ABO Advanced Exam Review Domain III

1

Use of Ophthalmic Instrumentation Part I

NFOS

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Domain 3 Tasks

- Explain the use of ophthalmic instrumentation
- Analyze the utilization of dispensing information
- Determine method of fabrication and ordering
- Distinguish the uses of visual assessment instrumentation
- Apply knowledge of legal and professional requirements for equipment maintenance

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ANSI Standards

- ANSI Z80.1 Prescription Ophthalmic Lenses
- ANSI Z87.1 Occupational & Safety Eyewear

- Note on ANSI…generally viewed as "voluntary" standards….However,
  - ANSI Z80 may be a STATE requirement for Opticians
  - ANSI Z87 Adopted by OSHA, so is FEDERAL REQUIREMENT.

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THE VISION COUNCIL

QUICK REFERENCE GUIDE – ANSI Z80.1-2020

1. Tolerance on Distance Refractive Power (Single Vision, Multifocal and Power Variation Lenses with a single reference point)

Sphere Meridian Power (minus cylinder convention)	Tolerance on Sphere Meridian Power (minus cylinder convention)	Cylinder ≥ 0.00 D ≤ – 2.00 D	Cylinder > – 2.00 D ≤ – 4.50 D	Cylinder > – 4.50 D
From – 6.50 D to + 6.50 D	±0.13 D	±0.13 D	±0.15 D	±4%
Stronger than ±6.50 D	±2%	±0.13 D	±0.15 D	±4%

2. Tolerance on Distance Refractive Power (Power Variation Lenses "Progressive Addition Lenses" with more than one reference point)

Sphere Meridian Power (minus cylinder convention)	Tolerance on Sphere Meridian Power (minus cylinder convention)	Cylinder ≥ 0.00 D ≤ – 2.00 D	Cylinder > – 2.00 D ≤ – 3.50 D	Cylinder > – 3.50 D
From – 8.00 D to + 8.00 D	±0.16 D	±0.16 D	±0.18 D	±5%
Stronger than ± 8.00 D	±2%	±0.16 D	±0.18 D	±5%

3. Tolerance on direction of cylinder axis

Nominal value of the cylinder power (D)	< –0.12 D	≥ –0.12 D ≤ –0.25 D	> –0.25 D ≤ –0.50 D	> –0.50 D ≤ –0.75 D	> –0.75 D ≤ –1.50 D	> –1.50 D
Tolerance of the axis (degrees)	Not Defined	± 14°	± 7°	± 5°	± 3°	± 2°

4. Tolerance on addition power for multifocal and progressive addition lenses

Nominal value of addition power (D)	≤ 4.00 D	> 4.00 D
Nominal value of the tolerance on the addition power (D)	±0.12 D	±0.18 D

5. Tolerance on Prism Reference Point Location and Prismatic Power

The prismatic power measured at the prism reference point shall not exceed 0.33Δ or the prism reference point shall not be more than 1.0 mm away from its specified position in any direction.

6. Tolerance on Prismatic Imbalance (mounted)

Single Vision And Multifocal Lenses	Vertical	Vertical	Horizontal	Horizontal
	0.00 to ≤ ±3.375 D	> ±3.375 D	0.00 to ≤ ±2.75 D	> ±2.75 D
Tolerance	≤ 0.33Δ	≤ 1.0 mm difference in height of PRPs	≤ 0.67Δ	≤ ± 2.5 mm from specified distance interpupillary distance

https://thevisioncouncil.org/sites/default/files/ANSI%20Z80%201-2015_Quick%20Reference%20v2.pdf

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Laws Governing Opticiary

- Remember that our "RULES" that we have to follow are broken into :

1) **Laws** (passed by lawmakers and signed off on by an executive)

2) **Regulations** (rules and guidelines written to enforce or clarify laws, generally by a specific officer or department, and have the SAME legal standing, and can be enforced, just like "laws")

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Laws Governing Opticiary

- And these Laws and Regulations can be passed by:

