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An American National Standard

Standard Specification for Skier Goggles and Faceshields[1]

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1. Scope

1.1 This specification covers the minimal requirements for alpine skier goggles and faceshields, to provide a reasonable degree of protection against foreign objects striking or lodging in the eye or surrounding soft tissue causing eye irritation or damage; and to minimize fogging and vision restrictions that distract or handicap the skier and thereby may cause accidents.

1.2 The scope of this specification shall include requirements for materials, lens size, optical properties, lens strength, field of vision, labeling, identification, and testing procedures for goggles and faceshields for alpine skiers.

1.2.1 Contact lenses, sunglasses, and corrective dress eye wear are not included within the scope of this specification.

1.3 The following safety hazards caveat pertains only to the test method portions, Sections 7 and 8 and Annex A1 of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E275 Practice for Describing and Measuring Performance of Ultraviolet and Visible Spectrophotometers

2.2 *American National Standards:*[3]

ANSI Z80.1 Requirements for First-Quality Prescription Ophthalmic Lenses

ANSI Z80.3 Requirements for Nonprescription Sunglasses and Fashion Eyewear

2.3 *Federal Standard:*[4]

National Institute of Standards and Technology Special Technical Publication 374 Method for Determining the Resolving Power of Photographic Lenses (1973)

3. Terminology

3.1 *Definitions:*

3.1.1 *central viewing zone*—that part of a lens which has its center in line with the wearer's line of sight when looking straight ahead. The zone is circular in shape. For the purpose of this specification, it shall be considered to be 38 mm in diameter. The center of the central viewing zone shall be the point of intersection of the line of sight with the lens as mounted on the Alderson headform.

3.1.2 *diopter*—a unit of measure of the refractive power of a lens with a focal distance of 1 m.

3.1.3 *eye glasses*—spectacles, sunglasses, or goggles having two separately mounted lenses, but excluding contact lenses.

3.1.4 *face shield*—an eye protective device attached to a helmet or headband(s) and which covers the wearer's eyes and face at least to a point located approximately at the tip of the nose and whose predominant function is protection of the eye.

3.1.5 *frame*—those parts of eye glasses or goggles containing the lens housings. The frame may be associated with padding.

3.1.6 *goggles*—an optical device worn before the eyes, the predominant function of which is to protect the eyes from the elements without obstructing peripheral vision. They provide protection from the front and sides, and may or may not form a complete seal with the face.

3.1.7 *headband*—that part of the device consisting of a supporting band or other structure that either encircles the head or protective helmet, or can be attached thereto.

3.1.8 *headform optical parameters*—key dimensions for the headforms as provided in Fig. 1.

3.1.9 *mid-saggital plane*—the anteroposterior plane through the longitudinal axis of the body.

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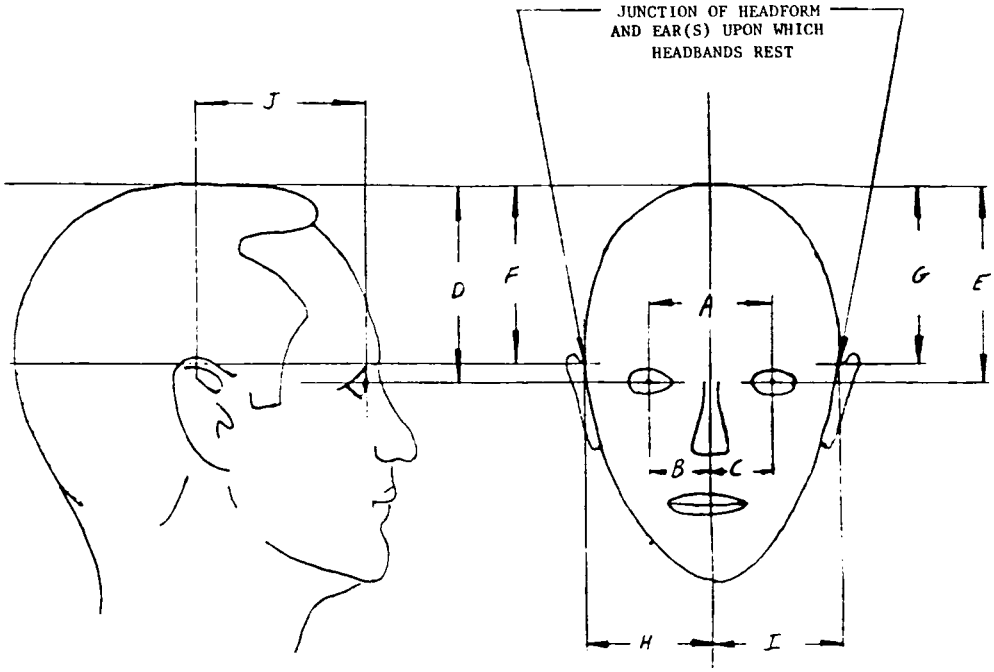
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

[4] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 3460, Gaithersburg, MD 20899-3460.



