On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.

VISION EXPO

1

FRAME & LENS:
MAKING A PERFECT MATCH

2-HOURS ABO

JESSE WALTERS, ABOM

2

JESSE WALTERS, ABOM

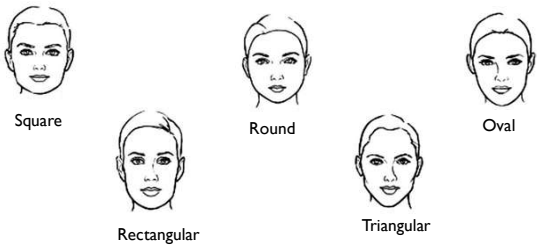
- NO FINANCIAL INTERESTS TO DISCLOSE
- ACCOUNT REPRESENTATIVE AND OPTICAL TRAINER FOR AN INDEPENDENT OD OWNED NATIONAL LAB: SUMMIT OPTICAL
- CE AUTHOR, CONTENT EDITOR AND ADVISOR FOR THE OPTICAL TRAINING INSTITUTE
- CE CONTRIBUTOR FOR QUANTUM OPTICAL
- ALL RELEVANT RELATIONSHIPS HAVE BEEN MITIGATED

3

THE OPTICIAN'S CHALLENGE: FRAME SELECTION & MEASUREMENTS

- How will the Rx, edge type and decentration affect thickness?
- Is the frame curve appropriate for the Rx?
- How important is adjustability?
- How does lens depth affect the Rx?

4



5

THE OPTICIAN'S CHALLENGE: IMAGINING THE FINAL PRODUCT

HOW DO YOU PREDICT AND CALCULATE THE FINAL COSMETICS AND FIT OF A SPECTACLE ORDER?

6

WHAT COULD GO WRONG?

- Cut-out problems
- Center and edge thickness
- Incompatible base curves
- Edge types affecting cosmetics

7

LENS CUT-OUT

SIZE, THICKNESS, DECENTRATION

8

BOX MEASUREMENTS

A= longest horizontal width

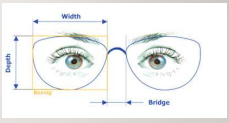
B= longest vertical height

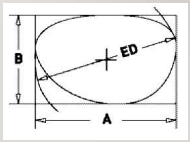
Dbl= closest distance between lenses

(from tip of bevel to tip of bevel)

ED= 2 times the longest radius of the lens from the geometric center to the farthest point.

(NOT the longest diagonal measurement)



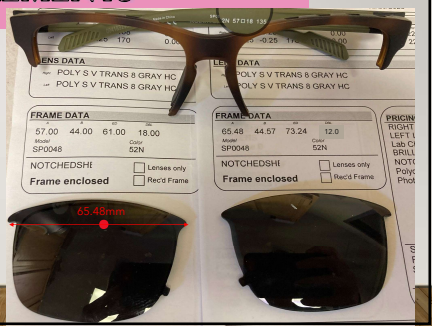


9

BOX MEASUREMENTS

All measurements are made from tip-of bevel to tip-of-bevel

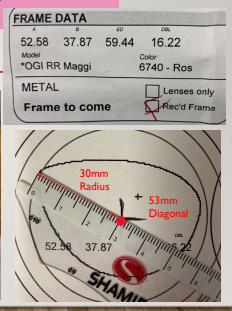
- A= longest horizontal width
- Dbl= closest distance between lenses



10

BOX MEASUREMENTS: ED

- ED= 2 times the longest radius of the lens from the geometric center to the farthest bevel point.
- **Estimates are not sufficient when:**
  - **The Rx is over +2.00D**
  - **The Frame shape has protruding corners or asymmetrical shape**

