

Utilize photography as evidence

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Introduction

Blasting has been completed when the lawyer calls to say that a landowner has filed a suit alleging damages to the roof of his home. Mitigation talks fail to produce an adequate resolution and the case goes to court. The blaster has pictures of the area made after the blasting was done showing the good condition of the roof. However the judge fails to allow the photographs to be entered as evidence and the homeowner wins the case.

In the beginning cameras were bulky items made of leather and wood utilizing glass plates with hand painted emulsions mixed by the photographer. Not many people had cameras or the zeal to deal with the effort required for making pictures. Today everyone is a photographer. Equipment ranging from disposable film cameras to sophisticated high speed motion picture digital video cameras are available and require much less effort to use. Even cellular telephones contain a camera.

Use of cameras by the blasting industry

The old saying, "A picture is worth a thousand words" is true; plus the camera can record an event in time. A verbal or written description is subjective because it is based on the observations and vocabulary of the observer. Thoughtful placement of a digital still camera or a scene recorded with a video camera portrays the event in a way words could never do. Images that accurately reflect the scene or event vastly improves communication. The use of photography by the blasting industry involves different tasks requiring different types of camera equipment.

Preblasting surveys

Before blasting starts the condition of the surrounding structures is documented. A preblasting survey is your first line of defense in handling capricious lawsuits, yet a it is useless if the photographs or video made during the survey will not be admissible in court.

Preblast photography is not limited to surrounding structures. Photography of the blast site and the surrounding area can help the blast design engineers. Time and travel to visit the blast area can be saved when photo documentation of site conditions is included in the design phase of a project. If arguments concerning design arise, these images may be needed in court .

Blast Design

Accurate plans eliminate delays and problems in the field. Downhole cameras record conditions otherwise invisible from the drill bench. If a driller has a question about a blast site problem and the blaster is on another site, sending a 'cell phone picture' aids communication between the two.

Record the drilling and blasting procedures

The detonation sequence may be difficult to visualize from the drill log and the blast record, especially for the viewer that is not a blaster. A visual presentation showing images of the blasting operation sequence can allay concerns of adjacent landowners during public meetings. Several coalmines have been required to video their blast detonations as the result of enforcement actions.

Analyze blast performance

High-speed cameras are used to slow down time and motion to analyze the blast performance. These motion pictures are used to measure the actual detonation delay times of blasting caps, determine velocity and trajectory of the blasted material. Post blast photography is used to measure the distribution and fragmentation of the muck pile.

Document post blast investigations

The post blast investigation of a damage complaint demands the same quality documentation as the preblasting survey. The investigation report is not complete without images of the post damage allegations.

Accidents and Thefts

Unfortunately accidents do occur in the explosives business. Thefts of explosive products occur only occasionally, but are certain to start an investigation by the authorities. The blaster or another company representative is generally the first person on the scene. Images of the area made immediately after the event will aid in the accident investigation or assist the authorities in recovering stolen goods and prosecution of the thieves.

Photography equipment

Camera equipment can be divided into two categories; still and motion picture cameras; then each category can be divided into film and digital equipment.

Film cameras are referred to as “wet photography”.

Camera film is a plastic strip covered with an emulsion that is sensitive to light. When exposed by the camera the resulting image requires special equipment to process or develop. Depending on the type of emulsion the image may be a Negative, or a Transparency. The negative shows light areas in the scene as dark areas on the film, opposite to reality. The transparency image is not reversed; it will look similar to what we see. Some instant film cameras are available that allow the image to be seen while on site. However most film requires processing, a time consuming chemical procedure, hence the term ‘wet photography’. Development is generally performed off site; consequently the images can not be reviewed

when the picture is made. Instant film cameras do allow review of the picture but are not generally used on blasting sites.

Digital Photography

The digital camera is a common technology used today. Instead of using film the camera uses a light sensitive electronic sensor to capture images. Two types of digital sensors are the Charge Couple Device (CCD) and the Complementary Metal Oxide Semiconductor (CMOS). Both are electronic devices and how they work is beyond the scope of this paper. Suffice it to say that the printed images produced by the two sensors are quite similar. Off site development is not needed providing the photographer an instant replay of the event or verification of the image. Inspecting the images while on site is a distinct advantage over film.

