A PRIMER ON ARCHITECTURAL PHOTOGRAPHY AND THE PHOTO DOCUMENTATION OF HISTORIC STRUCTURES

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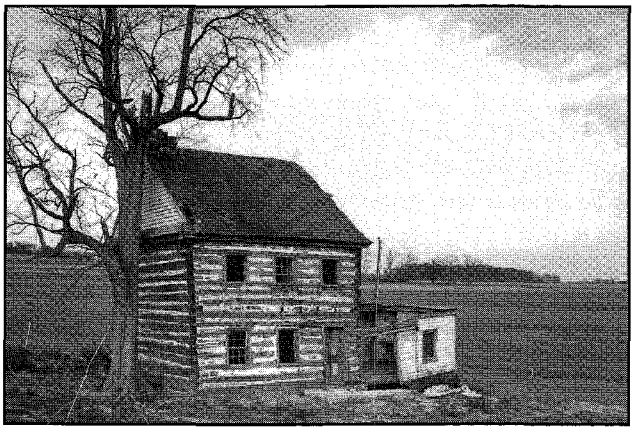
This primer outlines the most basic approach to photographic documentation and provides the photographic knowledge needed to document historic structures. The first step is to determine the minimum number of views required to document a particular building as well as the photographic equipment and information necessary to take them.

THE ESSENTIAL VIEWS

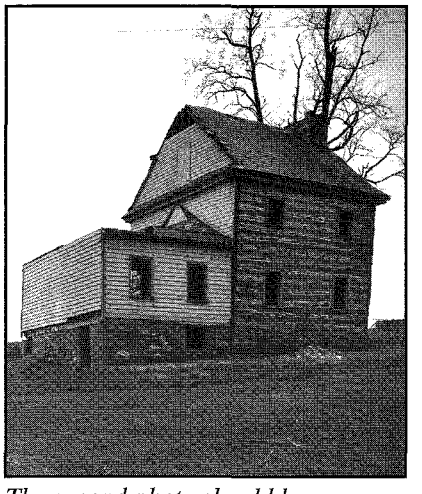
The purpose of photographic documentation of historic structures is to preserve as much visual information about a structure in as few photographs as possible. The photographer must identify the views that reveal the most information about a structure. In looking for that view, you need to think about the attributes of a building: overall shape, size, and major architectural elements such as windows, doors, construction materials, and architectural ornamentation. Photographs often directly indicate construction material--log, masonry, or frame.



If you were allowed only one photograph to document an historic structure, the best choice would be a perspective showing the front and one side of the building. The James Stewart House, circa 1748, Lancaster County, Pennsylvania. All photographs taken by David Ames unless otherwise noted.

They also suggest certain attributes of the building inferentially. The distribution of doors and windows, for example, can suggest the interior floor plan. A single photograph can include most of these elements.

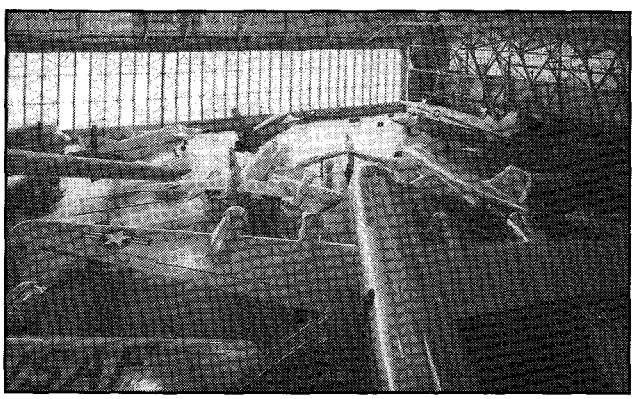
If you were allowed only one photograph to document an historic structure, what would it be? The best choice would be a perspective showing the front and one side of the building, when taken from a position 45 degrees from the front. When framing the building in the viewfinder, be sure that the entire building is visible including the point where the building meets the ground and without clipping off the peak of the roof or chimney. Although this sounds obvious, beginning photographers are often seduced by buildings and attracted by interesting details such as carpenter-cut jigsaw porches, pointed Gothic windows, and Greek Revival columns. Unfortunately, the resulting pictures sometimes fail to record a view showing the entire structure. To avoid this problem, include the surroundings of the building, its site, and landscape context. As the subject of the photograph, the building should occupy about 75 percent of the picture area, leaving the surrounding 25 percent of the frame to show visual information about the context of the building.



