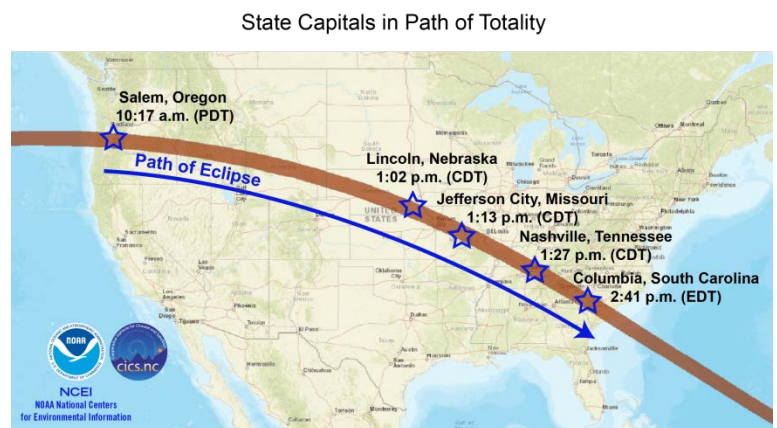


Solar Eclipse 2017

The Aug. 21 total solar eclipse will be an once-in-a-lifetime event for many people. A truly awe-inspiring event, a solar eclipse is when the moon blocks any part of the sun from our view. The bright face of the sun is covered gradually by the moon during a partial eclipse, lasting a few hours. During the brief period of a total eclipse when the moon fully covers the sun (only a couple of minutes), the light of day gives way to a deep twilight sky. The sun's outer atmosphere (called the solar corona) gradually appears, glowing like a halo around the moon in front of it. Bright stars and planets become more visible in the sky.



Watching a solar eclipse is a memorable experience, but looking directly at the sun can seriously damage your eyes. Staring at the sun for even a short time without wearing the right eye protection can damage your retina permanently. It can even cause blindness, called solar retinopathy. While environmental exposure to UV radiation is known to contribute to the accelerated aging of the outer layers of the eye and the development of cataracts, the primary concern over improper viewing of the Sun during an eclipse is the development of “eclipse blindness” or retinal burns caused by high-intensity visible light.



Looking directly at the Sun is unsafe except during the brief total phase of a solar eclipse (“totality”), when the Moon entirely blocks the Sun’s bright face, which will happen *only* within the narrow path of totality. There is only one safe way to look **directly** at the sun, whether during an eclipse or not: through special-purpose **solar filters**. These solar filters are used in “eclipse glasses” or in hand-held solar viewers. They must meet a very specific worldwide standard known as ISO 12312-2. NASA stresses that eclipse watchers are sure that their glasses are both from an **approved manufacturer** and have an **ISO icon** with **reference 12312-2**. Approved manufacturers include American Paper Optics, Rainbow Symphony, Thousands Oaks Optical, and TSE 17.

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What to Look For

How do you know if your eclipse glasses or handheld solar viewers are truly safe? You need to know that they meet the ISO 12312-2 (sometimes written as ISO 12312-2:2015) international safety standard. Filters that are ISO 12312-2 compliant not only reduce visible sunlight to safe and comfortable levels but also block solar UV and IR radiation. Unfortunately, we cannot check whether a filter meets the ISO standard ourselves as this requires a spectrophotometer that uses UV, IR and visible light through the filter and measures how much gets through at each wavelength. Solar filter manufacturers send their products to specialized labs that are accredited to

perform the tests necessary to verify compliance with the ISO 12312-2 safety specifications. Once they have the paperwork that documents their products as ISO-compliant, they can legitimately use the ISO logo on their products and packaging. Even more unfortunately, unscrupulous vendors can grab the ISO logo off the internet and put it on their products and packaging even if their eclipse glasses or viewers have not been properly tested. This means that just seeing the ISO logo or a label claiming ISO 12312-2 certification is not good enough. You need to know that the product comes from a reputable manufacturer or one of their authorized dealers.

"Eclipse Glasses" & Handheld Viewers

The following telescope and solar-filter companies manufacture and/or sell eclipse glasses (sometimes called eclipse shades) and/or handheld solar viewers that have been verified by an accredited testing laboratory to meet the ISO 12312-2 international safety standard for such products. They are listed in alphabetical order; those with an asterisk (*) are based outside the United States.

Solar Filter Brands

- [American Paper Optics \(Eclipser\) / EclipseGlasses.com](#)
- [APM Telescopes \(Sunfilter Glasses\)*](#)
- [Celestron \(EclipSmart Glasses & Viewers\)](#)
- [DayStar \(Solar Glasses\)](#)
- [Explore Scientific \(Solar Eclipse Sun Catcher Glasses\)](#)

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- [Lunt Solar Systems \(SUNsafe SUNglasses\)](#) [see their [unique kid-size eclipse glasses](#)]
- [Meade Instruments \(EclipseView Glasses & Viewers\)](#)
- [Rainbow Symphony \(Eclipse Shades\)](#)
- [Seymour Solar \(Helios Glasses\)](#)
- [Thousand Oaks Optical \(Silver-Black Polymer & SolarLite\)](#)
- [TSE 17 \(Solar Filter Foil\)](#)*

Instructions for safe use of solar filters/viewers:

- **Always** inspect your solar filter before use; if scratched, punctured, torn, or otherwise damaged, discard it. Read and follow any instructions printed on or packaged with the filter.
- **Always** supervise children using solar filters.
- If you normally wear eyeglasses, keep them on. Put your eclipse glasses on over them, or hold your handheld viewer in front of them.
- Stand still and cover your eyes with your eclipse glasses or solar viewer before looking up at the bright Sun. After looking at the Sun, turn away and remove your filter — do **not** remove it while looking at the Sun.
- Do **not** look at the uneclipsed or partially eclipsed Sun through an unfiltered camera, telescope, binoculars, or other optical device.
- Similarly, do **not** look at the Sun through a camera, telescope, binoculars, or any other optical device while using your eclipse glasses or handheld solar viewer — the concentrated solar rays could damage the filter and enter your eye(s), causing serious injury.
- Seek expert advice from an astronomer before using a solar filter with a camera, telescope, binoculars, or any other optical device; note that solar filters must be attached to the **front** of any telescope, binoculars, camera lens, or other optics.
- Do not use your cell phone to take pictures without a filter, it will fry the screen.
- There **may** be some interruption of cell phone and GPS, especially in older units.
- If you are *inside* the path of totality, remove your solar filter **only** when the Moon completely covers the Sun's bright face and it suddenly gets quite dark. Experience totality, then, as soon as the bright Sun begins to reappear, replace your solar viewer to look at the remaining partial phases.
- **Outside** the path of totality, you must **always** use a safe solar filter to view the Sun directly.

How can you tell if your solar viewer is **not** safe? You should not be able to see anything through a safe solar filter except the Sun itself or something comparably bright, such as the Sun reflected in a mirror, a sun glint off shiny metal, and the hot filament of an unfrosted incandescent light bulb, a bright halogen light bulb, a multiple-white-LED flashlight, or an arc-welder's torch. If you can see lights of more ordinary brightness through your eclipse glasses or handheld viewer, and you are not sure the product came from a reputable vendor, do not use. Safe solar filters produce a view of the Sun that is comfortably bright (like the full Moon), in focus, and surrounded by dark sky. If

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you glance at the Sun through your solar filter and find it uncomfortably bright, out of focus, and/or surrounded by a bright haze, it is no good.



Source: American Academy of Ophthalmology and American Astronomical Society