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New York State Continuing Education Mail-In Course

Got Standards?

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Yet another ANSI for dress eyewear has been approved! Your daily work life as an optical dispenser requires use of ANSI Standards in one sense or another. Without knowing (or referring) to these standards, it is impossible to provide quality eyewear that customers will be able to correctly see through. This article will present the key areas in the 1999 ANSI Z80.1 Prescription Ophthalmic Lenses – Recommendations. Keep in mind that there are also standards for safety eyewear, contact lenses, frames and sun lenses to name a few. These standards as well as Z80.1 can be obtained by calling Global Engineering Documents at 1-800-854-7179.

REFRACTIVE POWER TOLERANCE

The former Z80.1 – 1995 standard stated tolerances for sphere meridian, cylinder meridian and cylinder. Cylinder meridian is the difference in power between the sphere and cylinder. There are times when the sphere AND cylinder power could actually be off only +/- 0.12, yet creating a cylinder power difference of 0.25. In the former Z80.1 standards, this would not have been acceptable.

Example: Rx -5.50 -0.75 x 90 Upon verification,
Rx: -5.62 -0.87 x 90

This would NOT have been acceptable, as the total power that was ordered for each meridian was: -5.50 and -6.25, yet the lens verified has total powers of -5.62 and -6.50. The difference between -6.25 and -6.50 was an unacceptable 0.25.

Not only was this a difficult concept for many labs and dispensers to utilize, it resulted in higher lens rejections from surfacing laboratories. Thankfully, the 1999 standards have gone back to a tolerance applied only to the sphere power and cylinder power – not the cylinder meridian power. One note on this however, the

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sphere power now having the tolerance applied is the meridian of highest absolute power.

Example: Rx -3.00 -1.00

The highest absolute power to be verified is -4.00

Rx -3.00 +1.00

The highest absolute power to be verified is -3.00

Rx +3.00 -1.00

The highest absolute power to be verified is +3.00

Rx +3.00 +1.00

The highest absolute power to be verified is +4.00

The tolerances for sphere (meridian of highest absolute power) and cylinder powers are in the table below:

Absolute Highest Power	Tolerance on Highest Power	Cylinder 0.00 to 2.00	Cylinder 2.12 to 4.50	Cylinder over 4.50
From 0.00 to +/- 6.50D	+/- 0.13D	+/- 0.13D	+/- 0.15D	+/-4%
Above +/-6.50D	+/- 2%	+/- 0.13D	+/- 0.15D	+/-4%

Three examples of the table are below:

Example 1

Rx ordered: +3.25 -1.00 x 45

Verified Rx: +3.12 -1.12 x 45

(Continued on Page 2)

This Rx passes since the cylinder error of -0.12 D is within the tolerance of +/- 0.13 D, and the meridian of highest power ordered (+3.25) is within the +/- 0.15 D of the meridian of the highest power produced (+3.12).

Example 2

Rx ordered: -1.75 -1.25 x 125
 Verified Rx: -1.87 -1.37 x 125

This Rx fails since the cylinder error of -0.12 D is within the tolerance of +/- 0.13 D, but the meridian of highest power ordered (-3.00) is outside of the +/- 0.13 D of the meridian of the highest power produced (-3.25).

Example 3

Rx ordered: -7.75
 Verified Rx: -8.00

This Rx passes since 2% of 7.75 D is .31 D; therefore the Rx can be off 0.25 D!

CYLINDER AXIS TOLERANCE

The location of AXIS is as important as the power in each meridian. While some customers are more tolerant to axis location than others, we still need to be scrupulous when verifying the end result and comparing it to ANSI.

The tolerance for cylinder axis is in the table below:

Cylinder Power	Up to 0.37D	0.50-0.75D	0.87-1.50D	1.62 & above
Tolerance of axis (degrees)	+/- 7 degrees	+/-5 degrees	+/-3 degrees	+/-2 degrees

Two examples of the table are below:

Example 1

Rx ordered: +3.50 -1.50 x 65
 Verified Rx: +3.50 -1.50 x 62

This Rx passes, since the axis is off 3 degrees, and that is allowable with a cylinder power of 1.50 D.

