VISION TESTS WITH THE ORTHO-RATER		R _x - 0 FAR VISUAL PERFORMANCE PROFILE	
NAME _____	NO. _____			VERTICAL	X 1 2 3 4 5 6 7 8 9
DEPT. _____	JOB _____			PHORIA LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE _____	M _____	F _____	EXP _____	BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
DATE _____	TESTER _____	CLERK _____		ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
EXAM. IN LAST YEAR _____	CHANGE IN RX _____			ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
NOTE:				DEPTH	0 1 2 3 4 5 6 7 8 9
USAEHA VISION STANDARD NO. 1				COLOR	0 1 2 3 4 5 6
				R _x - 0 NEAR	
				BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
				ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
				ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
				PHORIA VERTICAL	X 1 2 3 4 5 6 7 8 9
				PHORIA LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

MED 506-13

Figure E-2. USAEHA Vision Standard No. 1.

CARD		OCCUPATIONAL VISION TESTS WITH THE ORTHO-RATER		R _x - 0 FAR VISUAL PERFORMANCE PROFILE	
NAME _____	NO. _____			VERTICAL	X 1 2 3 4 5 6 7 8 9
DEPT. _____	JOB _____			PHORIA LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
AGE _____	M _____	F _____	EXP _____	BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
DATE _____	TESTER _____	CLERK _____		ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
EXAM. IN LAST YEAR _____	CHANGE IN RX _____			ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
NOTE:				DEPTH	0 1 2 3 4 5 6 7 8 9
USAEHA VISION STANDARD NO. 2				COLOR	0 1 2 3 4 5 6
				R _x - 0 NEAR	
				BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
				ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
				ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
				PHORIA VERTICAL	X 1 2 3 4 5 6 7 8 9
				PHORIA LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

MED 506-14

Figure E-3. USAEHA Vision Standard No. 2.

CARD		OCCUPATIONAL VISION TESTS WITH THE ORTHO-RATER		R _x - 0 FAR VISUAL PERFORMANCE PROFILE							
NAME	NO.			VERTICAL	X 1 2 3 4 5 6 7 8 9						
DEPT.	JOB			LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15						
AGE	M	F	EXP.	BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15						
R _x NONE	ALL-WAYS	BI-FOCAL	FAR HEAR ONLY	IRRE-GULAR	JOB SPECIAL	SAFETY	ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15			
DATE	TESTER	CLERK			ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	DEPTH	0 1 2 3 4 5 6 7 8 9			
EXAM. IN LAST YEAR	NOTE	CHANGE IN RX			COLOR	0 1 2 3 4 5 6	R _x - 0 NEAR	BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15		
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> USAEHA VISION STANDARD NO. 5 </div>				ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	PHORIA VERTICAL	X 1 2 3 4 5 6 7 8 9		
				PHORIA LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15						

MED 506-17

Figure E-6. USAEHA Vision Standard No. 5.

CARD		OCCUPATIONAL VISION TESTS WITH THE ORTHO-RATER		R _x - 0 FAR VISUAL PERFORMANCE PROFILE							
NAME	NO.			VERTICAL	X 1 2 3 4 5 6 7 8 9						
DEPT.	JOB			LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15						
AGE	M	F	EXP.	BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15						
R _x NONE	ALL-WAYS	BI-FOCAL	FAR HEAR ONLY	IRRE-GULAR	JOB SPECIAL	SAFETY	ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15			
DATE	TESTER	CLERK			ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	DEPTH	0 1 2 3 4 5 6 7 8 9			
EXAM. IN LAST YEAR	NOTE	CHANGE IN RX			COLOR	0 1 2 3 4 5 6	R _x - 0 NEAR	BOTH	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15		
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> USAEHA VISION STANDARD NO. 6 </div>				ACUITY RIGHT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	ACUITY LEFT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	PHORIA VERTICAL	X 1 2 3 4 5 6 7 8 9		
				PHORIA LATERAL	X 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15						

MED 506-18

Figure E-7. USAEHA Vision Standard No. 6.

APPENDIX F

USE OF EMERGENCY EYEWASH FOUNTAINS

1. The Code of Federal Regulations (29 CFR 1910.151, para c) states as follows: "Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use." This requirement is based on the fact that chemical burns of the eyes need *immediate* first aid attention. Any delay in treatment will generally aggravate the injury.

