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MILITARY STANDARD

GOGGLES (METRIC)



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FOREWORD

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Chemical Research, Development and Engineering Center, Attn: SMCCR-SPT-S, Aberdeen Proving Ground, MD 21010-5423, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
3. This standard is approved for use by all Departments and Agencies of the Department of Defense in the selection of items for application. It is intended to prevent the entry of unnecessary items (sizes, types, varieties) into the Department of Defense logistics system. This document is not intended to restrict any service in selecting new items resulting from state-of-the-art changes. This standard is divided into two parts:

Part 1. Goggles, Industrial, Safety

Part 2. Goggles, Protective, Laser

PART 1. GOGGLES, INDUSTRIAL, SAFETY
(Part 1 of 2)

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1. SCOPE

1.1 Scope. Part 1 of this standard is a presentation of nomenclature, properties, specification requirements, uses, safety information and storage information for industrial safety goggles. This part does not include all of the items represented by the title or all those items which are commercially available. It does contain items preferred for use in the selection of industrial safety goggles for application by the Department of Defense.

1.2 Application. Goggles, industrial, safety are intended for military use where machine or operation present danger for flying objects, direct or reflected brightness (glare), hazardous liquids, injurious radiation, or a combination of these hazards.

1.3 Classification. Goggles, industrial, safety, included in this standard are classified as specific types required in hazardous environments where there is a reasonable probability that injuries can be prevented by use of such protection.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

A-A-1110 - Goggles, Industrial
A-A-1813 - Lens, Goggles, Industrial
A-A-1814 - Goggles, Industrial (Eyecup, Cover-Cup Type)
GG-G-531 - Goggles, Industrial and Spectacles, Industrial, Plastic
GGG-G-521 - Goggles, Industrial, Resilient Frame

MILITARY

DOD-G-51510 - Goggles, Industrial, Eyecups And Lenses, Goggles,
Industrial (Metric)

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

CODE OF FEDERAL REGULATIONS (CFR)

Title 29 - Department Of Labor, Occupational Safety And Health
Chapter VII Administration (Sections 1910.132 and 1910.252)

DEPARTMENT OF DEFENSE (DOD)

DOD 4160.21-M - Defense Utilization And Disposal Manual
DODI 6055.1 - Occupational Safety and Health Program
TE MED 506 - Occupational And Environmental Health Occupational
Vision

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

- ANSI Z80.1 - Prescription Ophthalmic Lenses, Recommendation For.
- ANSI Z80.3 - Ophthalmics - Nonprescription Sunglasses and Fashion Eyewear - Requirements
- ANSI Z87.1 - Practice for Occupational and Educational Eye and Face Protection

(Application for copies should be addressed to American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 Absorptive lens/plate. A transparent lens or plate which provides protection against injurious radiation in the ultraviolet, visible, and infrared portions of the spectrum.

3.2 Lens, corrective (Rx). A lens manufactured to the wearer's individual corrective prescription.

3.3 Striae. Internal imperfections of lens appearing as wavy distortion.

4. GENERAL REQUIREMENTS

4.1 Protection. Eye protection in the form of suitable goggles shall be required in hazardous environments where there is a reasonable probability that injuries can be prevented by the use of such protection.

No unprotected person shall knowingly be subjected to hazardous environments. The type of protector shall be made conveniently available, suitable for the work to be performed, and the employee shall use such protectors. 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.

Suitable goggles shall be provided where machines or operation present danger from flying objects, direct or reflected brightness (glare), hazardous liquids, injurious radiation, or a combination of these hazards.

Design, construction, testing and uses of eye protection devices are prescribed in the American National Standards Institute (ANSI) Standard, Practice for Occupational and Educational Eye and Face Protection Z87.1. Requirements for eye and face protection are also prescribed in 29 CFR 1910.132, 1910.133 and 1910.252. Guidance for eye protection is contained in TB MED 506 and DODI 6055.1.

Persons whose vision requires the use of corrective (Rx) lenses in spectacles, and who are required to wear eye protection, shall wear goggles or spectacles meeting construction standards stipulated in American National Standard for Occupational and Educational Eye and Face Protection, Z87.1. Goggles of one of the following types are available:

- a. Goggles that can be worn over corrective (Rx) spectacles without disturbing the adjustment of the spectacles.
- b. Goggles that incorporate corrective (Rx) lenses mounted behind the protective lenses.

4.2 Minimum requirements. Goggles shall meet the following minimum requirements:

- a. They shall provide adequate protection against the hazards for which they are designed.
- b. They shall fit snugly to the contour of the face to safeguard the eyes of the wearer and shall not interfere with movements of the wearer nor interfere with the adjustment of the spectacles.
- c. They shall be durable and reasonably comfortable.
- d. They shall be easily cleanable and capable of being disinfected.

4.3 Materials. Materials used in the manufacture of goggles shall combine mechanical strength and lightness of weight. They shall be nonirritating to the skin and shall withstand frequent disinfection. Any metal used shall be inherently corrosion resisting.

4.4 Marking. Each pair of goggles shall be distinctly and permanently marked to identify the manufacturer. In addition, all major components of the goggles shall bear a legible and permanent Z87.1 logo to indicate compliance with ANSI Z87.1.

4.5 Issue of goggles. Goggles are a personal item and should be issued for the exclusive use of one person. If circumstances require reissue, they should be thoroughly cleaned and disinfected in accordance with paragraph 6.4.3 of American National Standard, Practice for Occupational and Educational Eye and Face Protection, (ANSI) Z87.1.

