

Fresnel

(Everything You Ever Wanted to Know About Press-On Prisms but Were Afraid to Ask)

(Optical Seminars Course # HS-17)

by

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Course Objectives

Upon completing this one-hour home study module, participants should:

- ⇒ Be more aware of who Fresnel was.
- ⇒ Understand more fully Fresnel's contributions to optics in general.
- ⇒ Know the many benefits of a Fresnel, Press-On Prism.
- ⇒ Be able to quickly and correctly orient Fresnel prisms when the prism is in, out, up, or down.
- ⇒ Be able to quickly and correctly orient Fresnel prisms when the prism is ordered in, out, up, or down at a particular axis.
- ⇒ Easily attach a Fresnel prism to the back surface of a lens.
- ⇒ Be aware of other, similar "stick-on" products that are available.
- ⇒ Know how and where to obtain Fresnel products, and be aware of availability.
- ⇒ Access further outside resources.
- ⇒ Achieve at least an 70% score on the Final Assessment.

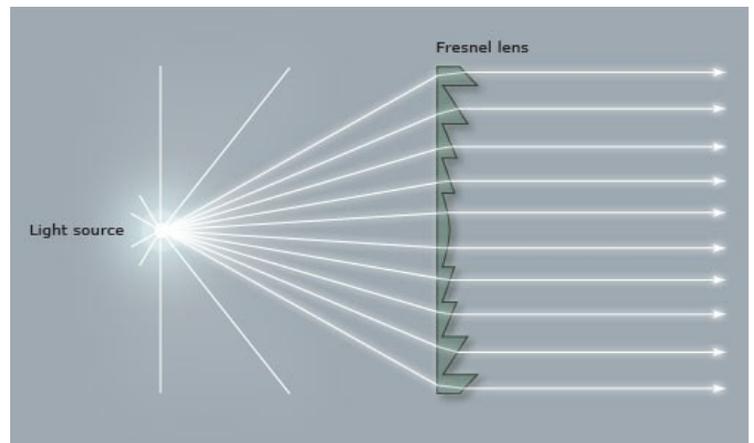
Introduction

Most people would have no idea who or what you meant if you asked if they were familiar with “Fresnel.” In fact, the last person I asked replied with, “I don’t know...is it a person or a thing?” The most accurate answer to that question is both.

Fresnel (pronounced fray-NEL or frah-NEL) the person was born Augustin-Jean Fresnel in France on May 10, 1788. Although he died only 39 short years later, on July 14, 1827, the physicist and civil engineer’s research had practically rewritten everything that was “known” about wave-light theory. And even though most opticians think about press-on prisms when they think of Fresnel, he was best known for probably saving untold thousands of lives at sea. Why? He invented the catadioptric (an optical system that involves both the reflecting and refracting of light to reduce aberrations) Fresnel lens, and used “stepped” lenses to extend the visibility of light from lighthouses.



Augustin-Jean Fresnel



The Fresnel Effect

Because he lived such a relatively short life and had a long-term battle with tuberculosis, Fresnel never gained much wealth or celebrity while alive, except of course, from his peers in the scientific community. On his deathbed, he was awarded the prestigious Rumford Medal, from the Royal Society of London, and his name to this day is synonymous with greatness when it comes to the study of optics and wave light theory. One of his contemporaries, Professor Humphrey Lloyd, an Irish physicist and provost of Trinity College in Dublin, described Fresnel's transverse-wave theory as "the noblest fabric which has ever adorned the domain of physical science, Newton's system of the universe alone excepted."

Lighthouses and More

Fresnel's design made possible the construction of lenses with a large aperture and short focal length without the massive size that would be required by a lens of conventional design. Fresnel lenses can be made much thinner than a comparable conventional lens, and in some cases even taking the form of a flat sheet. A Fresnel lens captures more oblique light from a light source, thus allowing the light from a Fresnel-equipped lighthouse to be visible over much greater distances.

Fresnel lenses reduce the amount of material required compared to a conventional lens by dividing the lens into a set of concentric sections. An ideal Fresnel lens would have an infinite number of sections. In each section, the overall thickness is decreased compared to an equivalent simple lens. This effectively divides the continuous surface of a standard lens into a set of surfaces of the same curvature, with step by step discontinuities between them.

According to an article entitled *Fresnel Lenses* in the Michigan Lighthouse Conservancy (January 31, 2008), "In some lenses, the curved surfaces are replaced with flat surfaces, with a different angle in each section. Such a lens can be regarded as an array of prisms arranged in a circular fashion, with steeper prisms on the edges, and a flat or slightly convex center. In the first (and largest) Fresnel lenses, each section was actually a separate prism. 'Single-piece' Fresnel lenses were later produced, being used for automobile headlamps, brake, parking, and turn signal lenses, and so on. In modern times, computer-controlled milling equipment is used to manufacture more complex lenses.