2. The initial treatment of choice is active mechanical flushing of the eyes with a copious supply of water. Authoritative sources indicate that active irrigation should generally continue for a period of 20-30 minutes. This amount of time is usually adequate for the more serious chemicals; e.g., alkalis and strong acids. All employees with a potential exposure to corrosive materials should be instructed in the proper use of eye-lavage fountains and the length of time necessary to flush the eyes.

3. Providing 20-30 minutes of eye irrigation requires a considerable volume of water. Based on information available from several emergency eye-wash fountain manufacturers, the flow rate in gallons per minute (gpm) is generally 1.5 to 2 gpm for most of the lavage fountains (portable and nonportable); therefore, 20-30 minutes of initial irrigation for the most hazardous chemicals will require 30-40 gallons of water. Portable eye-lavage fountains usually have a maximum capacity of 5-10 gallons allowing for a maximum usefulness of only 5 minutes.

4. Portable eye fountains generally are sealed units which work on a pressurized system. The tanks are pressured by use of a hand pump. The possible loss of pressure requires increased maintenance checks to recharge if necessary. The unit may fail to function because of a lack of interest in maintenance. Squeeze bottles and other plastic container devices have a water capacity less than the portable pressurized eye fountain. They will often lose water through evaporation and become

contaminated because of nonuse and lack of maintenance. They are easily misplaced and may not be available in an emergency.

5. Based on the above considerations, the following guidance is provided on the installation of emergency eye-wash systems.

a. Eye-wash squeeze bottles and other such plastic devices are not appropriate emergency eye-wash systems and shall not be used under any condition.

b. In all areas requiring an emergency eye-wash capability, every effort shall be made to install permanent eye-lavage fountains of the type described in paragraph 11-3F, DA Pam 385-3.

c. No portable eye-wash fountains shall be permitted in areas where a chemical splash hazard exists and where there is a continuous source of clean water available.

d. Portable eye-wash fountains shall be allowed in remote areas when no continuous flow of fresh water is available, when the installation of a fresh water system is not economically feasible, and when the hazard of chemical splash is minimal; e.g., in bulk storage areas.

e. The only portable lavage stations that shall be permitted are those delivering a flow rate of 1.5 to 2.0 gpm for a minimum of 20 minutes duration, and capable of irrigating both eyes simultaneously. Lower capacity stations; e.g., those delivering the required flow rate for 5 to 10 minutes, shall only be allowed if the chemicals involved are only mildly caustic or corrosive. Such a situation may be present at remote fuel terminals or field locations where use-concentrations of pesticides are dispensed. As another example, remote battery-charging locations, where batteries are handled or transported for charging or for the addition of electrolyte or water, should be provided with a permanent emergency eye-wash capability. If this is not feasible and a portable station is selected, it should meet the flow rate/time criteria described above.

f. All eye-lavage fountains, whether permanent or portable, shall be routinely checked. The frequency will vary according to the quality of the

water source and possible frequency of exposure. The fountain will be checked for flow rate, direction, and suitability; e.g., clarity of the water.

APPENDIX G
FDA-ANSI COMPARISON TABLE

Requirements	Eye glasses and sunglasses FDA requirements*	Occupational and educational eye protection ANSI Z87.1-1979 requirements†
Lens thickness	Glass and plastic. No specific requirements.	Glass and plastic. Not less than 3.0 mm. Not more than 3.8 mm.
Impact test	Must withstand 5/8-inch steel ball, weight approximately 0.56 ounces, dropped from a height of 50 inches upon the horizontal upper surface of the lens. Ball shall strike within 5/8-inch diameter circle located at geometric center of lens. Ball may be guided but not restricted in its fall by being dropped through a tube to within approximately 4 inches of lens. The lens shall not fracture.	Must withstand 1-inch diameter steel ball, weight approximately 2.4 ounces, dropped in free fall from a height of 50 inches onto the horizontal upper surface of the lens bearing permanent marking, impinging the lens within a circular area of 5/8-inch diameter of the lens' mechanical center. The lens shall not fracture in this test.
Penetration resistance test	None required.	Plastic Only. A pointed projectile of suitable size, consisting of a new Singer number 25, size 135 x 17 needle, fastened into a holder weighing approximately 1.56 ounces shall be freely dropped, pointed downward, from a height of 50 inches onto the outer surface of the lens. The projectile may be guided but not restricted in its fall by being dropped through a tube extending to within 4 inches of the lens. The lens shall not be pierced through from the impact.
Frames and marking	None required.	Safety spectacles require special frames. Combination of street wear frames with safety lenses meeting the standard are definitely not in compliance. Plastic fronts should be so designed as to satisfactorily accept lens insertion through the frontal side only. Spectacles shall be designed for industrial exposure and shall bear both a permanent trademark identifying the manufacturer and a "Z87" logo on fronts and temples.
Marking	Individual lenses are not marked; however, copies of invoices, shipping documents, and records of sale or distribution of all impact resistant lenses shall be kept for a period of 3 years. In addition, the results of the impact tests shall be kept for a period of 3 years.	Glass or Plastic. Each lens shall be distinctly marked in a permanent and legible manner with the manufacturer's monogram. Such marking shall be so placed as not to interfere with the vision of the wearer. Filter or absorptive lenses shall also