The second photo should be a perspective of the rear and other side of the building. These two perspective shots now comprehensively document the exterior of the structure. The slope of the hill dictated a vertical view to maintain perspective control. The James Stewart House.

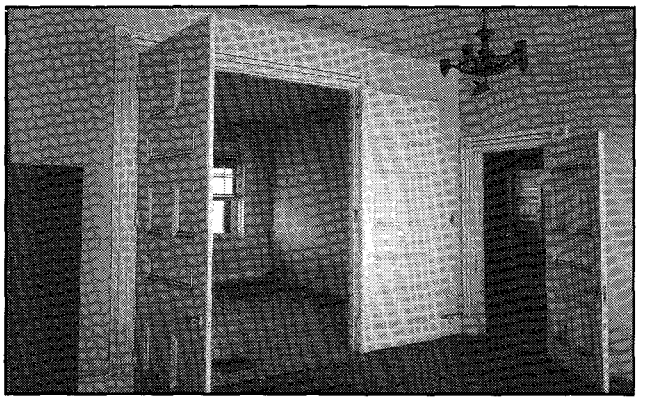
If you were to take a second and third photograph, what would they be? The second photograph should be a perspective of the rear and other side of the building. These two perspective photographs now comprehensively document the exterior of the structure. The third photograph should document what architects call the front elevation. An elevation is a drawing to scale of the side, front, or rear of a building. Projecting features such as window and door moldings, window sills, steps, and eves are all rendered as if they were totally flat. An elevation photograph shows the true proportions of one side of a building. Because that side is parallel to the film plane, approximate measurements can be taken from the photograph. In fact, measured drawings can be taken from a carefully controlled elevation photograph shot with a view camera.

What about interiors? First, identify the major space, room, or area in the building and then determine how other spaces are organized. Interior photographs should yield information about the floor plan. Some structures, such as hangars, barns, and some industrial buildings, are architectural shells enclosing a space. For such a structure, the first photograph would be taken from a corner opposite the main entrance and shot diagonally across the space. As with exteriors, the second photograph should be from the opposite corner, or should document an important element of the interior.



A photo of hangars, barns, and some industrial buildings should yield some information about its use. Wright-Patterson Air Force Hangar, Dayton, Ohio. Photo courtesy of David Diesing, HAER.

Most interiors of residential structures, for example, are laid out in hierarchical order from the most important, most formal, most elaborate room, to the plainer more functional rooms. First, determine the



This interior shot shows the hierarchical order of the building. Buttonwood, New Castle vicinity, Delaware.

order of importance and then begin to photograph the rooms. To gain information on the floor plan, set up the camera to shoot toward the main doorway, if possible, with the door open to reveal the spaces and rooms beyond. A three-view sequence might include the entry hall, showing how rooms open off of it, the main formal room, and a functional working space such as the kitchen. Three or four views should be sufficient to document the significant elements of the interior, rarely more than seven or eight.

The six essential photographs:

1) the front and one side;
2) the rear and one side;
3) the front elevation;
4) environmental view showing the building as part of its larger landscape;
5) major elements of the building, including doors, windows, additions; and
6) details, such as materials and hardware.

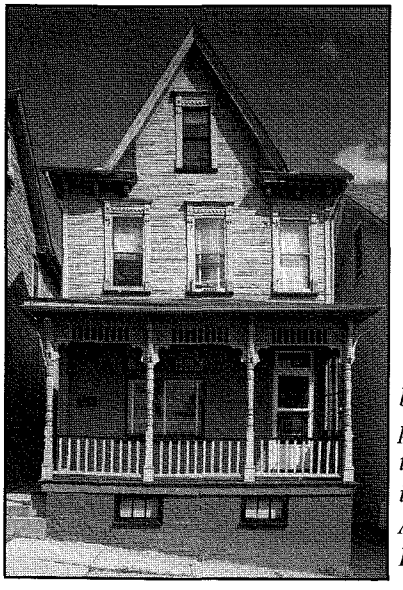
If planning to take more than six photographs, first carefully study the building and make a list of what should be photographed. Rarely will it take more than fifteen photographs to adequately document the exterior of a building.

