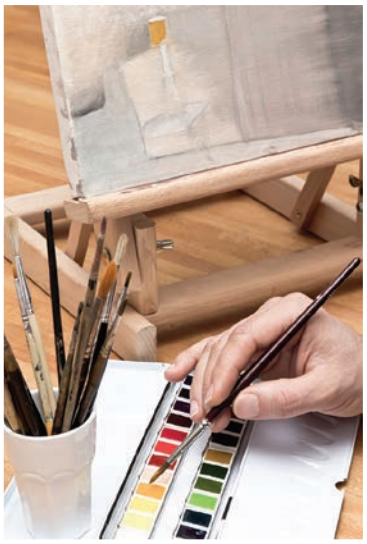
THE ART & SCIENCE OF

camber technology



Camber Technology **combines complex curves on both surfaces** of the lens to provide excellent vision correction. The unique, **continuously changing surface curvature** of the specially designed lens blank allows expanded reading zones with improved peripheral vision. When combined with a **sophisticated back surface digital design,** both surfaces work together to accommodate an expanded Rx range, offer better cosmetics (flatter) for many prescriptions, and yield user-preferred near vision performance.

THE TRUTH ABOUT BASE CURVE

Rapidly evolving technology is bringing exciting changes to the industry, but sometimes significant advancements can be acheived by simply going back to basics. Base curve, a commonly overlooked but essential property of a lens blank, is at the forefront of Camber's patented new front surface technology. To fully appreciate the benefits of Camber lenses, one must recall a fundamental principle of optics:
For every lens power, there is an ideal base curve.

Almost every ECP is familiar with the Tscherning Ellipse below, which indicates the two lens base curves that are optically ideal for each dioptric power. The top curve represents Wollaston's 1804 calculation. The bottom curve represents the flatter, more practicable calculation introduced by F. Ostwalt in 1898, which became the basis for standardized lens base curves. Though modern base curve recommendations are slightly flatter due to cosmetic preference, Ostwalt's calculation is still recognized as optically ideal. **[FIGURE 2.1]**

When the power of a lens is paired with its ideal base curve, the wearer enjoys clearer vision with minimal oblique astigmatism. When the base curve falls outside the ideal range for a given power, the wearer's off-axis visual acuity diminishes precipitously. The further the base curve is from the calculated ideal, the more rapid the reduction of off-axis acuity.
[FIGURE 3.1]

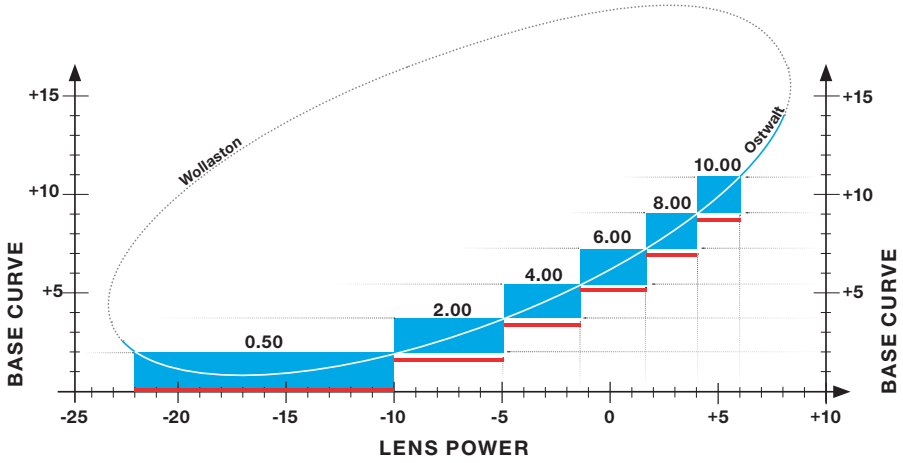
This has increased implications in a progressive lens, because the reading zone can only be accessed at an oblique angle. If the base curve is poorly matched, the patient may experience an abrupt drop-off in acuity in the reading area. Patients with high add prescriptions are even more likely to feel confined by this limitation.