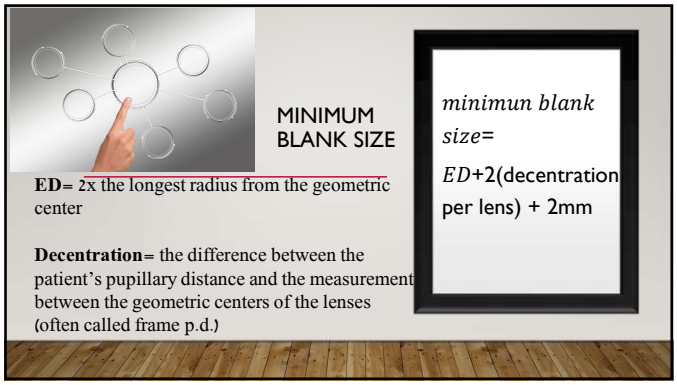


11

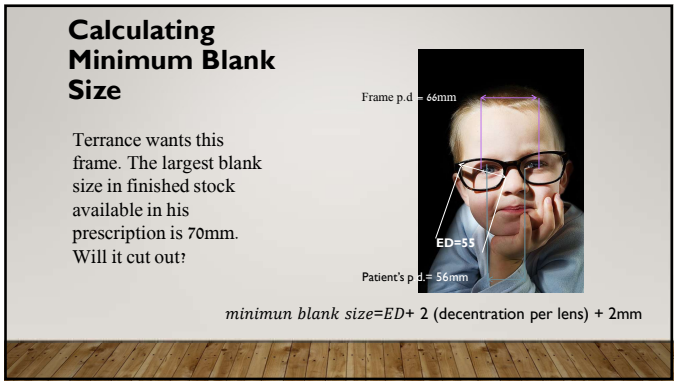
C-SIZE AND ARCHIVING SHAPES

- Circumference size measures the distance around a lens.
- Labs keep shapes on file that can be archived for accurate shape information.
- Lenses only orders should be accompanied by a C-size
- It's always better to send a frame

12


MINIMUM BLANK SIZE
minimun blank size= ED+2(decentration per lens) + 2mm
ED= 2x the longest radius from the geometric center
Decentration= the difference between the patient's pupillary distance and the measurement between the geometric centers of the lenses (often called frame p.d.)

13


Calculating Minimum Blank Size
Terrance wants this frame. The largest blank size in finished stock available in his prescription is 70mm. Will it cut out?
Frame p.d = 66mm
ED=55
Patient's p = 56mm
minimun blank size=ED+ 2 (decentration per lens) + 2mm

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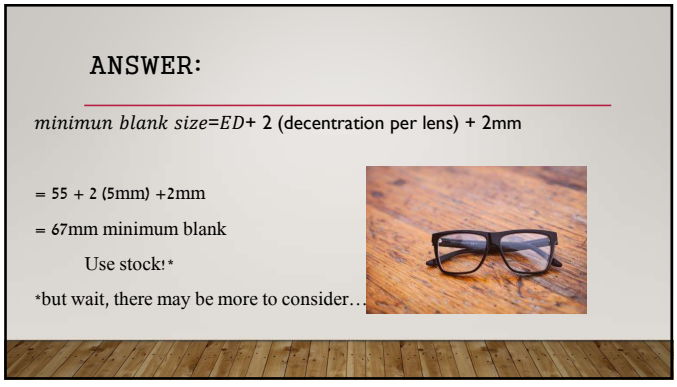
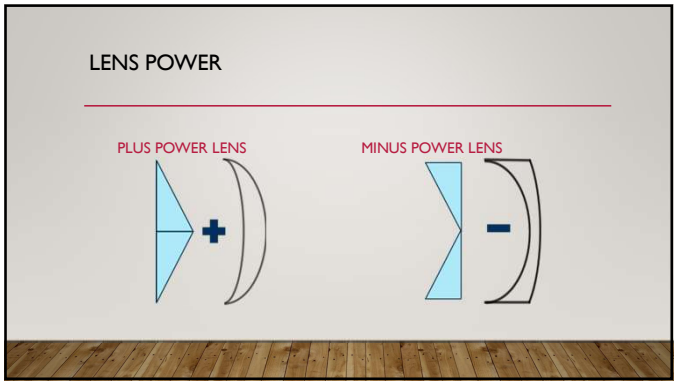

ANSWER:
minimun blank size=ED+ 2 (decentration per lens) + 2mm
= 55 + 2 (5mm) +2mm
= 67mm minimum blank
Use stock!*
*but wait, there may be more to consider…

