Office of the Fire Marshal and Emergency Management

INTRODUCTION TO PHOTOGRAPHY

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INTRODUCTION

Objective

Provide participants with an introduction to basic photography, to include:

- Introduction of basic photography theory;
- Introduction of basic digital photography;
- Introduction of basic camera handling and operations; and
- Introduction of the application of scene photography for either fire investigations or inspections.

BASIC PHOTOGRAPHY THEORY

What is photography?

The Meriam-Webster Dictionary defines the following:

Photography:

The art or process of producing images by the action of radiant energy and especially light on a sensitive surface (such as film or an optical sensor).

Photograph:

A picture or likeness obtained by photography.

BASIC PHOTOGRAPHY THEORY

What is photography?

Camera:

A device that consists of a lightproof chamber with an aperture fitted with a lens and a shutter through which the image of an object is projected onto a surface for recording (as on a photosensitive film or an electronic sensor) or for translation into electrical impulses (as for television broadcast)

BASIC PHOTOGRAPHY THEORY

Light & It's Properties

- Light is a form of electromagnetic radiation (It's a from of energy)
- The wavelength determines the color visible to the human eye
- Light travels in straight lines and radiates in all directions from a point source

Reflection:

- Light will reflect off an object at the same angle it strikes it (The angle of incidence = Angle of reflection.

Transmission:

- Light will pass through clear objects (Glass, water, ice, etc). An object that passes most or all light is said to be transparent. An object that passes no light is said to be opaque

BASIC PHOTOGRAPHY THEORY

Light & It's Properties

Diffusion:

- Light that is scattered, whether on reflection or transmission, is said to be diffused

Refraction:

- Light slows down when it enters a medium denser than a vacuum. This is generally insignificant in air, however the slowing that occurs in a relatively dense, but a transparent medium like glass or water, causes the rays to change direction. Lenses use the property of refraction of glass to form images

BASIC PHOTOGRAPHY THEORY

Photosensitive Materials

Many materials are sensitive to light:

- Wood, many metals, organic surfaces (leaves, brush, trees, etc.)
- Film Photography…
- Digital photography uses a CCD (Charged Couple Device) as its sensitive material, or
- A complementary metal-oxide-semiconductor (CMOS)
- These devices react to light by generating a tiny current or altering the charge of the individual photo site
- The current .charge is then converted to digital information and saved to memory (Memory card, internal memory etc.) for future use

BASIC PHOTOGRAPHY THEORY

The Camera

The camera is a simple machine which generally consists of the following features:

- A light tight box (the body) which holds the light sensitive materials (Film, CCD Sensor or CMOS sensor
- A lens or pinhole, which allows light to enter the camera
- A means of controlling how long the light enters the camera (Shutter)
- A means to control the intensity of the light falling on the light sensitive material (Aperture)
- Light rays reflected from or emitted by each part of the subject enter the camera lens. They are refracted (bent) to reform as a detailed image of the subject, focused on the film or sensors in the camera.

BASIC PHOTOGRAPHY THEORY

The Camera

The camera is a simple machine which generally consists of the following features:

- The light falling on film or a sensor creates a “Latent” image which is an image that requires further processing before it becomes usable to the human eye.
- Film requires ‘chemical’ processing versus digital requiring computer processing (Usually onboard the camera).

Aperture:

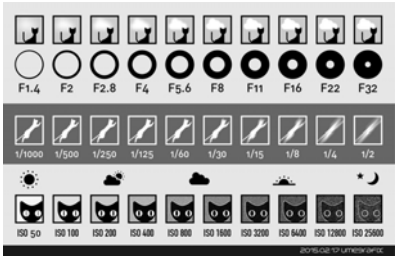
- is an adjustable diaphragm in the lens is scaled in “F-Number” (F-Stop) and controls exposure as well as depth of field.

Shutter:

- Is a movable opaque shutter scaled in fractions of a second that controls the length of time that light is allowed to act on the film or sensor. Altering the shutter speed alters the visual rendering of movement.