A	= 66.0 ± 1.3 mm	(2.60 ± 0.05 in.)
B = C	= 31.8 ± 0.8 mm	(1.25± 0.03 in.)
D = E	= 109.2 ± 2.5 mm	(4.30 ± 0.10 in.)
F = G	= 102.9± 2.5 mm	(4.05± 0.10 in.)
H = I	= 78.7 ± 2.5 mm	(3.10± 0.10 in.)
J	= 82.6 ± 1.3 mm	(3.25± 0.05 in.)

NOTE 1—If headform is found to be symmetrical or is to be made symmetrical then B = C, D = E, F = G, and H = I.
NOTE 2—A = Interpupillary distance.
B = Distance of right eye pupil from sagittal plane.
C = Distance of left eye pupil from sagittal plane.
D = Distance of right eye pupil from top of headform.
E = Distance of left eye pupil from top of headform.
F = Distance of top of right ear/headform junction from top of headform.
G = Distance of top of left ear/headform junction from top of headform.
H = Distance from right side of headform to sagittal plane.
I = Distance from left side of headform to sagittal plane.

FIG. 1 50th Percentile

3.1.10 *spherical power*—the average of the maximum meridional astigmatic power and the minimum meridional astigmatic power of a lens.

4. Materials and Design

4.1 All parts of a goggle or faceshield shall be free of sharp edges or projections that could cause harm or discomfort to the wearer.

4.1.1 Exposed lens edges shall have a minimum radius in the cross-sectional plane at the entire circumference to limit skin-penetrating ability.

4.1.2 Lens retention shall be sufficient to adequately retain the lens in position, and the frame shall be composed of material that in itself is not hazardous with regard to skin penetration.

4.1.3 Facial contact surfaces shall be of sufficient softness (suggested width 10 mm) and flexibility to minimize body surface injury in case of hard impacts.

4.2 A headband shall be capable of holding the goggle or faceshield securely under normal operating conditions. It shall be capable of easy adjustment and replacement. The "goggle-to-head" holding device shall not contain sharp edges.

4.3 Material(s) utilized in any portion of a goggle or faceshield shall be of durable quality, that is, material characteristics shall not undergo appreciable alterations under the influence of aging or of the circumstances of use to which the device is normally subjected (exposure to sun, rain, cold, dust, vibrations, contact of the skin, effects of sweat, or of products applied to the skin or hair).

4.4 Material(s) commonly known to cause skin irritation or disease shall not be used for those parts of the device which come into contact with the skin.

4.5 Because of environmental climatic changes and personal changes it is considered impossible to control "lens fogging," but any effort to minimize this condition is urged.

5. Optical Properties of Skier Goggles and Faceshields

5.1 *Optical Requirements*:

NOTE 1—5.1.2-5.1.6 apply to plano lensed goggles. Prescription lenses

must comply with requirements of ANSI Z80.1. Goggles for prescription lenses are to be supplied to the test laboratory with nominal 3-mm thick plano lenses.

5.1.1 *Field of View*—When tested in accordance with 8.1, goggles or faceshields shall have fields of view equal to or exceeding the following:

5.1.1.1 *Temporal Field*—50°,

5.1.1.2 *Nasal Field*—30°,

5.1.1.3 *Superior Field*—30°, and

5.1.1.4 *Inferior Field*—30°.

5.1.2 *Refractive Tolerances*—When tested in accordance with 8.7, the spherical power (as defined in 3.1.10) shall not be less than −0.37 diopters and shall not exceed +0.06 diopters.

5.1.3 *Astigmatism*—When tested in accordance with 8.7, the astigmatism shall not exceed 0.18 diopters.

5.1.4 *Power Imbalance*—When tested in accordance with 8.7, the maximum meridional power imbalance between the two eyes for straight ahead seeing shall not exceed 0.18 diopters.

5.1.5 *Prism*—For the primary viewing position of either eye of a shield or pair of lenses shall not exceed 0.65 prism diopters when tested in accordance with 8.6.

5.1.6 *Prism Imbalance*—When tested in accordance with 8.6, the prism imbalance shall meet the following criteria:

5.1.6.1 *Vertical Imbalance*—Shall not exceed +0.25 prism diopters.

5.1.6.2 *Horizontal Imbalances*—Negative values (base in) shall not be less than −0.25 prism diopters, and positive values (base out) shall not be more than +1.00 prism diopters.

5.1.7 *Optical Defects*—Within the central viewing zone, striae, warpage, surface ripples, or other defects that are apparent under the optical inspection test conditions of 8.3 shall be considered a failure; except that small specks or inclusions that are not seen when the lens is held close to the eye in the as worn position shall not be a cause of rejection.

