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File SA10778
Project 03CA14039

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REPORT

on

EYE AND FACE PROTECTION

Wiley X Eyewear
Livermore, CA

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DESCRIPTION



PRODUCT COVERED:

Spectacles/Goggles SG-1
Spectacles/Goggles CQC
Spectacles XL-1
Spectacles Saber
Spectacles Romer II
Spectacles PT-1
Spectacles B-2B
Spectacles JP-1
Spectacles JP-2
Spectacles JP-3
Spectacles JP-4
Spectacles XL-3
Spectacles XL-4

These spectacles and Goggles are similar to ANSI Type E except some have removable clear or tinted lenses. The SG-1 and CGC Models also fit snugly immediately surrounding the eyes as goggles.

GENERAL:

These safety spectacles and goggles are intended for eye protection for occupational workers where machines or operations present hazard of flying objects. They have been tested in accordance with ANSI Z87.1-2003 Occupational and Educational Eye and Face Protection Devices. All the Models meet the requirements for spectacles and the SG-1 and CQC Models also meet the requirements for goggles.

MARKING:

The Listing Marking as shown on the Listing Mark Data Page is marked on the package in which the spectacles are packed and the abbreviated marking shown on the Listing Mark Data page is stamped or molded into one of the temples. additional spectacle markings include:

Each lens shall be distinctly marked in a permanent and legible manner with the manufacturer's monogram. In addition if other than clear, prescription(Rx) or special purpose, each lens shall be marked with the applicable shade designation. For example, a shade 2.5 lens provided by manufacturer "K" would be marked as follows: "K-2.5." All markings shall be legible and permanent and placed so that interference with the vision of the wearer is minimal. All major spectacle/goggle components (front and both temples) except lenses shall bear a trademark identifying the manufacturer and shall be marked "Z87" to indicate compliance with the standard.

TOLERANCES:

Unless otherwise specified, ± 0.005 in. (± 0.13 mm) for all decimal dimensions, $\pm 1/16$ in. for fractional dimensions.

CONSTRUCTION DETAILS:

The spectacles and goggles are constructed in accordance with the following description, and illustrations.

The spectacles and goggles consist of one or two lenses in a wrap around protective plastic frame/front with integral flat fold side shields. See. Figs:

SG-1	Fig. 1 (R040002212)
CQC	Fig. 2 (R040005184)
XL-1	Fig. 3 (R040005185)
Saber	Fig. 4 (R040005186)
Romer II	Fig. 5 (R040005187)
PT-1	Fig. 6 (R040005188)
B-2B	Fig. 7 (R040005189)
JP-1	Fig. 8
JP-2	Fig. 9
JP-3	Fig. 10
JP-4	Fig. 11
LX-3	Fig. 12
LX-4	Fig. 13



1. Frame/front - TR-90 from Grilami except the LX-1 and LX-3 which have metal frames.
2. Lens - Polycarbonate, 1.5 mm minimum thickness.
3. Spatula Temple - The bottom edge of some of the temple pieces have a foam like material added for comfort. On some models, the temples are removable.
4. Hinge - Metal pins or screws attach the front to the temple pieces.
5. The JP-4 lens are light adjusting, Lenses in other models may be clear or tinted.

Lens Dimensions

As measured in the finished spectacles each lens measures as follows:

Model	Lens Width, mm	Lens Height, mm
SG-1	63	35
CQC (single lens)	175	50
XL-1	63	35
Saber (single lens)	175	50
Romer II	63	38
PT-1 (single lens)	175	50
B-2B	44	35
JP-1	70	35
JP-2	62	35
JP-3	71	33
JP-4	65	37
LX-3	60	34
LX-4	64	37

TEST RECORD NO. 3

SAMPLES:

The manufacturer submitted the following spectacles. They were subjected to the following tests in accordance with ANSI Z87.1-1989 for spectacles. The products were constructed as described in the preceding section of this Report.

Spectacles	JP-1
Spectacles	JP-2
Spectacles	JP-3
Spectacles	JP-4
Spectacles	LX-3
Spectacles	LX-4

GENERAL:

Test results relate only to the items tested.

TESTS:

High mass impact
High velocity impact
Drop ball impact
Thickness
Definition
Haze
Size

The Prismatic Power, Refractive Power, Definition, Flammability and Cleanability tests were not conducted because these Models use the same lens materials with the same base curvature as the SG-1 Model tested under Test Record No. 1 of File SA10778.

HIGH MASS IMPACT - Spectacles

METHOD

An Alderson 50th percentile male headform shall be used to hold the protective device. It shall be rigidly mounted in the horizontal position, face up, on a base which has a mass of 30kg (66 lb) or greater. The static stiffness of the headform shall be such that when a vertical 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 (0.079 in.) The missile shall have a 30 degree conical tip with a 1 mm (0.039 in) radius, shall weigh 500 g and have a diameter of 25.5 mm (1 in.). The missile will be held in position over the headform, tip down, at the designated test height. The missile shall have a heat treated tip.