1) Federal Gov

2) State Gov

3) Local Gov

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Laws Governing Opticiary

- **Federal Laws**
- **Federal Regulations**

- **State Laws**
- **State Regulations**

- **Local Laws and regulation (less applicable normally)**

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Example of FEDERAL LAW

- Fairness to Contact Lens Consumer Act
  - Must release CL Rx
  - Online can sell, but must verify (1 business day and is filled)
  - ENFORCED by FEDERAL TRADE COMMITTEE (FTC)

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Example of FEDERAL REGULATION

- FTC
  - EYEGLASS RULE
    - ODs and OMDs must give copy of Rx at conclusion of exam, even if not asked for
    - https://www.ftc.gov/business-guidance/resources/complying-eyeglass-rule
- FDA (food and Drug Agency)
  - Impact resistance standards 1971
    - Batch testing of plastic/resin lenses, individual drop ball testing of Glass Lenses
- OSHA (occupational Safety and Health Administration)
  - Require Eye and Face Protection on worksites when required
    - ADOPTED ANSI Z87 for these purposes

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Example of State Laws

- ALL states have laws and regulations on Optometrists, Dentists, Medical Doctors, nurses, Etc
- Some states have laws and regulations (ex licensing requirements) for Opticians
  - CT for example adopted ANSI as a STATE law for Opticians

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Other professional Requirements

- In addition to
  - Federal Laws (FCLCA, Federal Law)
  - Federal Regulations (FTC eyeglass rule, FDA impact, OSHA)
  - State laws if indicated
  - There are also OTHER requirements:

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Other professional Requirements

- It is the against the law to sell any lens other than polycarbonate or trivex lenses for children or monocular patients?
- TRUE or FALSE

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Other professional Requirements

- Actually there is generally no "law" (as far as I am aware).
- There IS, however, a legal concept called **"duty to warn"**
- in CIVIL cases, a professional can be held liable for injuries caused to another, if the practitioner had the opportunity to warn the patient of a hazard and failed to do so.

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Duty to Warn

- Optician has a duty to investigate what a patients needs are and to recommend the appropriate lens or lenses.
- IN absence of documentation, the practitioner can be held liable AND potentially revocation or action against license
- Many companies, concerned about liability, especially in minors, will set company policies to mandate using ONLY impact resistant lenses for minors, both to satisfy this "duty to warn" and to mitigate any potential liability (prevent lawsuits from injured patient, especially a child)

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- Back to ANSI

Recall that OSHA controls workplace safety (Eye and Face protection)

- Simply ADOPTED the "voluntary" ANSI Z87 standards to simplify process

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ANSI Z87

Basic Impact vs High Impact

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ANSI Z87

Basic Impact	High Impact
Z-87 markings	Z-87-2 markings (all now)
3.0 mm min CT	2.0 mm min for HI mat
	poly/trivex/tribri
	3.0 mm for all others
	CR-39, etc

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ANSI Z87

- Lens Markings:
- Upper temp corner includes:
- Manufacturer's initials
- "+" if Hi Impact Material (Poly, etc)
- Add'l
  - V for Variable
  - S for Special Purpose
  - etc

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ANSI Z87+

- 1/4" Steel Ball at 150 Feet/Second
- Lens Thickness: 2.0mm.
- Lens Markings: Sandblasted manufacturer's I.D. and "+"
- All Frames, Basic or High Impact must meet High Impact Standards
- Frame Markings: Front - A, DBL, Z87-2 or Z87-2+, Manufacturer's I.D. Temples - Length, Z87-2 or Z87-2+, , Manufacturer's I.D. On one temple

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Table 3. Marking Requirements