4.6 Interchangeability. All goggles of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts.

4.7 Safety. It is the responsibility of management to provide the proper eye protection and to instruct personnel in the proper use and care of specific types. It is the responsibility of the wearer to make certain that the proper protection is used for the work being done. The goggles described in this standard are designed for eye protection only and for use in certain general areas of employment. When other hazards are present in the occupational environment, additional protective measures may be required. Appropriate medical or safety authorities should be consulted to determine personal protective measures or environmental controls.

It is the responsibility of the wearer and all supervisors and managers to make certain that the proper protection is used.

4.8 Storage. Goggles shall be stored in a cool, dry place in their original packing. Moisture, temperature, type of container and extended exposure to direct sunlight may cause variations in shelf life.

4.9 Packaging data and labeling. Packaging, packing, labeling and marking shall be as specified in the contract or order.

4.10 Disposal of excess or unserviceable material. To minimize disposal problems, it is recommended that no more than a one year's supply of each item listed in this standard be stocked. When stocks have been declared excess or unserviceable, they will be disposed of in accordance with the Defense Utilization and Disposal Manual, DoD 4160.21-M, and applicable DoD Policy Memoranda. Guidance can be obtained from the servicing Defense Utilization and Marketing Office (DRMO) on procedures required for proper reporting and turn-in.

4.10.1 DISCLAIMER. RECOMMENDED DISPOSAL INSTRUCTIONS ARE FORMULATED FOR USE BY ELEMENTS OF THE DEPARTMENT OF DEFENSE. THE UNITED STATES OF AMERICA IN NO MANNER WHATSOEVER EITHER EXPLICITLY OR IMPLICITLY WARRANTS, STATES, OR INTENDS SAID INSTRUCTION, TO HAVE ANY APPLICATION, USE OR VIABILITY BY OR TO ANY PERSON OR PERSONS CONTRACTING OUTSIDE THE DEPARTMENT OF DEFENSE OR ANY PERSON OR PERSONS CONTRACTING WITH ANY INSTRUMENTALITY OF THE UNITED STATES OF AMERICA AND DISCLAIMS ALL LIABILITY FOR SUCH USE. ANY PERSON USING THESE INSTRUCTIONS WHO IS NOT A MILITARY OR CIVILIAN EMPLOYEE OF THE UNITED STATES OF AMERICA SHOULD SEEK COMPETENT PROFESSIONAL ADVICE TO VERIFY AND ASSUME RESPONSIBILITY FOR THE SUITABILITY OF THESE INSTRUCTIONS TO THEIR PARTICULAR SITUATION REGARDLESS OF SIMILARITY TO A CORRESPONDING DEPARTMENT OF DEFENSE OR OTHER GOVERNMENT SITUATION.

5. DETAILED REQUIREMENTS

5.1 Name. Goggles, Industrial, Safety, Plastic

5.1.1 Technical description. The goggles shall consist of a plastic frame with integral or replaceable plastic, clear or anti-glare lens, perforated or with hooded or screened vents and elastic headband. The goggles shall be designed to be worn over conventional type corrective spectacles and shall conform to the contour of the face. They shall fully protect the eyes from front and side exposure.

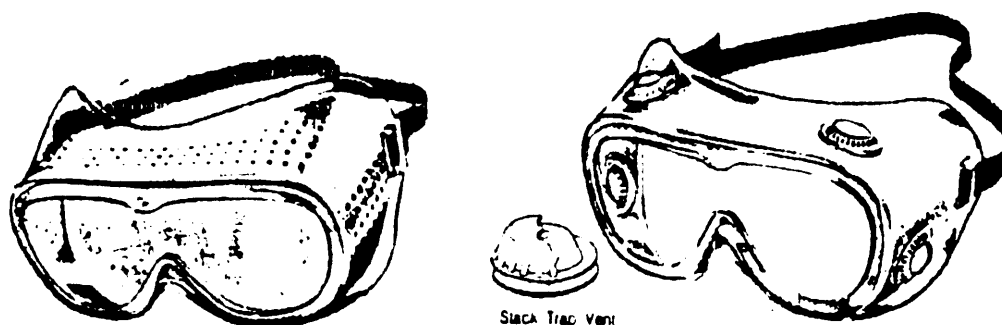


FIGURE 1. Typical illustration of goggles, industrial, all plastic with perforated or hooded vents.

5.1.2 Specifications.

A-A-1110 - Goggles, Industrial

GG-G-531 - Goggles, Industrial, and Spectacles, Industrial, Plastic

5.1.2.1 Commercial Item Description (CID), A-A-1110, Goggles, Industrial. The General Service Administration has authorized the use of Commercial Item Description (CID), A-A-1110, Goggles, Industrial, in lieu of Federal Specification GG-G-531, Goggles, Industrial And Spectacles, Industrial, Plastic.

5.1.2.1.1 Requirements. (A-A-1110) Commercial Item Description, Goggles, Industrial covers industrial goggles that provide protection against small flying particles of dust, chips and machine cuttings.

5.1.2.1.1.1 Conformance. Goggles shall comply with the eye protection requirements of American National Standard (ANSI) Z87.1.

5.1.2.1.1.2 Certification. The contractor shall certify that the product offered meets the salient characteristics of CID, A-A-1110 and that the product conforms to the producer's own drawings, specifications, standards and quality assurance practices, and is the same product offered for sale in the commercial marketplace.

5.1.2.1.1.3 Recovered materials. The manufacturer shall utilize recovered material to the maximum extent practicable.

5.1.2.2 Federal, GG-G-531, Goggles, Industrial and Spectacles, Industrial, Plastic. Goggles covered by Federal Specification GG-G-531 shall be of the following type, grades and classes:

Type I - Goggles

Grade A - Anti-fog treated lens

Grade B - Untreated lens

Class 1 - Clear lens

Class 2 - Antiglare lens

5.1.2.2.1 Requirements. (GG-G-531)

5.1.2.2.1.1 Standard commercial product. Except as modified by the provisions of this specification, goggles shall be the manufacturer's standard commercial product.

