Photography for Safety Professionals

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Introduction

The earliest developments in what is now termed "photography" were made in the 5th and 4th centuries BCE by the Chinese and Greek. Although these discoveries did not produce a lasting image, it opened the door for people like the Frenchman Louis Daguerre to take the concept of pinhole image projection and experiment with methods to create a lasting image. Chemical photography was the result of his efforts and has been very popular through the decades. Inventors continued to strive to refine the process. Consumers yearned for improved quality, longer lasting images and a way to store a greater number of images in a smaller space.

As with all technology, digital photography has experienced an evolution that eventually produced a consumer product. The space race in the late 1950's and early 1960's saw the birth of digital photography. Countries understood the benefit of photographing each other from space and worked diligently to produce a method that allowed pictures to be sent back to earth. In the 1980's, Sony produced the first consumer digital camera. Although it worked on a still video frame concept, companies have allowed the idea to jump start other projects.

Today we have utilized the advances in the computer and digital storage worlds along with the concept of light to create a lasting image and we now have the capability to produce high resolution images, store many images in a small digital space and we have the ability to manipulate digital data. The applications for digital photography are endless.

Occupational safety has become one of the areas that is benefiting from the development of digital photography. What are the applications of photography for the safety profession? What are the benefits of digital versus traditional film photography? What type of "gear should you have when just starting out as a budding safety photographer? Are there any legal considerations or implications surrounding the use of digital photography?

Applications

What are the potential applications for digital photography in the world of Occupational Safety? Occupational safety was born to "ensure a safe and healthful work environment for working men and women". Safety programs were built in all industries to identify and control hazards in the workplace. Safety programs have developed into an integral part of any business in today's world.

Safety professionals have the potential to use photographs in almost every facet of their program.

- Training
- Regulatory Compliance & Non-Compliance
- Documentation of:
    - Accidents
    - Fire/Arson
    - Theft
    - Insurance Claims
    - Motor Vehicle Accidents
    - Property Damage

The type of application helps to determine the equipment needed to tell a story. The types of images to be captured include close-up; scene over views; low light situations; various weather implications and so on.

Pixels

Pixel is the contracted word for picture element. A picture element is the smallest discernable element of a digital image. It is typically displayed as a colored dot. All of the colored dots, or pixels, are arranged as a mosaic. The resulting mosaic is the image that a person sees when they look at a digital representation of an image. Our minds translate the dots into an image that we can understand. The quality of the image is affected by the number of dots or pixels per inch. The closer together the pixels are, the more cohesive the resulting image and the less discernable the actual dots are to the human eye.

A megapixel equals one million pixels. The more pixels an image has, the higher the resolution. Resolution is the amount of detail that a computer or a printer is able to produce when viewing or reproducing a given image. The size of reproduction of an image can be extremely important if the image is to be used during litigation. Consider how large a reproduction must be to have impact on a jury of 12 individuals seated in a courtroom.

A digital camera also has a megapixel designation. This designation is used as a reference to the cameras resolution capabilities. The larger the number of megapixels, the higher the

resolution of the image produced by the camera. Many guides are available on line to show the correlation of megapixels to the size of printed images with acceptable quality. Once you have determined your applications for your photographs, it is strongly recommended that you review these available guides prior to equipment purchases or upgrades.

Equipment

Every photographer, including safety professionals, should create a "kit". A kit is a term used to describe a group of equipment that aids in creating appropriate images for whatever the photographers purposes are. Recommended equipment includes:

- 8 – 12 megapixel Digital Single Lens Reflex Camera
- Standard 55mm lens
- Zoom lens – focal length to be determined by an individual's needs or anticipated application
- Various Filters – haze, UV, polarizing
- Dedicated Flash Unit
- Hard Shell Storage/Carry Case
- Digital Storage Card (s)
- Neck Strap
- Numerous Batteries

Some of the choices you make regarding your equipment will be personal in nature and other decisions will be driven by the specific applications that you anticipate. Personal decisions may be impacted by your skill level (auto focus vs. manual focus), brand choices or loyalties (Nikon, Canon, Olympus, etc) and budget constraints. Specific applications may help you decide how many megapixels your camera has, types of filters you purchase and focal lengths of lenses.

Be honest with yourself. Create a list of your anticipated applications. Include options that you "must" have and then draw up a bare bones list of items you need to create a minimal kit. More options, more megapixels and more equipment require more money. Once you are proficient with a minimal kit, you can add items as you find they are necessary. Do not fall into the trap of having so many options or pieces of equipment that they slow you down and you miss the essential photographs because your attention is diverted to the process of creating the image.