5.1.8 *Physical Lens Defects*—Within the central viewing zone, pits, scratches, grayness, bubbles, cracks, water marks, or other defects that are apparent under the visible inspection test conditions of 8.5 shall be considered a failure; except that small specks or inclusions that are not seen when the lens is held close to the eye in the as worn position shall not be a cause of rejection.

5.1.9 When tested in accordance with any applicable optical test in 8.6 and 8.7, any goggle or faceshield that does not permit the test target to be brought into focus well enough to make the required measurement will be deemed to have failed that test.

6. Light-Transmitting Ability of Eye Protective Devices

6.1 *Clear Goggle or Faceshield*—A "clear" goggle or faceshield shall transmit not less than 80 % of the incident visible radiation. A goggle or faceshield that transmits less than 80 % of incident visible radiation shall be considered "tinted."

6.2 *Ultraviolet and Infrared Filtration*—Ultraviolet and infrared filtration shall meet the requirements of ANSI Z80.3 for Special Purpose Lenses.

6.3 *Resistance to Fogging*—A goggle or faceshield that is described as being resistant to fogging shall pass the test specified in Annex A1.

NOTE 2—To claim or describe a goggle or faceshield as being resistant to fogging is optional.

7. Lens Strength—Test Methods

7.1 *Basic Impact Resistance Test*:

7.1.1 *Significance and Use*—This test method is intended to ensure a basic level of protection from impact on the surface of a lens of a goggle or on the viewing portion of a faceshield. It may not be representative of all of the conditions of impact experienced in snow skiing.

7.1.2 *Apparatus*—An Alderson 50th percentile male headform (see Fig. 1) shall be used to hold the goggle or faceshield. It shall be rigidly mounted in the horizontal position, face up, on a base that has a mass of 30 kg (66 lb) or greater. The static stiffness of the headform shall be such that, when a vertically downward force of 20 kg (44 lb) is applied to the forehead of the headform, the back of the headform shall not deflect more than 2 mm (0.08 in.). The missile for impacting the goggle or faceshield shall be a polished steel ball, 22 mm (⅞ in.) nominal diameter, and shall have a mass not less than 43 g (1.52 oz). A loose-fitting guide tube shall be provided for the missile.

7.1.3 *Procedure*—Place the goggle or faceshield on the headform as it would be worn by the user. Drop the ball in free fall from a height (measured from the bottom of the ball) of 1.30 m (51 in.) above the exterior surface of the goggle or faceshield. Impact the goggle or faceshield three times: once above the center of each eye of the headform and once above the bridge of the nose of the headform. Test four representative samples of the type of goggle or faceshield.

7.1.4 *Analysis of Results*—The lens shall be retained in its frame, and it shall not fracture into two or more pieces. If all four samples pass the test, then the goggle or faceshield passes, but if any fail, then the goggle or faceshield fails.

7.1.5 *Report*—Fully identify the goggle or faceshield and record whether it passed or failed the basic impact test with spherical projectile. This report is for internal use by the manufacturer and is not included in statements for labeling.

7.1.6 *Precision and Bias*—Precision and bias information is not applicable, because the results of the test are stated qualitatively and not as numerical values of physical quantities.

7.2 *Higher Impact Resistance Test*:

7.2.1 *Significance and Use*—This test method is intended to ensure a level of protection from relatively heavy, pointed objects traveling at low speed. It may not be representative of all of the conditions of impact experienced in snow skiing.

7.2.2 *Apparatus*—An Alderson 50th percentile male headform (see Fig. 1) shall be used to hold the goggle or faceshield. It shall be rigidly mounted in the horizontal position, face up, on a base that has a mass of 30 kg (66 lb) or greater. The static stiffness of the headform shall be such that, when a vertically downward force of 20 kg (44 lb) is applied to the forehead of the headform, the back of the headform shall not deflect more than 2 mm (0.08 in.). The missile shall have a 30° conical tip with a 1 mm (0.04 in.) radius, shall have a mass of 500 g (17.6 oz), and shall have a diameter of 25.4 mm (1 in.). The missile shall have a heat treated steel tip. A loose-fitting guide tube with a smooth internal surface shall be provided for the missile. This guide tube is to prevent the missile from tumbling and

also to protect the operator. Partial shielding of the headform may be desirable to protect the feet of the operator.

7.2.3 *Procedure*—Place the goggle or faceshield on the headform as it would be worn by the user. Hold the missile above the headform with its tip 130 cm (51 in.) above the exterior surface of the transparent portion of the goggle or faceshield and aligned vertically above one eye of the headform. Allow the missile to fall freely through 130 cm. Test four representative samples of the type of goggle or faceshield.

7.2.4 *Analysis of Results*—The lens shall be retained in its frame, and it shall not crack, fracture, nor be penetrated by the tip of the missile. If all four samples pass the test, then the goggle or faceshield passes, but if any fail, then the goggle or faceshield fails.

