ICS® INC. LABORATORIES

Test Report T7658-01-1 Issue 1
ANSI/ISEA Z87.1-2010
PDS International Pte Ltd
WORKSafe Fotz Spectacles
25 October 2012

ACCREDITED
Test Laboratory
Certificate: 1722.01

Approved by:

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Prepared by:

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Issued to: PDS International Pte Ltd
10 Pandan Crescent,
#05-03/04 (LL2) UE Tech Park,
Singapore 128466

Date: 25 October 2012
Report: T7658-01-1
Issue: 1

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
6. Impact Protector Requirements
7. Optical Radiation Protector Requirements
-Ultraviolet Filters (Table 7)
-Visible Light Filters (Table 9)
-Special-Purpose Lenses (Table 10)

Samples:

WORKSafe Fotz Spectacles

Lens Color	Frame Color	Quantity	Sample ID
Clear	Frosted Smoke	20	8A
Grey		5	8B
I/O		20	8C

Date(s) submitted: 16 October 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:

Date(s) tested: 19 through 23 October 2012

Samples as assessed meet the requirements of ANSI/ISEA Z87.1-2010 for Impact Rated spectacles and the following Optical Radiation Protector Requirements:

Lens	ANSI Z87.1 Filter Scale Met	ANSI Z80.3 Function (Shade)
Clear	U6	Not applicable
Grey	U6 L3	General Purpose (Medium to Dark) Ultraviolet High or Prolong Exposure, Suitable for Driving
I/O	U6 L1.7	Cosmetic (Light) Ultraviolet High or Prolong Exposure, Suitable for Driving

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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	X	
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	X	
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
8A-2	89.2	89.4	0.998	X	
Requirement:	$100 \geq T_L \geq 85$		N/A		

5.1.3 Haze (Clear Lens Only)

Sample ID	Left (%)	Right (%)	Pass	Fail
8A-2	0.25	0.16	X	
Requirement:	≤ 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		
Clear								
8A-1	0.01	-0.01	0.02	0.02	-0.01	0.03	X	
I/O								
8C-1	0.01	-0.02	0.03	0.02	-0.02	0.04	X	
Requirement:	+/- 0.06		≤ 0.06	+/- 0.06		≤ 0.06		

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

Resolving Power

Sample ID	Left	Right	Pass	Fail
Clear				
8A-1	≥ 20	≥ 20	X	
I/O				
8C-1	≥ 20	≥ 20	X	
Requirement:	≥ 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				
Clear						
8A-1	0.12	0.10	<0.05	0.21 Base In	X	
I/O						
8C-1	0.10	0.13	<0.05	0.23 Base In	X	
Requirement:	≤ 0.50		≤ 0.25	Base Out ≤ 0.50 Base In ≤ 0.25		

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
Clear			
8A-3	Left	X	
8A-4	Right	X	
8A-5	Left	X	
8A-6	Right	X	
I/O			
8C-3	Left	X	
8C-4	Right	X	
8C-5	Left	X	
8C-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.

5.4 Marking Requirements (Complete Device -no replaceable components)

Component	Marking Present	Requirement	Pass	Fail
Left Temple	WORKSafe & Z87	Shall have at least one set of markings. The marking may be on the lens or the frames or both the lens and the frame. Requirement: Impact Rated Plano "MFGZ87+" Lens Type (if applicable): Special Purpose Lens "S" Ultraviolet Filter Scale "U#" Visible Light Filter Scale "L#" Welding Filter Shade "W#" Use (if applicable): Droplet and Splash Hazard "D3" Dust Hazard "D4" Fine Dust "D5"	X	
Right Temple	W Z87 +			
Clear Lens	W + U6			
Grey Lens	W + U6 L3			
I/O Lens	W + U6 L 1.7			

Markings shall be sequential.

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 (0.394in.) 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.

6.2.2 High Mass Impact

Sample ID	Location	Pass	Fail
Clear			
8A-7	Right	X	
8A-8	Left	X	
8A-9	Right	X	
8A-10	Left	X	
Grey			
8B-3	Right	X	
8B-4	Left	X	
I/O			
8C-7	Right	X	
8C-8	Left	X	
8C-9	Right	X	
8C-10	Left	X	

