



ANSI & CSA Standard



## ANSI/ISEA Z87.1-2020 Impact Testing

### Lens Marking of + or Z87+

#### High Mass Impact

500 Gram Pointed Weight  
dropped from at least 4 feet

Pass or Fail Result

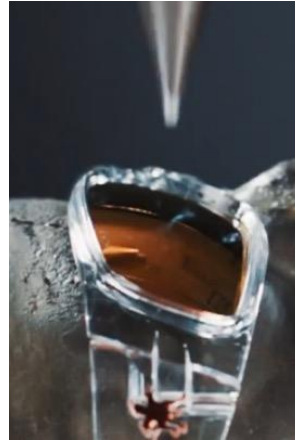
No break or fracture may occur of  
the frame or lens

#### High-Velocity Impact

4mm steel ball shot 45.7  
meters/sec

Pass or Fail Result

No break or fracture may occur



## Testing Validation

### CSA Z94.3-2020 Impact Testing

Temple Marking: CSA logo Z94.3

#### High Mass Impact

Not required

#### High-Velocity Impact

6mm steel ball shot 50.5 meters/sec

Pass or fail result

Limited fracture allowed

#### Side Coverage

Increased side coverage of the eye





# Military Ballistic

## MIL-PRF-3103

Ballistic Velocity Impact

-.15 caliber 5.8 grain Cylindrical  
Projectile = 195 meters per second

-Pass or Fail Result

-No break or fracture may occur



443 MPH  
712 KM/H



# UV Light

## ANSI/ISEA Z87.1-2020

All Polycarbonate lens options block out 99.9% UV light regardless of the color of lens

## U6 Marking on all Lenses

Typically, the human eye can detect wavelengths from 380 to 700 nanometers (sunlight)

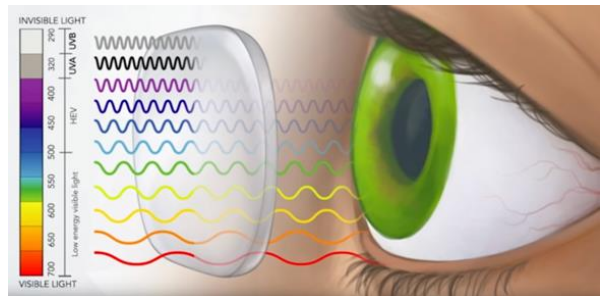


Table 8. Transmittance Requirements for Ultraviolet Filter Lenses		
Scale	Maximum Effective Far-Ultra-Violet Average Transmittance %	Maximum Near Ultra-Violet Average Transmittance %
U2	0.1	3.7
U2.5	0.1	2.3
U3	0.07	1.4
U4	0.04	0.5
U5	0.02	0.2
U6	0.01	0.1

All Polycarbonate Lens Manufactured by MCR Safety block 99.9% of UV Light ranging from 200-385nm

**320 nm to 400 nm UVA** (or “near UV”)

Useful for printing, curing, lithography, sensing and medical applications

**290 nm to 320 nm UVB**

Useful for curing, tanning and medical applications

**200 nm to 290 nm UVC**

Useful for disinfection and sensing – Germicidal Cabinets

**100 nm to 200 nm Far UV** or vacuum UV

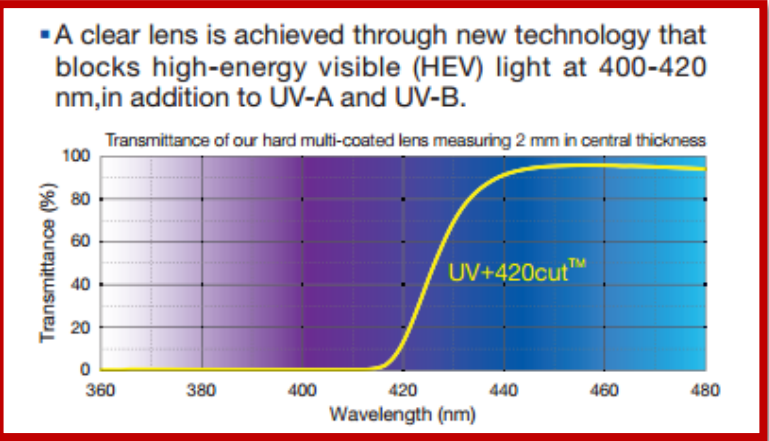
These wavelengths only propagate in a vacuum