Fresnel lens design allows a substantial reduction in thickness (and thus mass and volume of material), at the expense of reducing the imaging quality of the lens, which is why precise imaging applications such as photography usually still use larger conventional lenses.

Fresnel lenses are usually made of glass or plastic; their size varies from large (old historical lighthouses, meter size) to medium (book-reading aids, overhead projectors) to small (TLR/SLR camera screens, micro-optics). In many cases they are very thin and flat, almost flexible, with thicknesses in the 1 to 5 mm range.

Modern Fresnel lenses usually consist of all refractive elements. However, many of the lighthouses have both refracting and reflecting elements. That is, the outer elements are sections of reflectors while the inner elements are sections of refractive lenses. Total internal reflection was often used to avoid the light loss in reflection from a silvered mirror."

Fresnel produced six sizes of lighthouse lenses, divided into four different orders, based on focal length and size. A first-order lens has a focal length of 920 mm (@36 inches) and a maximum diameter of 2,590 mm (@8.5 ft) high. The complete assembly is about 12-feet tall and six-feet wide. The smallest (sixth-order) has a focal length of 150 mm (@6 inches) and an optical diameter 433 mm (@17 inches) high.

“The largest Fresnel lenses,” according to Kraig Anderson, writing in *Lighthouse Friends*, “are called hyper-radiant Fresnel lenses. One such lens was on hand when it was decided to build and outfit the Makapuu Point Lighthouse in Hawaii. Rather than order a new lens, the huge optic construction, 3.7 meters (12 ft) tall and with over a thousand prisms, was used there.”



Makapuu Point Lighthouse, Hawaii



According to a Wikipedia entry, “Fresnel lenses are used in many different capacities. They are used in simple hand-held magnifying glasses. They can be used to magnify the images in books, DVD screens, and are even used in traffic lights. Automobile side-view mirrors that are designed to lessen or eliminate a driver’s blind spot use Fresnel technology, as do some retina-identifying cameras. Fresnel lenses have also been used in popular entertainment. The British rock artist Peter Gabriel made use of them in his early solo live performances to magnify the size of his head, in contrast to the rest of his body, for dramatic and comic effect. In the Terry Gilliam film *Brazil*, plastic Fresnel screens appear ostensibly as magnifiers for the small CRT monitors used throughout the offices of the Ministry of Information. However, they occasionally appear between the actors and the camera, distorting the scale and composition of the scene to humorous effect. The Pixar movie *Wall-E* features a Fresnel lens in the scenes where the protagonist watches the musical *Hello, Dolly!* magnified on an iPod.”

Fresnel lenses have multiple applications in the fields of illumination, photography, imaging, overhead projectors, and even solar energy. Because plastic Fresnel lenses can be made lighter and cheaper than comparable glass lenses, they are

used to concentrate heat in some solar cooking devices, and in solar collectors used to heat water for homes. Of course, as stated earlier, when most opticians and other ECPs (Eye-Care Professionals) hear about Fresnel they think only about the eponymous stick-on or press-on prisms commonly used in opticianry today. The rest of this module will focus (pun intended) on Fresnel Press-on Prisms, their purpose, proper use, placement, client care, ancillary devices, and some resources available for further study. There is a fantastic, brief video that describes how the Fresnel prism arrangement works for lighthouse lenses. If interested, take a few minutes to view it at the following direct link:

https://www.youtube.com/watch?v=_9SIWvVyX3g

Fresnel Press-On Prism

Today, Fresnel Press-On Prisms are marketed under the trade name 3M Press-On Optics and are one of the few optical products we use that are still made in the USA. They are manufactured by 3M Health Care, in St. Paul, Minnesota. Press-On Optics is made of a flexible, vinyl material which can be easily cut to shape with simply a pair of sharp scissors. According to The Fresnel Prism and Lens Company's own literature, Press-On Optics offers both ECPs and patients the following benefits:

- ⇒ A simple, therapeutic, inexpensive, way to correct several visual disorders.
- ⇒ Provide an immediate correction.
- ⇒ They are a more comfortable, more cosmetically appealing treatment for strabismus and diplopia than conventional prisms.
- ⇒ They add NO noticeable weight or thickness to the spectacle.
- ⇒ Press-on prism material is flexible static vinyl which can easily be cut to shape with scissors to determine the acceptance of a proposed corrective prescription.
- ⇒ Adheres with just water to existing lenses, yet it can be easily repositioned.
- ⇒ Apply a Press-On sphere or prism to the back surface of one or both lenses of the patient's eyeglasses with just water.
- ⇒ It can be applied to the entire lens or to any region of the lens.
- ⇒ A full range of seventeen powers from 1.00 to 40.00 prism diopters allows you to broaden therapeutic uses and provides additional treatment options in your practice.

I would also add that, especially when dealing with high amounts of prism (five diopters or more), the Press-On is far more affordable than ground-in-lens prism. Consider this: I am writing this module in between helping patients. Today I am working on the front lines of my optical shop, and as serendipity would have it, I just finished helping a patient – we'll call her Mrs. Michaels – and for as long as I have been her optician (nearly 10 years) she has always had @ 8 diopters of ground-in, base-out prism in each eye. That is a total of 16 diopters of prism. At \$4 per diopter, that has always added \$64 to her total bill.