6.2.3 High Velocity Impact

Sample ID	Location	Velocity (ft/sec)	Pass	Fail
Clear				
8A-11	Right 0°	152	X	
8A-12	Right 30°	152	X	
8A-13	Right 90° ↑ 10mm	153	X	
8A-14	Left 0°	152	X	
8A-15	Left 30°	152	X	
8A-16	Left 90° ↓ 10mm	152	X	
Grey				
8B-4	Right 0°	151	X	
8B-5	Left 0°	150	X	
I/O				
8C-11	Right 0°	153	X	
8C-12	Right 30°	150	X	
8C-13	Right 90° ↑ 10mm	152	X	
8C-14	Left 0°	150	X	
8C-15	Left 30°	153	X	
8C-16	Left 90° ↓ 10mm	152	X	

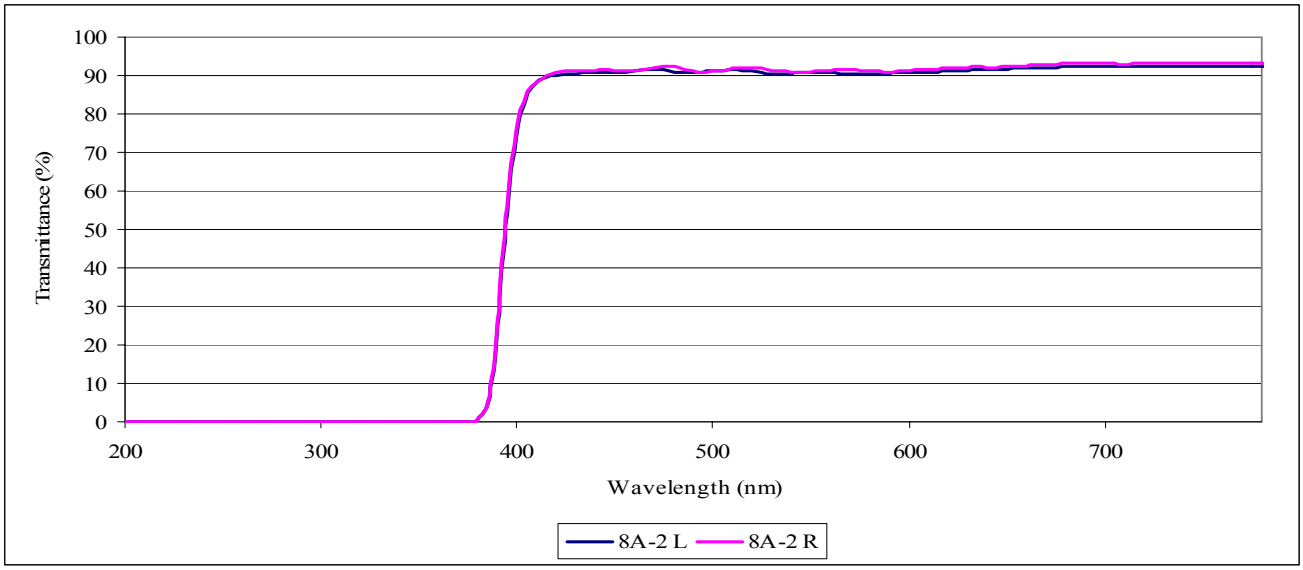
6.2.4 Penetration Test (Lenses Only)

Sample ID	Location	Pass	Fail
Clear			
8A-17	Right	X	
8A-18	Left	X	
8A-19	Right	X	
8A-20	Left	X	
I/O			
8C-17	Right	X	
8C-18	Left	X	
8C-19	Right	X	
8C-20	Left	X	

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

-Ultraviolet Filters (Table 7)

Sample:	8A-2L	8A-2R	Requirement (U6)	Pass	Fail
Far-Ultraviolet (200 to 315nm)	0.00018	0.00018	≤ 0.01%	X	
Near-Ultraviolet (315 to 380nm)	0.019	0.023	≤ 0.1%	X	



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

-Ultraviolet Filters (Table 7)