15


LENS POWER
PLUS POWER LENS
MINUS POWER LENS

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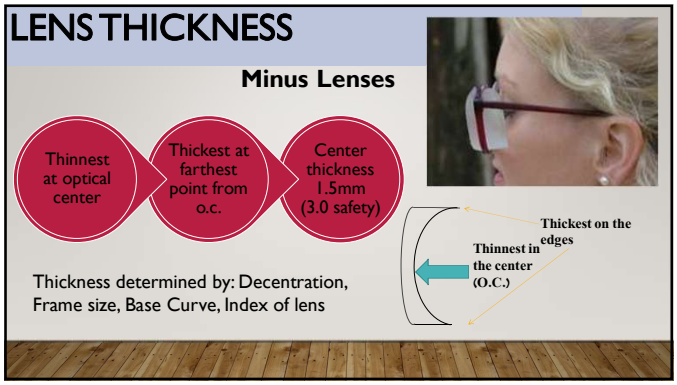
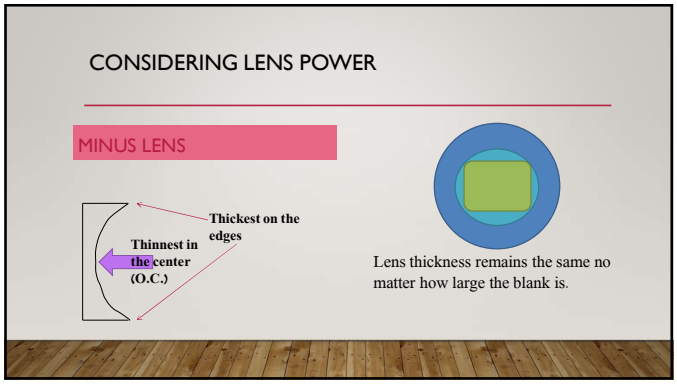
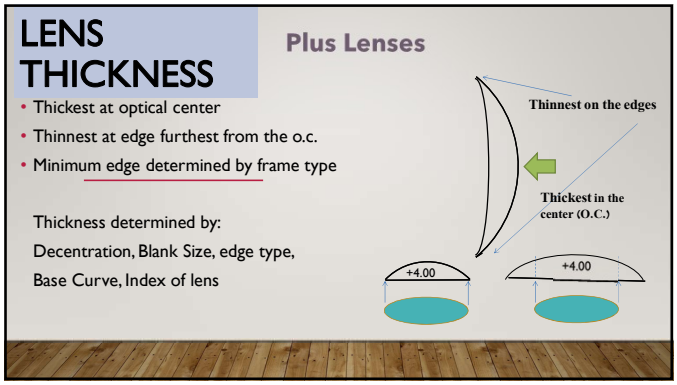

LENS THICKNESS
Minus Lenses
Thinnest at optical center
Thickest at farthest point from o.c.
Center thickness 1.5mm (3.0 safety)
Thickness determined by: Decentration, Frame size, Base Curve, Index of lens
Thickest on the edges
Thinnest in the center (O.C.)

17


CONSIDERING LENS POWER
MINUS LENS
Thickest on the edges
Thinnest in the center (O.C.)
Lens thickness remains the same no matter how large the blank is.

18


LENS THICKNESS
Plus Lenses
• Thickest at optical center
• Thinnest at edge furthest from the o.c.
• Minimum edge determined by frame type
Thickness determined by:
Decentration, Blank Size, edge type,
Base Curve, Index of lens
Thinnest on the edges
Thickest in the center (O.C.)
+4.00
+4.00

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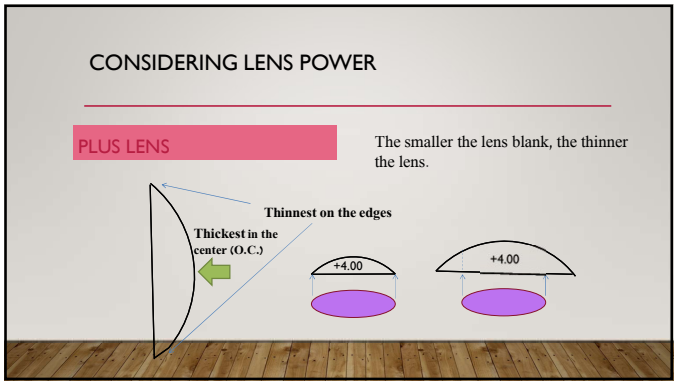

CONSIDERING LENS POWER
PLUS LENS
The smaller the lens blank, the thinner the lens.
Thinnest on the edges
Thickest in the center (O.C.)
+4.00
+4.00