Example 2

Rx ordered: -2.75 -0.75 x 140
 Verified Rx: -2.75 -0.62 x 146

This Rx fails, since the cylinder power of 0.62 is acceptable according to ANSI yet the axis is off 6 degrees, and only 5 degrees off axis is allowed with a cylinder power of 0.75 D.

It is easy to see that any lens is allowed to be off 2 degrees according to ANSI, yet we have all had customers who are even more finicky than that!

ADD POWER TOLERANCE

This ANSI specification is rather easy. Add powers up to + 4.00 D are only allowed a tolerance of +/- 0.12 D. Add powers over +4.00 D are allowed to be off by +/- 0.18 D. Again, this still limits us to +/- 0.12 D, as +/- 0.25 D is beyond the limit in this case.

Example:

Add ordered: +3.50
 Add verified: +3.25

This is unacceptable to ANSI, as only 0.12 D off is allowable.

PRISMATIC POWER TOLERANCE

Unmounted Lenses:

The prismatic tolerance is 0.33 prism diopters as measured at the Prism Reference Point. 1.0 mm error in prism reference point placement is allowed. It is important to remember that prism thinning prism is considered to be prescribed prism as well. Be sure to note and verify amounts of prism thinning used on all progressive lens orders.

Mounted Lenses:

There is NOT an individual prism tolerance for mounted lenses. Instead, the ANSI tolerance for prism is applied with consideration to prism imbalance. Prism imbalance is measured at the Prism Reference Point. When there is no prescribed prism, this point is called the optical center.

The tolerance for prism imbalance is given in the tables below:

Single Vision and Multifocal Lenses

Power of the Horizontal Meridian	Tolerance
0.00D to +/- 2.75D	0.67 prism diopters
Above +/- 2.75D	2.5mm total

Progressive Lenses

Power of the Horizontal Meridian	Tolerance
0.00D to +/- 3.37 D	0.67 prism diopters
Above +/- 3.37D	1.0mm per eye

All Lens Styles

Power of the Vertical Meridian	Tolerance
0.00D to +/- 3.37D	0.33 prism diopters
Above +/- 3.37D	1.0mm total

Note that tolerances for low power lenses are specified in prism diopters while tolerances for higher power lenses are specified in millimeters.

Examples of the tables are below:

Example 1

Rx ordered: OD +5.75 sph
OS +6.00 sph PD's: 30/31

Verified Rx: OD +5.75 sph
OS +5.87 sph PD's: 29/33

This example is acceptable to ANSI Z80.1. When the power is above 3.37 D and monocular PD's are specified, the monocular PD's are to be added together to obtain a binocular PD and compared to the standard of 2.5 mm tolerance. In this instance, the PD's ordered binocularly were 61, and the verified PD's are 62 (within the 2.5 mm tolerance).

It is urged however, that you maintain high standards yourself! It is still an important consideration to verify each eye monocularly and apply any misplacement of the Prism Reference Point to Prentice's Law. For the example given above:

+5.75 D off 1 mm creates .57 diopters of prism!
+6.00 D off 2 mm creates 1.2 diopters of prism!

While prism imbalance is the key concern here, it should still be noted that each eye might actually have a considerable amount of unwanted prism present. When these two amounts of prism are added together (using the rules of adding prism) there is 0.62 diopters of prism imbalance. Each lens will deviate light according to the amount of prism created by improper Prism Reference Point placement, yet it is the imbalance that will create havoc with an individual's vision. Using Prentice's Law to detect actual amounts of prism present in improperly made lenses will allow the dispenser to determine whether perhaps only one lens replacement will improve the situation.