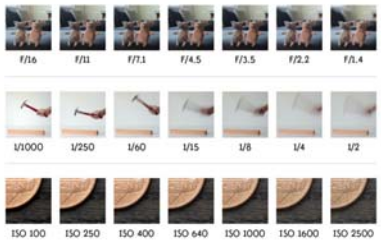
BASIC PHOTOGRAPHY THEORY

Shutter Speed Vs. Aperture



BASIC PHOTOGRAPHY THEORY

Shutter Speed Vs. Aperture

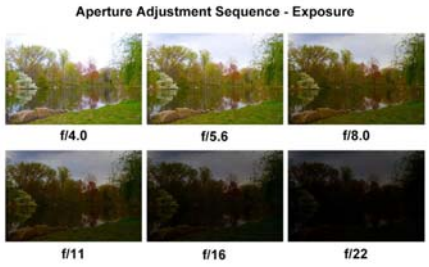


BASIC PHOTOGRAPHY THEORY

Shutter Speed Vs. Aperture

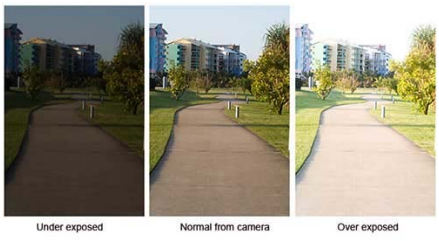
BASIC PHOTOGRAPHY THEORY

Shutter Speed Vs. Aperture



BASIC PHOTOGRAPHY THEORY

Shutter Speed Vs. Aperture



BASIC PHOTOGRAPHY THEORY

Lenses & Focus

Three major types of lenses:

- Normal lens (45-55 degrees angle of view) This is approximately the same angle of view as the human eye.
- Telephoto (35 degrees or less) Has a very narrow angle of view and has the effect of brining the subject closer to the camera.
- Wide Angle (70+ degrees) Wide angle of view and has the effect of moving the subject away from the camera to take in a wider field of view.

Additionally, there are also the:

- Zoom lens (Adjustable wide angle to telephoto angle) allows the camera user to adjust the focal length on the fly.
- Macro lens are designed for extremely close up photographs.

BASIC PHOTOGRAPHY THEORY

Lenses & Focus

Focus:

- Means using a lens to gather rays of light reflected from a subject, creating a sharp image at the focal plane (Where the film or digital sensor is)
- The farther away you are from an image the sharper it looks
- Enlargements are fuzzy when you are close to them but look detailed from afar

BASIC PHOTOGRAPHY THEORY

Exposure

Proper exposure is what every photo needs…

- It means recording a full scale of tones from all the dark areas of the image (Shadows) all the way through to the brightest parts of the image (Highlights)
- This now relies on the information from previous slides where we discussed both shutter and aperture on the camera
- Proper Exposure is considered to be a formula based on Intensity x Time.
- That is, the intensity of light is controlled by use of the aperture whereas the time is controlled by the shutter speed

BASIC PHOTOGRAPHY THEORY

Depth Of Field

- Is the distance between the nearest and farthest objects which can all be brought into acceptable focus on the film or sensor at the same time

The greatest depth of field occurs when:

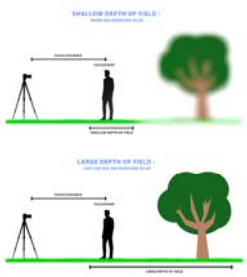
- The F/Number is high
- Lens focal length is short
- The subject is distant
- It varies with the aperture, where the greater the F/number the greater the depth of field.
- (Large F/Number = Less Light = Greater depth of field

Conversely,

- Small F/Number = More Light = Less Depth of field.

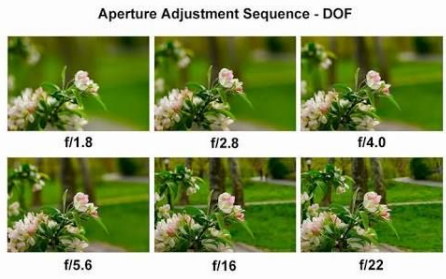
BASIC PHOTOGRAPHY THEORY

Depth Of Field



BASIC PHOTOGRAPHY THEORY

Depth Of Field



BASIC PHOTOGRAPHY THEORY

White Balance

- Different sources of light have different color characteristics.
- Daylight is blue (10k-15k)
- Sunlight is white (6k-7k)
- Fluorescent is green (4k-5k)
- Tungsten is yellow/red (2.5k-3k)
- Digital cameras have a setting where you can set the overall balance yourself.
- By choosing from a set of pre-set “White balance” settings, we use auto white balance setting as this virtually eliminates WB errors from occurring.
- With Auto-WB, the camera looks for the brightest point in the image and assigns that point the maximum white value and lets all the other values fall into line with this value.