Digital lens technology has allowed labs to create progressive lenses out of single vision lens blanks. But pairing lens power to ideal base curve in this situation is complicated — and compromises are inevitable.

A progressive lens has many powers, hence it has many ideal base curves, increasing in diopter from top to bottom. The distance zone power calls for a flatter base curve, while the near zone power calls for a steeper base curve. **[FIGURE 3.2]** However, when a free-form progressive lens is processed from a single-vision lens blank, the various powers must share a single base curve, one that may not be ideal for the near zone.

The Camber lens offers an elegant solution that represents the next step in digital progressive technology. In the following pages, we'll show you a new wave of front curve technology that offers wearers spacious, more comfortable fields of vision, in both the distance zone and reading area.

FIGURE 2.1 TSCHERNING ELLIPSE



POWER TO BASE CURVE

Standardized lens bases were designed to span the range of dioptric powers that conforms to Oswalt's equation (blue rectangles).

Modern base curves have shifted downward, due to comestic preference for flatter lenses (red lines).

FIGURE 3.1
THE IMPORTANCE OF PAIRING LENS POWER TO ITS IDEAL BASE CURVE

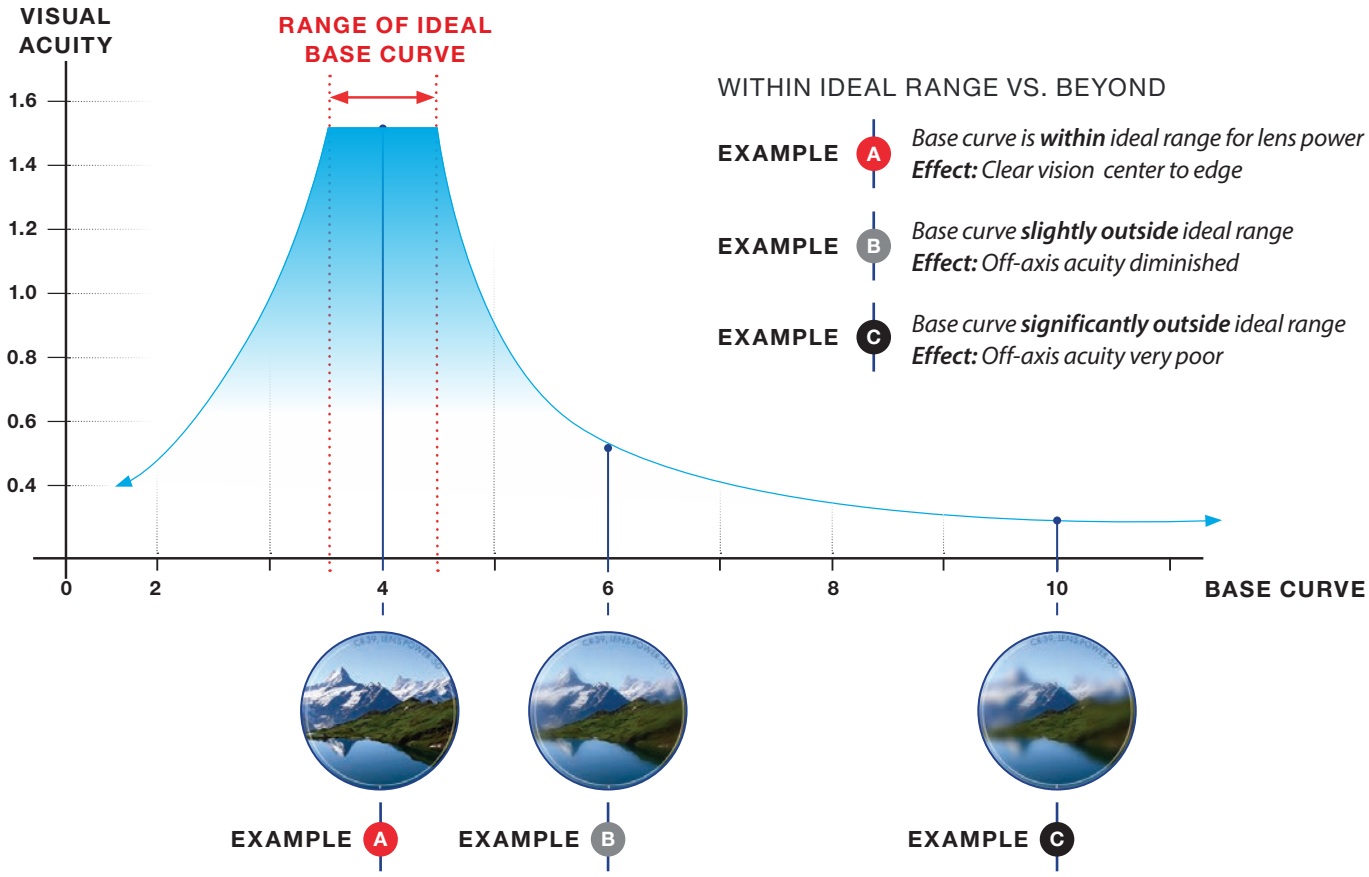
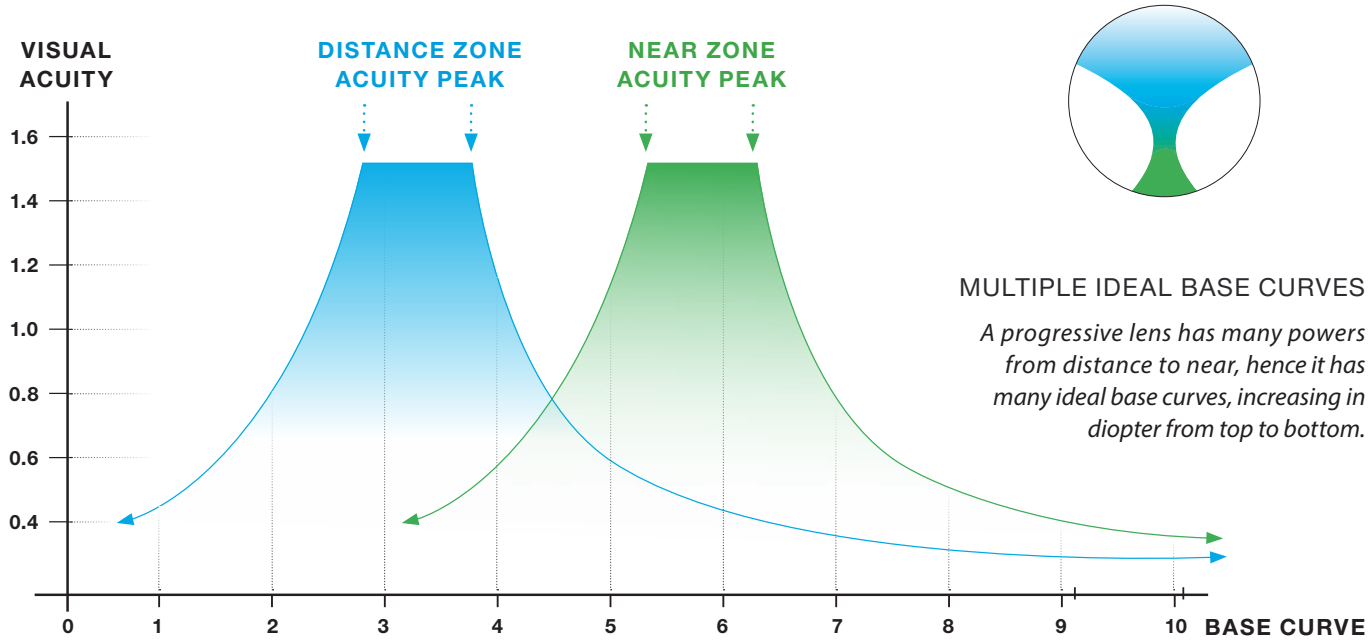


FIGURE 3.2
PROGRESSIVE LENSES: MANY POWERS FROM DISTANCE TO NEAR



FRONT SURFACE INNOVATION

The Camber lens blank features a variable base curve — a new front surface innovation that provides the optically ideal base curve in all viewing zones.