5.1.2.2.1.2 Materials. Lenses and frames of goggles covered by this specification shall be of suitable plastics. Hinges, fasteners, and reinforcements may be fabricated of suitable metals.

5.1.2.2.1.3 Disinfection. Materials used in goggles shall show no sign of deterioration or discoloration when subjected to the disinfection procedure as specified in ANSI Z87.1.

5.1.2.2.1.4 Corrosion resistance. Metal parts shall show no signs of corrosion when tested as specified in ANSI Z87.1.

5.1.2.2.1.5 Water absorption. Plastic parts shall show not more than 5 percent water absorption when tested as specified in ANSI Z87.1.

5.1.2.2.1.6 Flammability. The rate of flame - propagation for plastic components shall be 24 seconds per inch or less when tested as specified in ANSI Z87.1.

5.1.2.2.2 Design. Goggles shall consist of a plastic frame or mask, plastic lens, and adjustable headband of a suitable elastic material such as braided elastic, rubber strap, or other similar materials. Goggles shall be designed to generally contour to the shape of the face, covering completely the eye sockets and the facial area surrounding the eyes, offering both frontal and side protection to the wearer. Goggles shall be capable of being worn over conventional spectacles with no decrease in protection offered. The lens portion of the goggles shall be not less than 5-3/8 inches long (outside measurement) at the longest dimension and not less than 2-3/16 inches (outside measurement) at the widest dimension. Goggles shall be furnished with either integral or replaceable lens at the manufacturer's option, unless otherwise specified. Weight of complete goggles shall not exceed 3.0 ounces.

5.1.2.2.2.1 Frames or masks. Frames or masks shall be clear, translucent, colored or opaque as specified. They shall be sufficiently rigid to hold the lens securely in place before the wearer's eyes. Edges which contact the wearer's face shall be rounded. Ventilation openings shall be provided to permit circulation of air through the goggles. These openings shall not permit the passage of a sphere 5/64 inch in diameter. Methods of securing the lens in the frame or mask shall be sufficient to securely hold the lens in place when the fracture resistance test specified is conducted.

5.1.2.2.2.2 Lenses. Lenses shall not chip, fracture, be penetrated, or shatter when subjected to the impact resistance test as specified in ANSI Z87.1.

- a. Grade A. Grade A lenses, when tested as specified, shall show no visible fog. The anti-fogging treatment shall not be affected when used or cleaned according to the manufacturer's direction.
- b. Class 1. Lenses of Class 1 goggles shall be of clear plastic with a luminous transmittance of not less than 85 percent when tested as specified. They shall be free from striae, waves, and other visible defects which might impair optical qualities. Lenses shall be not less than 0.050 inch thick.
- c. Class 2. Lenses of Class 2 goggles shall be of antiglare design. They shall meet requirements of Class 1 lenses except that they shall be of colored plastic capable of reducing harmless glare and absorbing ultra-violet radiation. Specifically, Class 2 lenses shall be capable of meeting the color limits, traffic signal transmittance, and ultraviolet transmittance requirements for lenses suitable for daylight driving as detailed below when in accordance with:
 - (1) Color limits - values of X and Y shall not fall outside prescribed regions on the CIE standards chromaticity diagram in ANSI Z80.3.
 - (2) Traffic signal transmittance - 8 percent minimum for red, 6 percent minimum for yellow, and 6 percent minimum for green.
 - (3) Ultraviolet transmittance - no greater than 0.2 percent.

5.1.2.2.2.3 Headbands. Headbands of suitable elastic material shall be not less than 7/16 inch wide. They shall be adjustable in length and shall be fastened to the goggles frame in such a manner as to be easily replaceable. They shall not interfere with the facial fit of the goggles. The headband shall withstand, without visible deterioration, the disinfection test as specified in ANSI Z87.1.

5.1.3 Use. Plastic goggles with perforated frame are intended for protection where there is danger of injury to the eyes from small flying particles such as chips, or machine cuttings. Uses include the operation of machine tools, saws, grinders, buffers and polishers.

Plastic goggles with hooded vents are intended for protection where there is danger of injury to the eyes due to chemical splash.

5.1.4 Safety. The goggles should be carefully inspected before each use. Pitted or scratched lenses impair vision and could seriously reduce protection. Such lenses should be immediately replaced. Knotted, twisted, or slack head-

bands do not hold the frame in the proper position to protect the eyes and should be replaced immediately.

5.1.5 Storage. Goggles should be stored in the original packing in an area that is cool and dry.

5.2 Name. Goggles, Industrial (Eyecup, Cover-Cup Type)

5.2.1 Technical description. The goggles shall consist of two eyecups of rigid plastic material connected by a flexible adjustable nose bridge, replaceable lenses, lens seats, lens retaining rings and an adjustable, readily replaceable elastic headband.



FIGURE 2. Typical illustration of chippers' eyecup and cover-cup type goggles.



FIGURE 3. Typical illustration of welders' eyecup and cover-cup type goggles.

5.2.1.1 Styles and Functions of Protectors.

5.2.1.1.1 Basic Types. Goggles (eyecup, cover-cup type) comprise three basic types as follows:

- a. Cup-type goggles designed to be worn by individuals who do not wear corrective (Rx) spectacles.
- b. Cover-cup-type goggles designed to fit over corrective (Rx) spectacles.
- c. Rigid cover goggles designed to fit over corrective (Rx) spectacles.