See footnotes at end of table.

APPENDIX G
FDA-ANSI COMPARISON TABLE—Continued

Requirements	Eye glasses and sunglasses FDA requirements*	Occupational and educational eye protection ANSI Z87.1-1979 requirements†
Marking (Continued)		be marked with the shade number. Prescription ophthalmic fixed-tint lenses such as Pink No. 1 and 2; Gray No. 1, 2, and 3; and Green No. 1, 2, and 3 need not have a shade marking. All phototropic lenses shall be marked with the symbol "V." Each glass filter lens shall be marked with the letter "H" to indicate treatment for impact resistance.

* Title 21, Code of Federal Regulations (CFR), Section 801.410, Use of Impact-Resistant Lenses in Eyeglasses and Sunglasses.

† Title 29, CFR, Section 1910.133, Eye and Face Protection.

APPENDIX H

VISION AND EYE EFFECTS OF VIDEO DISPLAY DEVICES

1. Video display devices (visual display terminals (VDT), cathode ray tubes (CRT), microfiche-readers) are being used quite extensively and successfully throughout the military environment. The greatest application appears to be in the area of information display (i.e., graphics, word processing and data handling). Video display devices (VDD) are making inroads into office managerial procedures with their ability to rapidly display letters, numbers, and other symbols. The rapid introduction of VDT into the work place has created new visual tasks for the operators and complaints of eye strain are frequent.

2. While the operators of early VDD were highly motivated, trained and selected, today's operators are nonspecialists whose training and interest may well be in areas other than computer technology. This combined with the routinizing of many of the operator's tasks have accounted for the late development of visual complaints in this area. VDT, CRT and microfiche reader operators have complained of symptoms such as eyestrain, visual deterioration, headaches, changes in normal visual acuity and, in some cases, changes in color perception and general fatigue. There has also been the charge that the electromagnetic radiation from the VDT may cause cataracts. The National Institute for Occupational Safety and Health (NIOSH) undertook a survey in February 1977 to determine the possible eye effects of radiation from VDT type devices. Based upon present knowledge of biological effects the NIOSH study did not demonstrate that the VDT are capable of producing levels of radiation sufficient to create an occupational ocular radiation hazard.

3. The complaints expressed by operators using VDD are generally no different from other clerical workers. These symptoms basically fall into four different categories;

a. Ocular Symptoms. The eyes areas feel heavy, dry and uncomfortable. Eyes may seem to burn, be tender to pressure and ache from within or behind.

b. Visual Symptoms. The eyes are quite uncom-

fortable and it may be difficult to fixate objects and to gaze in certain directions for more than a short period of time. Single objects may have color fringes or be seen double.

c. Systemic Symptoms. The most common systemic symptom is headache. It is usually a dull ache that can be difficult to describe and localize accurately. Headaches are generally said to be superficial, originating from the forehead above the eyebrows. Also symptoms of neck and shoulder stiffness or aching are common.

d. Behavioral Symptoms. The worker may show an increased awareness concerning eyes, lighting and visual task. This may lead to positive changes to make the visual task easier or to avoid distracting light reflections. Also the worker may try various ways to improve the situation by manipulating the work environment.

4. There are two main causative factors for the previously mentioned symptoms. They are: (1) uncorrected vision disorders and (2) discomfort glare. Each video display worker should have routine vision screening and be advised to wear his best correction. With increasing age, there is a gradual loss of accommodation (presbyopia) which results in an inability to see near work distinctly. This inability can be compensated for by special glasses (bifocals or reading glasses) designed for near work. However, each individual must know his working distance to the terminal since most bifocals or reading glasses are fit for a 16-inch (40 centimeters) focal distance. Bifocals or reading glasses incorrectly fitted may result in the operators adopting an unnatural body posture as they sit before the display, thus resulting in severe muscular fatigue. Many of the symptoms reported by operators of clerical VDD are related to faulty work postures.