Not to mention the added thickness to the edge of her lenses. For the first time ever, today we had a conversation about other options, including the use of Press-On Prisms. She seems open to the idea, especially because her doctor wants to “experiment” with other amounts of prism. And guess what, \$40 (that’s my retail charge for a Press-On-Prism) per lens is a whole lot less than if we had to remake the entire lens. Mrs. Michaels wears Varilux, Crizal, Transitions, polycarbonate lenses. Do the math.

(Bonus Tip: Another way to get more bang for your buck when using Press-On-Prisms is this: Sometimes, depending on the size and shape of the lenses, you can use one Press-On-Prism for both lenses! Just remember that the useable area of the device is round and has a diameter of 65 millimeters. So, especially with children’s frames, it is easy to use only ONE Press-On for BOTH lenses.) If you have printed this module, the image you see below, is shown actual size to give you a better understanding of how you could use one for two lenses:



You may have been surprised that Press-On-Prisms are available as low as 1 diopter and as high as 40 diopters. They are made, in fact, in 17 different powers:

- | | | |
|-----------|-------------|-------------|
| 1. 1.00 Δ | 7. 7.00 Δ | 13. 20.00 Δ |
| 2. 2.00 Δ | 8. 8.00 Δ | 14. 25.00 Δ |
| 3. 3.00 Δ | 9. 9.00 Δ | 15. 30.00 Δ |
| 4. 4.00 Δ | 10. 10.00 Δ | 16. 35.00 Δ |
| 5. 5.00 Δ | 11. 12.00 Δ | 17. 40.00 Δ |
| 6. 6.00 Δ | 12. 15.00 Δ | |

Correctly Orienting a Press-On Prism

When a doctor prescribes prism, she usually writes it in one of two ways. First, let's look at the most common method:

Example #1:

O.D.: +2.00 -1.50 x 069; 12 Δ Base Down

O.S.: +2.25 -1.00 x 150; 12 Δ Base Up

+2.50 add O.U.

Even if you could find a lens blank thick enough, and a lab that would attempt to grind this lens, it would be thick as a brick. This job would be ideal for a Fresnel prism. Let's look at how to correctly choose, cut, and place the prism on the lens.



Figure 1



Figure 2

Notice that in the lower, left-hand corner of the Fresnel square (figure 1), you see the word "BASE." Let us assume also, that the eyeglass frame you see above (figure 2) is oriented so that you are looking through it (as a patient would), not at it (as an optician would). Therefore the lens on the left is indeed the left lens (L), and the lens on the right is the right lens (R). The correct way to place the Fresnel prism is shown below, in figure 3.

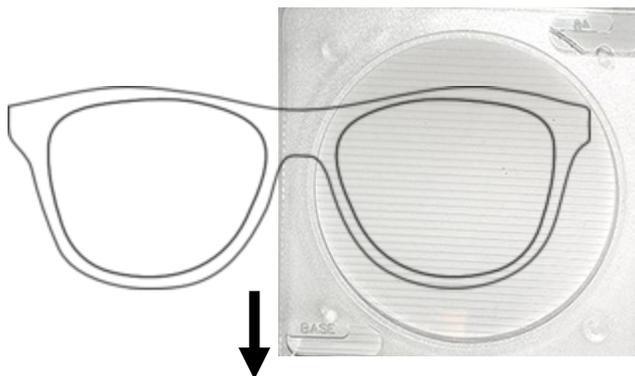


Figure 3

Figure 4, below, shows the Fresnel prism properly oriented for the left eye.

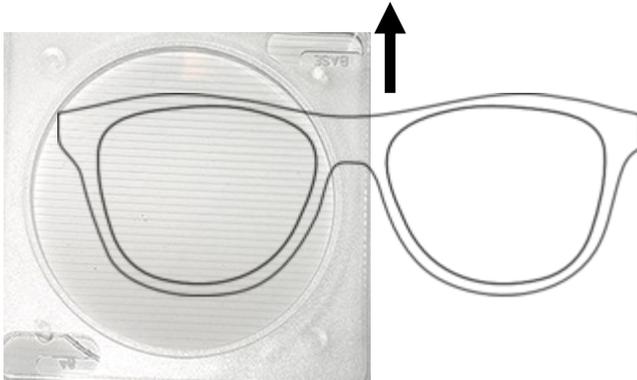


Figure 4

Example #2:

O.D. - 2.00 -2.50 x 180; 17 Δ Base In

O.S. - 1.25 -1.00 x 150; 17 Δ Base In

+2.50 add O.U.