The missile shall be dropped through a loose-fitting guide tube having a smooth internal diameter. The tube shall extend to within a short distance of the device being tested.

The protective device is placed on the headform as it would be worn by the user. The alignment shall be such that when the missile is dropped, its point is in line with either of the eyes of the headform. The missile shall be dropped from a height of 130 cm (51.2 in.). Four samples shall be tested.

RESULTS

JP-1	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass

JP-2	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass

JP-3	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass

JP-4	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass

LX-3	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass

LX-4	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass

REQUIREMENT

Frames shall be capable of resisting impact from a pointed projectile weighing 500 g dropped from a height of 130 cm (51.2 in.). No parts or fragments shall be ejected from the protector that could contact an eye of the headform.

HIGH VELOCITY IMPACT - SPECTACLES

METHOD

An Alderson Model ATD-3215 male headform shall be used for testing. The eyewear was mounted on the headform in the normal manner and the headform was rigidly mounted to the base.

The air gun was capable of propelling the 6.4 mm steel ball at a horizontal speed as given below. The speed of the ball was determined using timing equipment recording in units of 10 μ s or smaller such as an electronic timer and detectors spaced not more than 150 mm apart. The detectors were mounted in the projectile path between the muzzle end of the barrel and the lens under test. The recorded speed was made not further than 25 mm from the point of impact.

Model	Ball Speed m/s (fps) #
JP-1	45.7 (150)
JP-2	45.7 (150)
JP-3	45.7 (150)
JP-4	45.7 (150)
LX-3	45.7 (150)
LX-4	45.7 (150)

The velocity of the steel ball shall have a standard deviation not exceeding 2 percent of the specified test velocity over a test series of 30 shots.

A separate specimen may be used for each impact test, however the same specimen may be used for more than one impact if the previous impact will not increase the likelihood of failure. Use the same specimen for 3-4 impacts if possible.

HIGH VELOCITY IMPACT - SPECTACLES

Test the following 20 locations:

- a) 15 degrees toward the nasal side from the center of the left pupil.
- b) The point directly in front of the left pupil.
- c) 15 degrees temporally from the center of the left pupil.
- d) 30 degrees temporally from the center of the left pupil.
- e) 45 degrees temporally from the center of the left pupil.
- f) 60 degrees temporally from the center of the left pupil.
- g) 75 degrees temporally from the center of the left pupil.
- h) 90 degrees temporally from the center of the left pupil.
- i) 90 degrees temporally on the side protector located 10 mm above the plane of the eyes.
- j) 90 degrees temporally on the side protector located 10 mm below the plane of the eyes.
- k) 15 degrees toward the nasal side from the center of the right pupil.

Repeat each location for the right eye.

HIGH VELOCITY IMPACT RESISTANCE - SPECTACLES

A dab of toothpaste shall be placed on each headform pupil. A smudge of toothpaste on the protector lens is evidence that the lens contacted the eye during the impact test. The assembled headform and protective device shall be placed before the propulsion equipment. The steel ball shall be projected into the device at the velocity specified.

Determine standard deviation of velocity over 30 repetitions. Standard deviation shall not exceed 2 percent.

REQUIREMENTS:

Frames shall be capable of resisting impact from a 6.35 mm (1/4 in.) diameter steel ball traveling at the test velocity.

Spectacles:

No contact with either eye of the headform shall be permitted (as indicated by a paste smudge on the lens). No piece shall become detached from the inner surface of any frame component and the test lens shall be retained in the frame. Adherence of pieces to the contact paste or contact paste on the ball or protector is evidence of a failure. Examine the len(es) closest to the eye for evidence of fracture. If any fail, the device fails.

HIGH VELOCITY IMPACT RESISTANCE - SPECTACLES

Model: Wiley X JP-1

Test velocity: 45.7 m/s

Test Location Left Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of left pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

Test Location Right Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of right pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

HIGH VELOCITY IMPACT RESISTANCE - SPECTACLES

Model: Wiley X JP-2

Test Velocity: 45.7 m/s

Test Location Left Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of left pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

Test Location Right Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of right pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

HIGH VELOCITY IMPACT RESISTANCE - SPECTACLES

Model: Wiley X JP-3

Test Velocity: 45.7 m/s

Test Location Left Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of left pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

Test Location Right Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of right pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

HIGH VELOCITY IMPACT RESISTANCE - SPECTACLES

Model: Wiley X JP-4

Test Velocity: 45.7 m/s

Test Location Left Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of left pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

Test Location Right Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of right pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

HIGH VELOCITY IMPACT RESISTANCE - SPECTACLES

Model: Wiley X LX-3

Test Velocity: 45.7 m/s

Test Location Left Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of left pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

