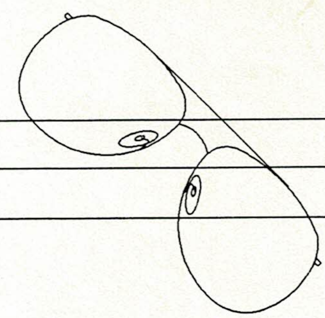
ABO PREPARATION

Week

5

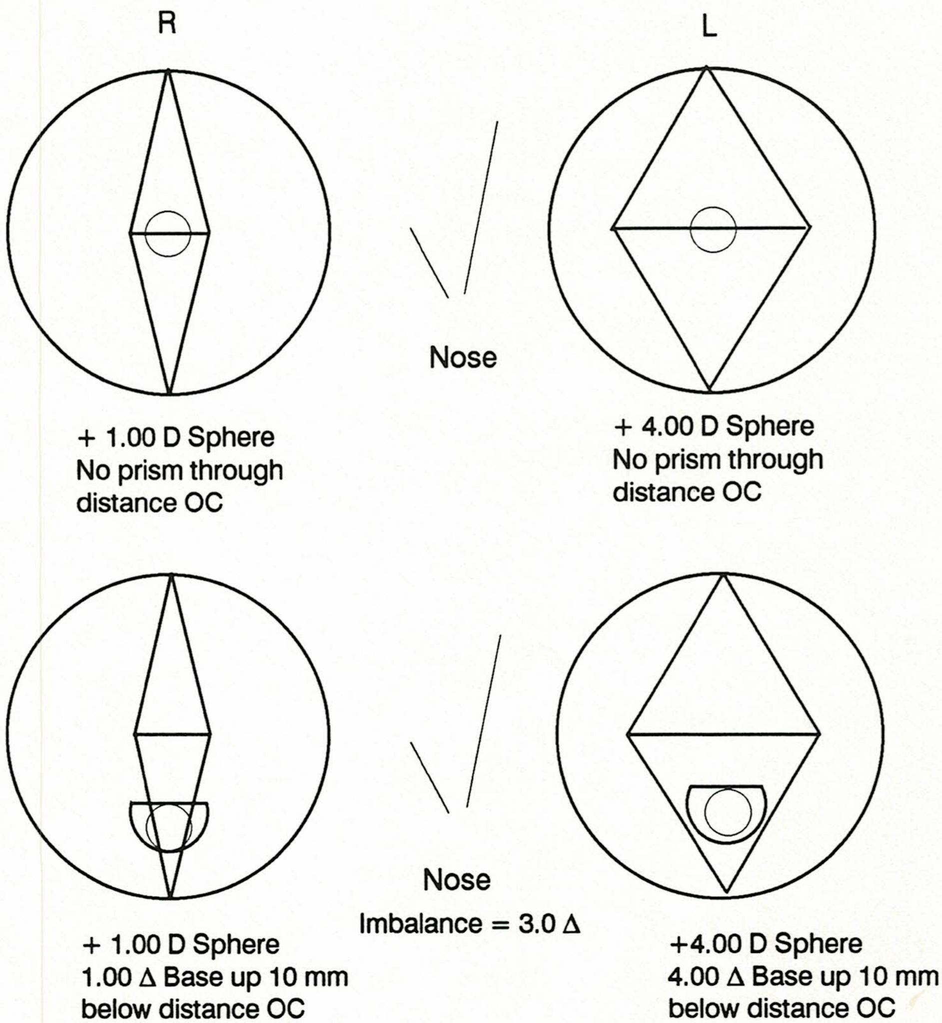
Slab Off



Ophthalmic Frames

CALIFORNIA OPTICAL LICENSE SCHOOL

Slab Off



Anisometropia is that condition where the refractive error of one eye differs significantly from that of the other and where each eye contains the same sign. An anisometropic condition exists above where the right eye is + 1.00 sphere and the left eye is + 4.00 sphere. Through the distance optical centers no prism exists. However if the gaze is directed away from the optical centers unwanted prism is induced. In this example, the patient is forced to look 10 mm away from the optical centers in order to utilize the bifocals. In doing so vertical prism is induced in each eye resulting in a total of 3.0 Δ of vertical prismatic *imbalance.* Excessive vertical prismatic imbalance may result in an inability for the patient to fuse the two images. Bicentric grinding or "slab off" is one way to correct for vertical imbalance.