To say that a building can be well documented with six photographs--three exterior and three interior--may sound hard to believe for individuals who shoot a 36-exposure roll on an outing. But, the purpose of photographic documentation is to be as complete yet as succinct as possible. The sequence of views described here can be used for nearly all photographic documentation of buildings, including the method recommended by HABS/HAER and the

National Register of Historic Places. Finally, when approaching a building, remember that probably only one photograph of the building will ever be published. In choosing the view to photograph, the main question to ask yourself is what one view yields the most information about that structure?

TECHNICAL REQUISITES OF A GOOD ARCHITECTURAL PHOTOGRAPH AND FILM FORMATS

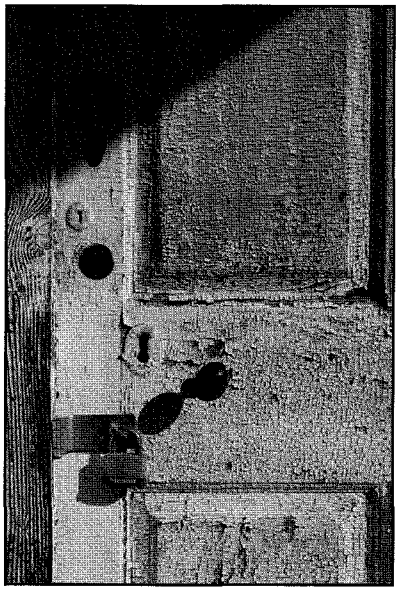
A good architectural photograph is one to which the viewer's reaction is, "What a great building!" not, "What a great photograph!" The photographic technique should be invisible. Such a photograph meets four technical requirements. First, vertical lines that are parallel in the building, such as the exterior walls, are parallel in the photograph. Second, everything in the photograph is in sharp focus and clearly delineated. Third, there is as much readable detail in the photograph as possible. Fourth, the picture includes as much of the whole object being photographed as possible. In photographic terms these requirements translate into a need for depth of field, perspective control, a large negative, and a lens with an adequate angle of view. These requirements are best met by a view camera using sheet film measuring four by five inches, or five by seven inches, or sometimes as large as eight by ten inches. View cameras are generally built like accordions, with a lens in the front connected by a bellows to a viewing screen in the back. Focusing is achieved by moving the lens forward or back until a sharp image is seen on the viewing screen.



"What a great building!" The photographic technique is invisible. 1415 3rd Avenue, Altoona, Pennsylvania.

Whereas the large negative and perspective controls of view cameras are needed for the finest documentation of historic structures such as that undertaken by HABS/HAER, most photographic documentation for the National Register of Historic Places and other programs is done with smaller, less elaborate cameras. This primer assumes the use of a smaller camera that uses 35mm or 120 roll film.

Let's start by sorting out film formats and camera types. Cameras are built to use three types of film: 35mm film perforated in a metal cassette; 120 roll film measuring 6.2 cm wide; and sheet film of various sizes, commonly four by five inches. The 35mm color slide is the smallest type used and has become the standard presentation format for government, industry, and education. Photographic documentation shot with black and white film by preservationists, cultural resource managers, and architectural historians is done chiefly with 35mm cameras and to a lesser extent, with roll film cameras, also called medium-format cameras.



Detail of door showing weathering, materials, and history of locks. Clearfield Farm, Smyrna vicinity, Delaware.

The two basic types of 35mm cameras are the **view-finder camera** and the **single-lens reflex camera**. On the view-finder camera, the image seen through the viewfinder above the taking lens only approximates what the picture will be. Even the most sophisticated of this type of camera suffers from this drawback. The single-lens reflex camera, on the other hand, is designed, through the use of a prism and mirrors, to view the scene through the taking lens. This allows the photographer to frame the subject precisely and to tell how much every part of the scene, from foreground objects to the distant background, will be sharp or out of focus. Among 35mm cameras, the single-lens reflex is the

best choice for architectural photography and photographic documentation.