Each Camber lens blank comes from a section of the "Elephant's Trunk" curve, creating a unique variable base curve front surface that continually increases in diopter from top to bottom. **[FIGURE 4.1]** This improved front surface profile gives each viewing zone a base curve that is well-suited to its function.

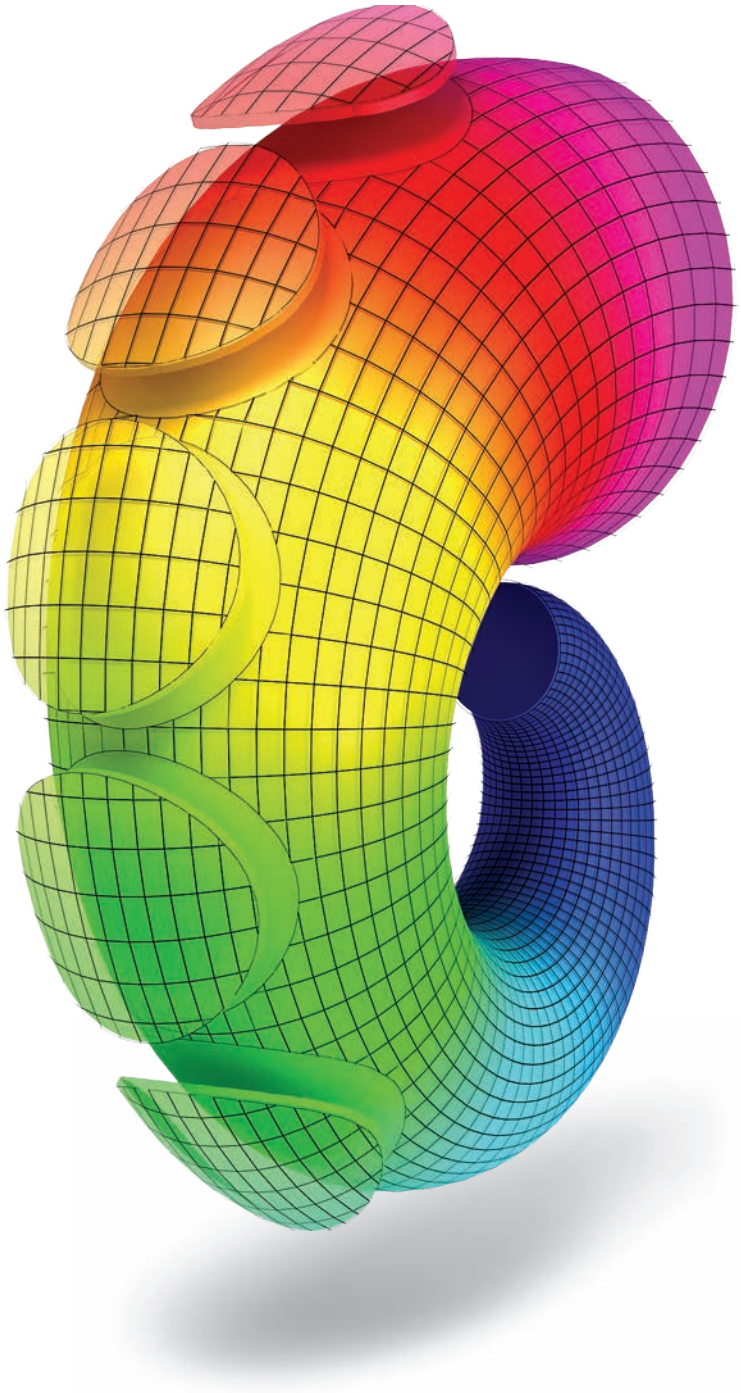
From the top of the lens blank to the bottom, the base curve increases up to three diopters. This "stacking of the spheres" is a totally new idea, unique to Camber lenses. [FIGURE 5.2]

This new front surface innovation provides benefits to wearers in both the distance and near zones. Wearers enjoy noticeably increased acuity in the periphery of the distance zone, as well as a reading area that is more comfortable and easier to find with the eye.