BASIC PHOTOGRAPHY THEORY

White Balance

WB SETTINGS	COLOR TEMPERATURE	LIGHT SOURCES
	10000 - 15000 K	Clear Blue Sky
	6500 - 8000 K	Cloudy Sky / Shade
	6000 - 7000 K	Noon Sunlight
	5500 - 6500 K	Average Daylight
	5000 - 5500 K	Electronic Flash
	4000 - 5000 K	Fluorescent Light
	3000 - 4000 K	Early AM / Late PM
	2500 - 3000 K	Domestic Lightning
	1000 - 2000 K	Candle Flame

BASIC PHOTOGRAPHY THEORY

White Balance

BASIC DIGTIAL THEORY

DSLR / Point & Shoot Cameras…

BASIC DIGITAL THEORY

This is the end result…

- When you depress the shutter release, a long series of events begins to take place.
- First, the camera focuses on the subject, then it measures the light and decides on the exposure required.
- The aperture stops down, the shutter opens, and when it reaches its maximum opening, the flash goes off (if set to do so), the shutter closes and the post-processing begins.
- The first step is for the computer to take the information from the CCD and convert the information to digital information (analogue to digital conversion).
- The onboard computer adjusts the 'gain' according to the ISO chosen by the operator.
- The brightest point is found and the white balance is adjusted.
- The computer then adjusts the contrast and applies any sharpening that is pre-set by the operator.

BASIC DIGITAL THEORY

File (Image) Format…

There are a few types of file format that a digital camera can be set to (Depending on the camera you have):

- RAW format in the digital information saved right after the analogue to digital conversion is complete.
- TIFF (Tagged Information File Format) is a 'lossless' compression format.
- JPEG (Joint Photographic Expert Group) is a 'compression' format group.
- Generally JPEG is used unless there is a specific need to use another format.
- Check to ensure your department policies to ensure you are using the correct format.

BASIC DIGITAL THEORY

Legal Issues…

Are digital photo's acceptable in court?

- Yes. Questions surrounding digital images usually involve the question of digital image manipulation. Any photograph (Yes, even film) can be manipulated, all though its easier to manipulate a digital image.
- Each file has metadata stored in it (Date, time, exposure information, GPS data if equipped).
- If imaging software is used to manipulate the image then this will change the metadata associated with the file.
- Allowing someone to see that its not the original image.

CAMERA HANDILING & OPERATIONS

Camera Functions & Features…

CAMERA HANDILING & OPERATIONS

Handling basics…

- Keep your camera clean to ensure that you get a sharp/crisp image. Blow the dust and debris away first, then wipe away with a soft lint free cloth. Do not use any cleaning solution not specifically designed for camera lenses, they can damage the lens coating.
- Use the camera strap provided… even new digital cameras are susceptible to even the slightest shocks & falls.
- Hold the camera consistently each time you take a photo will ensure sharp images.
- Hold the camera with your arms tight in against your torso and place the camera on your left palm to brace it (Your making your own human tripod essentially), then grip the camera with your right hand keeping your thumb and index free to use the controls.
- Install memory cards when the camera is turned off (To prevent damage to the card and camera).
- Install the battery to the camera when the camera is turned off.

CAMERA HANDILING & OPERATIONS

Setting the camera for general photography…

- Turn the camera on.
- Ensure that the camera is in ‘Auto’ mode.
- Check your settings to ensure the date, time and file format is correct.
- Format the camera to erase any previous images stored to memory.
- Reset the image count (Your images will be sequentially numbered).
- Check your settings to ensure that both the white balance and ISO is set to auto.
- Your first photo should be of your badge/ID as well as a business card as this identifies you as the photographer (Remember, these photos are the property of your department and could be used for the legal proceedings).

CAMERA HANDILING & OPERATIONS

Setting the camera for general photography…

- Begin photographing your subject material allowing the camera to do its work in the programmed automatic mode and auto flash as much as possible.
- Use the LCD screen on the back of the camera as it shows approximately 98% of the subject material being photographed.
- Always check the LCD screen to ensure that you have captured what you intended as well as the exposure of the photo.
- **NOTE:** After taking your first image (badge/ID) ensure that you do NOT delete any of your photos after, even is they are 'mistakes', not correctly exposed, or out of focus. Every image is assigned data to the file and will show the sequence of the photos. It will show missing images and cause there to be a gap in the continuity of evidence.