Type of Mark	Lenses & Replacement Lenses		Frame[1]	Marking for Complete Device (no replaceable components)[2]
	Spectacles	All Other		
All protectors shall bear the markings below.				
Manufacturer's Mark or Logo	Yes	Yes	Yes	Yes
Standard				
Plano, Readers, Magnifiers		**Z87**	**Z87**	**Z87**
Rx		**Z87**	**Z87-2**	**Z87-2**
Coverage (small head sies)[3]	**H**		**H**	
The following shall be required only when claims of impact rating, a specific lens type and/or use are made by the manufacturer.				
Impact Mark				
Impact Rated Plano, Readers Magnifiers	+	**Z87+**	**Z87+**	**Z87+**
Impact Rated Rx	+	**Z87+**	**Z87-2+**	**Z87-2+**
Relaxed Optical Level[6]	**O2**	**O2**		**O2**
Lens Type				
Clear				
Welding Filter (see table 7)[5]	**W** *shade*	**W** *shade*		**W** *shade*
UV Filter (see table 8)[4]	**U** *scale number*	**U** *scale number*		**U** *scale number*
IR Filter (see table 9)[4]	**R** *scale number*	**R** *scale number*		**R** *scale number*
Visible Light Filter (see table 10)[4]	**L** *scale number*	**L** *scale number*		**L** *scale number*
Variable Tint	**V**	**V**		**V**
Special Purpose Lenses	**S**	**S**		**S**
Anti-Fog	**X**	**X**		
Use				
Splash / Droplet			**D3**	**D3**
Dust			**D4**	**D4**
Fine Dust			**D5**	**D5**

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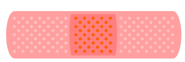
OSHA: Occupational Safety and Health Administration

- Federal agency charged with regulating safety practices in the work place and in educational settings.
- OSHA has adopted the Z-87.1 standards making them a federal requirement.



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FDA: Food and Drug Administration

- Began mandating impact resistance of ophthalmic lenses in 1971.
- Plastic and others can be "batch" Tested
- Glass ALL have to be
  - Tempered:
    - Either Heat or Chemically
  - Drop Ball Tested

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FDA: Food and Drug Administration

- Glass Drop Ball Test:
- Lenses must be capable of passing Drop-Ball Test:
  - 5/8"steel ball,
  - .56oz,
  - Height of 50 inches
  - Safety Glass, 3.0 = 1.0" steel ball
- Records must be keep three years after purchase.

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FDA: Food and Drug Administration

- Glass drop ball exceptions:
  - Prism Segment Multifocal
  - Slab Off
  - Lenticular Cataract,
  - Iseikonic
  - Depressed segment one-piece multifocal
  - Biconcave
  - Myodisc and minus lenticular
  - Custom laminate
  - Cemented assembly lenses

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FTC: Federal Trade Commission

- Established to prevent unfair business practices.
- Eyeglasses I and Eyeglasses II investigational studies.
- Doctor must give the patient a copy of their prescription immediately after the exam.

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The Art and Science of Eyewear Fabrication

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The Art and Science of Eyewear Fabrication

- Apply formulae used in the manufacture of eyewear.
- Describe the capabilities and limitations of conventional and digital surfacing.
- Explain the lens blank selection process.
- Describe factors that affect lens curves and thickness.
- List the steps from surface layout to finished lens edging.
- Apply verification standards in compliance with ANSI and federal regulations.

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Lens Fabrication

- Base Curves
- Boxing System
- Minimum Blank Size
- Optical Cross
- Transposition

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Lens Designs

Single Vision
- Spherical
- Aspheric
- Atoric

Bifocals

Progressive Addition Lenses

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Prescription to Lens Blank

- Material
- Minimum Blank Size
- Vertex Power Compensation
- Resultant Prism
- Nominal Power
- Sagittal Depth Formula
- Thick Lens Back Vertex Power

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History of Spherical Lens Design

- Biconvex
- Biconcave
- Plano Convex
- Plano Concave
- **Meniscus**

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Aberrations

Chromatic VS monochromatic

Chromatic

Chromatic Abberation

Dispersion of white light into individual colors

Through prism

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Aberrations

More dispersion for some materials than others

Inverse of the amount of Dispersion = abbe

Therefore, for Abbe, HIGH number is less dispersion

Low number is MORE dispersion

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Abbe Value

White light is composed of the visible spectrum of wavelengths each corresponding to a different color. When light enters a prism it is bent toward the base of the prism

Shorter wavelengths (e.g., violet) are bent at a greater angle than longer wavelengths (e.g., red)

Since a lens can be likened to two prisms (apex to apex for a minus lens and base to base for a plus lens), light passing through a lens has a tendency to separate into its respective colors as its varying wavelengths are focused at differing points.