In example #2 (above), the fact that the patient is myopic and not hyperopic is irrelevant to the placement of the Fresnel prism. But wait, Fresnel is only available in 15 Δ or 20 Δ , but not 17 Δ . What to do? It seems to me the best solution would be to grind 2 Δ base in on each lens, and then place a 15 Δ Fresnel prism on each lens. Figure 5, below, illustrates the proper placement of both Press-On Prisms.

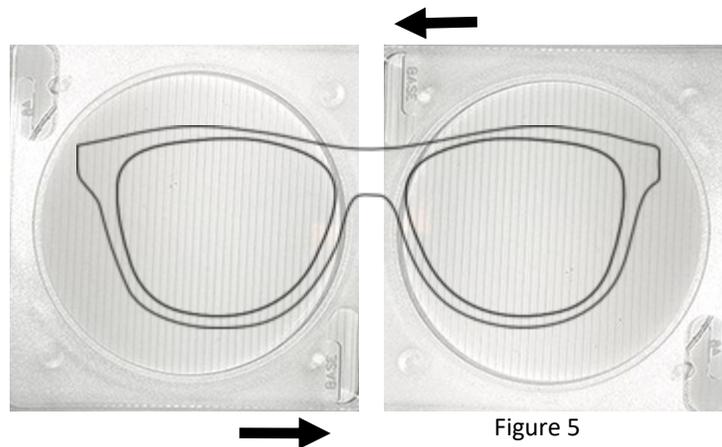


Figure 5

Notice that when the patient is wearing the glasses, if the corrected prism was vertical (up or down) then the lines of the Fresnel prism should be parallel to the floor. Likewise, if the corrected prism is horizontal (in or out), the lines should be perpendicular to the floor.

Let's take a look at one more example, using base out prism in one eye, and base down in the other eye.

Example #3:

O.D. - 3.75 -2.50 x 077; 20 Δ Base Out

O.S. - 1.25 -1.00 x 150; 15 Δ Base Down

+2.50 add O.U.

For example #3 (above), the optician would order a 20Δ Fresnel for the right eye, and a 15Δ Fresnel for the left eye. Proper positioning is shown below, in figure 5.

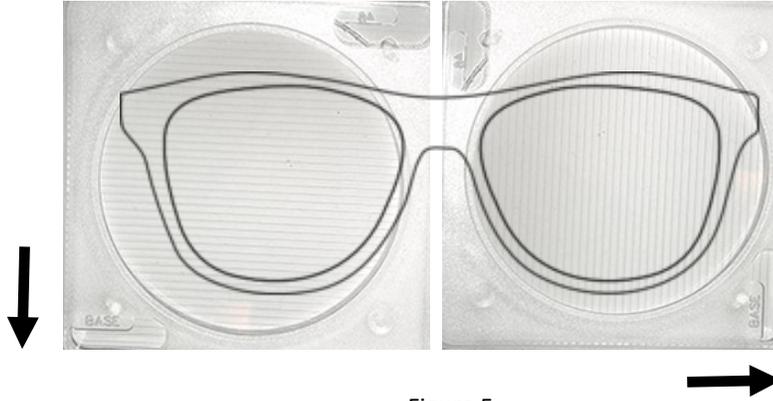


Figure 5

If you remember at the beginning of this section I said, a doctor can write a prism prescription two different ways. All of the previous examples showed how to place the Fresnel prism when a doctor writes it the most common way, indicating the prism as in, out, up, or down. Let's look at another less common prism prescription:

Example #4:

O.D.: - 2.25 sphere

O.S.: - 4.00 +1.25 x 90; 10Δ In at axis 40°

Single-Vision Distance

What to do? The first thing you might want to do is grab a protractor (figure 6). If you don't have one, you can buy one just about anywhere for about 29¢.