Because the sensor sees the image as an electrical impulse, both digital still cameras and video camcorders use internal software that records the signal as a digital file. Digital cameras may record onto various storage media, videotape, internal hard drive, removable storage card, or an optical disk. Analog video cameras are still widely used and record onto tape. The analog record requires a separate device or player to read the signal on the tape. The tape from the analog video camera can be converted into a digital file by computer software.

So what is the digital image?

Since the digital camera does not use film what does it produce a photograph, a picture, a computer screen shot, a television image, or all of the above? The camera creates a digital file that can be used to make an image.

The digital image file is defined as:

- A) Image in numerical form, which can be stored and manipulated by a computer.
- B) A numerical image is divided into a matrix of pixels
- C) Each pixel represents a particular amount of area and holds a numerical value indicating the radiance of the image at that point.

www.tsgc.utexas.edu/stars/glossary1.html:

About the time someone said a picture is worth a thousand words, another person said, “ a picture is a thousand lies”. In fact he was a lawyer talking about a photograph introduced as evidence in the late 1800s. Manipulation of film can result in a photograph that does not accurately represent the scene. Merely introducing the question in the courtroom that a picture may have been manipulated places doubt on the honesty of the image. If the image evidence is crucial to the outcome of the trial, the last thing you need is the jury wondering about the validity of that image. Computer manipulation of digital files is easy, even by a novice. With a few minutes of computer editing, that rock on the top of muck pile, can appear to have landed in the living room floor of the house next door.

Guilty Till proven Innocent

A trial is an adversarial procedure where the outcome is decided by the evidence. The explosives industry is considered the 'bad guy' till proven innocent. Digital images can be valuable to document the facts and prove innocence as well as guilt. Even if the photo evidence is genuine, but cannot comply with the rules of evidence the court will refuse to consider it.

It is imperative that personnel in the blasting industry know how the rules of evidence apply to film, digital photography, and video. Proper management of digital files insures the images can be used as evidence in the courtroom.

There are two kinds of evidence, one testimony is when a person answers questions or explains their knowledge of the facts and two is physical evidence. Photographs are considered physical evidence. Digital images are also physical evidence, but are considered 'fragile evidence' because manipulation of the file is so easy.

Depending upon the state and country in which the court is located in there will be nuances in the way the rules governing evidence are written and applied. In general however, traditional photographic techniques are well accepted by the court system. Since the introduction of digital image technology as evidence there has been controversy in the court room over it's acceptance.

The **trier of fact** is to disregard evidence in which relevancy is not adequately established. How does the judge determine if manipulation of the images actually occurred? The photographer's testimony is the best corroboration of the digital image. Hopefully he or she is believed when testifying that "the image is an accurate representation" of the scene. Other witnesses also can be asked about the image evidence introduced during the proceedings. In fact both parties will have photographs or video evidence. Witnesses may find them selves commenting on the other sides the image evidence and whether it accurately portrays the scene.

The digital image is an inanimate object and cannot testify, in other words a photograph or a print of a digital file cannot be asked questions. Therefore do not draw arrows or write directly on the images describing what it shows. Once the witness is on the stand and being questioned about the image evidence, it may be okay for the witness to mark on the printed image to clarify a point. Although it will be best to draw on a copy of the image which can be introduced as a separate piece of evidence.

The **Scientific Work Group on Imaging Technology**, SWGIT, has addressed the problem with digital photography that will be used as evidence. Their mission statement reads, " to facilitate the integration of imaging technologies and systems within the criminal justice

system, by providing definitions and recommendations for capture, storage, processing, transmission, and output of images.”

The SWGIT members consist of photographers, scientists, instructors, supervisors of federal, state, local, and international law enforcement agencies. Also representatives from the academic and research communities are included in the workgroup. Its member’s represent knowledge of each aspect of digital imaging uses and technology.

Although most issues involving the use of explosives in construction, quarrying, and mining are not considered criminal in nature, the SWGIT recommendations apply.

Currently the work group has published 15 section papers that offer recommendations on the use of digital images as court room evidence. In addition the SWGIT has jointly published technical recommendation papers with other professional groups working in the imaging field. The documents are consensus opinions from the workgroups, and should not be considered as law. The scope of this presentation does not address each of the papers, instead I have selected some of the basic issues, which should be valuable to explosives industry.