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Index of Refraction and Abbe Value

MATERIAL	INDEX	ABBE VALUE
Crown Glass	1.523	59
High Index Glass	1.60	42
High Index Glass	1.70	39
Plastic CR-39	1.49	58
Mid Index Plastic	1.54	47
Mid Index Plastic	1.56	36
High Index Plastic	1.60	36
High Index Plastic	1.66	32
Trivex	1.53	43
Polycarbonate	1.58	30

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Aberrations

Chromatic aberration is a function of MATERIAL

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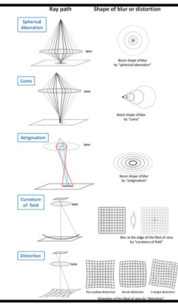
Achromatic Abberations



- 5 seidel abberations
  - Spherical Abberation
  - Coma
  - Marginal/Oblique Astigmatism
  - Curvature of Field
  - Distortion

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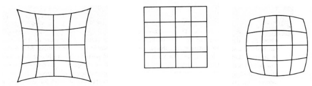
Achromatic Abberations

- 5 seidel abberations
  - Spherical Abberation
    - Not generally a big deal due to pupil size
  - Distortion



Pincushion
Plus lenses

Barrel
minus lenses

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Base Curves

Flatter Base Curves
Less Magnification
Thinner lenses

Steeper Base Curves
More Magnification
Thicker lenses

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Corrective Curve or "Best Form" Lens Theory

- Tscherning Ellipse
  - Best Base Curve to eliminate **Marginal** or **Oblique Astigmatism**

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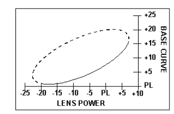
Tscherning Ellipse

- A graphical representation of the front surface power as a function of the total lens power in best-form lenses.
- There are two possible solutions, those that are least curved and those that are most curved.



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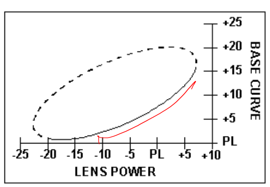
Tscherning Ellipse: Oswalt Branch

The least curved portion is called the Oswalt Branch.



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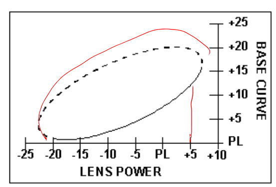
Tscherning Ellipse: Wollaston Branch

The most curved portion of the ellipse is called the Wollaston Branch.



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Corrected Curve Theory

- Different curves were needed to suit different families of Rx's.
- Proper matching would result in "Best Form" lenses with minimal aberrations.

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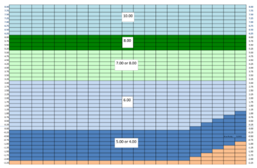
Corrected Curve Theory



- Different curves were needed to suit different families of Rx's.
- Proper matching would result in "Best Form"
- lenses with minimal aberrations.

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Choosing an Appropriate Base Curve

Higher Plus = STEEPER Base/Front Curves

Higher Minus = FLATTER Base/Front Curves

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Vogel's Formula

Choosing an Appropriate Base Curve

For Plus Lenses :

BC = SE +6.00

For Minus Lenses :

BC = (SE +6.00) / 2

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Vogel's Formula

Example: Rx +3.75 -1.50 x 90 = +3.00

BC = SE +6.00

SE = +3.00

Base Curve = +3.00 +6.00 = +9.00

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Example

- Example 2 : Rx -3.00 - 1.00 x 90

BC = (SE +6.00) / 2

Spherical Equivalent = -3.50

BC = (-3.50/2)+6.00 =

+4.25

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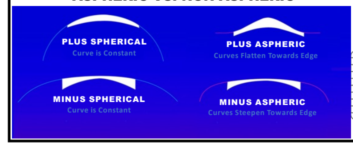
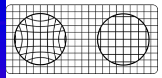
Aspheric Curves

Instead of a single radius of curvature (same curve throughout surface of the lens), changes towards periphery of lens

ASPHERIC VS. NON-ASPHERIC





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Aspheric Curves: Three main uses

1. Optical Aberration Control
   - Improved off center optics for Rx's > +7.00 or -23.00D than spherical base curve
2. Cosmetic:
   - Allows the use of flatter base curves while maintaining good optics.
3. Power Changes:
   - Used for progressive addition lenses.