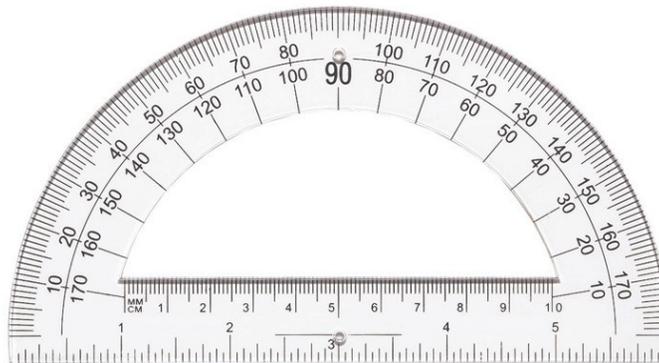
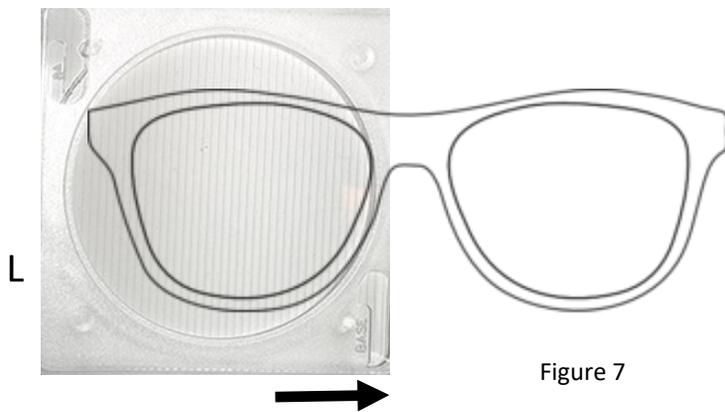
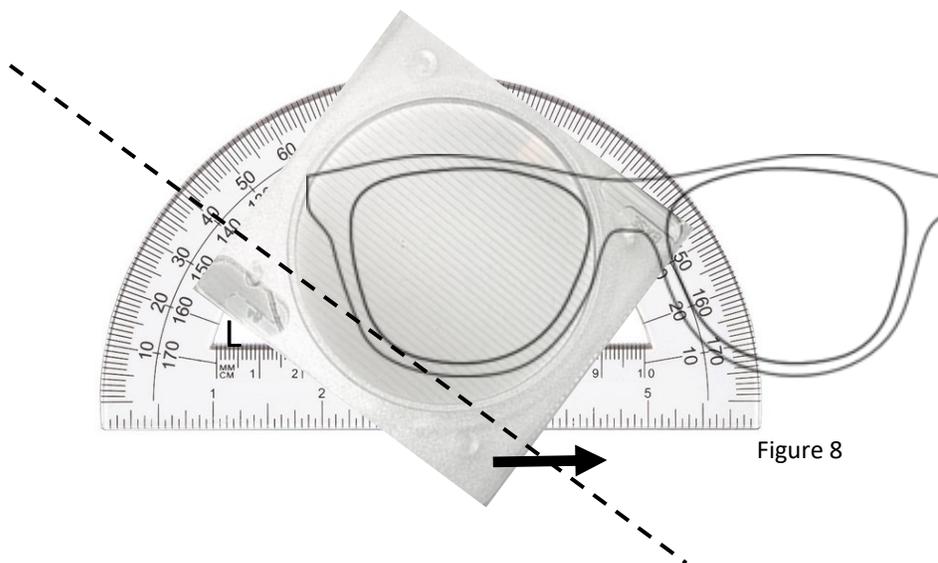


Figure 6

For Example #4, we know we are only going to need one Fresnel prism (10Δ for the left eye). Once again, let's look at the diagram with the eyeglasses, the Fresnel prism, and now the protractor added to the equation. The prescription calls for the prism to be IN at axis 40, so we know the prism must be oriented IN as shown in Figure 7.



However, since the Rx calls for the prism to be “In at axis 40,” we must use our 29¢ protractor. By superimposing the prism and spectacles over it, we can now easily rotate the Fresnel prism clockwise, until the lines of the prism line up at axis 40, as shown in Figure 8, below.



Trace the lens as described earlier, cut, place, and you are done!

Every once in awhile, I have seen an Rx such as this:

Example #5

O.D. +3.00 sphere

O.S. +2.25 sphere

ADD +2.75 O.U.

6Δ Base Down O.S. in near segment only

Don't freak out. All you would have to do is order a 6Δ Fresnel, orient it DOWN as in the previous examples, but instead of cutting out the Fresnel to fit the entire lens area, you just have to cut a segment the size and shape of the bifocal. For example, a FT-28, or FT-35. I have even done it for progressives! In that case I simply treat it as an Executive lens, and cut it 10-15 mm shy of the temporal side of the lens, thus ensuring that the entire width (and then some) of the progressive near-vision area is covered. Though I've never seen an Rx written for it, you could easily do the same thing if the doctor wanted the prism in the distance vision, but NOT the near. You would then just have to cut it the entire lens shape, and cut OUT the bifocal area.

The following is a sad, but absolutely true statement: I have had even veteran opticians tell me they simply refuse to fill an Rx that calls for a Fresnel prism. They simply lack experience, knowledge, and confidence. Hopefully, you now have enough knowledge and confidence to gain the experience needed to never turn a patient away. With a little time, effort, and perseverance, you'll be a Fresnel pro in no time at all.



Hillary Rodham Clinton

While testifying before the Senate Foreign-Relations Committee in Washington, DC, on January 23, 2013, former Secretary of State, Hillary Clinton was seen wearing Fresnel prisms on her eyeglass lenses. Previously, she had taken a fall and suffered a concussion. No doubt the prisms were there to correct for what was hopefully a temporary double vision, caused by the trauma.