SWIGT Section Review

Section 1 version 3.1 2007. 06.08 is an overview containing digital imaging definitions, and general evidence issues. A person using a film camera is said to “take a picture”. The proper terminology to use with a digital camera, videocam, or scanner is the “**capture**” of the image file. Of special note in this section are the following items, these items define the scope of digital images that can be allowed into evidence.

Item 1.4 states, “Relevant, properly authenticated digital images that accurately portray a scene or object are admissible in court. Digital images that have been enhanced are admissible when the enhancement can be explained by qualified personnel.”

Item 3 states, “a prerequisite to the admissibility of any evidence is that the evidence can be authenticated.”

Item 1.4 acknowledges that manipulation of the digital image file may be needed to extract information pertinent to the case or simply to allow a better image to be printed. Although the image file can be enhanced or manipulated it must be, “authenticated and explained by qualified personnel” or simply put the manipulation must be explained in detail.

If the testimony of the photographer is not convincing, testing of the digital image file can be required. Sophisticated programs used by well-trained and qualified technicians are able to prove if the image file has been altered. The testing involves comparing the quantization table that makes up the digital image file with reference files from the camera manufactures and various editing programs. Basically computer-editing software will leave a fingerprint in the digital file.

Item 3.2 and 3.3 describe process for the storage and archiving of the original images and digital files.

Item 7.3 states, "All personnel utilizing imaging technologies shall be trained and competent in the operation of relevant imaging technologies."

Item 7.4 suggests that a " Standard Operating Procedure Manual" be developed to formalize the procedures for capture, storage, process, transmission, and analysis of digital imagery. The importance of the procedure manual is described later.

Section 3 Guidelines for Field Applications of Imaging Technologies contains beneficial information to assist in the choice of camera equipment. This section describes advantages of both the film camera and the digital capture devices. Obviously cost and reliability are to be considered in the decision, but the intended purpose of the image should be the overriding factor.

The 35-millimeter (35 mm) roll film is available in many locations, has good quality and is the most common film size used today. Digital still cameras are compared to 35 mm to describe the quality of the sensor and the resulting image. You may well be asked on the stand to explain how your digital image compares to 35 mm.

Resolution or detail is a major difference between digital capture devices and silver-based film. A scale, called line pairs per millimeter (LP/mm), or lines per millimeter is used by the industry to define resolution. Digital cameras describe the sensor size in the number of pixels, or "mega-pixels". The larger the number of mega pixels a sensor contains the better quality of the resulting image.

To compare the size of the digital sensor that equals the 35 mm film requires some math. A frame of ISO 200 color film measures 36 mm wide and 24 mm tall, with a resolution of 50 lines pairs per millimeter. Therefore 36×50 equals 1800 line pairs horizontally and 24×50 equals 1200 line pairs vertically.

To determine the equivalent number of pixels, multiply the line pairs by two, because it takes two pixels to equal a line pair in one direction. Then multiply the two resulting quotients. In this example the 35-mm film resolution is 8,640,000 pixels. A digital camera would require a sensor capable of more than 8 megapixels obtain similar resolution.

However, another factor must be included in the comparison, the camera lens. The lens controls the field of view. By choosing lenses the photographer can select the angle of coverage for the scene. For example, the photographer is standing in the pit captures an image to record a fracture in the highwall using a 28-mm wide-angle lens. The resulting image file will encompass more of the scene than just the fracture. In fact the fracture may be hard to distinguish because it will be such a small portion of the image. A telephoto lens has a narrower field of view. By changing to a 200 - mm telephoto on the same camera, and from the same position the telephoto will produce an image in which the fracture will be more

discernable. Because less of the surrounding area is included, the number of pixels that record the crack with the telephoto will be greater than the wide-angle lens. The greater number of pixels used to record the point of interest, the better the resolution will be in the printed images.

Long ago I recall testifying about a bare spot in vegetation on a surface coal mine. I stood on the winch bumper and used a wide angle lens tilted to ward the ground. The witness for insurance company complained that my photograph was distorting the facts, he insisted that I had selected a lens and angle of view to make the bare spot appear larger than it really was.

Be prepared for this kind of attack. I make it a practice to photograph a brick wall at different focal lengths when I get a new camera. The grid pattern made by the mortar joints will show how the lens actually distorts the field of view. Hang on to those images in case you need to prove how much your optics distorts reality. When persons looks at an image they subconsciously image they were standing there. If you image is made from an odd perspective it may distort the viewer's impression. Study this section and the camera manual closely, be prepared to answer questions not only about the subject of the image but how it was captured.