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Aspheric Lenses

- Non-spherical surface that gradually changes in curvature from the center of the lens toward the edge
- Delivers the peripheral clarity of a "Best-Form" lens with a flatter profile.
- With high index, up to 25% thinner and 30% lighter

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Aspheric vs Best Form Lenses

+4.00 D Lens Design Comparison*	Best Form Lens	Flat Lens	Aspheric Lens
Front Curve	9.75 D	4.25 D	4.25 D
Center Thickness	6.6 mm	5.9 mm	5.1 mm
Weight	20.6 grams	17.7 grams	14.8 grams
Plate Height	13.7 mm	6.0 mm	5.1 mm
Rx off-axis	+3.78 DS	+5.18 DS -0.99 DC	+3.77 DS

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Aspheric Advantages:

Plus Lenses:
- Reduced lens thickness
- Less bulge for Plus Rx's
- Less magnification for plus Rx's

Minus lenses
- Less minification for minus
- Lenses look and stay better in frames.
- More frame choices.
- Improved peripheral vision

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Aspheric Lens Limitations

- Aspheric lenses, like spherical lenses, can be optimized for only one lens power. Each lens requires one of two unique base curves to deliver optimum optical performance in the periphery.

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Manufacturing

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Prescription to Lens Blank

- Material
- Minimum Blank Size
- Vertex Power Compensation
- Resultant Prism
- Nominal Power
- Sagittal Depth Formula
- Specular Magnification

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Minimum Blank Size

$$MBS = ED + (2 \text{ x Mono Dec})$$

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Minimum Blank Size:

MBS = ED + 2 x Decentration

Example: A=54 DBL=18 P.D.=64 ED=58

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Minimum Blank Size:

MBS = ED + 2 x Decentration

Example: A=54 DBL=18 P.D.=64 ED=58

A + DBL = GCD or Frame PD
54 + 18 = 72

GCD - P.D. divided by 2 = decentration per eye

72 - 64 = 8/2 = 4mm in per eye

ED + 2 x Dec. = MBS

58 + 2 x 4 = 66mm

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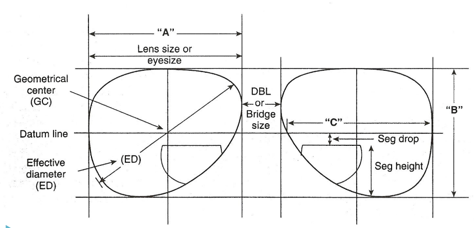
Boxing System



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Nominal Power Formula (Thin Lens)

$$F_T = F_1 + F_2$$

- F_T = The effective, vertex or lensometer power of the lens in diopters
- F_1 = The power of the front curve (BC) in diopters
- F_2 = The power of the back surface power in diopters

- Example:
  - Front surface (BC) = +6.00D
  - Back Surface = -4.00D
  - Nominal Power = +6.00 + (-4.00) = +2.00D

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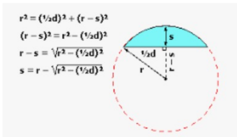
Sagittal Depth Formula (Lens Thickness)



www.Opticampus.com

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Sagittal Depth Formula Example

5-12. A surface made of polycarbonate has a true power of –6.00D and a diameter of 60 mm. What is the sag of the surface?

n = 1.586

r = (n – 1)/D = (1.586 – 1)/(6)