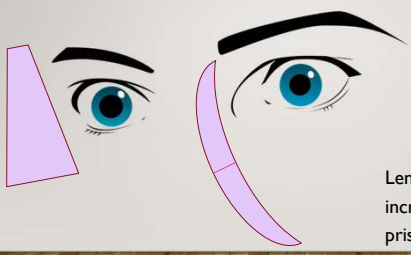
20

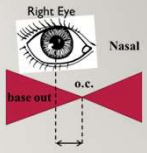

PRISM
THICKNESS AND OPTICS

21

Ground OR Decentered

PRISM: GRINDING VS. DECENTRATION





Lens thickness usually increases with prescribed prism…but not always

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USING PRENTICES RULE

Prentice's Law to determine decentration:

$$d = \frac{10P}{D}$$

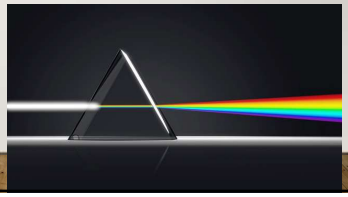
Prentice's Law to determine prism induced:

$$P = \frac{dD}{10}$$

d= decentration in mm

P= prism power

D= dioptric power of the lens



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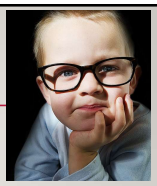
EXAMPLE:

TERRANCE'S RX:

-4.00 -1.00 X 090

2BO PRISM



1. Find the total power of the lens on the meridian of the prism. (hint: up and down is on the 90° meridian, in and out is on the 180)

Total power @ 180 = -5.00

2. APPLY PRENTICE'S LAW

Prentice' s Law to determine decentration:

$d = 10P/D$

$\frac{10 \times 2}{5.00} = 4MM$

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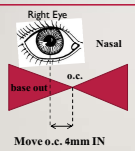
3. Determine what direction you need to decenter.



Remember: a plus lens looks like this.

Move o.c. 4mm IN

4. If the direction is the SAME as p.d. decentration, then ADD to your decentration per eye. If it is OPPOSITE, then SUBTRACT it.

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For Terrance, we need to ADD 4mm additional decentration.

minimun blank size=

ED+ 2 (decentration per lens) + 2mm

= 55 + 2 (9mm) +2mm

= 75mm minimum blank

Since a 70mm blank is the largest available, we now must order his lenses surfaced.

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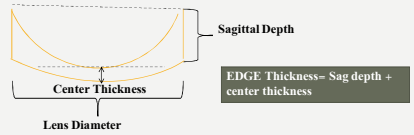
THICKNESS & SAGITTAL DEPTH

Minus Lens:



EDGE Thickness= Sag depth + center thickness

Plus Lens:

CENTER Thickness= Sag depth + edge thickness

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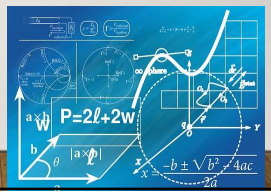
THICKNESS FORMULA FOR APPROXIMATION

$$sag = \frac{(d/2)^2 D}{2000(n-1)}$$

d= diameter of the lens in mm
D= lens power
n= index of refraction



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EXAMPLE:

Minimum blank size = 65mm
Lens power = +4.00
Lens material= Hi Index 1.67

$$sag = \frac{(65/2)^2 \times 4}{2000(1.67-1)} = 3.15 \text{ mm}$$

Assuming the thinnest edge is 1.5mm, the center thickness should be about 4.65mm.

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EDGE TYPE
Different edge types require different minimum thickness.
Zyl/metal/v-bevel/standard: 1.3mm min edge
Drill: 1.7mm
Groove/rimless/nylor: 2.2mm
Shelf Bevel: 2.2mm
Rimless Metal: 2.4mm
Safety: 3.0 (center or edge)