7.2.5 *Report*—Fully identify the goggle or faceshield and record whether it passed or failed the higher impact test with high mass, low velocity, pointed projectile. This report is for internal use by the manufacturer and is not included in statements for labeling.

7.2.6 *Precision and Bias*—Precision and bias information is not applicable, because the results of the test are stated qualitatively and not as numerical values of physical quantities.

8. Optical Test Methods

8.1 *Field of View (Angle of Vision)*:

8.1.1 *Significance and Use*—This test method is intended to determine the relative unobstructed angle visually available to the user.

8.1.2 *Apparatus*—Any sighting method may be used, provided that results equivalent to those obtainable with the apparatus described here can be obtained. The test device consists of one or more support plates mounted in vertical and horizontal planes about the Alderson headform as mounted per 7.1.2. Angular gradations may be marked on the support plates to aid in making the angle adjustments. Interpupillary distance shall conform to Fig. 1 for the specified headform.

8.1.3 *Procedure*—Place the goggle or faceshield on the headform as it would be worn by the user. Using a small diameter rod guided by the support plates, move the rod while sighting along its length so that it is concurrently aligned with one of the eye-pupils of the headform and an extremity of the field of unobstructed view provided by the goggle or faceshield. Measure and record the angle the rod forms with a line passing through the eye-pupil, parallel with the sagittal plane and normal to the vertical axis of the headform. Use this procedure for determining the limiting angle of vision in the superior, inferior, temporal, and nasal directions.

NOTE 3—A laser pointer may be used in lieu of the rod.

8.1.4 *Analysis of Results*—Compare measured results with the requirements specified in 5.1.5. If all equal or exceed the requirements, the goggle or faceshield passes, but if any is smaller, the goggle or faceshield fails.

8.2 *Luminous Transmittance*:

8.2.1 *Significance and Use*—Although individual preferences govern the choice of color and darkness of the lens of a goggle or faceshield, the luminous transmittance provides a means of quantitative comparison of the perceived light transmission of lenses.

8.2.2 *Procedure*—Determine luminous transmittance for C.I.E. Standard Source C by either the spectrophotometric or the physical photometric method of ANSI Z80.3. In case of question, spectrophotometry shall be the referee method.

8.2.3 *Report*—Report the luminous transmittance and the specific test method used. This report is for internal use by the manufacturer and its inclusion in statements for labeling is optional.

8.2.4 *Precision and Bias*—Precision and bias of the spectrophotometric method can be determined by checking the performance of the spectrophotometer according to Practice E275. However, such determinations may not be necessary, because these luminous transmittance tests are intended to indicate only nominal values.

8.3 *Optical Defects by Visual Inspection*:

8.3.1 *General Considerations*—Localized power errors or aberrations which are detected by optical inspection are permissible if no measurable or gross focimeter target element distortion or blur is found when the localized area is examined with a focimeter. Areas outside the central viewing zone or within 6 mm of the edge need not be tested for local power errors or aberrations, in accordance with ANSI Z80.1.

8.3.2 *Significance and Use*—These visual tests for localized power errors or aberrations provide a quick determination that a lens is sufficiently free from such defects, or that it must be tested more critically by the referee method of 8.4.

8.3.3 *Inspection Procedure*—One method of optical inspection is to view a high-contrast grid pattern of dark and light lines through the lens, scanning the lens area by area. Hold the lens approximately 305 mm (12 in.) from the eye for weak plus or minus lenses. For strong lenses, place the eye near the focus. The target should be placed at least 305 mm (12 in.) from the lens.

8.3.4 *Evaluation of Performance*—A grid pattern, as viewed through the lens, may appear smoothly curved and gradually distorted from the center of the field outward. However, sudden ripples, waves, or distortions that are visible to the naked eye are an indication of a possible significant aberration. The areas should be marked for evaluation by the referee method in 8.4.

8.3.5 *Report*—The marking of the areas to be evaluated by the referee method of 8.4 shall constitute the report of visually detected optical defects.

8.4 *Optical Defects by the Referee Method*:

8.4.1 *Significance and Use*—This referee method of testing for optical defects provides an instrumental method for quantitative measurement of degree of freedom from waves, poor definition, and optical aberrations. The result can be compared with specified numerical limit values to determine whether a lens is satisfactory.

8.4.2 *Procedure*—The referee method of determining freedom from waves, poor definition, and optical aberrations is to scan the central viewing zone with a telescope having an aperture between 5 and 8 mm in diameter. When the central viewing zone is so scanned, there shall be no sudden jump, doubling, or blurring of the image greater than 0.08 diopters change in power. Gradual power variations within the central viewing zone shall be within the power imbalance tolerances. An optical focimeter with electronic readout repeatable to 0.02