= 0.0977 m = 97.7 mm

d = 60

$$\text{sag} = r - \sqrt{r^2 - \left(\frac{d}{2}\right)^2}$$

$$\text{sag} = 97.7 - \sqrt{97.7^2 - \left(\frac{60}{2}\right)^2}$$

$$\text{sag} = 97.7 - \sqrt{9545.29 - 900} = 97.7 - \sqrt{8645.29}$$

$$= 97.7 - 93.0 = \mathbf{4.7\ mm}$$

$$\text{Sag} = \frac{n-1}{D} - \sqrt{\left(\frac{n-1}{D}\right)^2 - \left(\frac{d}{2}\right)^2}$$

$$\text{Sag} = \frac{(d/2)^2 x D}{2000\,(n-1)}$$

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Sagittal Depth Formula (Lens Thickness)Example

5-18. What is the approximate edge thickness of a –6.00D polycarbonate lens, n = 1.586, if the center thickness is 1.5 mm and the lens diameter is 60 mm?

EDGE THICKNESS = SAG + CENTER THICKNESS

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

$$\text{sag} = \frac{(30)^2 6.00}{2000(0.586)} = 4.6\text{ mm}$$

EDGE THICKNESS = 4.6 mm + 1.5 mm = 6.1 mm

In Example 5-13 the exact formula gave us 6.2 mm for this edge thickness in a flat form lens, and Example 5-14 gave an edge thickness of 6.5 mm for the same lens made on a +3.00 base curve.

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Sagittal Depth Formula (Lens Thickness)

- Thickness = Radius² x Power
- 2000 (n – 1)
  - N = Index of refraction of lens material used
  - Thickness is mm
- Step # 1 Decentration x 2 + ED
- Step # 2 Radius = ½ of amount in Step # 1
- Step # 3 Calculate thickness using formula
- Step # 4 Add minimum thickness to answer (1.5 to 2.0mm)

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Sagittal Depth Formula (Lens Thickness)Example

- Rx = -5.00 A= 54 DBL = 20 Frame GCD = 74 ED = 62mm
- Mono P.D. O.D. = 30mm Material = CR-39 Index 1.49
- Thickness = Radius² x Power
- 2000 (N – 1)
- Step # 1 54 + 20 = 74/2 = 37- 30 = 7 x 2 + 62 = 76mm
- Step # 2 Radius = ½ of amount in Step # 1 = 38mm
- Step # 3 Calculate thickness using formula
- Thickness = 38² x -5.00 = 1444 x 5 = 7220 = 7.36mm
- 2000 (1.49 – 1) 2000 x .49 980
- Step # 4 Add minimum thickness to answer (1.5 to 2.0mm)

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Specular Magnificatioı

6-4. What is the spectacle magnification for each of the lenses in the prescription below, and what is the difference in magnification percent for the two lenses?

The Rx is: +1.50

+4.50

The glasses fit at 12 mm. The lenses are made of CR-39, n = 1.498, BCs +6.25 and +9.25.

Use of calipers on the completed lenses shows thicknesses of 3 mm and 5 mm.

OD:

$$SM = \frac{1}{1-\left(\frac{t}{n}\right)D_1} \times \frac{1}{1-hD}$$

$$SM = \frac{1}{1-\left(\frac{0.003}{1.498}\right)(+6.25)} \times \frac{1}{1-(0.015)(+1.50)}$$

$$SM = \frac{1}{1-0.0125167} \times \frac{1}{1-0.0225}$$

SM = (1.01268)(1.02302) = **1.036**

%SM = (SM – 1)100 = (1.036 – 1)100 = **3.6%**

OS:

$$SM = \frac{1}{1-\left(\frac{t}{n}\right)D_1} \times \frac{1}{1-hD}$$

$$SM = \frac{1}{1-\left(\frac{0.005}{1.498}\right)(+9.25)} \times \frac{1}{1-(0.015)(+4.50)}$$

$$SM = \frac{1}{1-0.0308745} \times \frac{1}{1-0.0675}$$

SM = (1. 03186)(1. 07239) = **1.107**

%SM = (SM – 1)100 = (1.107 – 1)100 = **10.7%**

The right lens has 3.6% magnification, and the left lens has 10.7% magnification. The wearer has a magnification difference of 10.7 – 3.6 = **7.1%**.