Slab Off

How To Calculate Slab Off

1) Determine power of each lens in 90° meridian

2) Determine distance from optical center of carrier lens to reading level.

3) Apply Prentice's Rule to calculate amount of vertical prism induced in each eye at the reading level.

4) The *difference* in amount of ~~base up~~ vertical prism in each eye is approximately equivalent to amount of prism to be "slabbed off."

5) *Conventional Slab Off:* Is always ground base up on the lens with the most minus or least plus power in the 90° meridian.

6) *Reverse Slab Off:* A relatively new lens which is available to the laboratory from the lens manufacturer in which the prism has already been molded into the semi-finished lens. As the name suggests, the prism base is oriented base up, or in the reverse direction of the conventional base down orientation. In this case the slab off is placed in the lens with the least minus or most plus. To simplify matters it is useful to calculate all slab off as if itwere to be ground in the standard or conventional manner. Then, to use a reverse slab, simply order the lens base down in the opposite eye.

Simply stated, slab off, also called bicentric grinding, is base up prism ground in the reading portion only of a lens, generally a multifocal lens. It is used for the purpose of minimizing excessive vertical prismatic imbalance which may be induced through the reading portion, ususally as a result an anisometropia.

Grinding conventional base up slab off requires the skills of an expert optical journeyman . It is both costly and time consuming to produce. The reverse slab off described above is molded in the factory, allowing the laboratory to grind the lens in a manner very similar to any other single vision or multifocal lens. Both styles of slab off serve the patient equally well.

Practice Exercises

In the following prescriptions, calculate the amount of slab off needed to neutralize the verticle imbalance at the reading level. In all instances consider the the reading level to be 10 mm from the distance optical center.

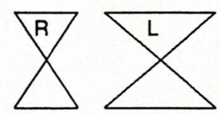
Example:

Rx: – 1.75 – 0.50 x 180
– 4.75 – 0.25 x 180
Add: + 2.00

Step 1 : Determine power in 90° meridian for each lens.
R: – 2.25
L: – 5.00

Step 2: Distance optical center = 10 mm from reading level.

Step 3: Prentice's Rule: Δ = F x dec (cm)
R: Δ = – 2.25 x 1.0 = 2.25 Δ base down
L: Δ =– 5.00 x 1.0 = 5.0 Δ base down



Step 4: Difference: The left lens contains 3.75 Δ more base down prism than does the right eye.

Step 5: Slab off the left eye 3.75 Δ base up for conventional slab off or slab off right eye 3.75 Δ base down for reverse slab.

Exercises:

4.50Δ R Con. R +4.00 L PL L 4 BT Con.