5. Discomfort glare may be caused by disturbing reflections on the screen or by contrast glare. Reflections can largely be eliminated by matting on the screen, or by changing the angle of the screen, or by diffusing the light from windows

and/or ceiling lighting. Contrast glare is caused by large luminance differences within the employee's field of view. The employee may be viewing a dark screen while facing a bright surface within the room. To eliminate contrast glare, the terminals should be placed far from windows and under no circumstance should the worker sit with his face turned to the window. Furthermore, the general illumination of the room should be lowered (24-40 ft candles) and, as with reflected glare, light from windows and overhead fixtures should be diffused.

6. Additional factors causing employee discomfort are: Poor illumination quality within the dis-

play unit, size of the letters or symbols to be interpreted, the flicker effect of the screen's light source associated with the refresher rate, the focusing capability of the equipment, long periods of duty performing the same task, and poor seating not allowing for comfortable and efficient posture.

7. This review of operator complaints related to VDD has attempted to delineate the causes of the complaints which are currently believed due to visual fatigue. Much research is still required in this area but the preceding are current recommendations and corrective actions that can be instituted to alleviate worker discomfort.

APPENDIX I

EYE PROTECTIVE EQUIPMENT

This appendix may be used as a guide for selecting the proper type of eye protection for eye hazardous jobs.

1. Goggles. *a. Eyecup.*

(1) *Types.*

(a) Cup-type—for individuals who do not wear corrective spectacles.

(b) Cover-cup-type—designed to fit over corrective spectacles.

(2) *Models.*

(a) Chipper—protects against impact from flying objects.

(b) Dust and splash—protects against fine dust particles, liquid splash or impact.

(c) Welding and cutting—protects against glare, injurious radiation, and impact.

b. Flexible or cushioned.

(1) *Chipper*—protects against impact.

(2) *Dust and splash*—protects against fine dust, splash, noninjurious mist and vapors.

(3) *Chemical (vented)*—for use when vapors are not injurious.

(4) *Chemical (nonvented)*—for use when vapors are hazardous.

(5) *Welding and cutting*—protects against glare, injurious radiation and impact.

2. Spectacle frames. *a. Metal* (with or without side shields).

b. Plastic (with or without side shields).

c. Combination metal and plastic (with or without side shields).

Note. Plastic frames are generally preferred when electrical exposure, chemical hazards, and explosive atmospheres are involved.

Note. Aging sometimes discolors plastic frames, they scratch easily, and they become progressively more brittle.

Note. At high temperatures, metal frames are preferred. Plastic frames soften at higher temperatures and do not hold the lenses securely.

3. Protective lenses. *a. Types (Material).*

(1) *Glass.*

(2) *Plastic.*

b. Types (Light Transmission).

(1) *Clear.*

(2) *Absorptive.*

(3) *Filter.*

c. Plastic Lenses Versus Glass Lenses.

(1) Both pass impact tests when of a certain formulation and thickness.

(2) Glass has slightly lower resistance than plastic to breakage from sharp objects.

(3) Plastic offers better resistance to small objects moving at high speed.

(4) Abrasion resistance, while not good with plastic, is improved when plastics are coated.

(5) Plastics are resistant to hot materials. Hot metal tends to adhere to and shatter glass, but not plastic.

(6) Plastics generally show surface reaction to some chemicals but satisfactorily stop splashes and protect the eye.

(7) Plastic takes longer to fog than glass.

(8) The principal advantage of glass is its superior resistance to scratching. However, when surfaces of glass do become scratched or pitted, the safety integrity of the lens may be greatly reduced. Scratches on plastic do not significantly reduce strength.

4. Face shields. *a. Styles.*

(1) Without crown protectors.

(2) With crown protectors.

(3) With crown and chin protectors.

b. Replaceable Windows.

(1) Clear transparent.

(2) Tinted transparent.

(3) Wire screen.

(4) Combination of plastic and screen.