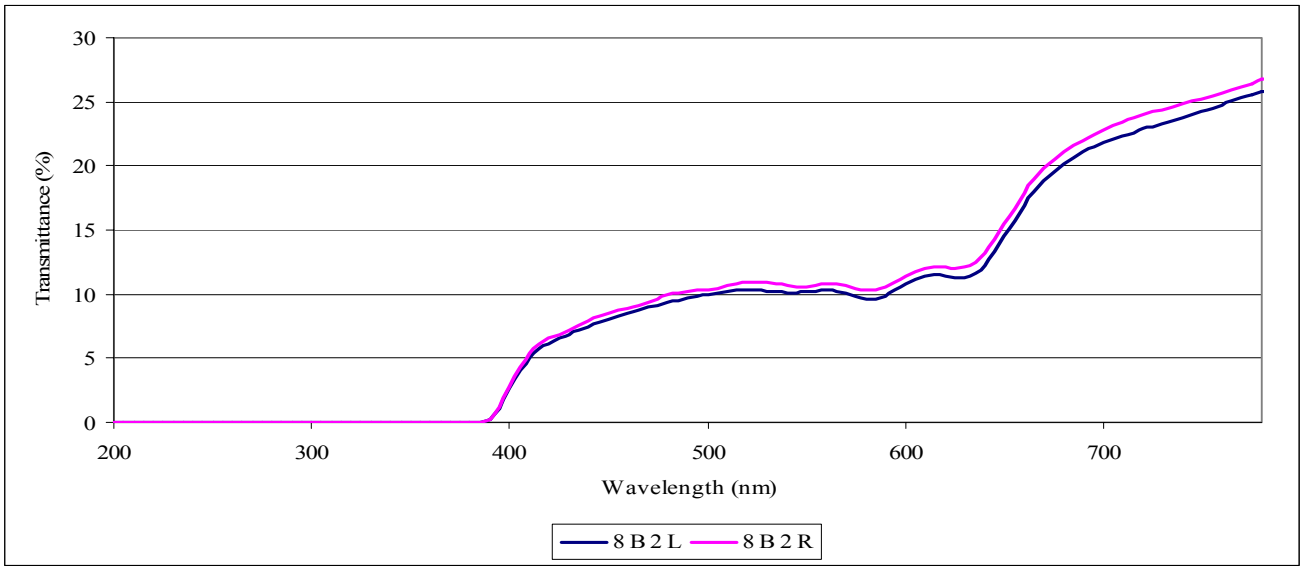
Sample:	8B-2L	8B-2R	Requirement (U6)	Pass	Fail
Far-Ultraviolet (200 to 315nm)	0.00003	0.00003	≤ 0.01%	X	
Near-Ultraviolet (315 to 380nm)	0.00006	0.00007	≤ 0.1%	X	

-Visible Light Filters (Table 9)

Sample:	8B-2L	8B-2R	Requirement (L3)	Pass	Fail
Luminous (T_L)-ILLA	10.6	11.2	8.5 to 18%	X	

-Special Purpose Lenses (Table 10)

Sample ID	Left (%)	Right (%)	Left/Right	Pass	Fail
8B-2	11.1	10.4	0.971	X	
Requirement:					
Tinted:	$85 > T_L \geq 8$		$1.10 \geq L/R \geq 0.90$		
Extra Dark:	$8 > T_L \geq 0.2$		$1.20 \geq L/R \geq 0.80$		



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7.1.2 Transmittance of Lenses; Clear and Filter Lenses – *I/O*

-Ultraviolet Filters (Table 7)

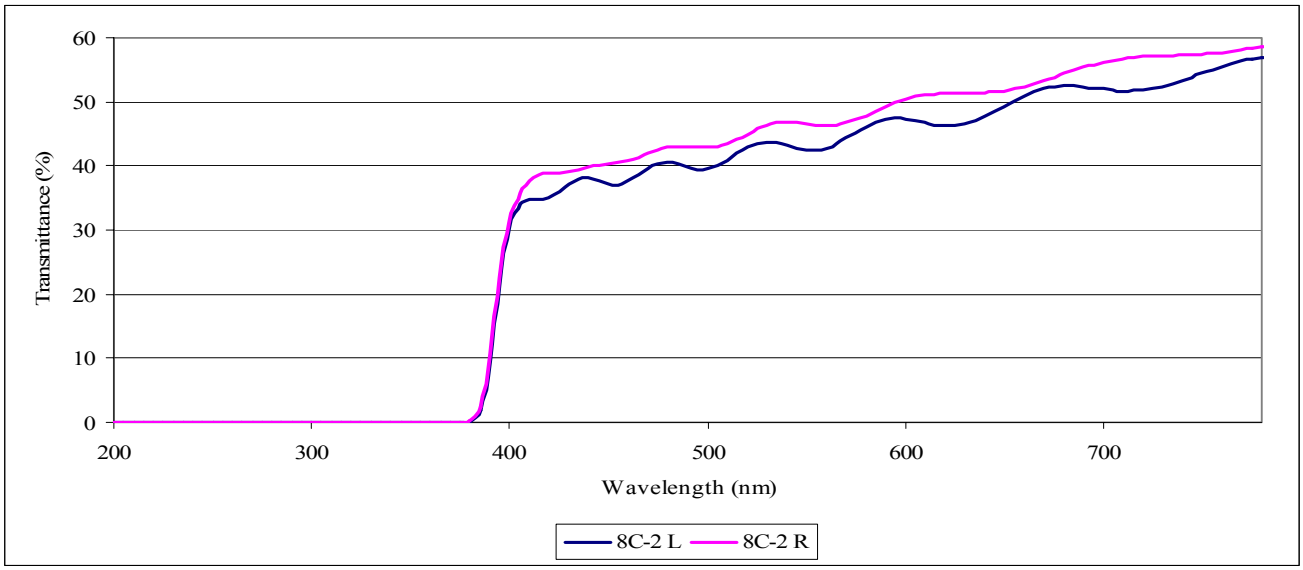
Sample:	8C-2L	8C-2R	Requirement (U6)	Pass	Fail
Far-Ultraviolet (200 to 315nm)	0.00005	0.00006	≤ 0.01%	X	
Near-Ultraviolet (315 to 380nm)	0.0072	0.0099	≤ 0.1%	X	