Example 2

Rx ordered: -2.00 PD: 29
Verified Rx: -2.00 PD: 32

For low-powered lenses, a prism imbalance of +/- 0.67 prism diopters is allowed. Using Prentice's Law, a 2.00 D lens off 3 mm creates 0.6 diopters of prism, therefore allowable by ANSI. Remember, we are told to add monocular PD's together for a combined total of 0.67 diopters of prism imbalance. This is different for comparing lenses monocularly in days gone by.

Example 3 (Vertical prism imbalance)

A +5.00 D lens with a prism reference point specified at 20 mm high can actually have a height of 19 to 21 mm high according to ANSI. Additionally, since the tolerance indicates that the combined total cannot exceed 1.0 mm, the left eye and right eye must be within 1.0 mm of each other.

Checking for vertical prism imbalance must be done carefully on a focimeter (lensmeter). One of two methods can be used: dotting the Prism Reference Point per eye and then measuring any difference between the two lenses, or setting the stage of the focimeter to a height predetermined vertically and dotting the two lenses at this point, looking for discrepancy in the targets seen through the eyepiece. Once again, it is important to note here that YOUR tolerance can be higher than ANSI, remembering that vertically – individuals cannot tolerate as much prism imbalance.

SEGMENT AND FITTING CROSS TOLERANCES

The table below gives the information on horizontal and vertical segment/fitting cross specifications. The centration requirements are the same as the 1995 version, with one exception. There is a new requirement for horizontal location of fitting crosses in progressive lenses.

Lens Style	Horizontal	Vertical	Pair
Conventional Multifocals	Segment centers must be within +/-2.5mm from binocular near PD	Segment height must be within +/-1.0mm from prescribed segment heights	Pair Segment heights must be within 1.0 mm of each other
Progressives	Fitting cross must be within +/-1.0mm from monocular distance PD's (no specification for near PD's)	Fitting cross must be within +/-1.0mm from prescribed fitting cross height	Fitting cross heights must be within 1.0 mm of each other

Notice that there is no recommendation for checking near PD's with progressive lens types. It is the distance monocular PD that must be verified and meet a 1.0 mm tolerance.

Example:

Progressive distance PD's ordered: 32/33
Verified distance PD's: 33/33

This situation meets ANSI tolerance for a +/- 1 mm deviation from distance PD requested.

SEGMENT TILT

Conventional multifocals having a segment with a straight top shall not have a tilt of the horizontal axis exceeding 2 degrees. Progressive addition lenses should use the permanent markings found on the lens, and shall not have a tilt of this horizontal axis exceeding 2 degrees.

While this seems difficult to measure there are devices available that allow a pair of eyeglasses to be

placed upon it with ability to visualize the straightness of segment alignment when compared to a series of horizontal line markings.

IMPACT RESISTANCE

The manufacturer may certify laminated, plastic and raised ledge multifocals that may be damaged by impact test procedures. All glass lenses (not laminated) shall be drop-balled.

Keep in mind that the drop-ball is a 5/8 inch steel drop-ball. This ball must drop 50 inches upon the lens being tested. Records indicating this procedure was completed must be maintained for six years. This drop-balling and record maintenance is the one "law" that lens fabricators must adhere to. The individual considered being the lens fabricator is the last person that handles any of the lens fabrication procedures: safety beveling, drilling, grooving, heat-treating, etc.

While there is not a recommendation for minimum lens thickness any longer, all lenses must pass drop-ball requirements. All plastic lenses will be batch tested and certified by the manufacturer, unless the lens is ground less than 2.0 mm. If the plastic lens is less than 2.0 mm, the fabricator is then responsible for drop-balling that lens.

CONCLUSION

While it is important to know these ANSI Z80.1 Standards and how to apply them, it is even more important that the dispenser is ethical about using these standards. I have always maintained this thought: ANSI Standards are only recommendations that our optical world has agreed to in the United States. They give us a framework to live by, however, there is nothing stating that your standards can't be higher! Pride must be taken in the eyewear that our customers leave our office with. After all, isn't our most important task giving our customers the best possible vision through their eyewear?