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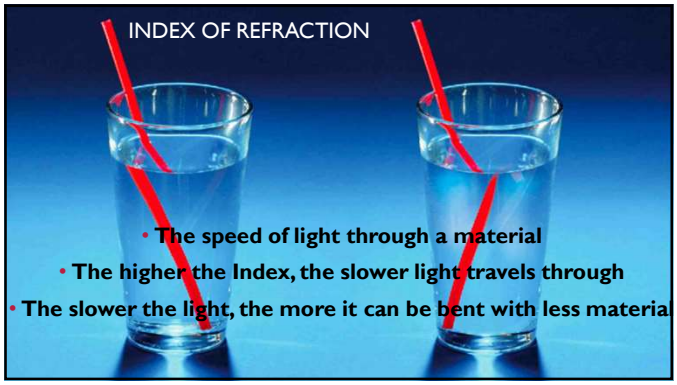
INDEX OF REFRACTION
• The speed of light through a material
• The higher the Index, the slower light travels through
• The slower the light, the more it can be bent with less materia

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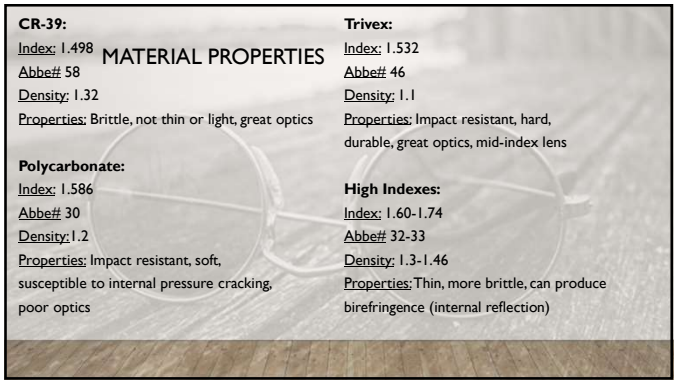
MATERIAL PROPERTIES
CR-39:
Index: 1.498
Abbe# 58
Density: 1.32
Properties: Brittle, not thin or light, great optics
Polycarbonate:
Index: 1.586
Abbe# 30
Density: 1.2
Properties: Impact resistant, soft, susceptible to internal pressure cracking, poor optics
Trivex:
Index: 1.532
Abbe# 46
Density: 1.1
Properties: Impact resistant, hard, durable, great optics, mid-index lens
High Indexes:
Index: 1.60-1.74
Abbe# 32-33
Density: 1.3-1.46
Properties: Thin, more brittle, can produce birefringence (internal reflection)

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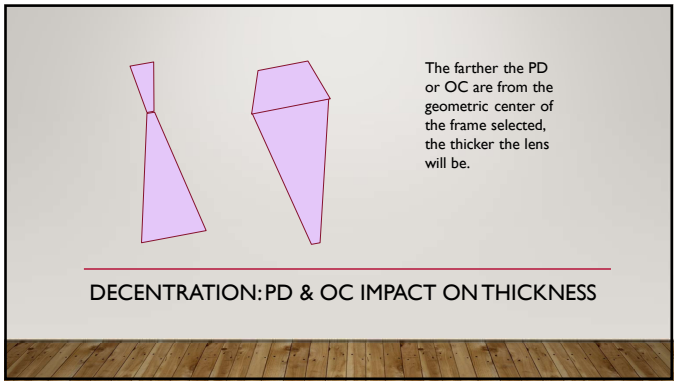
The farther the PD or OC are from the geometric center of the frame selected, the thicker the lens will be.
DECENTRATION: PD & OC IMPACT ON THICKNESS

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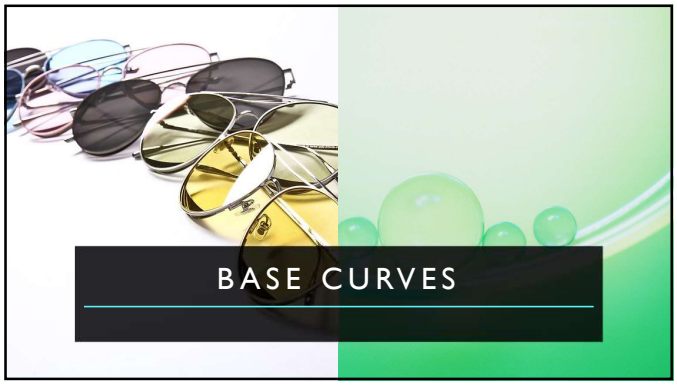
BASE CURVES