The most common roll-film cameras are a single-lens reflex camera and a twin-lens reflex camera. Roll-film cameras make different-sized negatives using the same film. The most common is 2-1/4 inch by 2-1/4 inch or 6 by 6 cm, producing a square negative. The largest is 2-1/4 inch by 3-1/4 inch or 6 by 7 cm. The larger size negative means that more detail is retained because the negative needs less enlargement. Although roll-film or media-format cameras provide a larger negative which is very useful, the cameras and lenses are more expensive than 35mm ones.

THE PHOTOGRAPHIC PROCESS AND CONTROLS

The image of an object being projected on the film by the taking lens is always distorted in some way. The architectural photographer must understand what these distortions are, how they are created, and how to use photographic controls to correct them as much as possible. On the other hand, some commercial and fine arts photographers use these distortions as a creative tool.

Controlling convergence. The purpose of an architectural photograph is to present a building as it appears to the eye. Buildings stand at right angles to the ground and vertical lines in the building appear parallel. Frequently, in photographs, buildings look like they are leaning backwards because the vertical lines of the building seem to converge. In order for vertical lines in the building to remain parallel on the film, the film plane must remain parallel to the building plane, but to include the top of a building in the ground glass or finder, often the photographer tilts the camera backward. Since optically the lens projects an upside down image on the film, when the camera is tipped backwards, the top of the film frame is further away from the building than the bottom of the frame, causing the lines to converge in the photograph toward the top of the building.

To completely correct for convergence, the optical center of the lens must be focused on the center of the building and the film plane must be parallel to the building. On the view camera the lens is focused at the center of the building optically by a device on the camera called a **rising front**. The lens board on the front of the camera can be raised. Elevating the optical center of the lens a few millimeters is equivalent to raising the camera several feet. The view camera has other controls for convergence. Some manufacturers of 35mm single-lens-reflex cameras make perspective control lenses that accomplish the same task as a rising front on a view camera.

For those without a perspective control lens, there are two ways to raise the optical center of the camera. One way is to raise it literally by shooting from the upper floor of a nearby building. This is even necessary with a rising front when shooting very tall buildings in a city. The second way is to use a wider angle lens and place the building in the top of the

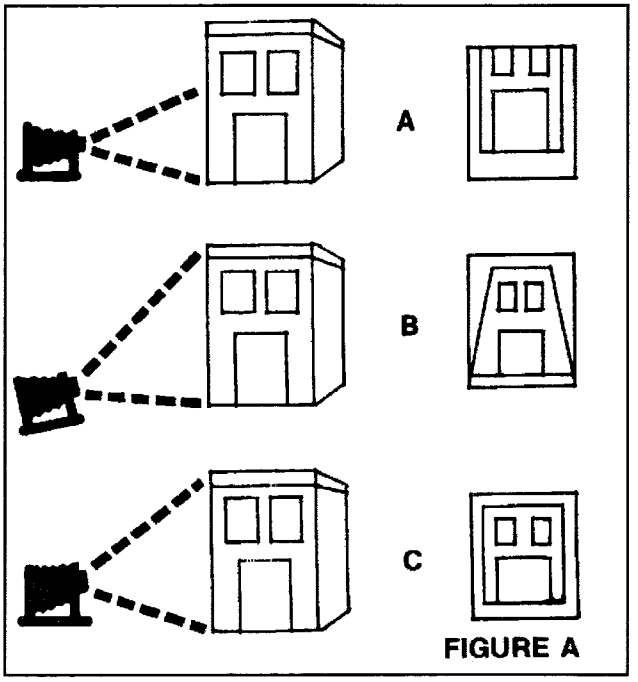


Figure A. The effect of rising front. The rising front adjustment can be used to alter the position of the image within the boarders, while keeping the lensboard and film plane parallel. The drawing shows the image of a subject repositioned through this lens shift. (A) is unacceptable because the entire building cannot be captured by the lens. Tilting the camera to show the entire structure creates converging parallel vertical lines (B). But if the camera back is kept vertical and the rising front adjustment used (C), no convergence will occur and perspective is restored. Illustration taken from Lahue et al, Petersen's Guide to Architectural Photography, *Petersen Publishing Company, 1972, page 7.*

frame, and then crop the foreground when printing the photograph. As such, one of the most important photographic processes to understand is how the image is transmitted through the lens to the film plane. Also, another control for minimizing convergence in an architectural photograph lies in knowing how to hold the camera.

