

The "Normal" Lens

©2016 Bob McMicken - Forensic-Photography.Com

This tutorial may be of special relevance to investigators shooting crime and accident reconstructions.

You may, from time to time, hear the term "normal lens." You may even be challenged by a defense attorney if you are brash enough to present a photo taken with something other than a "normal" lens, the implication being that wide angle, telephoto and macro lenses are somehow abnormal.

In the real world, telephoto lenses are normal for surveillance, sports and wildlife. Macro lenses are normal for fingerprints, footprints, tire tracks, firearms, tool marks, coins, bugs, flowers and postage stamps. Wide angle lenses are essential for landscapes and architectural work, and any time you are called upon to work in cramped quarters.

Perspective and the distortion thereof is more a function of distance from the camera to the subject than the focal length of your lens. This is explained at <http://www.dsrbodies.com/lenses/lens-articles/choosing-lenses/choosing-a-simple-prime-kit.html>.

The author, Thom Hogan, suggests taking a picture with your widest lens and zooming to various longer focal lengths to concentrate on objects at varying distance within the scene. Then, go back to the original wide angle photo and crop the same elements photographed at the longer focal lengths. The crops from a photo originally taken with a wide angle lens will be identical to those taken with your lens zoomed to progressively longer focal lengths.

Questions concerning "normal lenses" are likely to arise in connection with crime scene and accident reconstructions in which it is desirable to demonstrate what an individual could see from a certain vantage point.

This can be a problem for photographers using cameras equipped with a zoom lens covering the range from moderate wide angle to moderate telephoto. The wide angle setting is convenient when you can't back up. The telephoto setting is convenient when you can't get close.

The zoom lens on your DSLR may not satisfy a strict definition of "normal." That's not an issue that I'd care to debate with an aggressive attorney being coached by a well-qualified consultant.

Forget smart phones and point and shoots. To paraphrase Section 3 of the Scientific Workgroup on Imaging Technology guidelines:

- First responders can use a point and shoot camera, 35 mm film or six megapixel digital, with flash and closeup capability.
- Equipment for crime scene photography includes a single lens reflex camera ... with off camera flash, a sturdy tripod, and macro, normal, wide angle and telephoto lenses.

This, as you might well imagine, was written during the film era when it was customary to carry a collection of fixed focal length primes rather than one or two zooms plus a macro.

While SWGIT declined to specify a precise definition for "normal," we can reasonably assume that they were thinking of the 50 mm focal length on a full frame camera or a 35 mm lens on an APS-C camera.

If you foresee that a "normal" lens or the lack thereof might be an issue in an important felony trial, you or your department may be obliged to purchase a full frame DSLR such as the 24 MP Nikon D810 or the 50 MP Canon 5D and a "normal" 50 mm prime lens to go with your other lenses, even if it won't be used very often.

As a holdover from the film era, I have a "normal" Nikon 35 mm f/2 AF-D lens in my D7000 kit just in case a situation calling for an indisputably "normal" focal length should arise. A fast prime with a hard infinity stop, an infrared focusing mark and a depth of field scale is useful for many things, of which being able to claim that a particular photo was taken with a "normal" focal length is at the bottom of my list. I'm keeping my 50 mm f/1.4 AF-D purchased in 1993 in case I'm lucky enough to find a D810 in my Christmas stocking one fine morning.

The first reference that I can find to the so-called normal lens in evidence photography is *Photography in Criminal Investigations* by Charles C. Scott, published in 1938, which you can read for yourself at <http://scholarlycommons.law.northwestern.edu/jclc>. This is an excerpt from Scott's book *Photographic Evidence*, originally published in 1935.

Scott says, "By common usage a lens is said to be of normal focal length when its focal length is about equal to a line drawn diagonally through the two corners of the film size being used." Scott was both a lawyer and a photographer so we can assume that the term "normal lens" goes back prior to 1935.

Similar statements can be found in Kodak's *Photography in Law Enforcement*, *Modern Photography for Police and Firemen* by Sam Sansone, *Police Photography* by Larry Miller and *Crime Scene Photography* by Edward Robinson. I'm sure that a diligent paralegal could come up a long list of publications extolling the virtues of normal lenses generally and the 50 mm focal length in particular.

Visit http://en.wikipedia.org/wiki/image_sensor_format. The folks at Wikipedia have compiled the diagonal of all common and many uncommon sensor formats. The diagonal of a 35 mm negative or the sensor in a full frame digital camera is 43 mm, not 50 mm as often claimed.

Be that as it may, 50 mm is considered a normal lens on 35 mm film cameras and full frame digitals. How did this come about? Perhaps the answer can be found at http://www.Overgaard.dk/leica_history.html.