5.2.1.1.2 Models. The basic types of goggles (eyecup, cover-cup type) shall be subdivided as follows:

- a. Chipper's models providing impact protection against flying objects.
- b. Welder's and cutter's models providing protection against glare, injurious radiations, and impact.
- c. Dust and splash models providing protection against relatively fine dust particles or liquid splashes and impact.

5.2.2 Specifications.

A-A-1814 - Goggles, Industrial (Eyecup, Cover-Cup Type)
A-A-1813 - Lens, Goggles, Industrial
DOD-G-51510 - Goggles, Industrial, Eyecup And Lenses, Goggles, Industrial (Metric)

5.2.2.1 Commercial Item Description, A-A-1814, Goggles, Industrial (Eyecup, Cover-Cup Type). Goggles covered by this commercial item description shall be of the following classes and types:

- a. Class A - Chipper's
- b. Class B - Welder's
 - (1) Type I - Filter Shade No 4
 - (2) Type II - Filter Shade No 6

5.2.2.1.1 Requirements. (A-A-1814) The commercial item description requirements for goggles, industrial (eyecup, cover-cup type) are as listed below:

- a. Shall not interfere with the wearing of spectacles.
- b. Shall be ventilated and designed to generally contour to the shape of the face, covering completely the eye sockets, offering both frontal and side protection.
- c. Class A goggles shall be provided with two clear plate glass lenses.
- d. Class B goggles shall be provided with two filter lenses of the type specified in the solicitation or invitation and two cover lenses.

5.2.2.1.1.1 Conformance. Goggles shall comply with the eye protection requirements of ANSI Z87.1.

5.2.2.1.1.2 Lenses. Lenses shall be 50 mm round goggle lenses. They may be of glass or coated or uncoated plastic composition. Lenses shall be of four types as follows:

- a. Clear lenses. Impact-resistance, providing protection against flying objects.
- b. Absorptive lenses.
 - (1) Impact-resistance, reducing direct or reflected brightness (glare).
 - (2) Impact-resistance, providing protection against injurious radiation in the ultraviolet, visible, and infrared regions, by conforming to the requirements for Shades 1.7 through 3.0. (Lenses shall be in accordance with American National Standard Requirements, Practice of Occupational and Educational Eye and Face Protection, ANSI Z87.1, Table I.)
- c. Protective-Corrective (Rx) Lenses. Impact resistant, either clear or absorptive, as specified for persons requiring visual correction. (Lenses shall be in accordance with American National Standard Requirements for First-Quality Prescription Ophthalmic Lenses, ANSI Z80.1)
- d. Filter Lenses. Impact-resistant, providing protection against injurious radiations in the ultraviolet, visible, and infrared regions, by conforming to the requirements for Shades 4.0 through 8.0. (Lenses shall be in accordance with American National Standard, Practice for Occupational and Educational Eye and Face Protection, ANSI Z87.1, Table I.)

5.2.2.2 Commercial Item Description, A-A-1813, Lens, Goggles, Industrial. Lenses covered by this commercial item description shall be of the following types:

- a. Type I - Filter Shade No. 4
- b. Type II - Filter Shade No. 6
- c. Type III - Clear
- d. Type IV - Cover

5.2.2.2.1 Requirements. (A-A-1813) The commercial item description requirements for lenses, goggles, industrial are as listed below:

- a. Type I, II and III shall be single solid glass plate of a grade suitable for optical use. They shall measure 1.968 ± 0.008 inch in diameter and between 0.12 - 0.15 inch in thickness. Lenses shall be in the shade specified.
- b. Type IV shall be a single solid glass plate or allyl plastic. They shall measure 1.968 ± 0.008 inch in diameter and shall not be less than 0.050 inch in thickness.

5.2.2.2.1.1 Finish. Lenses shall be well polished, smooth and free from rough edges or any irregularities which may present a potential hazard through cutting or scratching the wearer.

5.2.2.2.1.2 Conformance. Lenses shall comply with the eye protection requirements of ANSI Z87.1.

5.2.2.2.1.3 Workmanship. Lenses shall be free from any defect which may affect appearance, durability or serviceability.

5.2.2.3 Military Specification, DOD-G-51510, Goggles, Industrial, Eyecup And Lenses, Goggles, Industrial (Metric). This specification covers two types and two classes of eyecup industrial goggles and three types of lenses for the goggles. The goggles and lenses shall be of the following types and classes:

Goggles

Type I - Cup-type

Class A - Chipper's

Class B - Welder's and Cutter's

Type II - Cover-cup type

Class A - Chipper's

Class B - Welder's and Cutter's

Lenses

Type I - Clear

Type II - Filter

Type III - Cover

5.2.2.3.1 Requirements. (DOD-G-51510)

5.2.2.3.1.1 Materials. When tested as specified, materials used in the manufacture of goggles and lenses shall conform to the ANSI Z87.1 requirements under the section on protectors - Material and Methods of Test for materials, disinfection, corrosion-resistance, and flammability.

5.2.2.3.1.2 Goggle components. Goggle components shall conform to the ANSI Z87.1 general requirements for eyecup goggles.

- a. Nose bridge. The nose bridge shall be flexible and shall be easily adjustable by hand to a fixed position. Type II, Class B goggles shall be equipped with a leather nose bridge pad of sufficient size, between the eyecups, to protect the eyes in the vicinity of the nose from harmful radiation.