Section 3 also addresses the role of the first responder on the scene. Transient issues need to be documented as soon as possible after event at an accident scene. For example the contract requires that all the rubble from a building demolition is to be contained within a vacant lot. If the rubble spreads onto an adjacent street clean up will begin quickly. A prudent blasting contractor should capture digital images before the clean up activities occur and also document the condition of the street surface after removal of the debris is completed. These images will be a valuable asset in mitigation talks.

Blasting contractors and other users of explosives generally have company policies on how to handle accident investigations. Be certain that these procedures include capturing images. Certainly images of a HAZMAT scene can be helpful in determining reclamation efforts and during mitigation.

A theft of explosives requires more consideration before company personnel photograph the area. Physical evidence includes footprints, fingerprints, and tire tracks. Be careful not to add your own footprints or fingerprints, thereby contaminating the crime scene. It may be best to just secure the area and wait for law enforcement.

Section 4 Recommendations and Guidelines for Using a Closed Circuit Television Security System is a good primer for establishing security monitoring of an explosives storage area. Recommendations include procedures for maintaining the tapes or other storage media used by the surveillance system. This paper provides suggestions for determining the number of cameras, camera selection, and camera placement in the monitored area.

An important term is introduced in this section, "Chain of Custody". It refers to who handles the and control the digital image files. When a change in possession of the image files takes place, such as the blaster giving the storage media card to the office secretary, it must be documented. If a break in the chain is found, the digital image file **may not** be accepted by the court as evidence. Chain of custody is an extremely important rule of evidence

Security camera recording devices use either videotape or hard drive to store the captured images. **Item 9.3** recommends that a videotape cassette should not be reused more than 12 times. Law enforcement may want to look at recordings made previous to the theft. It is suggested that 31 days of previous recordings be maintained in case the investigators request the data. Hard drive type recorders must be able to generate an optical disk containing copies of the image files or the hard drive may be requested during the investigation. If law enforcement requests the hard drive, be certain to have a back up drive on hand to install in the recorder.

Security camera placement

One of the most important considerations is selecting the placement of the security camera. Remember that the lens determines the field of view and effects resolution. Security video cameras do not have the picture quality of the digital still camera. A typical video camera has a resolution of 640 pixels in the horizontal plane and 480 in the vertical. Referring to the calculation used to compare film and digital still cameras demonstrates that the typical security camera is equal to a 1-mega pixel digital still camera.

Therefore, to read a license plate number or identify a face, the camera field of view should be about three feet across. Section 4 Item 7.5 provides a table listing lenses, sensor size, and distance from the camera to the subject to obtain the need field of view. Note that it is based on focal length of the lens in millimeters and the detector size in inches. For example a 1/3 inch detector with a 15.7mm lens would need to be 10 feet from the subject.

The lighting of the area also influences camera placement. The old photography rule 'put the sun over your shoulder' is equally true for placement security cameras. A back lighted subject will not contain adequate information to clearly see a face or read a plate number. Test each camera location and lighting on a television monitor to see if the image provides adequate detail.

A document trail to provide information to the law enforcement should include security camera specification information, the security equipment maintenance log, and a site plan of the camera placement. The name of the custodian of the image file records should be provided to the investigators. Section 4 provides an example of a System Documentation Form it is labeled Appendix C.

Establishing procedures for Storage of Digital image files

Section 13 describes the best management practices for documenting the procedures used by the company personnel in the handling of digital files. Capture of the still image or video by the camera is called the **Primary** digital file. An exact copy of what the camera recorded is called the **Archive** image

Archiving digital images, film, or videotape is storing the media in a protected location so that it can accessed in the future. Digital archive storage means that an exact copy of the digital file

from the camera and any edited version of the file must be kept. The hard drive of your computer should not be used for archive storage. Hard drives may fail or the laptop may disappear out your vehicle. A secure climate controlled environment is necessary for the film and videotapes.

A specific person must be assigned to be the custodian of the digital file archive. He or she will be responsible to maintain the integrity of the archive. Implementing controls on entering the files and distribution of the archived files by the custodian will assure proper chain of custody. In addition to maintaining the archive, the custodian will likely be called as a witness to explain the archive procedures.