If the wearer has good vision in each eye when corrected, this person might have a problem with fusion.

What can be done to decrease the 7.1% magnification difference?[1]

t = thickness of the lens in meters

n = index of refraction of the lens material

D_1 = base curve (BC) or front surface power of the lens

D = actual power of the lens

h = vertex distance + 3 mm, converted to meters

RULES FOR SPECTACLE MAGNIFICATION

	PLUS LENS	MINUS LENS
Increase BC	More magnification	Less minification
Increase t	More magnification	Less minification
Increase VD	More magnification	More minification

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Fabrication And Verification

NFOS

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Surfacing Choices

- Conventional Surfacing
- Digital Surfacing

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Conventional Surfacing

- Spherical, Toric
- Calculations
- Layout
- Blocking
- Generating
- Fining
- Polishing

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A Basic Surfacing Lab

- Layout Computer
- Marker
- Surface Tape
- Blocker
- Generator
- Cylinder Machine
- Laps
- Lens Inventory

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Calculations

- Frame Measurements
  - MM Rule
  - "C" Gauge
- Frame Tracing Unit
- Software

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Data Input : Tracer

- One or Two Eyes
- Number of Points
- Software
- Display

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Tracing Points

- A database of frame information and trace files that allow optical laboratories to select a lens blank and begin surfacing without having the actual frames

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Inventory

- Lens Materials
- Lens Coatings
- Lens Tints
- Blank Sizes
- Prescription Range

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Sag Gauge

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Data Input

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Layout

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Blocking

- Tape
- Alloy ,Wax or Thermoplastic

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Generator


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Fining and Polishing




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Basic Surfacing Lab

84

Automated Surfacing Lab

85

Surfacing

- In conventional surfacing, a generator grinds away plastic on back of lens creating rough surface
- Final Rx on back surface is produced by rubbing against an aluminum tool and pad in fining and polishing steps


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Surfacing

Grinding Curve Questions:

IF you have a -3.00 -2.00 x 180

Given a lens with a +3.00 Base Curve

- Transpose Rx:
- What are Grinding Curves
- What is Power at 180?
- What is power at 90
- Type of Astigmatism
- Orientation of Astigmatism

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Digital Surfacing or Free Form Machining

- A natural diamond cutting tool produces a very smooth surface that requires only light polishing to create transparency

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Digital Surfacing or Free Form Machining

- Each lens may require over 10 million calculations to generate the data file for the free forming machine to create the lens' surface
- The computer lens design is exact. Several companies use the same machinery. It is each company's computer program that determines the end product

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Schneider HSC 100

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Free Form Machining

- Create the Following Curves on the back of lens
  - Spherical
  - Aspheric
  - Atoric
  - Progressive
  - Other?
    - Slab off
    - Round/blended on back side
    - etc

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Wrap Around Sunglasses

- Frame requires approximately
- +8.00 or higher Base Curve
  - Remember that BEST optics are on a SPECIFIC designed base curve (Tsherning's Ellipse)….Artificially increasing BC will affect optics

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Rx Wrap Sunglasses

- Oakley
- Costa Del Mar
- Maui Jim
- Bolle'

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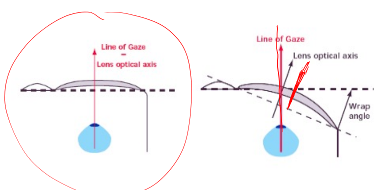

By increasing WRAP, will INCREASE Base OUT prism

To counter, will have to ADD BI to counteract

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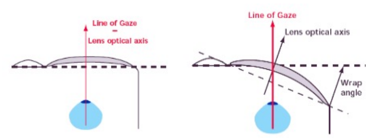

Will also change Sphere Power and change Cylinder Power

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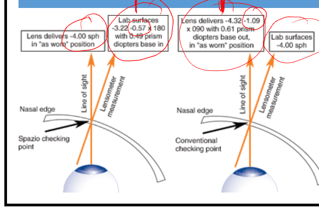
Correction for Wrap Rx Lenses



