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**INC. LABORATORIES**

Test Report T7811-01-1 Issue 1  
ANSI/ISEA Z87.1-2010  
Nautilus International (Cayman) Ltd.  
STDY 2048 Spectacles  
22 January 2013



Approved by:

A handwritten signature in blue ink, appearing to read 'Keith E. Whitten', written over a horizontal line.

Keith E. Whitten  
Laboratory Manager

Prepared by:

A handwritten signature in blue ink, appearing to read 'Cathy Woloszyn', written over a horizontal line.

Cathy Woloszyn  
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P.O. Box 30739 Camana Bay  
Grand Cayman KY1-1203  
Cayman Islands British West Indies

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**Objective:**

Contract testing to ANSI/ISEA Z87.1-2010 “American National Standard for Occupational and Educational Personal Eye and Face Protection Devices”.

- Clause(s): 5. General Requirements  
-excluding Marking Requirements  
6. Impact Protector Requirements  
7. Optical Radiation Protector Requirements  
-Special-Purpose Lenses (Table 10)

**Samples:**

STDY 2048 Spectacles

Lens Color	Temple Color	Quantity	Sample ID
Clear	Clear	32	1A
Smoke	Smoke	8	1B
Amber	Amber	8	1C

Date submitted: 10 December 2012

**Procedures:**

Testing protocols in accord with good laboratory practice were employed for all tests.

All tests were conducted in a standard laboratory atmosphere unless otherwise specified.

Samples were randomly selected from the quantity provided and tested in the as-received condition unless otherwise stated.

Testing procedures as specified within Section 9 of ANSI/ISEA Z87.1-2010 were followed unless noted in results.

When applicable, samples were assessed on medium headform (64mm PD).

Prismatic Power, Refractive Power, and Resolving Power are a function of lens geometry, not tint, therefore these tests were performed only on one tint variant of each lens type.

**Assessment Summary:**

Dates tested: 26 December 2012 through 11 January 2013

Samples as assessed meet the requirements of ANSI/ISEA Z87.1-2010 for Impact Rated Spectacles.

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**Assessment Summary-Continued:**

ANSI/ISEA Z87.1-2010 Requirements	Compliant	Non Compliant
5. General Requirements		
5.1 Optical Requirements		
5.1.1 Optical Quality	X	
5.1.2 Luminous Transmission (Clear Lenses)	X	
5.1.3 Haze	X	
5.1.4 Refractive Power, Astigmatism, Resolving Power, Prism and Prism Imbalance for Plano Protectors	X	
5.1.5 Refractive Power, Astigmatism, Prism and Prism Imbalance for Prescription Protectors	Not applicable	
5.2 Physical Requirements	X	
5.2.1 Drop Ball Impact Resistance	X	
5.2.2 Protector Acceptance Criteria		
5.2.3 Ignition	X	
5.2.4 Corrosion Resistance of Metal Components	Not applicable	
5.2.5 Minimum Coverage Area	X	
5.3 Minimum Lens Thickness	Not applicable	
5.4 Marking Requirements	Not assessed	
5.5 Other Requirements	Not applicable	
5.6 Replaceable Lenses	Not applicable	
5.7 Aftermarket Components	Not applicable	
6. Impact Protector Requirements		
6.1 General		
6.1.1 Impact Rated Protectors		
6.1.2 Frames and Shells	See 6.2.2 and 6.2.3	
6.1.3 Lateral (Side) Coverage	X	
6.2 Impact Requirements		
6.2.1 Protector Acceptance Criteria		
6.2.2 High Mass Impact	X	
6.2.3 High Velocity Impact	X	
6.2.4 Penetration Test (Lens Only)	X	
6.2.5 Prescription Lens Material Qualification	Not applicable	
6.2.6 Prescription Lens Mounting Qualification	Not applicable	
6.3 Additional Impact Requirements for Specific Protector Types	Not applicable	
7. Optical Radiation Protector Requirements		
7.1 Transmittance of Lenses		
7.1.1 Optional Transmittance Attributes (Markings)	See 5.4	
7.1.2 Clear and Filter Lenses	X	
7.1.3 Automatic Darkening Welding Filter Lenses	Not applicable	
7.1.4 Visible Light Filters	Not claimed	
7.1.5 Variation in Luminous Transmittance (Welding Filters)	Not applicable	
7.2 Transmittance of Housings (Welding Protectors Only)	Not applicable	
8. Droplet and Splash, Dust, and Fine Dust Protector Requirements	Not applicable	

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**Results:**

**5.1.1 Optical Quality; Result: Pass**

Lenses are free of striae, bubbles, waves and other visible defects which would impair their optical quality.

**5.1.2 Luminous Transmission (Clear Lenses)**

Sample ID	Left (%)	Right (%)	Left/Right	Pass	Fail
1A-2	92.6	92.4	1.002	X	
Requirement:	$100 \geq T_L \geq 85$		N/A		

**5.1.3 Haze (Clear Lens Only)**

Sample ID	Left (%)	Right (%)	Pass	Fail
1A-2	0.29	0.23	X	
Requirement:	$\leq 3$			

Illuminate C used instead of Illuminate A.