- b. Headband. The headband shall be made of solid, oil-resistant synthetic rubber no less than 9.5 millimeters (mm) wide. It shall be adjustable in length, shall be fastened to the eyecups in such a manner as to be easily replaceable, and shall not interfere with the facial fit of the eyecups.
- c. Eyecups.
 - (1) Materials. When tested as specified, eyecups shall conform to the ANSI Z87.1 detailed requirements for eyecup material.
 - (2) Vision and fit. Eyecups shall conform to the ANSI Z87.1 detailed requirements for vision and fit for cup-type goggles (Type I) or cover-cup-type goggles (Type II), as applicable.
 - (3) Ventilation. Eyecups shall conform to the ANSI Z87.1 detailed requirements for ventilation for chipper's models (Class A) or welder's and cutter's models (Class B), as applicable.
 - (4) Lens-retaining rings. Eyecups shall conform to the ANSI Z87.1 detailed requirements for lens-retaining rings.
 - (5) Lens seat. Eyecups shall conform to the ANSI Z87.1 detailed requirements for lens seat.
 - (6) Interior finish. The eyecups shall have a permanent, dull, low-reflecting interior finish.
- d. Lenses. Each pair of Class A goggles shall be furnished with two Type I lenses. Each pair of Class B goggles shall be furnished with two Type II filter lenses of the shade specified and two Type III lenses. Lenses shall conform to the following ANSI Z87.1 requirements, when tested as specified in paragraph 4.2.4.1 or examined as specified in paragraph 4.2.3.1 as applicable.
 - (1) ANSI Z87.1 detailed requirements for eyecup goggle lenses.
 - (a) Dimensions
 - (b) Optical quality
 - (c) Impact resistance
 - (d) Plastic lens penetration (if applicable)
 - (e) Edges
 - (f) Transmittance
 - (g) Haze
 - (h) Cover lenses
 - (i) Marking

(2) ANSI Z87.1 general requirements for lenses.

- (a) Optical quality
- (b) Prismatic power
- (c) Refractive power
- (d) Astigmatism
- (e) Definition
- (f) Size tolerance
- (g) Edges
- (h) Haze

(3) ANSI Z87.1 detailed requirements for lenses.

- (a) Lens thickness
- (b) Marking
- (c) Transmittance
- (d) Lens strength

5.2.2.3.1.3 Shades of filter lenses. Filter lenses shall be of the shades in the ANSI Z87.1 table entitled Transmittance and Tolerances in Transmittance of Various Shades of Absorptive Lenses, Filter Lenses and Plates.

5.2.2.3.1.4 Sodium light filter lenses. When required, sodium light filter lenses shall be furnished in the shades shown in Table I as specified. Sodium light filter lenses shall have a strong absorptive band in the region of the sodium line (589.3 nanometers). The lenses shall meet the requirements for Type II filter lenses except that the thickness of the lenses shall be no less than 2.2 mm and no more than 4.0 mm. When tested as specified the transmission at 589.3 nanometers shall be no greater than 15 percent of the total visible transmission, as shown in Table I, The maximum transmission shall be between 485 and 600 nanometers.

TABLE I. Sodium filter lens light transmittance.

Shade Number	Percent sodium light (589.3 nanometers transmittance)		
	Minimum	Standard	Maximum
2.5	2.70	3.45	4.34
3.0	1.31	2.09	2.69
4.0	0.49	0.78	1.28
5.0	0.18	0.29	0.47
6.0	0.07	0.11	0.18

5.2.2.3.1.5 Workmanship. Eyecup goggles, components, and lenses shall be free from defects such as tears, cracks, and chips, and shall be free from foreign matter such as dirt, oil and grease.

5.2.3 Use. Goggles, industrial (eyecup, cover-cup type) are intended for protection of the eyes of the wearer from flying objects and when fitted with proper lenses, to protect the eyes of the wearer from glare, injurious radiations and impact.

5.2.4 Safety. The goggles should be carefully inspected before each use. Pitted or scratched lenses impair vision and could seriously reduce protection. Such lenses should be immediately replaced. Knotted, twisted, or slack headbands do not hold the frame in the proper position protect the eyes and should be replaced immediately.

5.2.5 Storage. Goggles should be stored in the original packing in an area that is cool and dry.

5.3 Name. Goggles, Industrial, Resilient Frame

5.3.1 Technical description.. The goggles shall have resilient frames made to be worn over conventional-type spectacles or directly over the eyes. The goggles may be ventilated or non-ventilated as required by their intended use. When chemical goggles are ventilated, the openings shall be baffled or screened to prevent the direct passage of dust or liquids into the interior of the eye-cup. The goggles shall have a positive means of support on the face, such as an adjustable headband or other suitable means of support, to retain the frame comfortably and snugly in place in front of the eyes.

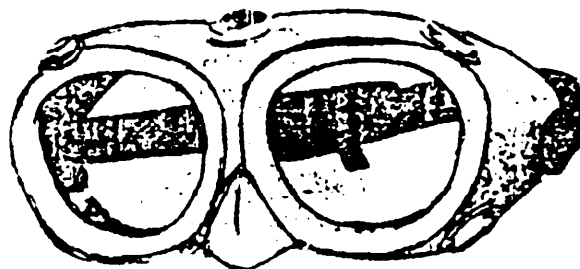


FIGURE 4. Typical illustration of goggles, industrial, safety, resilient frame, ventilated.

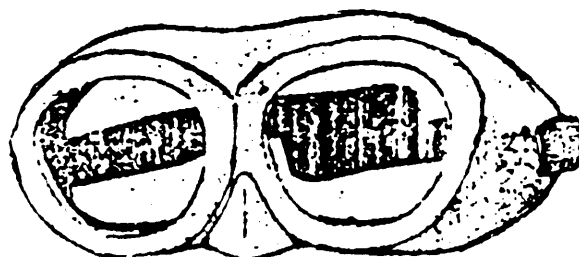


FIGURE 5. Typical illustration of goggles, industrial, safety, resilient frame, non-ventilated.