Digital lens design gives optical designers a lot of power to create lenses that are customized to each patient. But when a progressive lens is made from a single vision lens blank, the uniform front curve creates optical problems that lens designers must digitally correct. Rather than focusing every design decision on achieving a fully personalized lens, some of the design power must go toward "compensation correction." **[FIGURE 5.3]**

Camber's new variable base curve technology reduces the need for compensation correction, allowing more digital design power to be used to refine and customize the design for each individual eye.

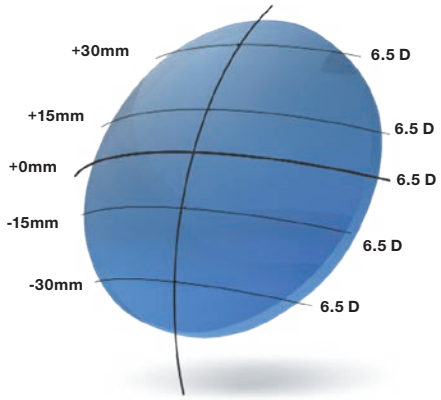
FIGURE 4.1
ELEPHANT'S TRUNK CURVE



VARIABLE BASE CURVE

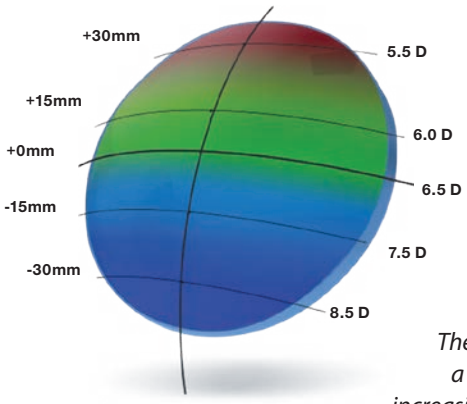
The radius of the blank continually decreases from top to bottom.

FIGURE 5.1
COMPARE FRONT SURFACES



SINGLE VISION BLANK

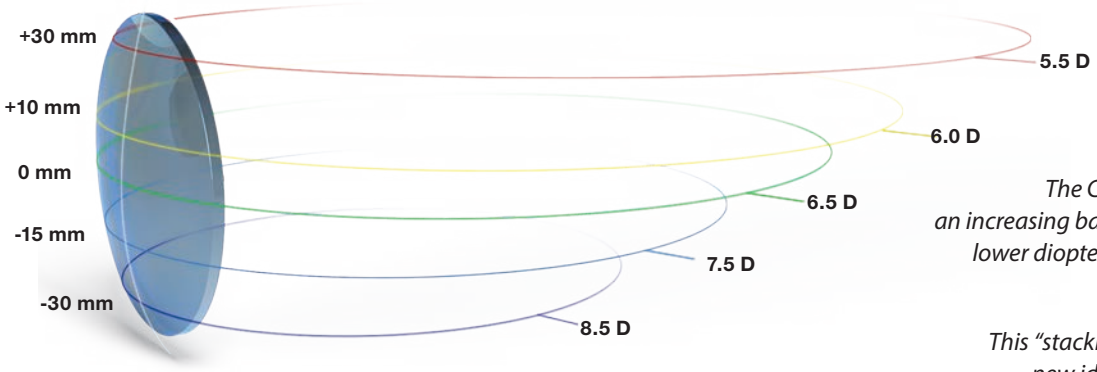
The single vision lens blank has one base curve from top to bottom.



CAMBER BLANK

The Camber lens blank has a patented, continuously increasing base curve, ideal for the increasing power profile of free-form progressive lenses.

FIGURE 5.2
STACKING OF THE SPHERES

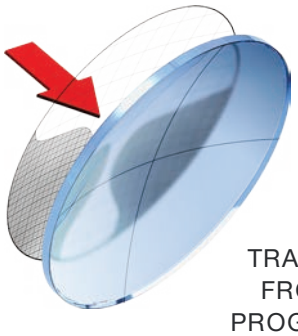


INCREASING CURVE

The Camber front surface features an increasing base curve from top to bottom: lower diopter in the distance zone, higher diopter in the reading zone.