1) Rx: + 1.00 – 0.25 x 90
+ 5.50 – 0.50 x 90
Add: + 3.00

2) Rx: + 4.50 – 0.50 x 180
+ 0.25 – 0.25 x 180
Add: + 1.50

3) Rx: – 0.50 sph
– 4.25 + 0.75 x 90
Add: + 2.25

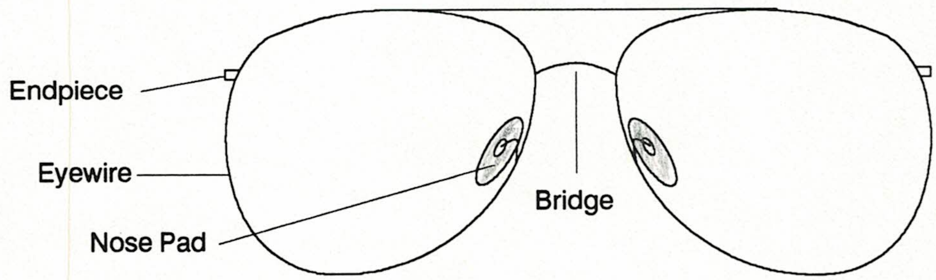
R –.50
L –4.25
375 BD R

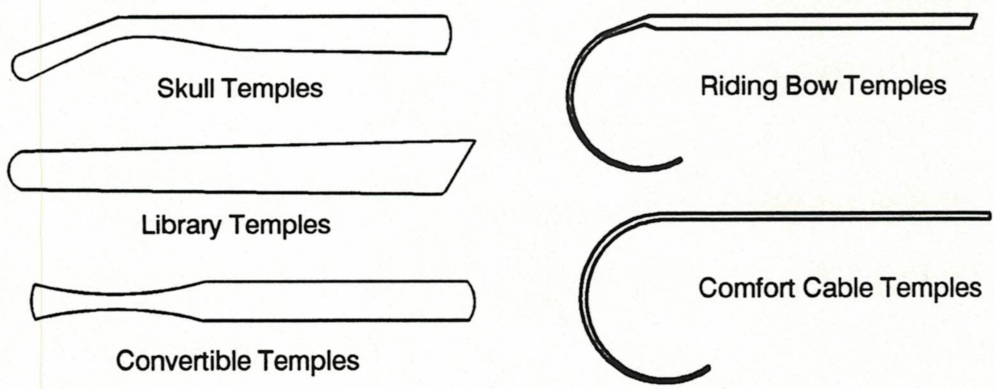
4) Rx:– 9.25 – 3.00 x 180
– 5.75 – 0.25 x 180
Add: + 2.75

R –12.25
L –6.00
625 BD R

6: Ophthalmic Frames

Principal Parts



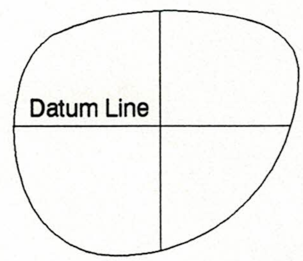


A frame is that portion of a pair of spectacles designed to hold the lenses in the proper position before the eyes. Although ophthalmic frames come in a large variety of styles, sizes, shapes, and colors, they usually have certain basic parts in common. As illustrated above, the principal parts of a frame include the *front* and the *temples.*

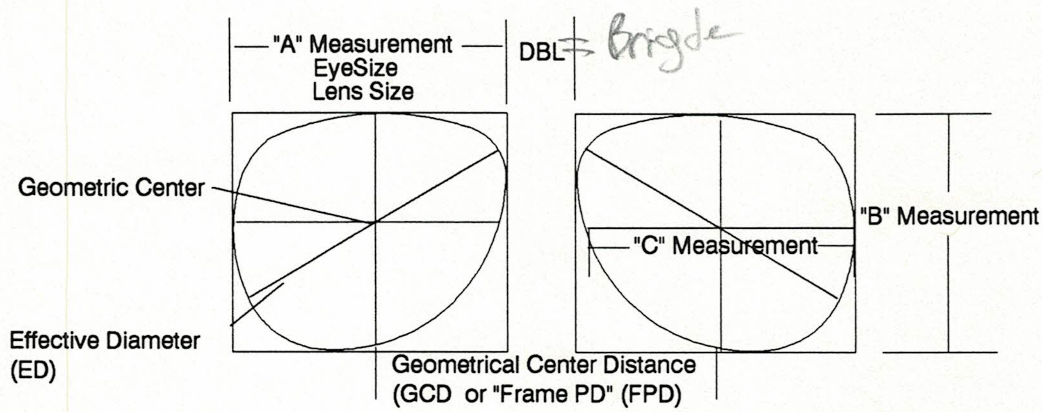
The front consists of two *eyewires* which surround and hold the lens in place, a *bridge* which connects the two eyewires, and a pair of *endpieces* to which the temples are usually connected.

Temples may be divided into five basic categories: 1) *Skull Temples* which bend down behind the ear and follow the contour of the skull, resting evenly against it; 2) *Library Temples* which are generally straight and hold the spectacles on primrily by pressure against the side of the head; 3) *Convertible Temples* which can be used either as library or skull temples depending on the manner in which they are bent; 4) *Riding Bow Temples* which curve around the ear and extend to the level of the ear lobe. They are often used in both children's frames and safety eyewear; 5) *Comfort Cable Temples* which are similar to the riding bow but are constructed from a metal flexible coiled cable.

Measurements & Markings



Datum System Of Measurement



Box System of Measurement

Frames may be measured using either one of two systems, the *Datum System* or the *Box system.*

When measuring an eye size using the datum system, an imaginary line is drawn through the middle of the eyewire both in the horizontal and vertical planes. The length of those lines correspond to the horizontal and vertical measurements of the eyewire. Given a shape such as that illustrated above, it is easy to see how inconsistencies in measurement can result using this system.

The box system is more accurate and more widely used in the optical industry today. In this system an imaginary box is drawn around the area to be measured. The distance between opposite, parallel sides of the box determine the length of the distance being measured. This system yields accurate measurements even with unusual shapes.