Correctly Placing a Press-On Prism

Here is a step-by-step method to properly place the Fresnel prism on the back lens surface:

1. Remove the lens from the frame.
2. Align the Fresnel prism film correctly, lay it on the lens, and cut the film to match the lens outline. If necessary, you may trace the outside of the lens directly onto the smooth side of the Fresnel prism. If you do that, use an extra-fine point, non-permanent marker. Remember, the ridged side will always point toward the wearer's eye, while the smooth side will always adhere to the inside surface of the lens.
3. Trim the edges of the prism to fit inside the beveled edge of the lens. Slide a razor blade against the bevel of the lens, or use scissors, at the angle of the bevel, so that the film is trimmed inside the beveled edge.
4. Clean the lens and the prism in warm, soapy water. Rinse.
5. Submerge the lens and prism in a container of clean water. Brush any bubbles off the surfaces to be matted. Place the bottom edges together and press the prism onto the lens in a kind of rolling motion, much like laying a pie crust on a cutting board.
6. Remove the finished lens assembly from the water and push any bubbles out by gently pushing on the prism film with your thumb, sliding the bubbles out. Slide the prism to position it properly, if necessary.
7. Replace the lens in the frame. Be careful not to catch any of the Fresnel prism film between the lens and frame. If necessary, trim an additional 1-2 mm around the Fresnel prism, so that it doesn't make contact with the frame.



Patient Cleaning Instructions

When you purchase a Fresnel Press-On Prism you also receive a care and instruction sheet to give to your patients. I encourage you to give it to them, and go over the care verbally as well. The most recent version comes in 13 different languages.

Probably the most important of the care instructions is for the patient to never remove the prism from their glasses for cleaning. Rather, they are instructed to rinse the spectacle lenses under a gentle stream of warm, running water. If any contaminants remain after that, they are to use a gentle brush (a soft-bristled toothbrush would be ideal) to clean in between the grooves. They are to then pat or blot the lens dry with a clean, lint-free cloth. They are also instructed to return to their optician if the prism is detached, loses its “stick-ability,” or if it becomes discolored.

While the “yellowing” of Fresnel prisms used to be an issue, these days...not so much. All Fresnel prisms come with an expiration date—usually four or five years in the future. Under normal wearing circumstances they should last years even past that date.

Other Related Patient Products

Made of the same material as the Press-On Prism, 3M also offers Press-On Aspheric D-Segs. About the size of a FT-28, all of the placement and cleaning instructions are the same as for the Fresnel prism. A pair is generally the same price as the Fresnel prisms, and they are available in the following powers: +1.00, +1.50, +2.50, +3.00, +4.00, +5.00, and +6.00D. Again the number of uses for such a product is only limited by your imagination. They could be used to turn plano sunglasses into readers. Professionals (electricians, plumbers, etc.) might use them to quickly and cheaply turn their every-day glasses into “occupational-seg” glasses.

In the interest of full disclosure (Optical Seminars is not in the business of promoting one specific brand over another) other companies produce similar products. For example, Optx 20/20 makes a stick-on bifocal (in limited powers). While I have never used them, they generally sell for a few dollars less than the 3M product.

Fresnel also sells Press-On Aspheric plus and minus products. They are the same diameter as a Fresnel prism (@ 65 mm or 2.5 inches), and according to the company literature have a multitude of occupational and recreational uses. For example: welding masks, dive masks, goggles, reading golf scores, and on and on. The Press-On Aspheric plus powers available are 0.50, 1.00, 1.50, 2.00, 2.50, 3.00, 3.50, 4.00, 5.00, 6.00, 7.00, 8.00, 10.00, 12.00, 14.00, and 16.00 diopters. Minus powers are available in 1.00, 2.00, 3.00, 4.00, 5.00, 6.00, 7.00, 8.00, 9.00, 10.00, 11.00, 12.00, 13.00, and 14.00 diopters.

www.fresnel-prism.com

When opticians need to order a Fresnel prism, they generally turn to their wholesale lab. One of the best-kept secrets in our industry just might be the Fresnel Prism and Lens Company. If you are a licensed optician, ophthalmic technician, or any other ECP, you may open an account with the company, and buy all of the Fresnel products directly, cutting out the time and expense of going through a “middle man.”

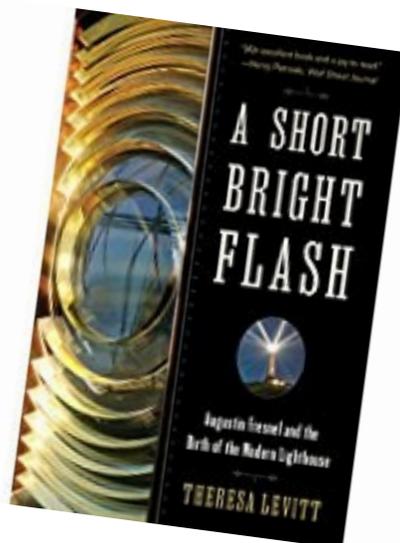
The Fresnel Prism and Lens Company offers, Fresnel Press-On Optics, the Press-On plus and minus lenses, the Press-On Aspheric D-Lenses, Fresnel cleaning kits (meant to be sold to consumers, a prism nomograph (think fancy protractor), occlusion eye patches, and various Fresnel prism trial sets.