Hardware manufactures have provided storage media since personal computers were invented. **Removable media**, such as the "Floppy disk" was found in every type of PC until recently. Now the optical disk and USB 'thumb drive' are the standard. One thing is for certain, any of the storage media currently in use today will be replaced by something new and better.

If the image files need to be stored for a long period of time, the life span of the storage media must be considered. Larger companies may have a "server" which can be set up as an archive. For smaller companies the Optical disks are a better solution. CD-ROMS and DVD disk have a life span of several years. The archived files should be moved onto new media if there is a concern age of the storage media or about the ability of the storage media to be read by available equipment.

Malfunctions of storage media do occur, a videotape cassette can become damaged or unusable, an optical disk can become damaged or cannot be read. Fire or theft can destroy the archive. Therefore two storage disks are better than one, use one for review and keep the second for backup. One of the copies should be maintained off site for security purposes.

The structure of the file system can be established with tools in the computer operating system. Software vendors also provide programs for storage of digital images. I would caution you about using these programs. The most important consideration in the digital file storage is to know how to explain on the witness stand every detail of the digital image file archive. If the software does the storing automatically and you are unable to describe in detail the steps it follows, you may not convince the trier of fact that you have a complete chain of custody.

Some of the camera manufactures provide software with the camera that stores the files and any edits that you do to files in two separate locations on the hard drive. This method makes documentation of the archive storage procedures difficult, and cumbersome to move digital files to storage media. Other software has a burn to disk feature that uses propriety language that cannot be accessed by other programs. Stand alone DVD players may include a record feature allowing the photographer to archive videotape directly from the camera. Digital files of the videotape can be played automatically on DVD players attached to television or on computers. These recorders place a VOB file to make the disk auto play in the DVD player and a separate file for the digital video images. Not all computer software programs can read the VOB files produced from these recorders, making editing or duplication difficult. In addition the

recorders compress the image files reducing the resolution of the image played back. This method of archive is not recommended for detailed analysis purposes.

Always use a CDR or a DVDR media disk, never a disk that has RW on it. Use a separate disk for each job site. When writing files on an optical disk the software will allow you to chose to place additional files later or to finalize the disk, always chose finalize. You will certainly have a greater number of disks with this method, but the advantage outweighs the costs involved.

Cellular telephone image files should be downloaded from the telephones to the image file archive. Since the person that captures the image may be at a remote location, be certain to include the name and cell phone number of that person in data documenting the image file.

Information about each digital image file should be included in the archive It is essential to record who captured the image, when, and where the digital file was captured. A paper ledger will suffice but a digital text document or a searchable database is much better. The more information collected, the easier it is to retrieve need images from the archives. However the amount of data entry required must be seriously considered before implementing policy. Recording to much information can make the task so time consuming that the policy will likely be ignored.

If the evidence must be provided to another company or the opposing council, never provide the original storage media. Create an exact copy of the stored digital image files. If the information is requested during a court proceeding ask you attorney if the notes that explain the images and any edited or analyzed files must be released. The custodian of the records must keep a detailed log and chain of custody form when disseminating the digital files.

When or if may digital image files be removed from the archive. Limits of liability involving the use of explosives vary in different situations. Purging files is dependent on the regulations governing your business and the nature of the data. Certainly the threat of a blasting damage claim lawsuit ceases at some point in time. However I suggest consulting your attorney before purging any files from the archive.

It is essential that every employee follow the archive procedures every time. A single flaw could eliminate a valuable image from the evidence list.

Digital file types

The SWGIT papers and many other texts discuss the file type of digital images. Basically there are two file types that are created in the camera, a jpeg which is a **Lossy** file and a proprietary format that is a **Lossless** file.

The size of the file and the image resolution is greatly affected by the choice of file type. For example 'RAW' refers to a file that that the camera manufacture uses to store date created by the firmware. Because it is not compressed it is considered **Lossless**. It produces a large file size , but creates the best quality digital file the camera is capable of. TIFF is another lossless

file type, and it has the advantage of being read by a greater number of programs than propriety programs from the camera manufactures.

JPEG file formats compress the data file producing a dramatically smaller file. It works by reducing 8 bits of information to 1 bit consequently it is a **Lossy** format. Most digital cameras provide adjustments to allow different levels of JPEG compression. If the greatest compression setting is chosen more image files can be captured before a download is needed plus these files transfer faster.