Test Location Right Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of right pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

HIGH VELOCITY IMPACT RESISTANCE - SPECTACLES

Model: Wiley X LX-4

Test Velocity: 45.7 m/s

Test Location Left Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of left pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

Test Location Right Eye	Pass or Fail
a) 15 degrees to nasal side	Pass
b) Center of right pupil	Pass
c) 15 degrees temporal	Pass
d) 30 degrees temporal	Pass
e) 45 degrees temporal	Pass
f) 60 degrees temporal	Pass
g) 75 degrees temporal	Pass
h) 90 degrees temporal	Pass
i) 90 degrees temporal 10 mm above	Pass
j) 90 degrees temporal 10 mm below	Pass

DROP BALL IMPACT

METHOD

The lens shall be placed mechanically centered, convex side up, on the test block. The test block consists of a rigid plastic tube 1 inch tall with a 1 inch inside diameter and a 1/8 inch wall thickness. A 1/8 in neoprene gasket is placed on top of the tube under the lens.

A 1 in. diameter steel ball weighing 68 grams shall be dropped in free fall from a height of 127 cm (50 in.) onto the horizontal outer surface of the lens, perpendicularly impinging on the lens within a circular area of 16 mm diameter centered at the lens mechanical center.

REQUIREMENT

Lenses shall be capable of resisting impact from a 24.4 mm (1.0 in) diameter steel ball dropped from a height of 127 cm (50 in) without fracture.

RESULTS

JP-1	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

JP-2	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

JP-3	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

JP-4	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

DROP BALL IMPACT (cont.)

LX-3	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

LX-4	Results, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

THICKNESS

METHOD

Measure thickness of lens in areas where the lens attaches to the frame with a micrometer.

RESULTS

Specimen No. JP-1	Thickness, mm
1	2.00
2	2.04
3	2.06
4	2.05
5	2.00

Specimen No. JP-2	Thickness, mm
1	1.53
2	1.52
3	1.52
4	1.52
5	1.52

Specimen No. JP-3	Thickness, mm
1	1.52
2	1.53
3	1.53
4	1.54
5	1.53

Specimen No. JP-4	Thickness, mm
1	2.06
2	2.05
3	2.01
4	2.03
5	2.05

Specimen No. LX-3	Thickness, mm
1	2.03
2	2.00
3	2.01
4	2.03
5	2.05

Specimen No. LX-4	Thickness, mm
1	2.00
2	2.00
3	2.00
4	1.99
5	2.00

REQUIREMENT

When used in frames marked Z89-2, the lenses shall be not less than 2.0 mm (0.079 in.) thick.

PENETRATION TEST

METHOD

The lens is placed, convex side up, on the test block used above. A pointed projectile consisting of a new singer No. 25 needle fastened into a holder, weighing approximately 44.2 g shall be freely dropped point downward, from a height of 127 cm. The projectile may be guided, but not restricted, in its fall by dropping it through a tube extending to within 100 mm of the lens.

RESULTS

Specimen JP-1	Penetration, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

Specimen JP-2	Penetration, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

Specimen JP-3	Penetration, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

Specimen JP-4	Penetration, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

Specimen LX-3	Penetration, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

Specimen LX-4	Penetration, Pass/Fail
1	Pass
2	Pass
3	Pass
4	Pass
5	Pass

PENETRATION TEST (cont.)

REQUIREMENTS

Removable plastic lenses shall be capable of resisting penetration from a weighted projectile weighing 44.2 gm dropped from a height of 127 cm without fracture or penetration.

HAZE

METHOD

Measure haze in accordance with ASTM D1003. Test three specimens.

REQUIREMENT

In any portion 5 mm in diameter, up to 1.5 mm from the edge of each new clear zero-power lens, the haze shall not exceed 3 percent.

Sample	Haze			Comments
	1	2	3	
JP-1 green tinted lens	2.04	1.98	1.77	
JP-2 green tinted Lens	0.04	0.11	0.10	
JP-3 amber tinted lens	0.40	0.56	0.47	
JP-4 clear/light adjusting lens	1.05	0.41	1.27	
LX-3 amber tinted lens	0.91	0.89	1.14	
LX-4 gray tinted lens	0.84	0.60	0.73	

SIZE - SPECTACLES

Requirement:

None, Information is used to describe spectacles.

As measured in the finished spectacles each lens measures as follows:

Model	Lens Width, mm	Lens Height, mm
JP-1	70	35
JP-2	62	35
JP-3	71	33
JP-4	65	37
LX-3	60	34
LX-4	64	37

Test Record No. 3 Summary

The results of the investigation indicate that the products evaluated comply with the applicable requirements, and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this report.

Test Record No 3 by:

STEVE DERYNCK
Staff Engineer

Reviewed by:

STEVE CORRADO
Principal Engineer