5. **Laser-protective eyewear.** *a.* Virtually all present-day lasers are potential eye hazards. Personnel whose occupations require exposure to laser operations in excess of applicable protection standards should be furnished suitable laser safety

goggles that will protect for the specific wavelength of the laser and be of optical density (O.D.) adequate for the energy involved.

b. The following references provide more detailed guidance.

(1) AR 40-46, Control of Health Hazards from Lasers and Other High Intensity Optical Sources.

(2) TB MED 279, Control of Hazards to Health from Laser Radiation.

(3) Laser Protective Eyewear, Technical Guide (TG) 081, published by the US Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

6. Special protective eyewear. a. Special goggles are available where a gastight fit is desired.

b. Wire-screen goggles, with cloth-bound edges, are sometimes used by metal workers in extremely humid atmospheres.

c. Wire-mesh face shields are used for pouring low-melting-point metals, as in babbitting.

7. Absorptive lenses. Absorptive lenses are available for use in industrial safety spectacles, and they have a shade range from 1.5-14. Absorptive lenses used as sun glasses are normally in the shade range of 1.5-3. Absorptive lenses are defined in ANSI Z87.1-1979 as a lens that absorbs varying proportions of the ultraviolet, visible and infrared rays according to the composition and density of the lens. All absorptive (filter) lenses shall be legibly marked with a shade number that describes the transmission characteristics of the specific lens.

APPENDIX J

SELECTION OF SHADE NUMBER FOR WELDING FILTERS

<i>Welding operation</i>	<i>Suggested shade number*</i>
Shielded Metal-Arc Welding, up to 5/32 in (4 mm) electrodes -----	10
Shielded Metal-Arc Welding, 3/16 to 1/4 in (4.8 to 6.4 mm) electrodes -----	12
Shielded Metal-Arc Welding, over 1/4 in (6.4 mm) electrodes -----	14
Gas Metal-Arc Welding (Nonferrous) -----	11
Gas Metal-Arc Welding (Ferrous) -----	12
Gas Tungsten-Arc Welding -----	12
Atomic Hydrogen Welding -----	12
Carbon Arc Welding -----	14
Torch Soldering -----	2
Torch Brazing -----	3 or 4
Light Cutting, up to 1 in (25 cm) -----	3 or 4
Medium Cutting, 1 to 6 in (25 to 150 mm) -----	4 or 5
Heavy Cutting, over 6 in (150 mm) -----	5 or 6
Gas Welding (Light), up to 1/8 in (3.2 mm) -----	4 or 5
Gas Welding (Medium), 1/8 to 1/2 in (3.2 to 12.7 mm) -----	5 or 6
Gas Welding (Heavy), over 1/2 in (12.7 mm) -----	6 or 8

* The choice of a filter shade may be made on the basis of visual acuity and may, therefore, vary widely from one individual to another, particularly under different current densities, materials, and welding processes. However, the degree of protection from radiant energy afforded by the filter plate or lens when chosen to allow visual acuity shall still remain in excess of the needs of eye filter protection. Filter plate shades as low as shade 8 have proven suitably radiation-absorbent for protection from the arc-welding processes.

Note. In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the operation (spectrum).

APPENDIX K

LISTING OF 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 Palpebral Edema Corneal Ulcers Blindness
		Fluorine & Compounds	G/F/M/V	Eye Irritant
		Phosphorus & Compounds	D	Eye Irritant
Sulfur Dioxide		V	Eye Irritant	
Trichloroethylene		V/L	Eye Irritant	
Zinc & Compounds		F/D/V	Eye Irritant	
Entomology	Ammonia	G	Blepharospasms Palpebral Edema Corneal Ulcer Blindness	
	Creosol	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/V/M	Eye Irritant	
	Methylene Chloride	L/V	Eye Irritant	
	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 Ulcer Blindness
		Bromine & Compounds	V/G	Eye Irritant
		Ethyl Chloride	L/G	Eye Irritant
		Methylene Chloride	L/V	Eye Irritant
Sulfur Dioxide		V	Eye Irritant	
Acetone		L/V	Eye Irritant	
Ammonia		G	Blepharospasms Palpebral Edema Corneal Ulcer Blindness	
Paint		Bromine & Compounds	V/G	Eye Irritant
		Ethyl Chloride	L/G	Eye Irritant
		Methylene Chloride	L/V	Eye Irritant
	Sulfur Dioxide	V	Eye Irritant	