Between 1913 and 1924, Leitz engineer Otto Barnack designed the world's first 35 mm rangefinder camera. When Leica decided to produce the camera commercially in 1924, Leitz engineer Max Berek designed a 50 mm f/3.5 lens. Their brainchild, the Leica Model A, was rolled out in 1925 and the rest is history.

Why 50 mm? Fifty millimeter lenses are among the most economical to manufacture. Here's proof from Nikon's web site:

- 24 mm f/1.4 AF-S G - \$2199.95
- 35 mm f/1.4 AF-S G - \$1,799.95
- **50 mm f/1.4 AF-S G - \$484.95**
- 85 mm f/1.4 AF-S G - \$1,699.65

These are all AF-S G lenses. The older AF-D and AI-S lenses are slightly less expensive but we're comparing apples to apples.

Before zooms became popular, entry level 35 mm film cameras were typically sold with a 50 mm lens for the same reason that entry level digital cameras are usually sold with a zoom. First time buyers can't take pictures without a lens so it makes sense to bundle the camera with an inexpensive lens.

The notion that there is magic in the 50 mm focal length can be dismissed as a combination of happenstance, tradition and manufacturing economics. Nevertheless, for whatever reason, normal lenses are a fact of forensic life.

Why not shoot at the "normal" focal length marked on your lens barrel? This would be 50 mm on a full frame camera, 35 mm on an APS-C camera. Having spent time on the stand being cross-examined by top-notch trial lawyers, I would prefer to avoid trying to explain why a zoom lens at a marked aperture of 35 mm on an APS-C camera or 50 mm on a full frame camera is just as good as a 35 mm or a 50 mm prime.

If you have *copies* of your camera-original JPEGs and a good editor such as Faststone installed on your laptop, you can prove that a photo taken with a zoom lens was captured at the claimed focal length. See [EXIF-Metadata.PDF](#).

The downside of this approach is that the average prosecutor is not a photographer and may not know what how to lay a proper foundation and when to object when a well-coached defense attorney demands a yes or no answer.

Dr. Marc Green in [Photographs versus Reality](#) explains why one should not rely on photographs to prove what can and cannot be seen from a given vantage point or under a certain lighting condition. We look for simple answers such as "always use a normal lens" but the answers that we seek are not always simple.

We want simple answers to complex questions and "always use a normal lens" is simple, perhaps too simple. Creating a credible reconstruction requires preparing detailed, carefully dimensioned drawings showing the relationship between important elements within the scene and where the witnesses were standing during the course of the initial investigation.

Presumably, the purpose of creating a reconstruction is to demonstrate what each witness could or could not see from his or her vantage point. Once you've

recreated you scene, stand where each witness was standing if this can be determined with reasonable certainty. Use a moderate wide angle to short telephoto zoom. Compose the shot in the viewfinder to see what focal length is actually needed to capture the scene to the satisfaction of the attorney requesting the reconstruction.

You may or may not be able to capture the entire scene, or the critical elements within the scene, with a "normal" focal length. If you can, I suggest replacing your zoom with a "normal" prime to take your money shots just to avoid giving an aggressive defense attorney something to challenge.

Will using a "normal" lens give the judge and jury a true picture of what a given witness could and could not see from his or her vantage point?

Not bloody likely. Ideally, pictures should be viewed at a distance equal to from 1.5x to 2x the diagonal of the image and the picture should be enlarged to a size equal to the magnification times the focal length.

I received this advice circa 1975 from Axel Hansen, a photographer on the legal staff of the Southern Pacific railroad based on a pamphlet published by the Evidence Photographer's International Council. The formula was repeated in an recent Internet article written by Keith Cooper that you can read at www.northlight-images.co.uk/article_pages/print_viewing_distance.html.

Thus, for the "normal" lens idea to hold water, you've got to know how the picture will be displayed once it reaches the courtroom. If the courtroom has an existing audio-video system capable of displaying photographic evidence, the judge may insist that the system be used whether or not it is ideal for the purpose.

For more information, see:

- <http://www.tissuegroup.chem.vt.edu/chem-ed/ethics/garrison/shooting.html>
- <http://www.forensic-photography.com/presenting-photographic-evidence.pdf>
- <http://www.forensic-photography.com/perspective-distortion.pdf>

Should someone approach me with the idea of shooting a crime scene reconstruction, I would suggest that he or she Google "expert witness" and select a court-qualified forensic engineering consultant to do the dirty deed. I'm too old and I lack the necessary academic credentials such as a PhD after my name to stick my neck in that particular noose.