Storage Options

As time progresses, it is inevitable that society will find better ways to achieve goals. Storing photographic images has seen progress through the years as well. Film degrades over time, photographs fade and turn yellow. The advancement of technology helped to develop archival storage techniques, techniques to slow the impending degradation. Even with the introduction of archival methods, storage required space and the search began to create a method for storing more images in a smaller space.
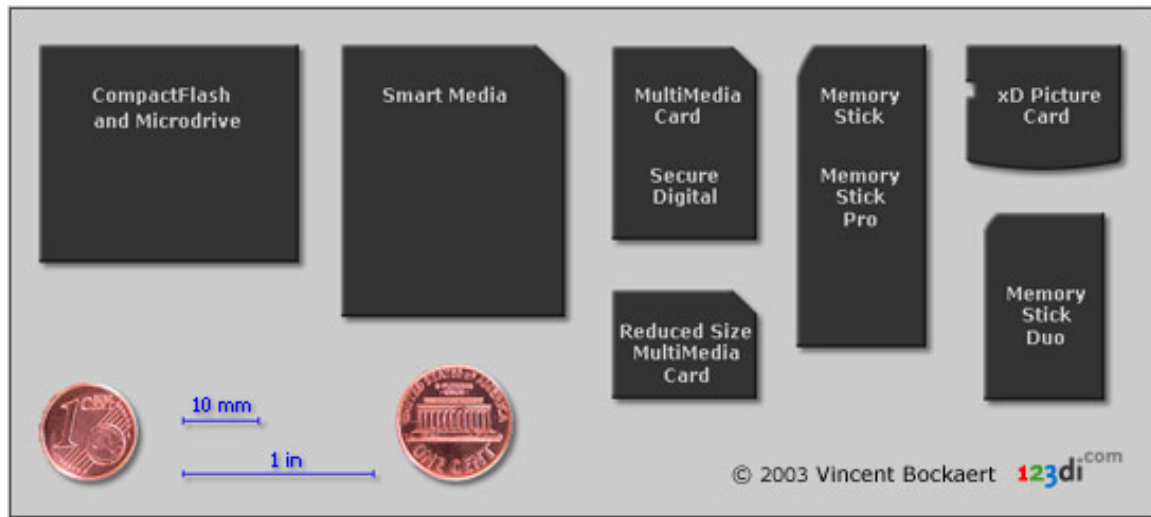
Figure 1. Examples of various digital storage cards

The introduction of digital photography helped to solve the age old space/storage issue. Digital photos are compressed and stored on small cards that must be deciphered by a computer (see Figure 1). Purchasing a storage card can be difficult due to the large number of choices available. Some of the variables amongst the different cards include size, formatting, capacity and write protection.

Advances in the computer industry have drastically affected the cost of digital storage cards. Large capacity storage devices become more and more affordable on a daily basis. It is quite common to find a 4 gigabyte storage card on sale for roughly $20. If you were utilizing an 8 megapixel camera, the capacity of your storage card would be in excess of 800 images. The potential is staggering.

Creating Images

Although there are no "rules" of photography, in the strict sense, there are several guidelines that a photographer can utilize to enhance their images. When a person has time to assess the area or to "compose" their image, they have an opportunity to emphasize or draw attention to a certain subject matter.

Composition: Photographic composition is the relationship between objects and elements of a photographic image. The degree to which any one element is emphasized may drastically change the viewer's reaction or interpretation of the image. The photographer has the capability to influence, to a certain extent, how an image is received by the viewer. To exert this influence, a photographer changes the relationship of the elements within the photograph. The photographer does not move objects around, but rather moves around the objects to change perspective.

Three "rules", or guidelines, of photography that photographers use to create images that have impact are the rule of thirds, leading lines and depth of field.

Rule of Thirds: The use of the rule of thirds can be traced back to the visual arts of Leonardo Di Vinci, the ancient Greeks and even the Babylonians and Egyptians. When we take photographs, the first instinct of an un-practiced photographer is to center the image in the middle of the viewfinder.

