What lens material is used in protective eyewear?

Polycarbonate is the most common lens material used in plano (non-prescription) types of eyewear. Polycarbonate is considered stronger and lighter than glass and has good optical properties. CR-39™ is an allyl/resin plastic used for certain prescriptions where polycarbonate is not suitable. CR-39 monomer is used for casting plastic lenses for prescription eyewear, sunglasses and other plastic products requiring high abrasion resistance and high quality optical properties. Lenses made from this plastic, however, are not as strong as those made with polycarbonate. Polycarbonate is less expensive than both glass and CR-39.

Since style is the only difference in eyewear, does it matter which eyewear I select?

Yes. There are many criteria important in selecting the correct protective eyewear. Although style may be a consideration, other features may be more important. These include:

- Size and fit of eyewear
- ANSI/CSA/CE approval
- Lens tint and color
- Scratch resistance and/or anti-fog coatings for harsh environments
- Splash and dust hazard protection
- Protection from irritant vapors and gases
- Compatibility with other PPE
- Need for secondary protection, such as a face shield or welding shield
- Presence of electromagnetic radiation including UV and IR
- Vision correction needs such as reader lenses

How do I know if my protective eyewear is ANSI approved?

ANSI Z87.1-2003 requires manufacturers to provide specific markings on spectacles (safety glasses) and goggles. These include:

- The manufacturer’s mark or symbol
- “Z87” which indicates compliance with basic impact requirements of the standard
- “Z87+” or “+” for spectacles and goggles meeting high-impact requirements of the standard
- Shade number for filter lenses
- “V” for photochromic lenses

Spectacles with non-removable lenses require only one marking. The marking may be placed on the front or one of the temples and include the manufacturer’s mark or symbol, “Z87” indicating compliance with the standard, a shade number, if applicable, and a “+” if the spectacle meets high-impact requirements. Goggles with non-removable lenses must bear the appropriate marking on the frame or the lens.

Why is UV protection important?

Exposure to ultraviolet (UV) radiation is associated with a variety of health effects including arc-eye or welders flash, cataracts, sunburn and skin cancer. The eyes are particularly vulnerable to the effects of UV radiation. The sun is the main source for UV exposure. Use of polycarbonate in the lens material is >99% effective in blocking UVA and UVB from natural sunlight. Arc welding is a common man-made source of UV.

More than 700,000 workers suffer eye injuries at work each year in the United States, yet 90% of them could have been prevented. Source: Prevent Blindness America

*CR-39 is a trademark of PPG Industries, Inc.
Why is lens color an important consideration?

Lenses are offered in different tints and colors for a variety of reasons, including vision enhancement, glare reduction and style preference. Lighting conditions in the work environment and the need for filtering of specific visible light wavelengths dictate vision enhancement and glare reduction requirements. Style preference is mostly the cosmetic appeal that certain lens colors offer. Examples of lens colors commonly found and specific applications where they may be used are presented below.

<table>
<thead>
<tr>
<th>Lens Color</th>
<th>Use Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Indoor work environments with normal to low lighting conditions</td>
</tr>
<tr>
<td>Amber</td>
<td>Low light applications or other environments where greater light contrast is required (e.g. overcast conditions, foggy days, dusk)</td>
</tr>
<tr>
<td>Mirrored</td>
<td>Indoor and outdoor under bright conditions, cosmetic appeal</td>
</tr>
<tr>
<td>Smoke</td>
<td>Outdoor under bright sunlight</td>
</tr>
</tbody>
</table>

What does the term “base curve” mean?

Base curve is used to describe the curvature of the front surface of the eyewear lens. Low base curve eyewear, <6 base spherical, have less curvature on the outer surface. Side protection is commonly supplemented on these models through the use of side shield extensions. High base curve eyewear >6 base spherical, have more curvature on the outer surface. Lens curvature allows side protection through wrap-around design.

Is fit important?

Yes. Individual facial features, comfort needs and compatibility with other PPE all affect eyewear fit. Eyewear size, adjustability (e.g. nose height, temple length and angle, etc.), and comfort supports are all desirable features.

Are my safety glasses resistant to chemicals?

Safety glasses are generally designed for impact protection from flying particles and should not be used where there is potential for direct contact with chemicals. Goggles with splash protection are the only protective eyewear intended for this use. Splash goggles typically have indirect or covered vents to minimize liquids and dusts from entering.

What type of coatings are available on protective eyewear?

Coatings are applied to lenses to enhance eyewear performance. They are designed to improve scratch resistance, minimize fogging and provide anti-static properties. No eyeglass lens material is scratch-proof. However, a lens treated on the front and back with a clear, hard coating does improve scratch resistance. Polycarbonate lenses, which offer great impact strength, are easily scratched. Softness properties of polycarbonate typically require that a scratch-resistant coating be applied to improve their durability. Other coatings, such as anti-fog, are applied to the lens to improve performance in harsh environments. Anti-fog coatings may be either hydrophilic (water loving) or hydrophobic (repel water) types. Anti-fog coatings are generally not permanent and will erode after repeated cleanings. Proper care and cleaning of an anti-fog lens, following the manufacturer’s recommendations, will help maintain coating performance.

Where can I find more information on protective eyewear and safety?

3M Occupational Health and Environmental Safety Division  
www.3M.com/OccSafety  
OSHA, Occupational Safety & Health Administration  
www.osha.gov  
NIOSH, National Institute for Occupational Safety and Health  
www.cdc.gov/niosh  
CDC, Centers for Disease Control  
www.cdc.gov  
Prevent Blindness America  
www.preventblindness.org  
ANSI, American National Standards Institute  
www.ansi.org