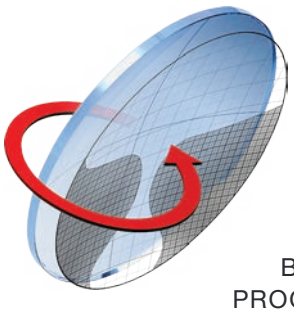
This "stacking of the spheres" is a totally new idea, unique to Camber lenses.

FIGURE 5.3
COMPENSATION VS. PERSONALIZATION



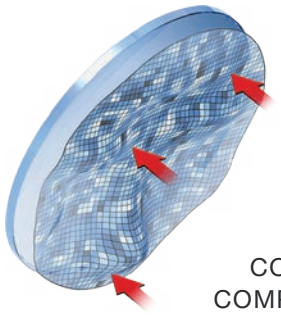
TRADITIONAL FRONT SIDE PROGRESSIVE

When the progressive design was on the front, there was a "varying" base curve "built in"– a higher base curve in the reading area vs. in the distance area. This is actually the correct optics for visual acuity.



DIGITAL BACK SIDE PROGRESSIVE

Digital surfacing brings the progressive design to the back surface of the lens and no longer has a "varying" base curve "built in" since a single vision front base curve is used. This creates optical problems that must be corrected.



CURVE CORRECTION COMPENSATION

Optical designers must first correct the optical problems created by a Single Vision front curve. They are also unfortunately "using up" their design tools for "compensation correction" rather than incorporating the best enhancements for the patient.

THE CAMBER **FINISHED LENS**

MERGING COMPLEX CURVES

With Camber lenses, the innovative lens blank is only the beginning. When the unique front surface is combined with a sophisticated back-side digital design, both surfaces work together to become the Camber finished lens. The following is an introduction to the three essential components of a Camber finished lens.

THE CAMBER BLANK W/ VARIABLE BASE CURVE

The Camber lens blank improves on the single vision lens blank, by offering a continuously increasing base curve that is better suited for progressive prescriptions. (More on pages 4 and 5.)