Shop/Area	Substance	Form*	Action/effect
Paint (Continued)	Arsenic	D/F	Conjunctivitis
	Benzene	L/V	Eye Irritant
	Carbon Disulfide	L/V	Eye Irritant
			Optic Nerve Damage
	Diacetone Alcohol	V	Eye Irritant
	Dioxane	L/V	Eye Irritant
	Methyl Alcohol	L/V	Eye Irritant
			Central Field Loss
			Blurred vision
			Blindness
			Loss of vision
			Eye Irritant
Hospital	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
	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
	Methyl Alcohol	L/V	Eye Irritant
			Central Field Loss
			Blurred Vision
Sewage Treatment			Blindness
	Trichloroethylene	L/V	Eye Irritant
	Zinc & Compounds	V/F/D	Eye Irritant
	Chloride of Lime	D	Conjunctivitis
			Blephoritis
Water Plant			Corneal Ulcer
	Chlorine	L/G	Eye Irritant
	Hydrogen Sulfide	G	Eye Irritant
	Chloride of Lime	D	Conjunctivitis
			Blepharitis
Petroleum, Oils, and Lubricants			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
	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
Battery			Central Field Loss
			Blurred vision
			Blindness
	Xylene	V	Eye Irritant
	Hydrogen Chloride	G/M	Eye Irritant
Sulfuric Acid	L/V	Eye Irritant	
		Progressive Damage	

* V—vapor; L—liquid; M—mist; D—dust; F—fume; G—gas.

APPENDIX L

RACKET SPORTS—OCULAR PROTECTION

1. Racket sports (tennis, badminton, squash, and racket ball) have enjoyed explosive growth during the past several years within the military communities. But the general public and most of the participants are unaware that these sports present a potential ocular hazard to the player.

2. There are four ways that these ocular injuries may occur: (1) contact with the ball; (2) contact with the racket; (3) contact with the other player; and (4) contact with the court. The most common source of ocular contusion is through direct contact with the ball.

3. What happens if you are struck in the eye by the ball without protection? The ball has a peak velocity of around 90-95, mph, but it varies with the strength of the player and the tension of the racket strings. Usually only one eye is involved. Pain is excruciating. Loss of visual acuity most often is only partial and temporary but it can be permanent.

4. In the 3 years 1975-1977, there were an estimated 11,000 eye injuries from racket sports that were treated in hospital emergency departments throughout the US. In each year, the number of eye injuries increased by approximately 1000 over the previous year. In this same study of racket sport injuries, it was found that there were many serious eye injuries. Some of these included traumatic hyphema (blood in anterior chamber), dislocated lens, orbital fracture, retinal tears, retinal detachment, vitreous hemorrhage, lacerated globe and permanent corneal scarring. Very often, the injury will cause loss of work time and productivity.

5. Players can reduce the potential for injury if they would wear eye protective devices, develop a strategy to avoid being hit and to avoid hitting

the opponent. In racket ball and squash, do not look back to see the ball; reaction times are very short due to the lack of distances in the back court. In tennis, several injuries have occurred during warmup while more than one ball was in play on the same court. Also, the temperamental firing of a shot in anger or frustration after the loss of a point has caused serious injuries.

6. Protective eyewear, such as glasses or protective goggles, should be worn. These devices act to absorb the energy from the ball, racket, or shuttlecock before the eye is struck. An unprotected eye is vulnerable to the total force of the blow. Today, by Federal law, all spectacles made and sold have impact-resistant lenses (FDA, dress safety); however, the fashion type frame, usually wire or rimless, negates protection if the lens is struck. An excellent way to protect vision while taking part in court sports is to employ the same means used in eye hazardous industry, wear industrial safety glasses (ANSI Z87.1-1979). The differences between the Food and Drug Administration (FDA) and the American National Standards Institute (ANSI) regulations on protective eyewear are significant. However, the major differences are in impact-resistance of the lenses and the strength of the frames. The military optical laboratories do not furnish approved industrial safety spectacles.

7. If your visual acuity is excellent without correction, procure a pair of plano protective spectacles or the racket ball type goggles available through most PX and sporting goods stores.

8. The small cost of ocular protection can almost eliminate the needless suffering from eye injuries. The benefit gained both in terms of suffering and disability prevented as well as the savings of medical costs and lost time far outweigh the cost of education and monitoring programs.



The proponent agency of this regulation is the Office of The Surgeon General. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to HQDA (DASC-PSP), WASH DC 20310.

By Order of the Secretary of the Army :

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