-Visible Light Filters (Table 9)

Sample:	8C-2L	8C-2R	Requirement (L1.7)	Pass	Fail
Luminous (T_L)-ILLA	44.8	47.9	43 to 55%	X	

-Special Purpose Lenses (Table 10)

Sample ID	Left (%)	Right (%)	Left/Right	Pass	Fail
8C-2	45.8	46.3	0.989	X	
Requirement:					
Tinted:	$85 > T_L \geq 8$		$1.10 \geq L/R \geq 0.90$		
Extra Dark:	$8 > T_L \geq 0.2$		$1.20 \geq L/R \geq 0.80$		



7.1.4 Visible Light Filters (ANSI Z80.3-2008) Transmittance Requirements

-Grey

Sample ID:	8B-2L	8B-2R	Requirement (Medium to Dark)	Pass	Fail
4.6.1 Luminous Transmittance					
Luminous (Tv) - ILLC	10.3	10.9	8 to 40%	X	
4.6.2 Mean Transmittance					
UVB (280 to 315nm)	0.00007	0.00007	≤ 1%	X	
UVA (315 to 380nm)	0.00006	0.00007	≤ 0.5Tv	X	
4.6.3 Transmittance Properties Related to Traffic Signal Recognition					
4.6.3.1 Color Limits					
Yellow (x,y)	0.589, 0.410	0.590, 0.410	See ANSI Z80.3 Figure 1	X	
Green (x,y)	0.213, 0.430	0.214, 0.431		X	
D65 (x,y)	0.339, 0.356	0.341, 0.356		X	
4.6.3.2 Traffic Signal Transmittance					
Luminous (Tv) - ILLC	10.3	10.9	≥ 8%	X	
Red	13.2	14.1	≥ 8%	X	
Yellow	10.8	11.5	≥ 6%	X	
Green	10.1	10.7	≥ 6%	X	
4.6.3.3 Spectral Transmittance					
Min. 475 to 650nm	9.0	9.3	≥ 0.2Tv	X	

UVB and UVA limits are for High or Prolonged Exposure.

Visible Light Filters (ANSI Z80.3-2008) Transmittance Requirements

-I/O

Sample ID:	8C-2L	8C-2R	Requirement (Light)	Pass	Fail
4.6.1 Luminous Transmittance					
Luminous (Tv) - ILLC	43.9	47.0	>40%	X	
4.6.2 Mean Transmittance					
UVB (280 to 315nm)	0.00008	0.00009	≤ 1%	X	
UVA (315 to 380nm)	0.0072	0.0099	≤ 0.5Tv	X	
4.6.3 Transmittance Properties Related to Traffic Signal Recognition					
4.6.3.1 Color Limits					
Yellow (x,y)	0.581, 0.418	0.582, 0.418	See ANSI Z80.3 Figure 1	X	
Green (x,y)	0.215, 0.416	0.215, 0.417		X	
D65 (x,y)	0.331, 0.344	0.331, 0.344		X	
4.6.3.2 Traffic Signal Transmittance					
Luminous (Tv) - ILLC	43.9	47.0	≥ 8%	X	
Red	48.0	51.7	≥ 8%	X	
Yellow	45.7	48.9	≥ 6%	X	
Green	42.8	45.8	≥ 6%	X	
4.6.3.3 Spectral Transmittance					
Min. 475 to 650nm	39.5	41.9	≥ 0.2Tv	X	

UVB and UVA limits are for High or Prolonged Exposure.

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Sample Photograph(s):

Clear

Grey

I/O

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