The rule of thirds is a guideline used in the visual arts such as painting, design and photography (see Figure 2). The human eye is naturally drawn to a location not in the center of a page but rather two thirds of the way up a page. The rule states that important subject matter or photographic elements should be arranged such that they intersect or run through the intersections created when an image is separated into 9 equal squares as noted below. It will take practice to compose an off center image.
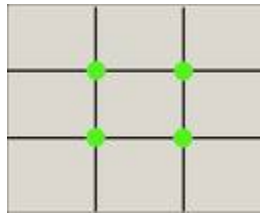

Figure 2. Visual depiction of the rule of thirds

Leading Lines: There is one technique of image creation that can be extremely powerful. This technique is known as leading lines. Leading lines have the capability to draw the viewer's attention to a single focal point, or to one or more intended subjects. Leading lines can be anything that may be readily available such as tire tracks, foot prints, a fence or even lines that are created by machinery or equipment. A line as defined by Webster's dictionary is something that is distinct, narrow and elongated. A line may be curved, wavy or straight. The person framing the scene through the viewfinder can often times control what information is communicated in the image (see Figure 3).
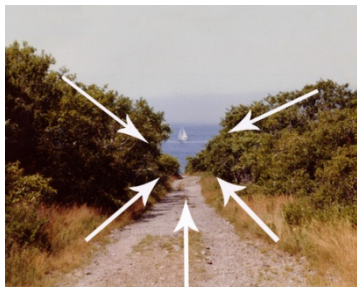
Figure 3. Visual depiction of leading lines including a field example

Depth of Field: Depth of field is the distance in front and beyond an object that is in focus. Depth of field is impacted by the amount of light that reaches the sensors. Aperture is a word that is used interchangeably with the term f-stop. The aperture, or f-stop, is the size of the opening, or shutter, within the camera. How quickly the shutter opens and closes is referred to as the shutter speed. These two entities are interdependent upon one another (see Figure 4).
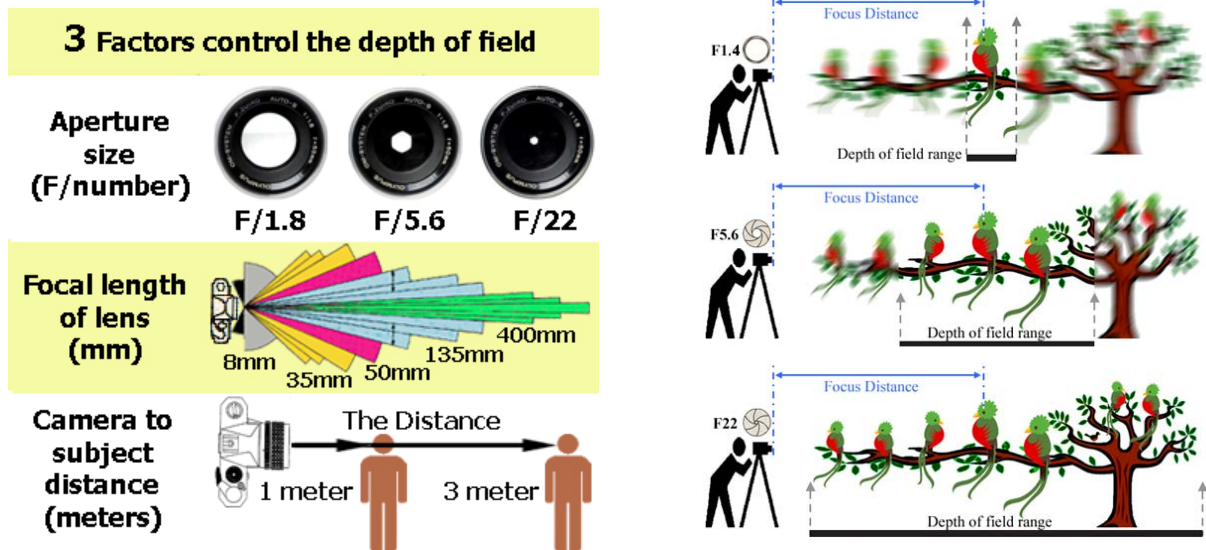
Figure 4. Correlation of aperture to photographic depth of field.

Considerations for Safety Applications

The most important thing to remember, as you create an image as a safety professional, is to know what story it is you want to tell. The story will then dictate the types of images you should

be capturing with your camera. Consider a traffic accident. As you approach the scene with you gear, are you interested in the damage to the car? Do you think that you will have a potential future need to prove fault or attempt to make a case for liability? The answers to these questions dictate whether your images should be full scene over-views, close up's of damage, or even a series of shots showing all of these types of images.