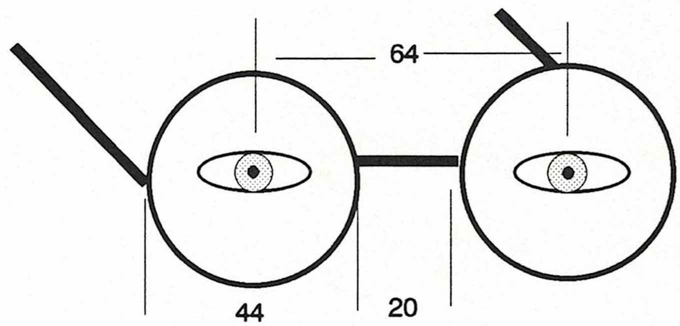
Measurements & Markings

Summary of Frame Measurements (Box System)	
A	Horizontal measurement of box enclosing lens area
B	Vertical measurement of box enclosing lens area
C	Width of the lens along the central datum line
Effective Diameter	Twice the distance from the geometrical center of the lens to the bevel farthest away from it.
Frame Difference	The difference between the horizontal and vertical measurements.
Bridge Size (DBL)	The least distance between the two lenses.
GCD	The geometric center distance also known as theDBC, distance between centers, and sometimes referred to as the FPD or Frame PD, is the distance from the geometric center of one eyewire to the geometric center of the other.
Overall Temple Length	Distance from the center of the center barrell screw hole to the end of the temple tip.
LTB	Length to bend. Measurement from the center of the barrel to the middle of the bend.
FTB	Front to Bend. Distance between the plane of the frame front and the bend of the temple. Applies to frames where the endpiees wrap around and there is some distance between the frame front and the beginning of the temple.

Theoretically, the GCD may be calculated by adding the A measurement to the DBL. In practice, however, there are often discrepencies in the actual physical measurements and those marked on the frame. A competant optician is capable of taking accurate measurements, and this skill plays an especially important roll as it relates to frame dimensions.

Horizontal Lens Decentration

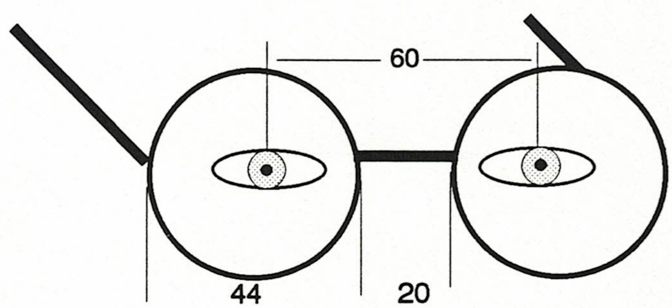
Example A



PD = 64 Rx = – 1.00 Sphere OU

In this case the optical center of the lens is in the same postition as the geometric center of each eyewire. No decentration is necessary

Example B



PD = 60 Rx = – 1.00 Sphere OU

Since the GCD is 4 mm wider than the PD, the lenses must be decentered in 2 mm in each eye. This will position the MRPs to properly correspond with the pupilllary distance.

The amount of decentration required in each eye is equal to the GCD – PD ÷ 2

In most cases the pupillary distance of the patient will be narrower than the distance between the geometric centers of the selected frame. Less commonly, the PD will be equal to the frame's geometric centers, and in rare cases the width of the PD will be greater than the GCD. In any case, to avoid unwanted prism, it is essential that the *major reference points* (MRPs) of the lens correspond to the pupillary distance. In the first example above, the PD and GCD are equal to 64 mm and therefore no decentration is necessary. In the second example, the GCD is 4 mm wider than the PD. By aplying the formula above, it can be seen that the amount decentration required in each eye is 2 mm.

Minimum Blank Size

The formula for determining the smallest possible lens blank which will work for any given frame and PD combination is as follows:

Minimum Blank Size (MBS) = (GCD – PD) + ED

In the examples on the previous page, the ED is the same as the A measurement since the frame illustrated is round. Therefore, the theoretically smallest lens size that can be used in Example A is 44 mm. The theoretically smallest lens which can be used in Example B is equal to 48 mm.

Example A: MBS = (64 –64) + 44 = 44

Example B: MBS = (64 – 60) + 44 = 48

These minimum blank sizes are considered to be theoretical for two reasons:

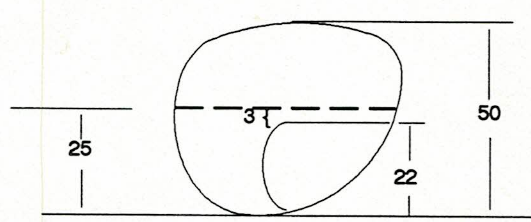
1) Two to three millimeters should always be added the the MBS to allow for imperfections such as chips or bubbles which may exist along the periphery of an uncut lens.