**5.1.4 Refractive Power, Astigmatism, Resolving Power, Prism and Prism Imbalance for Plano Protectors**

**Refractive Power & Astigmatism**

Sample ID	Left ( $m^{-1}$ )		Right ( $m^{-1}$ )		Pass	Fail
	Refractive Power	Astigmatism	Refractive Power	Astigmatism		
1A-1	0.02	0.01	0.04	0.01	X	
Requirement:	$\pm 0.06$		$\leq 0.06$			

Note: Tested in a simulated as worn position using a 19mm aperture.

**Resolving Power**

Sample ID	Left	Right	Pass	Fail
1A-1	$\geq 20$	$\geq 20$	X	
Requirement:	$\geq$ Pattern 20			

Note: Tested in a simulated as worn position using a 19mm aperture.

**Prism and Prism Imbalance**

Sample ID	Prismatic Power (cm/m)		Vertical Imbalance(cm/m)	Horizontal Imbalance(cm/m)	Pass	Fail
	Left	Right				
1A-1	0.11	0.11	<0.05	0.09 Base Out	X	
Requirement:	$\leq 0.50$		$\leq 0.25$	Base Out $\leq 0.50$ Base In $\leq 0.25$		

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**5.2 Physical Requirements; Results: Pass**

Protectors are free from projections, sharp edges or other defects which are likely to cause discomfort or injury during use.

**5.2.1 Drop Ball Impact Resistance**

Sample ID	Location	Pass	Fail
1A-3	Left	X	
1A-4	Right	X	
1A-5	Left	X	
1A-6	Right	X	

**5.2.2 Protector Acceptance Criteria**

When each type test is conducted as indicated above, a complete device shall fail if any of the following occurs:

- piece fully detached from the inner surface
- fracture
- penetration of the rear surface
- lens not retained

**5.2.3 Ignition; Result: Pass**

Samples (Lenses and Temples) did not ignite or continue to glow after removal of the steel rod.

**5.2.5 Minimum Coverage Area; Result: Pass**

The eye wire and lens cover in plane view an area of not less than 40 mm (1.57 in.) in width and 33 mm (1.30 in.) in height (elliptical) in front of each eye, centered on the geometrical center of the lens 64mm (2.52 in.) PD.

**6.1.3 Lateral (Side) Coverage; Result: Pass**

When mounted on the medium headform protectors provide continuous lateral coverage (i.e. no openings greater than 1.5mm (0.06 in.) in diameter) from the vertical plane of the lenses tangential to a point not less than 10 mm (0.394 in.) posterior to the corneal plane and not less than 10 mm (0.394 in.) in height above and not less than 10 mm (0.394 in.) in height below the horizontal plane centered on the eyes of the headform. The probe does not contact the headform within the defined coverage area.

**6.2.1 Protector Acceptance Criteria**

When each type test is conducted as indicated in Sections 6.2.2, 6.2.3 and 6.2.4 and, as applicable Section 6.2.6, a complete device shall fail if any of the following occurs:

- piece fully detached from the inner surface
- fracture
- penetration of the rear surface
- lens not retained
- for the high-velocity test, the unaided eye observes any piece adhering to the contact paste, or observes contact paste on the projectile or complete device.

In the case of plano protectors with a prescription lens carrier, contact of the prescription lens carrier with the headform does not constitute a failure.

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**6.2.2 High Mass Impact**

Sample ID	Location	Pass	Fail
<i>Clear</i>			
1A-7	Right	X	
1A-8	Left	X	
1A-9	Right	X	
1A-10	Left	X	
<i>Smoke</i>			
1B-3	Right	X	
1B-4	Left	X	
<i>Amber</i>			
1C-3	Right	X	
1C-4	Left	X	

**6.2.3 High Velocity Impact**

Sample ID	Location	Velocity (ft/sec)	Pass	Fail
<i>Clear</i>				
1A-11	Right 0°	153	X	
1A-12	Right 30°	151	X	
1A-13	Right 90° ↑ 10mm	153	X	
1A-14	Left 0°	152	X	
1A-15	Left 30°	153	X	
1A-16	Left 90° ↓ 10mm	153	X	
<i>Smoke</i>				
1B-5	Right 0°	153	X	
1B-6	Left 0°	151	X	
<i>Amber</i>				
1C-5	Right 0°	151	X	
1C-6	Left 0°	153	X	

**6.2.4 Penetration Test (Lenses Only)**

Sample ID	Location	Pass	Fail
1A-3	Right	X	
1A-4	Left	X	
1A-5	Right	X	
1A-6	Left	X	

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**7.1.2 Transmittance of Lenses; Clear and Filter Lenses**

**-Special Purpose Lenses (Table 10)**

Sample ID	Left (%)	Right (%)	Left/Right	Pass	Fail
<b>Smoke</b>					
1B-2	25.8	25.8	1.000	X	
<b>Amber</b>					
1C-2	36.8	37.2	0.989	X	
Requirement:					
Tinted:	$85 > T_L \geq 8$		$1.10 \geq L/R \geq 0.90$		
Extra Dark:	$8 > T_L \geq 0.2$		$1.20 \geq L/R \geq 0.80$		

**Sample Photographs:**



Clear



Smoke



Amber

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