Creating an image must take into consideration all of the topics previously mentioned. If you are diligent and consider each of the items associated with choosing gear and composing an image, then is should ease some of the issues that will be discussed next.

Legal Uses of Photographs

Photographs have been used in legal actions since 1839 and in the United States Courts since the 1860's. Many of the safety professionals' uses of photography have the potential to involve the legal profession. Even the simplest accident investigation by a safety professional has the very real potential to enter the legal arena (e.g., workers compensation claim or litigation against a building owner, contractor, subcontractor, designer, or manufacturer). Additionally, amongst the various purposes for which a safety professional may utilize photographs and photography, only the legal profession provides rules and standards in regards to photographs. As the legal profession often involve actions considered to be of substantial importance and/or involve significant monetary amounts safety professionals should be aware of these rules, standards, and limitations. Some of these actions may be "pseudo-legal", such as insurance claims, accident documentation, and non-compliance observations (all of which could lead to a legal action), or legal action such as a civil or criminal litigation.

The most restrictive obligations and rules in regards to photographs (i.e., evidence) are present in the litigation realm. Preparing as if photographs are intended for a litigation matter (or a potential litigation matter) serves as a worst case scenario and will ensure that photographs remain useful, even if litigation was not expected at the time of the original photograph. While these rules are not excessively restrictive, they do provide a framework in which to develop standard operating procedures ensuring that the potential use of a safety professionals' photograph(s) will not be challenged.

Photographs as Evidence

Photographs serve a significant role as evidence in litigation and have been used in the United States courts since the 1860's. Some estimates state that photographs are used in half the trials in the United States. The Federal Rules of Evidence (" Rules FRE")[1] define *photographs* as "still photographs, x-ray films, video tapes, and motion pictures"; a broad definition that clearly also encompasses the digital realm. Understanding that a photograph is a form of evidence is the first

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[1] Individual jurisdictions each have their own set of evidentiary rules. The Federal Rules are often used as the basis for state rules and are therefore used herein to present an example. Personnel practicing in the legal field should seek local legal counsel in regards to questions specific to evidentiary rules in their jurisdiction.

step in understanding all of the considerations and obligations that are imposed upon the photographer by the evidentiary rules. These considerations include issues regarding admissibility (into a court of law) of the photograph(s), relevance, and ability to authenticate the photograph (where required).

The Federal Rules of Evidence were initially developed prior to the advent of digital photography and subsequent revisions have not considered the different issues presented by digital photography versus conventional photography. More than one state jurisdiction has considered implementing evidentiary rules specifically addressing digital photographs; however, none of these proposals were enacted. Prior to the development of the Federal Rules, acceptance of conventional photographs as evidence was well established; the Federal Rules codified the practice of acceptance. As such, safety professionals should be aware of the potential areas for challenges in regards to digital photography along with the suggested best practices.

Admissibility

The first element to consider in the use of a photograph as evidence is admissibility; whether the photograph is admissible as evidence. The US Legal System tends toward over-inclusiveness and the Federal Rules of Evidence provide that "[a]ll relevant evidence is admissible". The Rules also include the contrary, "[e]vidence which is not relevant is not admissible". Exceptions to the general rule of admissibility include danger of prejudice, confusion of the issues, or waste of time. The important element is that the evidence must be *relevant*. The Rules define relevant evidence as "evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence".

To understand relevance, consider a photograph of the entranceway to a confined space within a basement. The photograph shows that the entranceway possesses a number of warning signs, including signs identifying the space as requiring a confined space entry permit, identifying the potential presence of an airborne contaminant, and requiring respiratory protection to enter. The relevance of this photograph, as stated above, is based upon whether this photograph has the potential to make any fact of consequence more or less probable. If the legal action is a person claiming injury due to the building owner's failure to warn of the hazard this photograph is clearly relevant to document the nature and extent of warnings provided. Consider instead the relevance of this same photograph if the legal action is a claim against a manufacturer for an injury due to a defective ladder within the building.

Perhaps most significant is the Federal Rules of Evidence requirement that photographs be authenticated to be admitted into evidence. This requirement will be "satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims". There are two main theories in admitting photographs. The most common is the pictorial testimony theory. A person, not necessarily the photographer, familiar with what the photograph depicts testifies that the photograph represents a fair and accurate representation. The second theory is the silent

witness theory. Under this theory the nature and reliability of the process used to create the photograph must be shown. An example of the silent witness theory would be the authentication of security camera footage as evidence of the conditions at the time of an accident where no one was present to observe the conditions.