2) Lens sizes are available from the manufacturers only in certain predetermined sizes, the diameters of which usually range from 60mm - 80 mm in 5-6 mm increments.

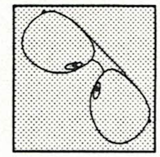
Vertical Decentration

It is necessary to calculate vertical decentration when determining where the line of a bifocal segment is positioned relative to the datum line of the frame. This may be expressed in the following formula.

Vertical Decentration = seg height – (B measurment ÷ 2)



In the example to the left, since the A measurement = 50 mm the datum line is 25 mm from the bottom most portion of the lens. The seg height is 22 mm. Subtracting half the B measurement from the seg height results in : 22 – 25 = –3. Therefore the segment line is decentered 3 mm below the datum line, or would be commonly referred to as seg = "3 below." If the seg height were say, at 28mm, the result would be + 3 mm positioning the seg line 3 mm above the datum line or "3 above."

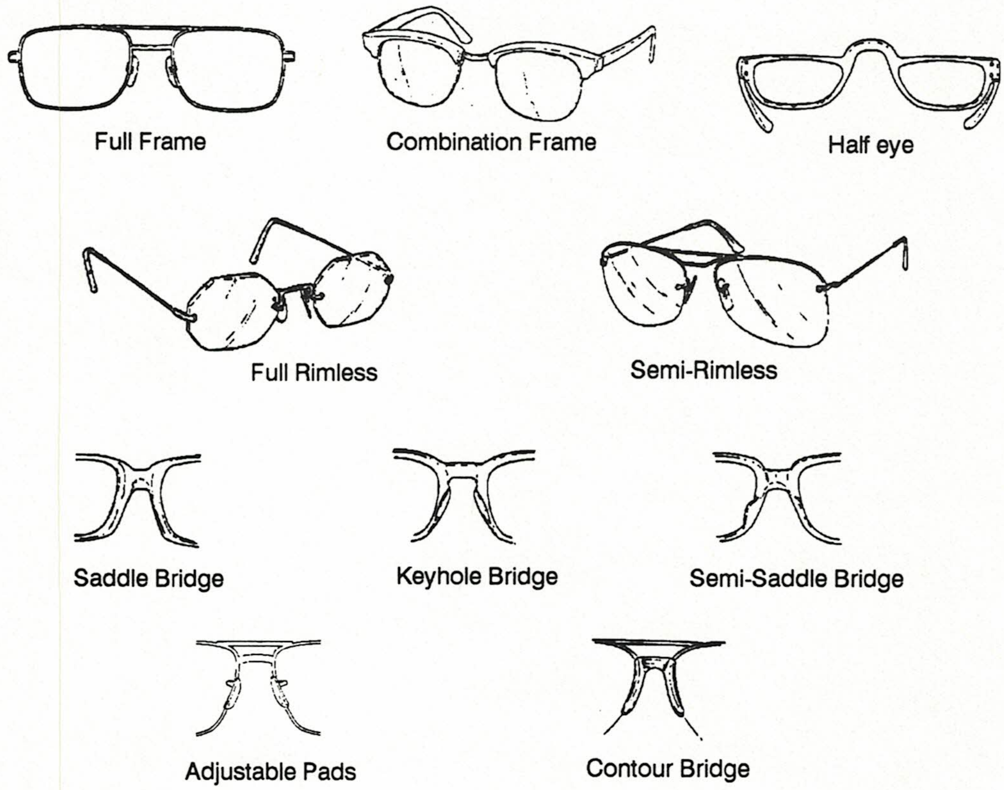


Frame Materials

Frame Materials

<u>Plastic:</u>	<u>Characteristics:</u>
Cellulose Acetate (Zyl)	Most popular material for plastic frames. Nonflammable, durable, color fast, and available in large quantities.
Optyl	Relatively new epoxy material. Light in weight, cannot be overheated or burned, will not shrink. Optyl's "memory" will cause it to revert to original shape when heated.
Cellulose Proprionate	Durable material. Molded rather than cut from a flat sheet like acetate.
<u>Metal:</u>	
Gold	Made of gold in combination with other materials such as nickel, copper, beryllium ,and chrome. Frames may be gold filled, or gold plated. Some solid gold frames are available, but aside from the high cost, the softness of the material makes them difficult to work with and keep in adjustment.
Silver	Silver itself is not used in the manufacturing of frames due to its softness. Instead, white gold is used.
Stainless Steel	Noncorrosive, strong, and light in weight.
Aluminum	Light in weight, long lasting, may be anodized allowing for many variations in color.
Titanium	Relatively new material. Very light weight, durable, and available in a variety of colors and styles.
<u>Nylon:</u>	Synthetic material made from coal, water, and air. Light weight and very strong. Often used in children's frames and industrial safety eyewear. Requires a good deal of heat for lens insertion and adjustments.

Frame Styles



Ophthalmic frames may be divided into two broad categories of materials, plastic and metal. The table of the opposite page itemizes the most popular materials and describes the general characteristics of each. As indicated in the diagram above the basic frame styles used include the *full frame, combination frame, half eye, full rimless,* and *semi rimless.* The styles we commonly call rimless are actually semi-rimless designs since there is a bar connecting the endpieces to the bridge. The lenses of a semi-rimless frame may be mounted in several different ways. These include the *screw mounting,* where a screw is placed through a drilled hole in the lens then attached to the frame. One type of screw mounted design is called a *numont* mounting where each lens is held in place by only one screw. Some lenses are *tension mounted* where clips attached to the eyewire fit into notches in the lens and are held it in place with tension. Tension mountings are sometimes referred to as *balgrip* mountings. *Nylon mounted* frames are the most popular semi-rimless design currently used. In this design, a nylon cord attached to the eyewire fits into a groove located around the periphery of the lens. A nylon mounted rimless design is safe, durable, relatively easy to work with and fashionable.