A word of caution is needed when determining which level of compression to select. Overly compressed jpeg files produce artifacts that appear in the printed image. Artifacts can make a straight line appear to be jagged and unwanted dots to appear in areas of low contrast, such purple dots in a cloudy sky. This over compression effect can obstruct the detail in the image you are trying record. Plus you do not want to explain if the purple dots are fly rock or UFOs.

If file size is not a concern, capture the digital image file with the best quality setting the camera allows. If number of images is more important use the compressed jpeg files. Two examples of when compression selection is an issue are documenting alleged blast damage and capturing a blast detonation. The lossless camera setting to obtain the best detail is preferred. Documenting the inspection of the complainants' property or the post blast status of a known defect demand we use the best resolution setting possible.

Digital single lens reflex (SLR) cameras can capture 3-5 frames per second. The images of the blast detonation made with the digital SLR will contain greater resolution than a video. If the camera is on the high quality RAW setting it will fill the storage capacity of the camera buffer or the storage card quickly, causing a portion of the blast to be missed. Selecting the compressed file type will allow the capture of the entire detonation. Each camera and storage media combination will require a different setting to keep the shutter clicking through the entire detonation sequence. Test the digital camera and the storage card to be used prior to the blast event. This will enable you to determine the optimum setting for your equipment. Lighting of the blast site will also effect the shutter speed setting. If the natural illumination is too dark to allow a shutter speed of 1/125 of a second, the images will be blurred due to motion. In that case the video camera will be better. Be certain to record the camera settings used in the archive records.

It is hard to identify an image from the file name of the primary file name created by the camera. However, the rules of evidence dictate that no changes can be made to the primary when copied into the archive, this includes the file name. The custodian of the records must devise a way of storing the digital image files that will enable their retrieval without opening each file to see it. Use of the computer operating system makes it possible to create a structure of file folders so that each folder can be named to make it simple and easy to relate it to the job site.

For example in windows, create a directory folder named for project, then insert sub folders for each phase of the job. Folders named for photographer or date then can segregate the image

files in each phase's folder. Searching for image files then becomes a narrowing process. Start with the project then the type activity and then date. A separate file folder can be included for each project to archive the bookkeeping information for the images. Which ever method is chosen remember simpler is better.

Digital images files will be changed as part of the image analysis process, but the result is no longer a copy of the **Primary** image. A lossless format is recommended all edited or analyzed digital archive files. All edited or analyzed digital files must be saved as a separate file in the archive system. These image files must have different name than that of the primary and or archive file and a description of the editing performed must be included in the archive. Procedures must be developed by the custodian of the image archive and explained to the employees in detail.

Section 5 Recommendations for Use of Digital Image Processing in Criminal Justice System

Digital image processing is an accepted practice in forensic sciences. It is the position of the Scientific Working Group on Imaging Technologies that changes to an image made through digital image processing are acceptable in forensic applications provided the following criteria are met:

1. The original image is preserved.
2. The processing steps are logged when they include techniques other than those used in a traditional photographic darkroom.
3. The end result is presented as an enhanced image, which may be reproduced by applying the logged steps to the original image.
4. Documenting image processing steps should be sufficient to permit a comparably trained person to understand the steps taken, the techniques used, and to extract comparable information from the image.

The list of photo editing and analysis programs available is a long one. If the blaster is only concerned with being able to print a true and accurate image from the file simple software is all that is needed. If the employee's digital image files will be used in court, he or she must be trained in the use of the archive procedures and the digital camera software. When additional software is used to enhance the file, the person performing the work should be trained in the operation of the program. Remember the trier of fact may not allow the image as evidence when the witness that is unable to describe the editing process performed on an image.

Image editing software tools may use a graph or a slider to make the adjustments the image. It is hard to quantify these settings in the archive records. Some image editing programs utilize tools that are controlled by a number value. For example, "the image was darkened a value of minus 15". These quantitative tools remove arbitrary descriptions allowing another person to accurately recreate the image as required by rule 2. Basically speaking unless you are

extracting a hidden subject, like a fingerprint on a cardboard box, the fewer the number of adjustments performed the better.

Do not crop the image, do not use the clone tool to cover up unwanted items. Sharpening the focus also is not recommended unless to computer operator is well versed in the software. Excessive use of the 'sharpen' tool can create artifacts and reduce the value of the image. Color is often controlled by the printer, record the printer type and specifics settings used to make the printed image.