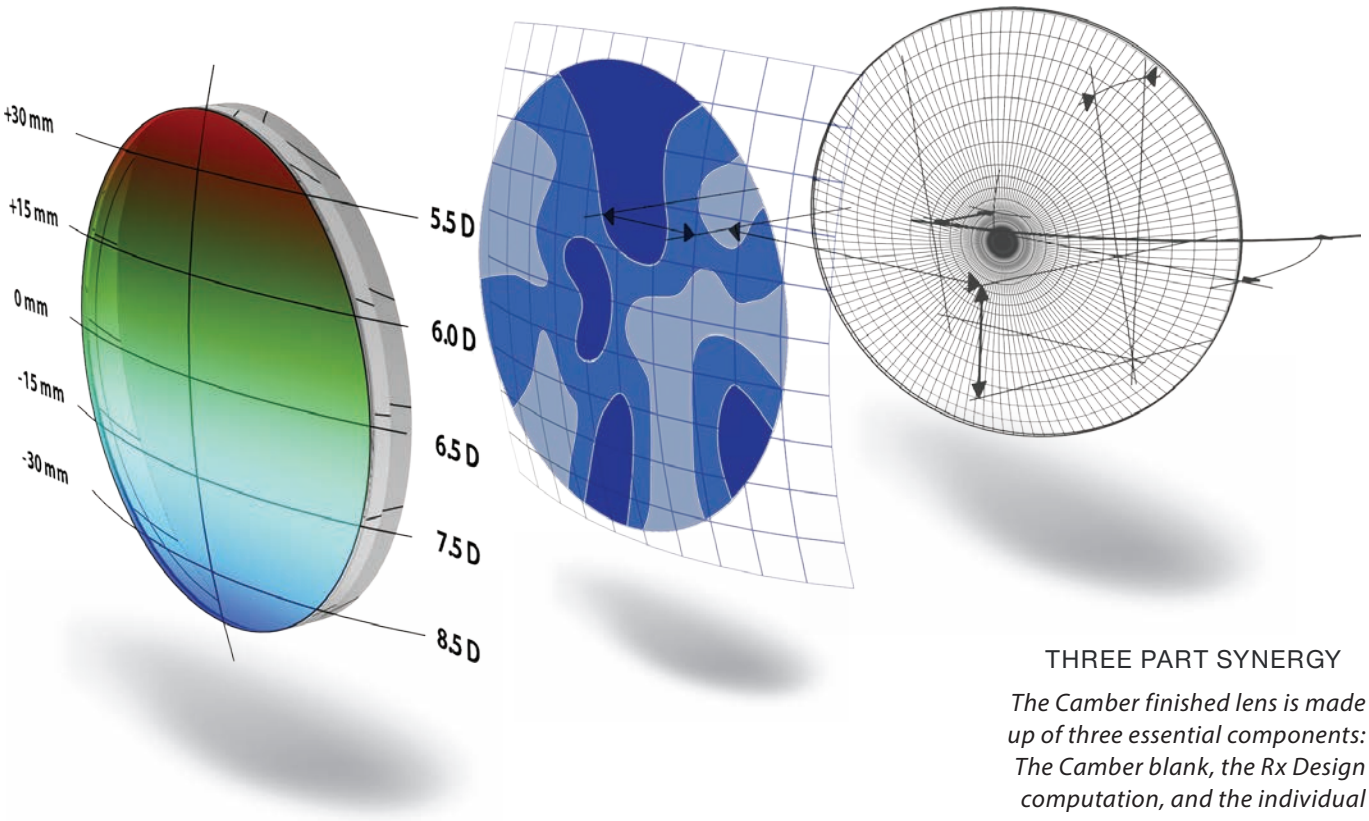
THE CAMBER RX DESIGN COMPUTATION

The state-of-the-art, digitally designed back surface of the lens is calculated in mutual accord with the unique Camber variable base curve. The Camber Rx design computation was developed by IOT, an international digital design firm that has been steadily gaining recognition in the industry.

THE INDIVIDUALIZATION PARAMETERS

The Rx Design Computation is further enhanced, when desired, by a complete set of individualization parameters that take into consideration the unique attributes of the frame and the preferences of the wearer. The result is a finished lens that is comprehensively customized for each individual patient.