Controlling sharpness with focus and depth-of-field. An image is made on film by light striking it as transmitted through the lens from the object being photographed. The amount of light reaching the film is controlled by a combination of the shutter speed and the size of the opening in the lens, called the **aperture**. All cameras have a standard progression of shutter speeds from the slowest to the fastest. Each successive shutter speed setting is twice as fast as the previous one and admits half as much light. The sequence, defined, in seconds is: 1, 1/2, 1/4, 1/8, 1/15, 1/25, and 1/60, continuing up to the fastest setting, which is frequently 1/500 or 1/1000. In photography, the unit of measurement of light, or the doubling or halving of the amount of light reaching the film, is called a **stop.**

The light transmitted through the lens is also regulated by varying the size of the lens opening which is controlled by expanding or contracting the ring of thin metal blades. Lens openings also follow a standard progression from the largest to the smallest, with each smaller opening allowing half as much light--one stop. The settings on the lens barrel from the largest opening to the smallest are in a sequence of f/1.0, f/1.4, f/2.0, f/3.5 and upward to f/22 or f/32 and sometimes higher depending on the lens. The apparently odd progression of numbers is based on the formula for the area of a circle. Reducing the size of the aperture or increasing the shutter speed is called stopping down.

In addition to its effect on the amount of light entering the camera, the size of the aperture helps to determine how much of the image in the photograph is in sharp focus. Measured from near to far between foreground and background, the area or zone which is in sharp focus is called the depth-of-field. The smaller the aperture, (remember that the larger number means smaller aperture) the more of the foreground and background will be in focus, or the greater the depth of field. In fact, each time you double the f-stop, for instance from f/8 to f/11, you double the depth of field. The larger the aperture, the shallower will be the area in focus. Controlling depth of field is one of the most important skills in architectural photography.

What does this mean in practical terms? It means, for example, that with a wide-angle 28mm lens on a 35mm camera, at f/22 everything from 2.5 feet to infinity can be in focus. Because aperture and shutter speed control the amount of light entering the camera stopping down to increase the depth of field requires compensation for the loss of light by using a slower shutter speed and a tripod.

When the camera is hand-held, the prerequisite for sharpness is to use a shutter speed fast enough to stop camera shake. Humans cannot hold a camera rock-steady, only tripods can do that. Even a very slight camera shake can produce a subtle degradation of an image. The rule of thumb is that the shutter speed should be set at 1/125 second, or higher, to assure sharp images with a hand-held camera. Since telephoto lenses magnify an image, and they also magnify shake, so a higher shutter speed of 1/250 second is recommended for use with telephoto lenses. Actually, there is an inverse focal length guide for minimum shutter speed for a hand-held camera: the minimum shutter speed should be the inverse of the focal length of the lens, (this applies only to 35mm cameras) so that one can use a slower shutter speed with wide-angle lenses than with longer ones. For example, shooting with a 28mm lens, you could use a shutter speed of 1/125 second--theoretically.

Example of using a longer lens for inaccessible detail. Buttonwood, New Castle vicinity, Delaware.

Lenses and angle of view. Lenses control the width of the scene that will appear on the film. Lenses are classified by their angle: wide-angle, normal, and telephoto. The angle of view of the human eye is about 50 to 55 degrees--that is, the angle of what you can see from the left- to right-of-center as you look straight ahead. The lens approximating this angle of view for a particular format is the normal lens for that format. Lenses are specified in terms of their focal length in millimeters. A 50mm lens, for example, is the normal lens for a 35mm camera, and a 150mm is the normal lens for a 4x5 inch view camera. The longer the focal length of a lens the greater the magnifying power. Lenses that have a wider than normal viewing angle, 65 degrees or more, are called wide-angle lenses. Lenses with narrower angle of view, 35 degrees, which magnify images are called **telephoto lenses**. Most architectural photography requires wide-angle lenses--28 mm to 35 mm --most frequently ones with about a 65 or 75 degree angle-of-view. A 90mm lens provides the same angle of view for a 4x5 inch view camera.