While the admissibility and acceptance of photographs as evidence is well accepted and sets a low threshold to acceptance, challenges to the use of photographs is not impossible. Some of the most common means to challenge photographs are due to poor practices on the part of photographers. This is especially true when using digital photography which offers more opportunities for photograph manipulation.

There is a general perception that undetectable manipulation of a conventional photograph requires an expert's skill while similar manipulation of a digital photograph is "child's play". The ease of use of programs such as Adobe Photoshop only exacerbates this perception. This fear appears misguided since while programs such as Photoshop do bring editing tools within the realm of the average person, digital manipulations by unskilled personnel are readily detectable by experts. Despite this one jurisdiction proposed requiring digital photographs to have un-editable information within the file to be admissible in a court of law.

Recommendations/Best Practices

While it is unlikely that a safety professional will be involved in a challenge to the authentication of a photograph reminiscent of the famous evidentiary argument of the photograph showing O.J. Simpson wearing Bruno Magli shoes, it is still recommended that photographers understand the potential for challenges and utilize best practices to serve as a preemptive measure. Though the rules of evidence have not grown to specifically address digital photography, law enforcement has embraced the techniques of digital photography and have developed procedures to aid in ensuring admissibility of these photographs. These procedures include:

- Using a camera with sufficient pixels to accurately show both necessary detail and to be enlarged as necessary for presentation

- Using no compression (or as little compression as possible) in saving photographs

- Accurately setting and using the in-camera data system to incorporate date and time into a photograph's metadata

- Downloading photographs in a timely manner

- Being able to produce an archival (i.e., unedited) copy of the original photograph file

- Using a chain of custody type system to accurately record any changes (i.e., contrast, brightness, cropping, etc.) made to a digital photograph

Conclusion

Photography and the ability of capturing scenes and conditions as they exist is an important tool in a Safety Professional's toolbox. Understanding the available equipment, proper use of the equipment, and ways to enhance results obtained with the photographic equipment are vital to obtaining the required result. One of the most significant uses for a Safety Professional's photographs is in the legal field, specifically as it relates to litigation. An understanding of evidentiary rules that will be applied to the photographs is necessary to ensure that the Safety Professional's photographs will be able to be admissible as evidence. Safety Professionals can proactively work to ensure the future admissibility of their digital photographs by understanding and following the recommended best practices.

References

Federal Rules of Evidence, Rules 401, 901, 1001, 1002 and 1003.

Wisconsin Assembly Bills 584 (2003) and 472 (2005).

Hawaii House Bill 1309 (2003).

Bianchini, Victor E. and Harvey Bass: A Paradigm for the Authentication of Photographic Evidence in the Digital Age, 20 *T. Jefferson L. Rev.* 303 (Summer 2008).

Witkowski, Jill: Can Juries Really Believe What They See? New Foundational Requirements for the Authentication of Digital Images. 10 *Wash. U. J.L. & Pol'y* 267 (2002).

Barakat, Brian and Bronwyn Miller: Authentication of Digital Photographs Under the "Pictorial Testimony" Theory: A Response to Critics, 78 *Fla. Bar J.* p. 38 (July/Aug. 2004).

Scott, Charles C.: Photographic Evidence (2d Ed. 1993).

Luco v. United States, 64 U.S. (How.) 515 (1860).

Scientific Working Group on Imaging Technology: Recommendations and Guidelines for the Use of Digital Image Processing in the Criminal Justice System. *Forensic Science Communications*, Jan. 2003, Vol. 5, No. 1, available at www.fbi.gov/hq/lab/fsc/backissu/jan2003/swgitdigital.htm.

Scientific Working Group on Imaging Technology: Best Practices for Image Authentication. Available at http://www.theiai.org/guidelines/swgit/guidelines/section_14_v1-0.pdf.

Scientific Working Group on Imaging Technology: Digital Imaging Technology Issues for the
    Courts. Available at http://www.theiai.org/guidelines/swgit/guidelines/section_17_v2-
    0.pdf.

Scientific Working Group on Imaging Technology: Best Practices for Documenting Image
    Enhancement. Available at
    http://www.theiai.org/guidelines/swgit/guidelines/section_11_v1-3_20100115.pdf.

 http://www.fetoon.net/DOF.html   (Exhibit 4)

Grill. Tom. *Photographic Composition.* New York: Watson-Guptill Publications, 1990. (Exhibits
    1-2)