In the case of high speed or fragmentation analysis not everyone is going to understand how the software works. A witness should never attempt to explain how the results were obtained if he or she does not understand. Never risk the credibility of your testimony by answering question on issues that you do not fully understand. Limit your response to statements to which you have knowledge. For example you could answer that your were present when the high speed camera recorded the blast, and that it appears to be the images of the blast you observed or you merely reviewed the results of the fragmentation study.

Manufacture Software Issues

Subsequent versions of software may include changes, which prevent reading the files made by the earlier version when the edited image files were made. Therefore all versions of the manufacture's software must be retained. The older version software can be reinstalled in order to read the files.

If the custodian finds that the equipment or software to review the digital evidence will become obsolete or no longer serviceable the digital archive files should be transferred to a usable format. Records must be made to describe the procedure used to copy the digital files to the new format. Failure to do so could make the new files unusable as evidence.

Standard Operating Procedure Manual

SWGIT in conjunction with the Scientific Working Group on Digital Evidence and Imaging Technology (SWDGE) have issued recommendations for developing a standard operating procedure manual (SOP).

This manual should be written and distributed when the equipment and procedures for your company are established. Identification of the Custodian of the Image Files Archive and how to contact the person should be listed near the front of the SOP. Whether you chose an outline or letter style format it must contain clear concise language with reference to who, when, where, why and how digital still image and videotape will be captured, processed, stored, and for what purposes it will be used.

For example, the blasting site is surrounded by a number of homes. Citizen complaints may end up in mitigation or court. Preblasting surveys of the surrounding homes is specified in the

contract. Who will perform the surveys? How will the surveys be documented? Where will the surveys be stored, and who will be provided a copy? A SOP will eliminate confusion by defining the procedures to follow.

An out line of steps to follow from the capture of the image to final archive of the digital file must be provided to all personnel. Define record keeping practices for when images are captured. A printed form in addition to an electronic database would provide flexibility to the personnel capturing the images. Procedures for the handling and maintaining the storage media must be defined. Specify the practices for editing images and procedures for the performing image analysis.

Procedures for disbursement of images must be clearly spelled out. The SOP must define the limits on the use of images. The blaster may submit images to archive and keep a copy of his own. For example, If the blaster emails an image of the job that shows a distasteful situation or includes a violation to friend it is no longer a protected image file. If the opposing council gets a copy, it could be introduced as evidence in order to discredit your testimony. Prior to use by an employee or an outside entity a query form should be submitted to custodian of the image files. The form provides two things, a way to track who wants to use the digital image files and for what purpose, and is a link in the chain of custody.

If the damages are inside a residence the distribution of the image must be very limited to prevent invasion of privacy. In fact be aware that the resident may have items in the home which he or she does not want the general public to know about. Regulatory personnel and preblasting surveyors must be cautious not to show the contents of the home. Limit photography to only the alleged damages.

Because all procedures will require modification over time the SOP should be structured to enable the reader to know if the information is contemporary with company policy. Title the chapters, sections or pages with the date and version of the document.

Security Breach

If your computer system is broken into will digital files on the system be admissible in court? It is possible that "hackers can eliminate your computer file or corrupt it to point the information is no longer valid. Unscrupulous people may even add image files to your computer, which require mandatory jail time! Each security breach will present a different set of problems and questions. The safest way to insure the security of your files is adequate backup and off-site storage of duplicate files.

In conclusion

Judging from the video round up a lot of blasters are carrying cameras. If the worst happens and you find yourself in the witness chair will you be able to use all those pictures and images? I urge you to read the entire list of information generated by the SWGIT and SWEGE and the information that came with the camera and software. Following the work groups

recommendations and those of your attorney will insure that you indeed will be allowed to say this image is a true and accurate representation of the facts and withstand any challenges.

Refernces

American National Standards Institute (ANSI/A) TR26-1993

<http://www.theiai.org/guidelines/swgit/index.php>

http://news.com.com/A+picture+worth+a+thousand+lies+-+page+2/2008-1046_3-6199869-2.html?tag=st.num

<http://www.crime-scene-investigator.net/csepguide.html>

http://www.imaging.org/resources/web_tutorials/inside_jpeg/inside_jpeg.cfm

<http://www.evidencephotographers.com/index.html>

<http://www.visualexpert.com/Resources/photoevidence.html>