CAMERA HANDILING & OPERATIONS

Flash…

- Fire scenes are inherently dark as a result of both the power being terminated and soot in many cases covering the surfaces throughout.
- Many of the 'Point and shoot' digital cameras have built in flashes that are underpowered for the purposes in this application of photography.
- Further, these cameras rarely have a 'Hot shoe' to add an additional external flash to it.
- Your photo's are being taken for a reason. They are building part of your investigation / inspection and may be entered into evidence at a trial.
- Photo's need to be taken with this in mind and not that of "Its just going to have to do".

SCENE DOCUMENTATION

Scene Photography

- From the onset of the investigation begin documenting the scene through the use of photography the same way that you document it in your notes.
- Your photographs from the investigation are a representation of the scene how you found it, as you processed it, located exhibits, as you reassembled it and as you left it upon the completion of your scene examination.
- Your photos give a person (Other investigators, the courts, police, stakeholders, ect.) the ability to view the narrative of the scene examination. The photos you take provide the storyline for your investigation.
- Photos need to be taken in chronological order and as the investigation progresses, should overlap which provides the viewer the ability to understand where one photo left off and where the next starts.

SCENE DOCUMENTATION

Scene Photography

- Photos taken need to be taken from multiple perspectives to allow the viewer to be able to understand what it is that they are observing. Don't zoom in on an exhibit or fire pattern without providing the reasonable perspective to the viewer to allow them to see what it is your trying to capture.
- The following perspectives should be included: Overall, Midrange and Closeup
- Overall – Provides a wide angled approach allowing for as much of the overall subject material being photographed to be captured in the photo.
- Midrange – Provides the same angle and subject material as the 'Overall' photo above, but the perspective is more zoomed in to start attracting the viewer to the detail of the subject material.
- Closeup - Provides a zoomed in perspective of the subject material. This photograph will provide details of the subject material being photographed.

SCENE DOCUMENTATION

Scene Photography

- **Example:** "The next two pages of the slide deck will provide three photos from an interior compartment fire. The subject material being photographed is the remains of a cigarette located within the area of fire origin. As you will see, starting with an 'overall' photograph of the area of origin, the following two photos are progressively more focused on the subject material (The remains of the cigarette)".

SCENE DOCUMENTATION

Overall

Midrange

SCENE DOCUMENTATION

Closeup

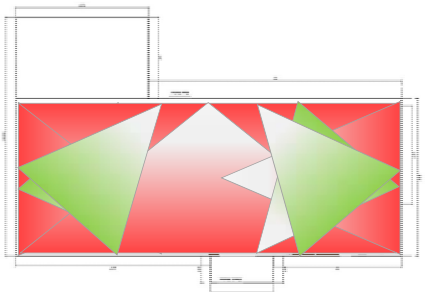
SCENE DOCUMENTATION

Scene Photography

- Ensure when photographing interior of a room that you capture each wall as well as corners of the room. You will end up with a minimum total of 4 photographs of walls and 4 photographs of the corners of room. The basis of the order allows the viewer to methodically and chronologically view the room in a manner that provides a 360° view with overlapping photographs.
- ***Example:*** *"The next slide is a basic layout of a room. The progress of the photographs can be seen by watching the arc travel around the room. Red represents the four walls while the green represents the four corners".*
- Room size will dictate how much of your field of view you can capture in each photo. Judge the room based upon what you can see in your field of view and modify it to achieve a 360° view of the rooms interior.

SCENE DOCUMENTATION

Photographing an interior room…



SCENE DOCUMENTATION

Photographing An Interior Room

SCENE DOCUMENTATION

Photographing A Structures Exterior

SCENE DOCUMENTATION

Evidence Markers…

Evidence Markers:

- Markers are devices, placed in the field of view, that aid in the interpretation of a photograph.
- In court, exhibit markers draw attention to pieces of evidence and help jurors, who are ordinarily unfamiliar with the subject matter, to understand their significance and relationship with the crime.
- Because placing markers in the field of view can leave the investigator open to the charge of tampering with evidence, two sets of photographs must be taken.
- The first set will record the crime scene in its original state and the second set will include the markers.
- Markers must not misrepresent the evidence or conceal any significant part of it.
- There are generally three types of markers used: Rulers, Location markers and Identifying data.

SCENE DOCUMENTATION

Photographing With Evidence Markers

SCENE DOCUMENTATION

SCENE DOCUMENTATION

SCENE DOCUMENTATION

SCENE DOCUMENTATION

SCENE DOCUMENTATION

Photographing Objects

QUESTIONS?

Thank You