5.3.2 Specification. Federal, GGG-G-521, Goggles Industrial, Resilient Frame. Goggles covered by this specification shall be of the following types and styles:

- a. Type I - Ventilated
 - (1) Style A - Dual lens
 - (2) Style B - Single lens
- a. Type II - Nonventilated
 - (1) Style A - Dual lens
 - (2) Style B - Single lens

5.3.2.1 Requirements. The federal specification requirements for goggles, industrial, resilient frame are listed below:

5.3.2.1.1 Standard commercial product. The goggles shall, as a minimum, be in accordance with the requirements of Federal Specification, GGG-G-521 and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the goggles being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures, and represents the latest production model.

5.3.2.1.2 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification unless otherwise specified.

5.3.2.1.3 Cleaning and sanitization. All materials shall not deteriorate or discolor when tested as specified.

5.3.2.1.4 Corrosion resistance. All materials shall show no impairment when tested as specified.

5.3.2.1.5 Types and styles.

5.3.2.1.5.1 Type I, style A. Type I, style A goggles shall be ventilated in a manner to permit circulation of air, and shall consist of essentially a resilient frame, dual lenses, and headband as follows:

- a. Resilient frame. Frame shall be molded of resilient material such as natural or synthetic rubber or plastic that is nontoxic and nonirritating to the skin. When rubber is used it shall have the physical properties as shown in Table II and meet the requirements of the tests as specified.

TABLE II. Physical properties of rubber.

	Before aging <u>1/</u>	After aging <u>1/</u> (percent change) (maximum)
Ultimate tensile strength, (psi), min	1200	- 25
Ultimate elongation, %, min	550	+ 25
Permanent set <u>2/</u> , %, max	20	+ 25
Tear strength (pounds per inch thickness), min	150	- 25
Hardness durometer A	50 <u>±</u> 7	+ 10

1/ As specified in GGG-G-521, par. 4.6.2.

2/ After 400 percent elongation for 10 minutes and rested 10 minutes.

- b. Lenses. Lenses for style A goggles shall be not less than 0.12 inch nor more than 0.15 inch in thickness. Lenses shall be made from single, solid-glass plate of a grade suitable for optical use. Lenses shall be free from striae, waves, or other visible defects which will impair their optical qualities. The optical surfaces shall be polished and shall be free from visible surface defects. Lenses shall be heat treated. After subjection to the impact resistance test, lenses shall not crack, fracture, chip or be ejected completely from the frame.
- c. Headband. The headbands for style A goggles shall be made of molded natural rubber, synthetic rubber, or of elastic webbing and shall be not less than 7/16-inch wide. Means shall be provided for adjustment to fit all head sizes and for detachment of headband from the goggles frame.

5.3.2.1.5.2 Type I, style B. Type I, style B, goggles shall be ventilated in a manner to permit circulation of air, and shall consist of essentially a resilient frame, single lens, and headband as follows:

- a. Resilient frame. Requirements for style B, goggle frame shall be the same as those specified for style A.
- b. Lens. The lens of style B goggles shall be not less than 5.375 inches long (outside measurement) at the longest dimension and not less than 2.187 inches wide (outside measurement) at the widest dimension. The lens shall be not less than 0.050 nor greater than 0.060 inch thick. Lens shall be of transparent plastic of optical quality.

free from striae, waves, or other visible defects which might impair the optical qualities. The optical surface of the lens shall be free from visible surface defects. The lens shall not crack, fracture, chip, or be ejected completely from the frame when tested as specified. The lens shall not be pierced through from the impact when tested as specified. The material shall not burn at a rate greater than 3 inches per minutes when tested as specified.

- c. Headband. The headbands for style B goggles shall comply with the headband requirements for style A goggles.

5.3.2.1.5.3 Type II, style A. Type II, style A, goggles shall conform to the requirements for type I, style A goggles except the frames shall have no ventilating openings, and the lenses shall have a means to prevent fogging.

5.3.2.1.5.4 Type II, style B. Type II, style B, goggles shall conform to the requirements for type I, style B goggles except the frame shall have no ventilating openings, and the lens shall have a means to prevent fogging. When the frame material is plastic it shall be clear, translucent, colored or opaque, and shall have the physical properties shown in table III when tested as specified.

TABLE III. Physical properties of plastic.

Ultimate tensile strength (psi), min	1,600
Ultimate elongation, %, min	325
Hardness durometer A	70 + 8

5.3.3 Use. Resilient frame goggles are intended for eye protection from splash, spray, or mist of chemicals, exposure to fine dust concentrations, and impact of flying particles. Nonventilated (type II) resilient frame goggles are intended for eye protection from harmful acid and chemical vapors and any area where gastight goggles are required.

5.3.4 Safety. The goggles should be carefully inspected before each use. Pitted or scratched lenses impair vision and could seriously reduce protection. Such lenses should be immediately replaced. Knotted, twisted, or slack headbands do not hold the frame in the proper position to protect the eyes and should be replaced immediately.

5.3.5 Storage. Goggles should be stored in the original packing in an area that is cool and dry.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Part 1 of this standard is intended to cite nomenclature, properties, specification requirements, uses, safety information and storage information for industrial safety goggles preferred for application by the Department of Defense.

6.2 Issue of DODISS. When this standard is used in acquisition, the applicable issue of the DODISS must be cited in the solicitation (see 2.1.1, and 2.2).