- Must:
  - Add BI
  - Reduce Sph Power
  - Add WTR Cyl to counteract ATR that is created

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Finishing Lab

- Lens Layout
- Blocking
- Tracing (prev used Patterns)
- Edging
- Grooving (semi rimless)
- Drilling (rimless)
- Polishing/Tinting (optional)
- FINAL INSPECTION

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Inspection & Verification

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Auto Lensmeter

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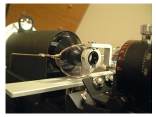
Lens Verification

1. Focus the Eyepiece
2. Check distance prescription with convex surface facing operator and concave against the lens stop.
3. Always start with the lens with the most power in the vertical meridian
4. Prism: The target is always displaced in the direction of the base.
5. Check add power with the concave surface facing the operator.



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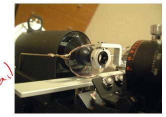
Lens Verification

Prism: The target is always displaced in the direction of the base.

Very important



Thomasneff100@gmail

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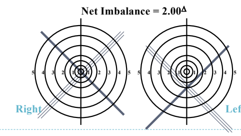
Verifying Prism

- Target Displaced in Direction of Base
- Auxiliary Prisms over 5.00 Prism Diopters



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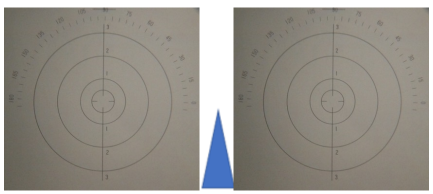

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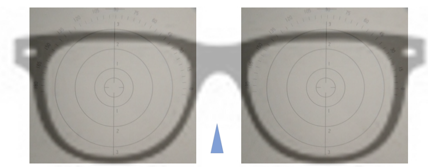

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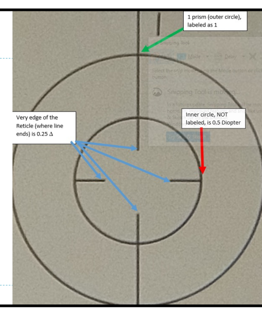

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- If you are given a +5.00 and center the lens in the Lensometer (at the Optical center).
- Assume this is an OD
- NOW MOVE THE LENS IN 4 mm.
- What is the prism?
- Where are the mires found in the lensometer?

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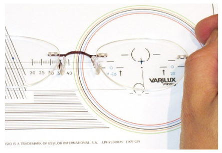
Verification: Progressives

- Remark Lenses



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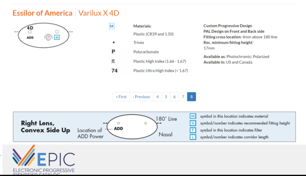
Identifying the Lens

- Locate all markings
- The Vision Council Electronic Progressive Lens Identifier
- Shows picture of each type of progressive lens with all hidden markings.



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Verification: Progressives

- Locate laser-engraved circles and add power.
- Confirm monocular Pd. and fitting height
- Check distance power
- Check prism at O.C./P.R.P., unless prescribed, prism should be equal in each lens(Prism used for thinning should equal 2/3 the add power)

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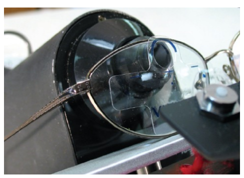
Verification: Progressives

- Check Distance RX through Distance Verification Circle



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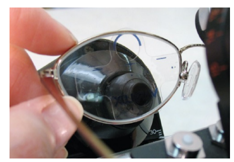
Verification: Progressive Add Power

- For Front Surface PAL, Verify with CX Surface against Lens Stop.
- For Back Surface PAL, Verify with CC Surface against Lens Stop.



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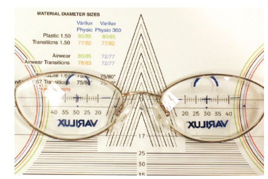
Verification: Progressives

- Monocular P.D.
- Fitting Height



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