

# Who Needs X-Ray Protective Lenses?

People regularly exposed to scattered radiation need to protect their eyes with leaded glass. Occupations using X-ray producing machines need leaded glass lenses. Occupations include doctors, dental and medical professionals, veterinarians, laboratory technicians, and people working in various roles in hospitals, clinics and research facilities. Areas can be as diverse as electrophysiology, orthopaedic surgery, radiology, catheterization laboratories, urologic procedures and veterinary surgery.

# The Impact of X-Ray Exposure and the Eye

The eyes are the most sensitive area of the body to radiation and are susceptible to damage by exposure during X-ray procedures and working around any type of imaging equipment. Exposure risks the development of lens opacities and cataracts.

There are radiation dose limits to the eye – along with extremities and skin – that must not be exceeded to avoid significant detrimental tissue and organ damage. The current dose limit of radiation exposure for the eye is 20 millisieverts (mSv) per year averaged over 5 years, and not more than 50 mSv received in any one year. This is much reduced from the previous annual limit of 150 mSv.

## Use of Radiation Leaded Glass Spectacles

Not only is leaded glass recommended for protection, the wearing of leaded side shields is also recommended by ARPANSA (Australian Radiation Protection and Nuclear Safety Agency). In fact, the use of leaded safety glasses is necessary when working with analytical X-rays encountered in the hospital, clinic, research facility or laboratory by technicians, doctors and medical professionals where there is the possibility of exposure to radiation<sup>5</sup>. While research has shown that leaded spectacles cannot provide complete protection to the eyes<sup>2</sup>, they do provide adequate ongoing and routine protection from X-ray exposure and their use is necessary<sup>3 5</sup>.

## Radiation Scatters

According to The University of Toronto<sup>1</sup>, the primary beam is not the only source of ionizing radiation. Radiation actually scatters.

lonizing radiation can also arise from secondary emissions and scattering of X-rays from the sample and leakage of primary or scattered X-rays through gaps and cracks in shielding and from faulty shutters, beam traps or collimator couplings.

## Rx Safety Radiation Leaded Glass

Rx Safety offers 1.80 index leaded glass lenses in both prescription and non-prescription, all made at its manufacturing premises at Lonsdale in South Australia. These lenses provide protection against X-ray radiation from scattered radiation.

Our lens material has been specially formulated and it contains over 70% weight lead oxide and a lead equivalence of 0.75mm thickness. Every batch of leaded glass lenses is independently tested to ensure they meet ARPANSA standards.

Rx Safety can assess a patient's own scriptable frame to determine whether it can be fitted with Rx Safety's leaded glass lenses, otherwise a frame can be chosen from Rx Safety's range.

Rx Safety's leaded glass lenses are available in plano, single vision, bifocal and progressive.

| Radiation Leaded Glass Lens Properties |                     |  |  |  |
|----------------------------------------|---------------------|--|--|--|
| Lead equivalent                        | 0.75mm thickness Pb |  |  |  |
| Refractive index                       | 1.80                |  |  |  |
| Abbe number                            | 25.4                |  |  |  |
| Density                                | 5.18 g/cm3          |  |  |  |



## **Rx Safety Frames**

Rx Safety has a variety of frame styles and colours suitable for X-ray leaded glass lens fitting, which are also suitable for fitting of side shields. The range can be viewed at **rxsafety.com.au** 

# Rx Safety Side Shields

All of Rx Safety's frames are compatible with side shield additions. Our X-ray leaded glass frames have been painstakingly selected to give adequate lateral side coverage when affixed with leaded side shields.

However, our side shields may be unsuitable for the patient's own frames. Rx Safety can advise suitability upon frame inspection.



|                                                                                                 | Base Curve (D) | Rx Range        | Add Powers         | Cyl          |  |
|-------------------------------------------------------------------------------------------------|----------------|-----------------|--------------------|--------------|--|
| Single Vision                                                                                   | 4.25           | 0.00 to - 9.00  |                    | - 9.00 Max   |  |
| Single Vision                                                                                   | 6.25           | - 2.50 to +6.00 |                    | - 4.50 D Max |  |
|                                                                                                 |                |                 |                    |              |  |
| Bifocal D28                                                                                     | 4.25           | 0.00 to - 9.00  | Add 1.00 to 3.00 D | - 9.00 Max   |  |
| Bifocal D28                                                                                     | 6.25           | - 2.50 to +6.00 | Add 1.00 to 3.00 D | - 4.50 D Max |  |
|                                                                                                 |                |                 |                    |              |  |
| Progressive Comfort                                                                             | 3.50           | 0.00 to -9.00   | Add 1.00 to 3.00 D | - 9.00 Max   |  |
| Progressive Comfort                                                                             | 6.00           | - 2.50 to +6.00 | Add 1.00 to 3.00 D | - 4.50 D Max |  |
| Progressive fitting height of 20 mm recommended; 17 mm is minimum at the optometrist discretion |                |                 |                    |              |  |

## Prescription Range\*

## Plano Curve Range

|               | Base Curve (D) | Rx Range (D) | Diameter |
|---------------|----------------|--------------|----------|
| Single Vision | 4.25           | 0.00         | 72mm     |
| Single Vision | 6.25           | 0.00         | 72mm     |
| Single Vision | 8.00           | 0.00         | 73mm     |

\*Script range is based on use of OG220 58 frame at pd of 61 mm (average female Rx Safety script) \*Feasibility of powers outside of script range calculated after frame and PD information is available



## What We Do

Specialty optics

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#### Contact Our Team

#### Australia

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#### International

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**Email:** enquiries@rxsafety.com.au

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### Lens Thickness

- Minimum lens thickness of the leaded component of leaded glass lenses is 2.8 mm
- Progressive and D28 design are laminated to the leaded component and are significantly thicker depending upon the script
- Leaded glass cannot be chemically hardened
- Leaded glass can be multicoated

### Lens Identification

Each leaded glass lens is etched in the temporal corner with >0.75 Pb This code signifies that the lens is composed of leaded glass with greater than or equal to 0.75 mm Lead equivalency.

## References & Further Reading

<sup>1</sup> University of Toronto, Environmental Health and Safety *Module 10 Radiation Safety for X-ray units* <sup>2</sup> W.E. Moore, G. Ferguson and C. Rohrmann, *Physical factors determining the utility of radiation safety glasses*, Med Physics, 7 (1), Jan/Feb: 8-12 (1980)

<sup>3</sup> Department of Environment, Climate Change and Water NSW (Nov 2009) *Policy on X-ray* protective clothing

<sup>4</sup> A.J. Cousins, R.B. Lawdahl, D.P. Chakroborty and R.E. Koehler, *"The case for Radioprotective Eyewear/Facewear: Practical Implications and Suggestions*, <u>Invest.Radiology</u>, 22:688-692, (1987)
 <sup>5</sup> Australian Radiation Protection and Nuclear Safety Agency, *Fact Sheet Improved Eye Safety in Image Guided Intervention Procedures* (March 2015)

#### How to order

It's easy to do business with us even if you don't have an account.

- 1. Fill out your lens order using your own script pad or use ours at: https://rxsafety.com.au/order-forms/
- Email or fax your order to our team
  Email: ebolto@rxsafety.com.au
  Fax: 1800 111 461

We accept credit card payment (VISA or MasterCard) or payment via EFT.

#### Find out more

For the full product range, catalogue and further information please visit **rxsafety.com.au** or contact Rx Safety's friendly team who are always happy to help.

#### rxsafety.com.au