# UV 420 Protection

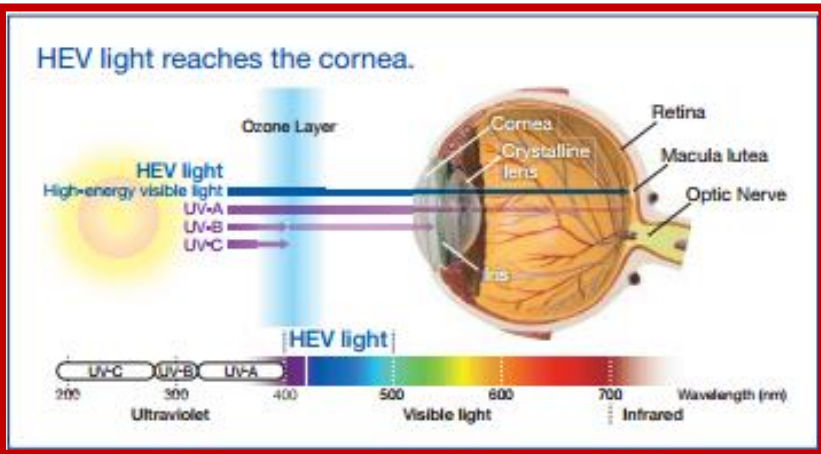
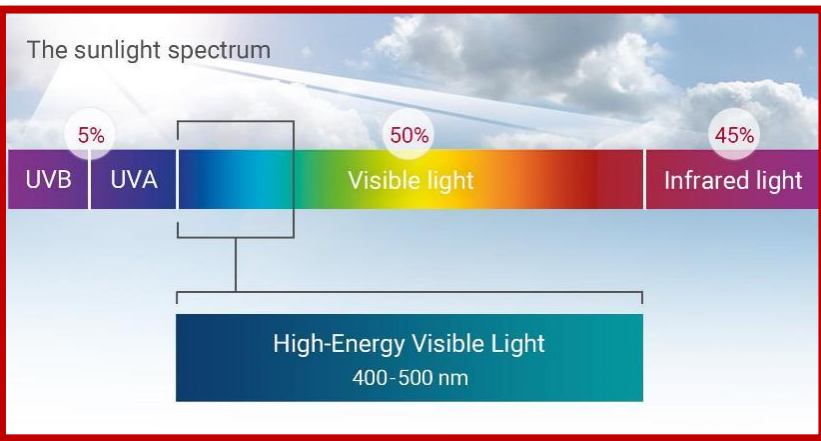


Standard Polycarbonate Safety Glasses block up to 385nm.

UV420 protects against UVA,B,C, and HEV light up to 410 nm at 99.9%

■ UV and HEV light cut rate

	Wavelength	Percentage	
		2 mm nonprescription	1.2 mm nonprescription
Cut rate	380-500 nm	42.2	39.1
	400 nm	99.9	99.9
	410 nm	99.9	99.7
	420 nm	86.1	70.5
	430 nm	30.1	20.2
ISO12312-1	380-500 nm	24.3	—



Research shows that blocking UV and HEV light is critical to protecting eyes from cataracts and age-related macular degeneration.



# ANSI Lens Sequence Markings

Manufacturing Mark	C
Coverage Small Head Size	H (BK2, CK2, S22)
Impact Mark	+ or Z87+ lens and frame
Welding Filter	W shade
UV Filter	U scale number
IR Filter*	R scale number
Visible Light	L scale number
Variable Tint	V
Anti-Fog <b>NEW</b>	X

## Specific to MCR Safety

Max 36 Anti-Fog Anti Scratch	36
Max 6 Anti-Fog	6
UV-AF Anti-Fog	Leaf Symbol
Magnifier (Reader)	1.00,1.50,2.00,2.50