6.3 Subject term (key word) listing.

Absorptive lens/plate
Anti-fog treated lens
Antiglare lens
Chippers (eye-cup)
Chipper's models
Clear lens
Cover-cup-type goggles
Cup-type goggles
Dust and splash models
Eye protection
Goggles, industrial
Goggles, industrial (eyecup, cover-cup type)
Goggles, industrial, resilient frame
Lens, corrective (Rx)
Lens, goggles, industrial
Plastic frame (clear), plastic lens (clear)
Plastic frame (clear), plastic lens (clear), ventilated
Plastic frame (green), plastic lens (green)
Rigid cover goggles
Rubber frame, plastic lens (green)
Spectacles, industrial, plastic
Untreated lens
Welder's and cutter's models
Welders (eye-cup, cover cup)
Welders (flexible mask - filter plate)
Welders (rigid side cup)

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.5 Abbreviations. The use of abbreviations are in accordance with MIL-STD-12 where applicable. Metric system abbreviations and symbols are in accordance with ASTM E 380.

PART 2. GOGGLES, PROTECTIVE, LASER
(Part 2 of 2)

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1. SCOPE

1.1 Scope. Part 2 of this standard is a presentation of nomenclature, properties, specification requirements, uses, safety information and storage information for goggles, protective, laser. This part does not include all of the items represented by the title or all those items which are commercially available. It does contain items preferred for use in the selection of goggles, protective, laser for application by the Department of Defense.

1.2 Application. Goggles, protective, laser are intended for military use when laser beams, direct or reflected present danger to eyes.

1.3 Classification. Goggles, protective, laser, included in this standard are classified as specific types required in hazardous environments where there is a reasonable probability that injuries to the eyes, due to laser beams can be prevented by the use of such protection.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. This paragraph is not applicable to the military standard.

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

CODE OF FEDERAL REGULATIONS (CFR)

Title 29, Chapter VII - Department Of Labor, Occupational Safety And Health Administration

DEPARTMENT OF DEFENSE (DOD)

DOD 4160.21-M - Defense Utilization And Disposal Manual
DODI 6055.1 - Occupational Safety and Health Program
AR 40-46 - Control of Health Hazards from Lasers and Other High Intensity Optical Sources.
TB MED 524 - Control of Hazards to Health from Laser Radiation.
TG 081 - Laser Protective Eyewear.

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

ANSI Z136.1 - Safe Use of Lasers.

(Application for copies should be addressed to American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 Optical density (OD). Logarithm to the base ten of the reciprocal of the transmittance.

3.2 Radiant exposure. Surface density of the radiant energy received.
Unit: joules per centimeter squared ($J \cdot cm^{-2}$)

3.3 Nanometer (nm). 10^{-9} m.

4. GENERAL REQUIREMENTS

4.1 Protection. The need for laser protective eyewear has been demonstrated for all regions of the optical spectrum. Visible and near infrared laser wavelengths present a hazard to the retina of the eye due to the focusing ability of the lens. Suitable laser safety goggles shall be required for personnel exposed to laser beams. The goggles shall protect for the specific wavelengths of the laser used and have an optical density (OD) adequate for the energy involved. Laser protective eyewear should be selected to protect against the maximum exposure anticipated, while still allowing the greatest amount of light to enter the eye. Requirements for eye and face protection are prescribed in 29 CFR 1910.132, 1910.133, and 1910.252. Guidance in the use of laser protective eyewear is contained in Department Of The Army Technical Guide No. 081 (TG 081), Technical Bulletin No. MED 524 (TB MED 524) and DOD: 6055.1.

Factors in determining appropriate eyewear are contained in American National Standard, Safe Use of Lasers, ANSI Z136.1, as follows:

- a. Wavelength of laser output.
- b. Potential for multiwavelength operation.
- c. Radiant exposure or irradiance.
- d. Maximum permissible exposure (MPE) (see ANSI Z136.1, Section 8, Criteria for Exposure of the Eye and Skin).
- e. Optical density of eyewear at laser output wavelength.
- f. Visible light transmission requirement.
- g. Peripheral vision requirement.
- h. Radiant exposure or irradiance and the corresponding time factors at which laser safety eyewear damage (penetration) occurs, including transient bleaching.
- i. Need for prescription glasses.
- j. Comfort and fit.
- k. Degradation of absorbing media, such as photobleaching.
- l. Strength of materials (resistance to shock)
- m. Capability of the front surface to produce a specular reflection.

4.2 Construction and materials. There are two effects that are utilized to selectively filter out laser wavelengths. Filters are designed to make use of selective spectral absorption by colored glass or plastic, or selective reflection from dielectric coatings on glass, or both. There are advantages to each method.

The simplest method of fabrication is to use colored glass absorbing filters that are generally the most effective in resisting damage from wear and from very intense laser sources. Unfortunately, most absorbing filters are not case-hardened to provide impact resistance, but clear plastic sheets are generally placed behind the glass filter.

The advantage of using reflective coatings is that they can be designed to selectively reflect a given wavelength while transmitting as much of the rest of the visible light as possible. However, some angular dependence of the spectral attenuation factor is generally present.

The advantages of using absorbing plastic filter material are greater impact resistance, lighter weight, and ease of molding into curved shapes. The disadvantages are that they are more readily scratched, quality control appears to be more difficult, and the organic dyes used as absorbers are more readily effected by heat and ultraviolet radiation and may saturate or bleach under Q-switched laser irradiation.

4.3 Marking. All laser protective eyewear shall be clearly labeled with the optical density and wavelength for which protection is afforded (see ANSI Z136.1, paragraph 4.6.2.5). Color coding or other distinctive identification of laser protective eyewear is recommended in multi-laser environments.

4.4 Issue of goggles. Personnel whose occupation or assignment require exposure to laser beams should be furnished suitable laser safety goggles. The goggles shall protect for the specific wavelengths of the lasers and have an optical density adequate for the energy involved.