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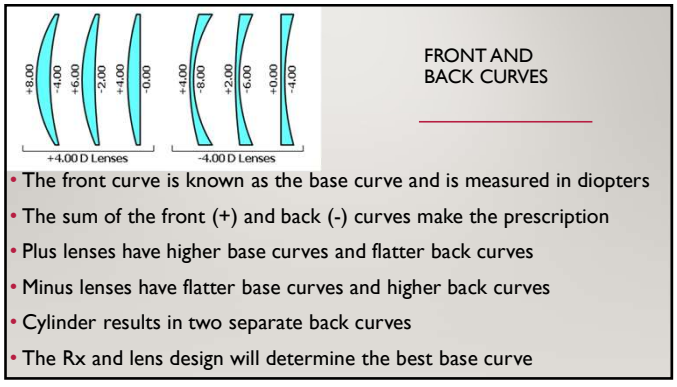
FRONT AND BACK CURVES
+8.00
+4.00
+6.00
-2.00
+4.00
-0.00
+4.00 D Lenses
+4.00
-8.00
+2.00
-6.00
+0.00
-4.00
-4.00 D Lenses
• The front curve is known as the base curve and is measured in diopters
• The sum of the front (+) and back (-) curves make the prescription
• Plus lenses have higher base curves and flatter back curves
• Minus lenses have flatter base curves and higher back curves
• Cylinder results in two separate back curves
• The Rx and lens design will determine the best base curve

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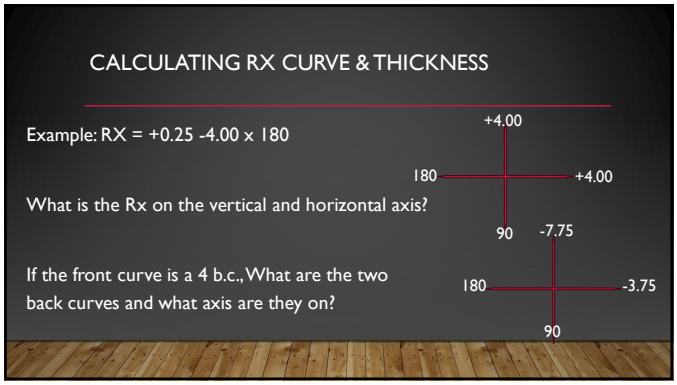
CALCULATING RX CURVE & THICKNESS
Example: RX = +0.25 -4.00 x 180
+4.00
180
+4.00
90
-7.75
What is the Rx on the vertical and horizontal axis?
If the front curve is a 4 b.c., What are the two back curves and what axis are they on?
180
-3.75
90

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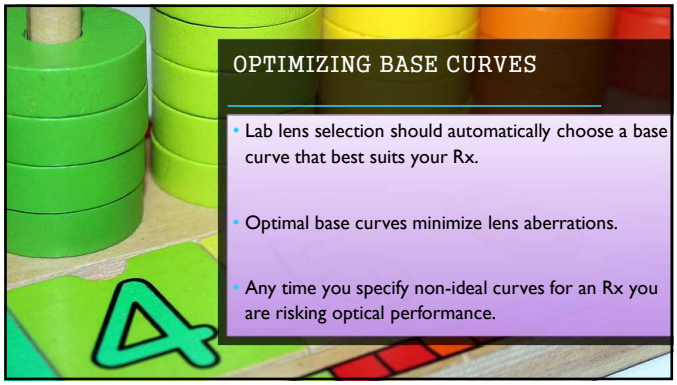
OPTIMIZING BASE CURVES
• Lab lens selection should automatically choose a base curve that best suits your Rx.
• Optimal base curves minimize lens aberrations.
• Any time you specify non-ideal curves for an Rx you are risking optical performance.
4

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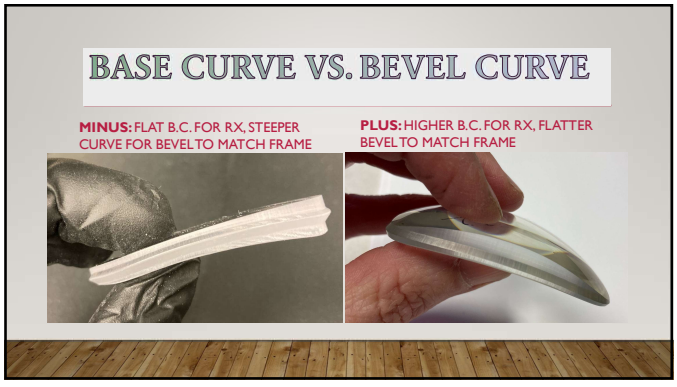
BASE CURVE VS. BEVEL CURVE
MINUS: FLAT B.C. FOR RX, STEEPER CURVE FOR BEVEL TO MATCH FRAME
PLUS: HIGHER B.C. FOR RX, FLATTER BEVEL TO MATCH FRAME