Take a few minutes to check out the company by following this direct link:

www.fresnel-prism.com

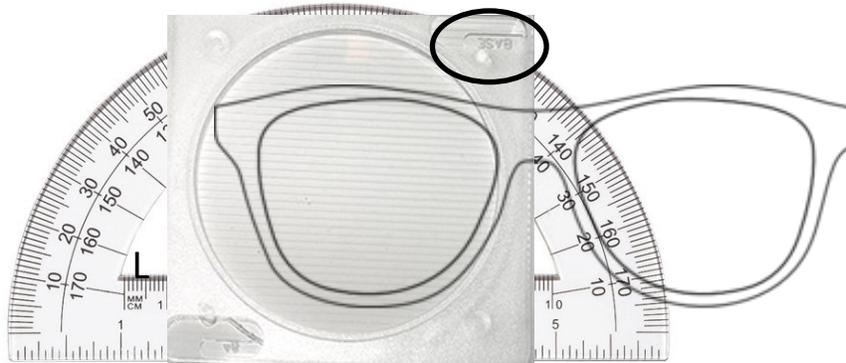
Suggested Resources

- *A Short, Bright Flash: Augustin Fresnel and the Birth of the Modern Lighthouse* by Theresa Leavitt (Published by W.W. Norton & Co., 2015)
- www.fresnel-prism.com



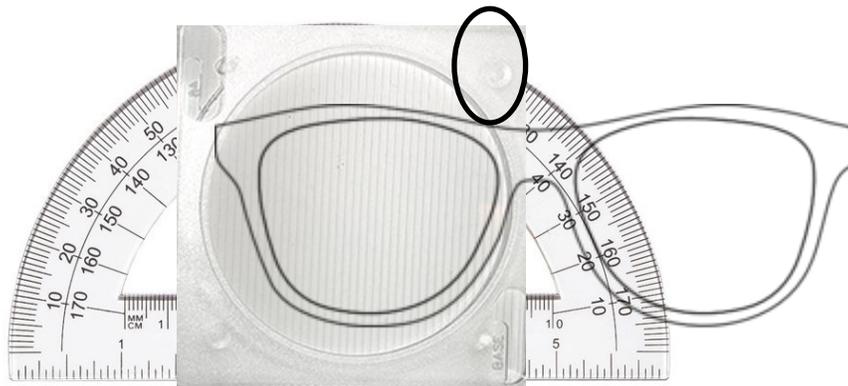
Final Assessment For all questions that show a Press-On-Prism, the word BASE is encircled by 

1. The way this 10 Δ Fresnel, Press-On Prism is oriented below, which of the following would be the correct prescription for the left eye?



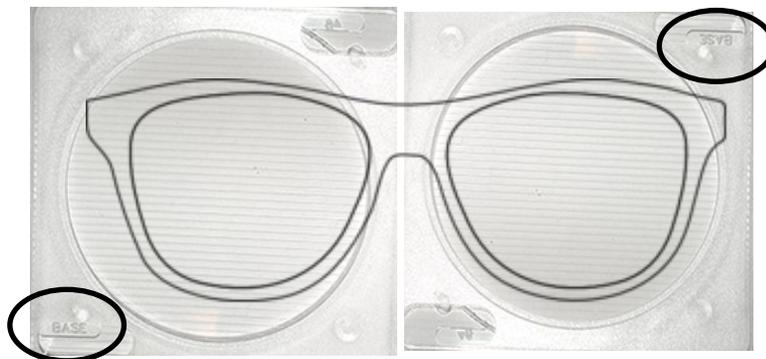
- A. 5 Δ Base Up
 - B. 5 Δ Base Down
 - C. 10 Δ Base Up
 - D. 10 Δ Base Out
-

2. The way this 10 Δ Fresnel, Press-On Prism is oriented below, which of the following would be the correct prescription for the left eye?