4.5 Safety. Visible and near infrared laser wavelengths present a hazard to the retina of the eye due to the focusing ability of the lens. Personnel involved in operation of potentially hazardous laser equipment should receive instructions that will give them an understanding of the hazards for that particular laser and prescribe if needed, proper protective eyewear (goggles). It should allow the best compromise between protection and high visibility to prevent an associated hazard due to reduced vision and be compatible with normal corrective lenses (spectacles) when required.

4.6 Storage. Goggles shall be stored in a cool, dry place in their original packing protected from direct sunlight.

4.7 Packaging data and labeling. Packaging, packing, labeling and marking shall be as specified in the contract or order.

4.8 Disposal of excess or unserviceable material. When stocks have been declared excess or unserviceable, they will be disposed of in accordance with the Defense Utilization and Disposal Manual, DoD 4160.21-M, and applicable DoD Policy Memoranda. Guidance can be obtained from the servicing Defense Utilization and Marketing Office (DRMO) on procedures required for proper reporting and turn-in.

4.8.1 DISCLAIMER. RECOMMENDED DISPOSAL INSTRUCTIONS ARE FORMULATED FOR USE BY ELEMENTS OF THE DEPARTMENT OF DEFENSE. THE UNITED STATES OF AMERICA IN NO MANNER WHATSOEVER EITHER EXPLICITLY OR IMPLICITLY WARRANTS, STATES, OR INTENDS SAID INSTRUCTION, TO HAVE ANY APPLICATION, USE OR VIABILITY BY OR TO ANY PERSON OR PERSONS CONTRACTING OUTSIDE THE DEPARTMENT OF DEFENSE OR ANY PERSON OR PERSONS CONTRACTING WITH ANY INSTRUMENTALITY OF THE UNITED STATES OF AMERICA AND DISCLAIMS ALL LIABILITY FOR SUCH USE. ANY PERSON USING THESE INSTRUCTIONS WHO IS NOT A MILITARY OR CIVILIAN EMPLOYEE OF THE UNITED STATES OF AMERICA SHOULD SEEK COMPETENT PROFESSIONAL ADVICE TO VERIFY AND ASSUME RESPONSIBILITY FOR THE SUITABILITY OF THESE INSTRUCTIONS TO THEIR PARTICULAR SITUATION REGARDLESS OF SIMILARITY TO A CORRESPONDING DEPARTMENT OF DEFENSE OR OTHER GOVERNMENT SITUATION.

5. DETAILED REQUIREMENTS

5.1 Name. Goggles, Protective, Laser

5.1.1 Technical description. The goggles shall consist of a opaque, flexible plastic frame with capped air vents which prevent entry of light, yet admit air, conform snugly to the face with an adjustable headband and fit over prescription glasses (see figure 1). The lens may be plastic or glass. The glass lens may be backed up with clear plastic for additional impact protection. The goggles shall protect for the specific wavelengths of the lasers and have an optical density adequate for the energy involved. Typical illustrations of goggles, protective, laser are shown in figure 1.



FIGURE 1. Typical illustrations of goggles, protective, laser.

5.1.2 Specifications. Manufacturer's requirements. (No Government specification).

5.1.2.1 Requirements. A variety of goggles, protective, laser are commercially available. The manufacturers' requirements for optical densities at principal wavelengths and their luminous transmittance are shown in Table I.

5.1.3 Use. Goggles, protective, laser are used by personnel whose occupation or assignment require protection from exposure to laser beams. The goggles shall protect for the specific wavelengths of the lasers and have an optical density adequate for the energy involved.

5.1.4 Safety. (Refer to 4.5)

5.1.5 Storage. (Refer to 4.6)

TABLE I. Manufacturers' requirements for optical density at principal wavelengths and luminous transmittance of goggles, protective, laser.

Source	Wavelength (nm)	Optical density	% luminous transmittance
Argon	455	10.4	25
	488	8.6	25
	488	15	45
	514.5	11	45
	515	5.5	25
	515	7	46
Carbon dioxide	10600	>20	92
Gallium Arsenide	840	11.2	46
	840	14	45
	840	17.4	35
Helium-Neon	632.8	6	20
	633	4	30
	633	4.1	10
	633	5	30
Krypton	565	4	15
Neodymium	1060	9	63
	1060	9.5	46
	1060	14	45
	1060	14.7	35
Neodymium (double frequency)	530	4.5	5
Neon-Nitrogen	332	15	70
	337	16	70
Ruby	694	4.4	46
	694	6.1	10
	694	7.1	35
	694	12	26
	694.3	6	20

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Part 2 of this standard is intended to cite nomenclature, properties, requirements, uses, safety information and storage information for goggles, protective, laser preferred for application by the Department of Defense.

6.2 Issue of DoDISS. When this standard is used in acquisition, the applicable issue of the DoDISS must be cited in the solicitation (see 2.2).

6.3 Subject term (key word) listing.

Eye protection
Goggles, protective, laser
Laser protective eyewear
Optical density
Radiant exposure

6.4 Changes from previous issue. Part 2 is an addition to MIL-STD-1434; therefore, marginal notations are not used.

6.5 Abbreviations. The use of abbreviations are in accordance with MIL-STD-12 where applicable. Metric system abbreviations and symbols are in accordance with ASTM E 380.

Preparing activity: Army - EA

Project Number 4240-0553

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Navy - SH
Air Force - 99

Review activities:

Army - MD
Navy - MS, YD
DLA - GS

User activities:

Army - AV, ME
Navy - MC

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions -- Reverse Side)

1. DOCUMENT NUMBER

MIL-STD-1434A

2. DOCUMENT TITLE

GOGGLES (METRIC)

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

 VENDOR USER MANUFACTURER OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

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