In considering lenses of a particular focal length, the photographer must examine fixed focal length or prime lenses. Another type, of course, is **zoom lenses** in which the focal length of a lens can be changed, effectively providing several lenses in one. A standard zoom lens that comes with many cameras is a 35mm to 80mm zoom. Wide-angle zoom lenses, from 24mm to 50mm, for example, can be very useful for architecture photography. Zoom lenses, however, have several disadvantages compared to prime lenses. They are generally not as sharp, and they are slower, meaning they don't admit as much light when opened fully. This limits their use in low-light situations. Most professional architectural photographers prefer prime lenses.

Choosing a camera, lenses, and a tripod. Other than the view camera, the most useful 35mm or medium-format camera for architectural photography is one that has a built-in through-the-lens light meter and an electronic shutter that allows for exposures of several seconds. The simplest mode of determining exposure with a built-in meter is a match-needle system. In this system the shutter speed is first chosen and then the aperture setting is selected by opening the aperture until a needle in the viewfinder matches the shutter speed. Also useful is an aperture-preferred form of semi-automatic exposure control, in which the aperture is chosen to assure depth of field. The camera automatically selects the correct shutter speed. Fully automatic cameras should not be used unless the automation can be turned off or overridden.

A wide angle lens is necessary for shooting interiors. This photo was taken with the equivalent of a 24 mm lens on a 35 mm camera. Mt. Jones, McDonough vicinity, Delaware.

The camera must have interchangeable lenses. The most useful architectural lens is one with a 75 degree angle of coverage which is a 28mm lens for a 35mm camera, about 50mm lens for a 2-1/4 inch roll film camera, and a 90mm for a 4x5 mm. Although fairly wide, it is a very versatile lens. It is wide enough to photograph large structure from fairly close up--such as a hangar--or in cramped locations, such as on a city street. It is also wide enough to handle most interiors. As mentioned earlier, it is also wide enough to provide some degree of perspective control by holding the camera level and placing the building at the top of the frame.

The second most useful lens would be a 35mm lens, a very moderate wide angle for 35mm camera, 65mm lens for 2-1/4 camera, and 121mm lens for a 4x5 view camera. Also, 35mm and 28mm are the focal length of most perspective control lenses manufactured for 35mm cameras. As a third lens, a moderate telephoto from about 80 to 105mm can be useful for photographing inaccessible details such as cornices and chimney stacks.

In architectural photography a tripod is as important as the camera. All view cameras require tripods,

but tripods are as important for smaller cameras as for larger cameras. First, in order to assure that the film plane is parallel to the building, the camera must be leveled. Second, framing an architectural view is a contemplative exercise because one is trying to include as much visual information about the building as possible, and the ground glass needs to be carefully studied. Third, once the view is selected, then camera adjustments have to be made, such as perspective control, rising front, or depth of field which requires choosing the right combination of shutter speed and aperture. Fourth, the small apertures required for adequate depth-of-field (being especially important when photographing interiors) require shutter speeds too slow for the camera to be hand-held. And finally, low light levels, almost always encountered in interiors, often require slow shutter speeds as well.

Film. Because it is archival and color film is not, black and white film is required for photographic documentation of historic structures. Also, many photographers argue that black and white film is a better medium than color for capturing architectural structure and form because it is more abstract. Black and white films are rated according to their speed,which is the measure of how much light is needed to get onto the film in order to get an image. A slow film requires a lot of light, and a fast film requires less. Films are given a film speed rating called an ISO with the slowest being rated at ISO 25 and the fastest at 1600 or more. The difference between slow and fast films is that slow films have a finer grain and produce sharper photographs. Grain is what you see when a subject in a photograph that should be smooth and featureless, such as a blue sky, has a detectable speckled pattern in it. The finer the grain in the negative, the more detail there will be in the final print. One of the major advantages of larger format cameras over 35mm is that the negative does not need to be enlarged as much to produce an 8x10 inch print. The great advantage of 4x5 and 5x7 sheet film is not only that enlargements are nearly grainless even at great enlargement, but that portions of the negatives can be easily enlarged.

Black and white films are categorized as slow films (below ISO 100), medium-speed films (around ISO 100), fast films (ISO 400), and ultra-fast films (over ISO 400). A number of black and white films on the market have a variety of characteristics beyond grain and sharpness. This primer recommends Kodak T-Max ISO 100 and ISO 400 films for two reasons. First, film manufacturers have made great progress in reducing grain in recent years with what are called "new technology films" and these are the most grain-free films available. T-Max is Kodak's new technology film. Ilford's new technology films are called Delta 100 and 400. Second, in the United States, the film processing industry has standardized on T-Max films, thus assuring that nearly all labs are equipped to process T-Max.