- A. 10 Δ Base Up
- B. 10 Δ Base Out
- C. 10 Δ Base In
- D. 10 Δ Base Down

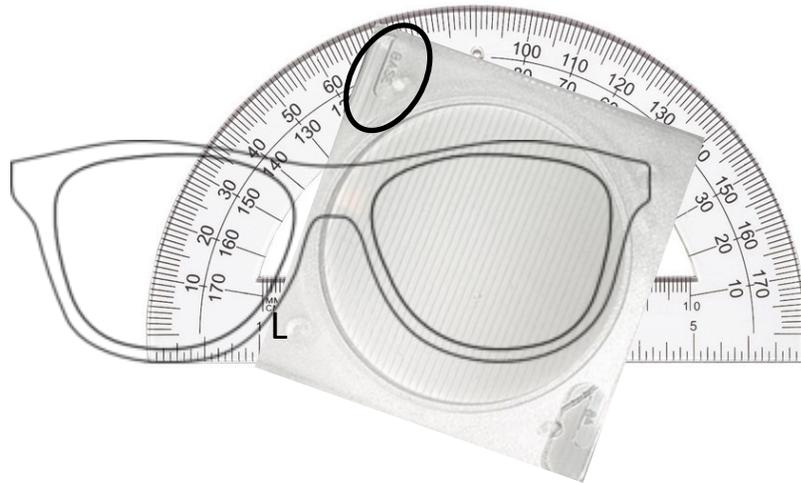
3. How old was Augustin-Jean Fresnel when he died?
- A. 29
 - B. 39
 - C. 49
 - D. 59
4. While Fresnel lenses allowed for a substantial reduction in thickness and volume, what was the effect on imaging quality?
- A. It was enhanced proportionally to the amount of the prism.
 - B. It was not affected at all.
 - C. It reduced the image size by as much as 50%
 - D. It reduced the image quality of the lens.
5. How many different powers are available in 3M's Press-On Optics?
- A. 15
 - B. 16
 - C. 17
 - D. 18
6. In the diagram below, if both Fresnel Prisms are 20Δ , what is the correct prescription?
- A. 20Δ Base In O.U.
 - B. 20Δ Base In O.D.; 20Δ Base Up O.S.
 - C. 20Δ Base Up O.D.; 20Δ Base Down O.S.
 - D. 10Δ Base Up O.D.; 10Δ Base Down O.S.



7. Fresnel technology has been used in all of the following except:
- A. High-quality digital movie projectors
 - B. Traffic signals
 - C. Automobile headlamps
 - D. Lighthouses
8. As mentioned in this module, the less common way a doctor prescribes prism is:
- A. By prescribing it as Up, Down, In, or Out.
 - B. By prescribing it as Up, Down, In, or Out at a particular axis.
 - C. By prescribing it as High, Low, Left, or Right.
 - D. By indicating on the prescription to simply “Duplicate Current Prism.”
9. The best way to trim a Press-On Prism to size is by using:
- A. Sharp scissors or a razor blade.
 - B. Only the cutting tool sold by the Fresnel Prism Company.
 - C. Only sharp scissors.
 - D. Only a razor blade.
10. When it comes to placing a Fresnel Press-On Prism on the lens, which of the following statements is true?
- A. The grooved side is always placed against the lens.
 - B. The smooth side is always placed against the lens.
 - C. You should always use ice-cold water to help the vinyl adhere too the lens more effectively.
 - D. You should always let the lab worker(s) cut and orient it for you.
11. If 27Δ of Base Out prism was prescribed for only one eye, what would be the best approach?
- A. Order a 27Δ Fresnel Press-On prism and adhere it properly.
 - B. Order a 20Δ Fresnel Press-On and a 7Δ Fresnel Press-On and put one on top of the other.
 - C. Grind 2Δ of Base Out prism on the lens, and use a 25Δ Fresnel Press-On prism too.
 - D. Grind the 27Δ of prism in the lenses by splitting it: 13.5Δ prism in each lens.

12. The way this 10 Δ Fresnel, Press-On Prism is oriented below, which of the following would be the correct prescription for the right eye?

- A. 10 Δ Up
- B. 10 Δ In and Up at 100°
- C. 10 Δ Down
- D. 10 Δ Out and Up at 100°



13. An optical system that involves both the reflecting and refracting of light to reduce aberrations is known as a:

- A. Biodiopic system
- B. Catadioptric system
- C. Fresnel system
- D. Lighthouse system

14. According to the Fresnel Prism and Lens Company's literature, all of the following are benefits of a Fresnel Press-On Prism, except:

- A. It adds no noticeable weight or thickness to the spectacles.
- B. Is flexible and easily cut to shape.
- C. Is available in a range of 1 Δ up to 50 Δ .
- D. It can be applied to the entire lens or any section of the lens.

15. If you are using a Fresnel Press-On prism to correct a 20 Δ vertical imbalance:

- A. The lines of the Fresnel prism will be parallel to the floor.
- B. The lines of the Fresnel prism will be perpendicular to the floor.
- C. The ridges of the Fresnel prism will be closest to the surface of the lens.
- D. The amount of prism is out of range to use a Fresnel Press-On prism.

16. The highest power available in 3M's Press-on Aspheric D-Segs is:
- A. + 5.00 D
 - B. + 6.00 D
 - C. +10.00 D
 - D. +12.00 D
17. The highest minus power available in 3M's Press-On Aspheric lenses is:
- A. - 5.00 D
 - B. - 10.00 D
 - C. - 12.00 D
 - D. - 14.00 D
18. The lowest plus power available in 3M's Press-On Aspheric lenses is:
- A. +. 25 D
 - B. + .50 D
 - C. + .75 D
 - D. + 1.00 D
19. The highest plus power available in 3M's Press-On Aspheric lenses is:
- A. + 4.00 D
 - B. + 8.00 D
 - C. + 12.00 D
 - D. + 16.00 D
20. When placing the Fresnel Press-On prism onto the lens, if the prism is too big, you should trim an additional:
- A. 1-2 mm
 - B. 2-3 mm
 - C. 3-4 mm
 - D. 4-5 mm