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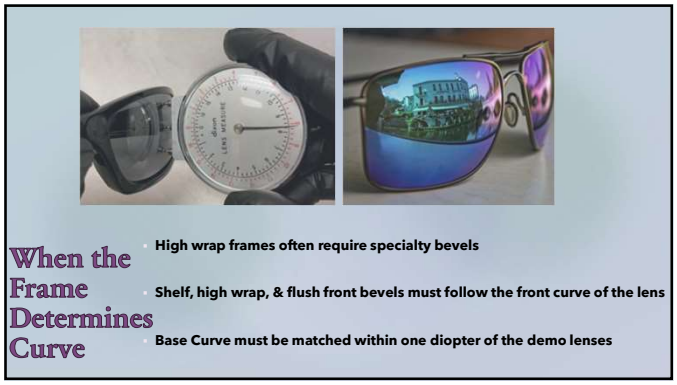
When the Frame Determines Curve
High wrap frames often require specialty bevels
Shelf, high wrap, & flush front bevels must follow the front curve of the lens
Base Curve must be matched within one diopter of the demo lenses

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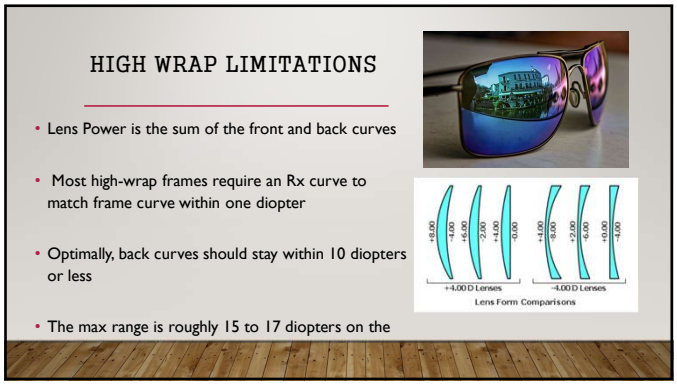
HIGH WRAP LIMITATIONS
Lens Power is the sum of the front and back curves
Most high-wrap frames require an Rx curve to match frame curve within one diopter
Optimally, back curves should stay within 10 diopters or less
The max range is roughly 15 to 17 diopters on the
+4.00 D Lenses
-4.00 D Lenses
Lens Form Comparisons

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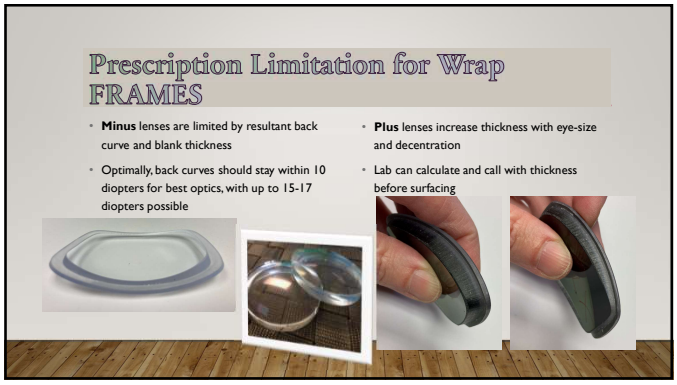
Prescription Limitation for Wrap FRAMES
Minus lenses are limited by resultant back curve and blank thickness
Optimally, back curves should stay within 10 diopters for best optics, with up to 15-17 diopters possible
Plus lenses increase thickness with eye-size and decentration
Lab can calculate and call with thickness before surfacing