*A very big thank you to OLA Member Update,
March 9, 2000, for clarifying many of these standards.*

New York State CEC Mail-In Course

#00-75

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Got Standards?

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Name: _____ License #: _____

Mailing Address _____

NYSSO Member: Yes No **If no, the registration fee is \$30.00; please complete the section below and the membership application on the reverse side:**

Method of Payment: Check (payable to NYSSO) Credit Card (please complete section below):

Type of Credit Card: Visa Mastercard Dollar Amount _____

Expiration Date: _____ Card #: _____ Signature: _____

For each question indicate (with a YES or NO) whether the situation is acceptable to ANSI Z80.1 (1999).

- | | | | | | |
|---|-----|----|--|------|-------|
| 1. A +11.75 -2.75 x 80 was ordered, and returned as +11.62 -2.75 x 82. | YES | NO | 9. Fitting heights for progressive lenses were ordered as: 24.5 & 25
Upon verification, they were found to be: 25 & 25 | YES | NO |
| 2. A -2.25 -1.25 x 155 was ordered, and returned as -2.25 -1.50 x 154. | YES | NO | 10. Rx: -5.00 -1.75 x 120
The highest absolute power is:
A. -3.25 B. -5.00 C. -6.75 D. -7.75 | | |
| 3. A -5.62 -2.37 x 43 was ordered, and returned as -5.75 -2.50 x 45. | YES | NO | 11. Rx: +9.00 -0.75 x 30
The highest absolute power is:
A. +8.25 B. +9.00 C. +9.75 D. 30 | | |
| 4. A -9.50 -4.75 x 113 was ordered, and returned as -9.50 -4.50 x 112 | YES | NO | 12. This article overviews which standard?
A. Z80.1 1995 B. Z87 1999
C. Z80.1 1999 D. Z807 1999 | | |
| 5. An add power of +3.00 was ordered, and returned as +2.87. | YES | NO | 13. A plastic lens ground less than 2.0 mm must be drop-balled by the lens fabricator. | True | False |
| 6. An OD -4.00 sph was ordered with 2.5 prism diopters Base Out, and returned with 2.75 prism diopters Base Out. (Hint: use Prentice's Law to see how many mm off the Prism Reference Point would be in this instance). | YES | NO | 14. When there is prism prescribed for a lens, the point in the lens where all criteria of the prescription is perfectly met is called the optical center. | True | False |
| 7. OD -7.50 5 prism diopters Base Up
OS -8.25

Upon verification the Prism reference points were dotted with 2.5 prism diopters

Base Up in the OD and 2.5 prism diopter Base Down in the OS. Using a mm ruler, these dots were found to be 2.0 mm off from each other vertically. | YES | NO | 15. In New York State all dispensers of eyewear are required by law to meet ANSI Z80.1 Standards prior to dispensing the eyewear to a customer. | True | False |
| 8. Progressive lenses of +4.00 sph were ordered. Upon verification, the OS optical center was found to be 2.0 mm higher than the right. | YES | NO | | | |

Membership Application

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HOME ADDRESS _____ FAX # _____

BUSINESS ADDRESS _____ EMAIL ADDRESS _____

PHONE (HOME) _____ PHONE (BUSINESS) _____

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Membership Type: Active (\$150) Newly Licensed-Active (\$75) Associate (\$75)
 (see below for category descriptions) Corporate (\$150) Student (\$10)

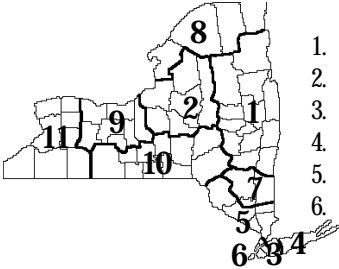
Method of Payment: Check (payable to NYSSO) Credit Card (please complete section below) 

Type of Credit Card: Visa Mastercard Dollar Amount: _____

Expiration Date: _____ Card #: _____ Signature: _____ 11/00

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* For new members, membership fees with applications received after March 1 will be pro-rated at 50%.