Which film should you use? With 35mm medium format camera, T-Max 100 will yield excellent 8x10 prints. Remember, however, that small apertures to gain

Some Common Black and White Film Types

Film	***ISO***	***Grain Resolution***
Kodak Technical Pan	25	Ultra-fine/Ultra-high
Ilford Pan F	50	Extremely-fine/Very-high
Kodak High Speed Infrared	80	Fine/Medium
Kodak T-Max 100	100	Extremely-fine/Very-high
Ilford FP4 Plus	125	Extremely-fine/High
Ilford Delta 100	100	Extremely-fine/High
Kodak Plus-X	125	Very-fine/High
Kodak Tri-X Professional	320	Fine/High
Kodak Tri-X	400	Fine/High
Kodak T-Max 400	400	Fine/High
Ilford HP5	400	Fine/High
Ilford Delta 400	400	Fine/High

Notes: The slower the ISO, generally the finer the grain and contrast. Also, these films are offered in all formats. Sheer films are generally offered in 4x5, 5x7, and 8x10 sizes and can frequently be obtained in smaller or larger sizes or by special order by the manufacturer.

depth of field, especially for interiors, will make the film effectively slower, necessitating slow shutter speeds and a tripod. On the other hand, a T-Max 400 film can be a good choice in those unfortunate circumstances when you must record a number of buildings in a short period. However, an ISO 400 film can be almost too fast for very bright sunny days. Consider the "Sunny f/16 Rule" for exposure. On a sunny day you can calculate the correct exposure (without a meter) by setting your aperture at f/16 and your shutter speed at the ISO rating of the film over one. Thus, the correct exposure for an ISO 400 film on a sunny day is 1/400 at f/16 or, in terms of shutter speeds available on the camera, 1/500 at f/16. For some cameras this is almost at the mechanical limit of the camera for highest shutter speed and smallest aperture. Many photographers find a film speed of ISO 200 to be more useful and so will "rate" and shoot an ISO 400 film at 200. Practically, this means setting the ISO dial on the camera at 200. This requires a slightly reduced development of the negative to compensate for the overexposure, which most labs will do on request. It also produces a lower contrast negative that can be very helpful since the lighting in many architectural situations is very contrasty.

THINKING PHOTOGRAPHICALLY

To conclude, automatic cameras are not appropriate for photographic documentation of architecture. For starters, when you use an automatic camera you tend to turn off your brain. Good architectural photography and photographic documentation melds a knowledge of architecture with an understanding of the significant features of a building and the photographic process. You must think about light, depth-of-field, and about what will photographically capture the architectural and historical significance of the building. Not only do you lose control of your materials with an automatic camera, you lose your opportunity to think through the relationship between the film and the building. Ok, it's time to hit the field!

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GLOSSARY

Aperture: The amount of light reaching the film is controlled by a combination of the shutter speed and the size of the opening of the lens.

Depth of Field: The range around a particular point of focus that is rendered as acceptably sharp in a photograph. Depth of field varies with the f/stop.

F/stop: The number that expresses the size of the lens opening relative to focal length.

Large Format: Any camera that is intended to use with film 4 x 5 inches or larger.

Medium Format: Any camera that uses 120 size roll film. The format is between 35 mm and 4 x 5 in size.

Perspective Control (PC) lens: A specifically designed lens that mimics view camera perspective control movements, and is intended to be used with single lens reflex cameras.

Single Lens Reflex: A camera design, incorporating a mirror and a prism, that allows the photographer to see in the viewfinder whatever the taking lens sees.

Telephoto Lens: A lens of a longer-than-normal focal length with a relatively short physical length. Not all long lenses are of tele design.

View Camera: A camera design that allows the photographer to manipulate various optical parameters by altering the relative orientation of a film back and a lens linked together by flexible light-tight bellows. The image is viewed on a ground glass screen in the film back.

Zoom Lens: A lens in which the focal length can be changes, effectively providing several lenses in one.

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