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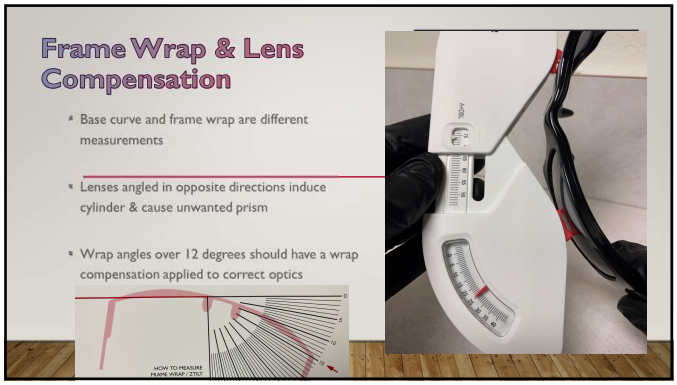
Frame Wrap & Lens Compensation
Base curve and frame wrap are different measurements
Lenses angled in opposite directions induce cylinder & cause unwanted prism
Wrap angles over 12 degrees should have a wrap compensation applied to correct optics

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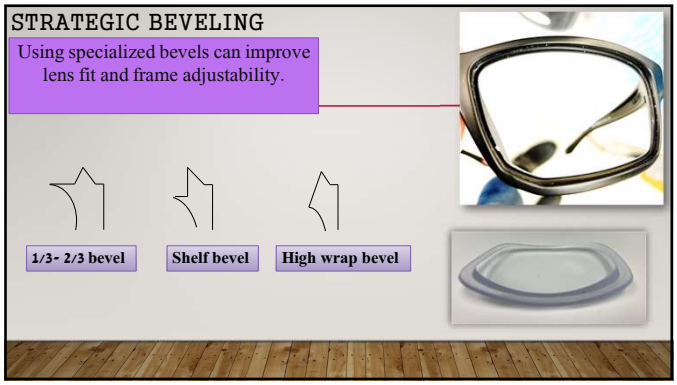
STRATEGIC BEVELING
Using specialized bevels can improve lens fit and frame adjustability.
1/3- 2/3 bevel
Shelf bevel
High wrap bevel

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Clip-ons
Please include with your frame OR note in special instructions
Bevels must be made flush-front to allow clip fit
High power lenses needing extra flat or steep curves may not be compatible

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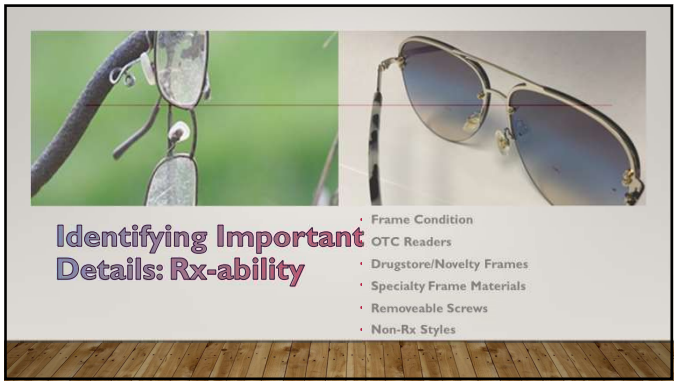
Identifying Important Details: Rx-ability
Frame Condition
OTC Readers
Drugstore/Novelty Frames
Specialty Frame Materials
Removeable Screws
Non-Rx Styles

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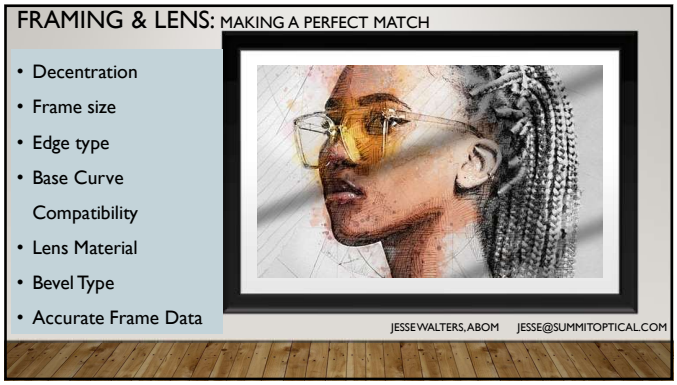
FRAMING & LENS: MAKING A PERFECT MATCH
• Decentration
• Frame size
• Edge type
• Base Curve
Compatibility
• Lens Material
• Bevel Type
• Accurate Frame Data
JESSE WALTERS, ABOM JESSE@SUMMITOPTICAL.COM

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