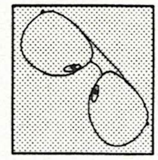
Frame Selection

By Shape Of Face

Face Shape	Description	Recommended Frame Shape
Oval	Normal	Most shapes will be suitable
Oblong	Long	Deep frame preferably with low temple attachment.
Round	Wide	Relatively narrow frame preferably with a high temple attachment.
Square	Wide	Same criteria as round
Triangular	Erect triangle	Width of frame should approximately equal lower widest part of facial area. Darker colors work well.
Diamond	Inverted Triangle	Lighter looking frame is recommended such as metal or rimless or lighter colors in zyl.

Bridge Selection

Selecting the proper bridge size and shape for any given patient is a crucial part of frame selection both from a cosmetic and a purely practical perspective. Since a "high" bridge such as a keyhole style tends to accentuate nose length it should be avoided with longer noses and recommended with shorter, stubbier noses. The opposite holds true with "lower" bridge designs such as a saddle bridge. Patients with especially narrow bridges are generally successful with adjustable nose pads. Very often adjustable pads can be added to a zyl frame which may increase the selection of wearable frames for the narrow-bridged patient. Zyl bridges and "comfort" bridges for metal frames are difficult to adjust, therefore care must be taken to insure the fit is suitable right from the beginning during the initial frame selection.



Frame Selection

Prescription Considerations	
Higher Minus Lenses	**Higher Plus Lenses**
Recommend	*Recommend*
Smaller Eyesize	Smaller Eyesize
Heavier Frame Material	Sturdy Frame Construction
Rounder Shapes	Rounder Shapes
Lightweight Lenses	Small Frame Difference
Higher Index Lens Material	Adjustable Nose Pads
Antireflection Coating	Lightweight Lenses
Edge Coating	Higher index Lens Material

When presented with a prescription of higher power, the competant optician must draw upon many of his/her skills to achieve a satisfactory fit and a satisfied patient. Proper frame selection is of utmost importance. The size must be kept to a minimum, and the fit of the bridge takes on added importance due to additional lens weight. The eyes should be fairly well centered in the eyewire to minimize decentration. If the lens power exceeds ±7.00 diopters, vertex distance must be considered. Other options include higher index lens materials and special lens designs such as lenticular and myodisc which are designed to minimize thickness. The various lens coatings should be considered in an effort to enhance the functional as well as cosmetic value of the eyewear.

ABO PREPARATION COURSE

5: Slab Off
Ophthalmic Frames

Published By:

CALIFORNIA OPTICAL LICENSE SCHOOL
4330 Barranca Parkway
Suite 101-129
Irvine, CA 92714
(714) 551-5455

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