Table 3. Marking Requirements				
Type of Mark	Lenses & Replacement Lenses		Frame <sup>1</sup>	Marking for Complete Device (no replaceable components) <sup>2</sup>
	Spectacles	All Other		
All protectors shall bear the markings below.				
Manufacturer's Mark or Logo	Yes	Yes	Yes	Yes
Standard				
Plano, Readers, Magnifiers		Z87	Z87	Z87
Rx		Z87	Z87-2	Z87-2
Coverage (small head sies) <sup>3</sup>	H		H	
The following shall be required only when claims of impact rating, a specific lens type and/or use are made by the manufacturer.				
Impact Mark				
Impact Rated Plano, Readers Magnifiers	+	Z87+	Z87+	Z87+
Impact Rated Rx	+	Z87+	Z87-2+	Z87-2+
Relaxed Optical Level <sup>6</sup>	O2	O2		O2
Lens Type				
Clear				
Welding Filter (see table 7) <sup>5</sup>	W shade	W shade		W shade
UV Filter (see table 8) <sup>4</sup>	U scale number	U scale number		U scale number
IR Filter (see table 9) <sup>4</sup>	R scale number	R scale number		R scale number
Visible Light Filter (see table 10) <sup>4</sup>	L scale number	L scale number		L scale number
Variable Tint	V	V		V
Special Purpose Lenses	S	S		S
Anti-Fog	X	X		
Use				
Splash / Droplet			D3	D3
Dust			D4	D4
Fine Dust			D5	D5



# Visible Light



## Lens markings required for both ANSI and CSA

Table 10. Luminous Transmittance requirements for Visible Light Filters			
Scale	Maximum %	Nominal %	Minimum %
L1.3	85	74.5	67
L1.5	67	61.5	55
L1.7	55	50.1	43
L2	43	37.3	29
L2.5	29	22.8	18
L3	18	13.9	8.5
L4	8.5	5.18	3.16
L5	3.16	1.93	1.18
L6	1.18	0.72	0.44
L7	0.44	0.27	0.164
L8	0.164	0.10	0.061
L9	0.061	0.037	0.023
L10	0.023	0.0139	0.0085

## VLT Visual Light Transmittance %

Amount of light that passes thru the lens

Lens	VLT% Range	Average	Lens Marking
Clear	88-92	90	-
I/O Clear Mirror	32-40	36	L2
Gray	12-16	13	L3
Brown (Espresso)	12-16	13	L3
Banana Mirror	9-13	9	L3
Black Mirror	12-16	13	L3
Blue Mirror	12-16	13	L3
Blue Diamond Mirror	12-16	13	L3
Fire Mirror	12-16	13	L3
Emerald Mirror	12-16	13	L3
Silver Mirror	12-16	13	L3
Clear Blue Light Filter	88-16	88	S
Light Blue	65-70	68	S
Amber	77-82	80	S
Orange	55-65	57	S
Vermillion	55	55	S
Filter 2.0	28-35	30	W2.0
Filter 3.0	11-15	12	W3.0
Filter 5.0	1.5-2.5	2	W5



ANSI/ISEA Z87.1-2020  
W Markings Define Shade #

**W2.0 W3.0 W5.0**

Visible Light

Infrared Transmittance



# Cutting (Welding) Filters

Table 7. Transmittance Requirements for Welding Filters

Shade	Luminous Transmittance			Maximum Effective Far-Ultraviolet Average Transmittance %	Maximum Infrared Average Transmittance %
	Maximum %	Nominal %	Minimum %		
W1.3	85	74.5	67	0.1	<30
W1.5	67	61.5	55	0.1	25
W1.7	55	50.1	43	0.1	20
W2.0	43	37.3	29	0.1	15
W2.5	29	22.8	18.0	0.1	12
W3.0	18.0	13.9	8.50	0.07	9.0
W4	8.50	5.18	3.16	0.04	5.0
W5	3.16	1.93	1.18	0.02	2.5
W6	1.18	0.72	0.44	0.01	1.5
W7	0.44	0.27	0.164	0.007	1.3
W8	0.164	0.100	0.061	0.004	1.0
W9	0.061	0.037	0.023	0.002	0.8
W10	0.023	0.0139	0.0085	0.001	0.6
W11	0.0085	0.0052	0.0032	0.0007	0.5
W12	0.0032	0.0019	0.0012	0.0004	0.5
W13	0.0012	0.00072	0.00044	0.0002	0.4
W14	0.00044	0.00027	0.00016	0.0001	0.3
W15	0.00016	0.00010	0.000061	0.00007	0.2
W16	0.000061	0.000037	0.000023	0.00004	0.1

OTES:

- ) The near-ultraviolet average transmittance shall be less than one tenth of the minimum allowable luminous transmittance for the associated shade number.
- ) The blue light transmittance shall be less than the measured luminous transmittance.