FIGURE 6.1 COMPONENTS OF A CAMBER LENS



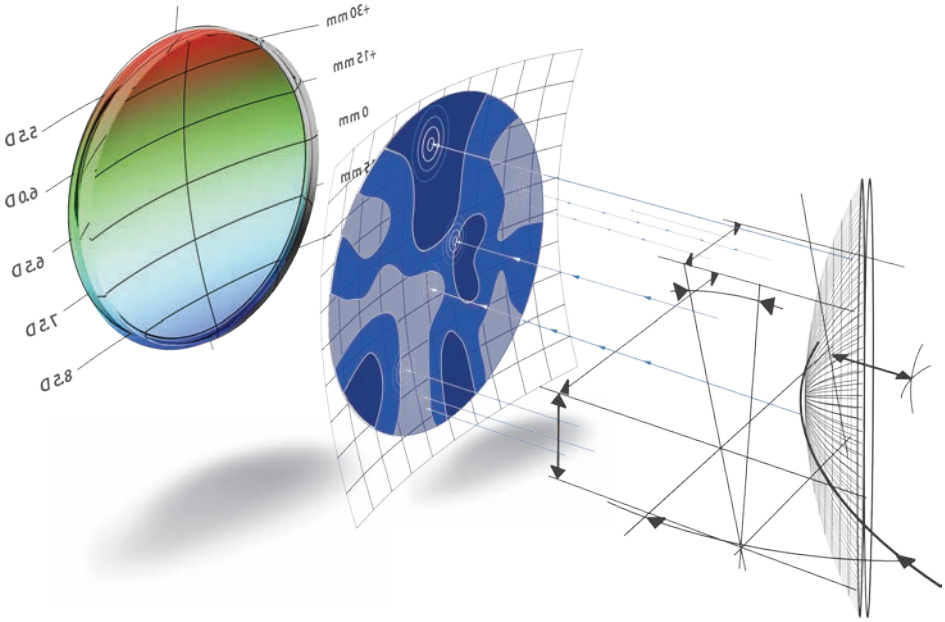
THREE PART SYNERGY

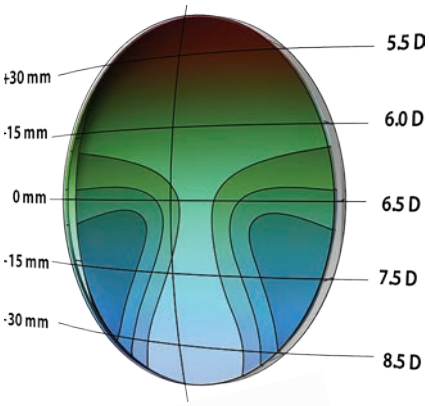
The Camber finished lens is made up of three essential components: The Camber blank, the Rx Design computation, and the individual wearer's custom parameters

FIGURE 7.1 A COMBINATION OF COMPLEX CURVES CREATES CAMBER RX

HIGH-END DIGITAL PROCESSING

Once the Individualization Parameters are embedded into the Camber Rx Design Computation, the enhanced back surface design is processed into the Camber lens blank.





THE COMBINATION OF FRONT AND BACK SURFACES CREATES PROGRESSIVE RX

The combination of the Camber variable base curve front surface and the enhanced digital back surface design creates the Camber finished lens, an advanced digital progressive lens that provides remarkable visual acuity in every viewing zone.

AN ADVANCED LENS LIKE NO OTHER

Camber finished lenses give wearers an outstanding visual experience, with spacious reading zones, improved peripheral vision, an expanded Rx range, better-looking lenses in many prescriptions, and user-preferred near vision performance.

camber

ADVANCED CURVE TECHNOLOGY

FOR PROGRESSIVE RX WEARERS

HIERARCHY OF IMPORTANCE

FOR MAKING A SUCCESSFUL PROGRESSIVE RX

There is a lot of confusion in our industry about which parameters are the most important towards supplying a successfully dispensed RX progressive. Not surprisingly, those items directly controlled by the ECP are still the most important! Base curve and lens index material play a role more important than factors such as customization and individualization.

MOST IMPORTANT	Proper refraction Fitting Height PD Measurement
IMPORTANT	**Base Curve Selection** Design of Progressive Corridor Length Index of Lens Material
NICE TO HAVE	Customization Individual Wearer's Parameters

HOW CAMBER LENSES BENEFIT **OPTICIANS AND LABS**

SUPERIOR OPTICS
Wide open fields of vision

CONVENIENT STOCKING
Small number of blanks in stock, just like SV blanks

PREMIUM TECHNOLOGY
Feel confident that the product you are dispensing is as technologically advanced as any lens on the market

STANDARD PROCESSING
Processing similar to standard digital progressives

EASIER FRAME SELECTION
Higher base curve prescriptions have fewer frame limitations

BETTER LOOKING
More cosmetically appealing front curve for many high plus and high add prescriptions

HOW CAMBER LENSES BENEFIT **PATIENTS**

BETTER VISION
In all zones, compared to SV Blank

LATEST TECHNOLOGY
Camber's two-surface design is unique and patented

FULLY CUSTOMIZABLE
Every variable that affects vision can be individualized to patient

IMPROVED READING AREA
More spacious, easier to find with the eye

EASIER ADAPTATION
Study shows quicker adaptation for most wearers

WEARERS PREFER CAMBER
Study shows more wearers preferred lenses made from Camber blanks to lenses made from single vision blanks

YOUNGER OPTICS
The Optical Lens Innovators

YOUNGEROPTICS.COM