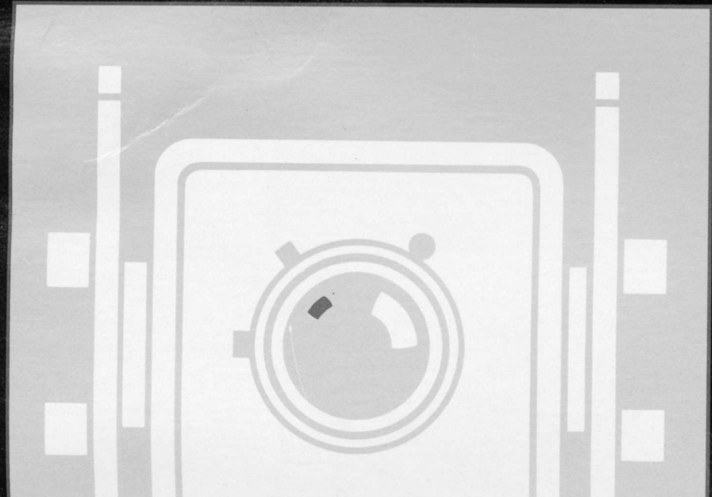
LARGE FORMAT



The Professional's Choice

Introduction TO THE VIEW CAMERA

This workbook is designed to guide you toward a basic understanding of photography's most versatile tool — the view camera. Once you have read, and understood the information, terms and principles presented in this text, you will be prepared to enjoy the fruits of this most amazing instrument. Please keep in mind that "enjoy" is the operative word, because as soon as you are comfortable with the capabilities of the view camera, its image control possibilities will delight you.

The view camera in and of itself is a very simple, mechanical tool. What tends to scare or intimidate newcomers is actually the same thing that attracts most serious professional and amateur photographers to it, and that is its ability to "move." The view camera movements are designed to help the photographer do what no other camera can do — control shape, focus and placement of the image or subject.

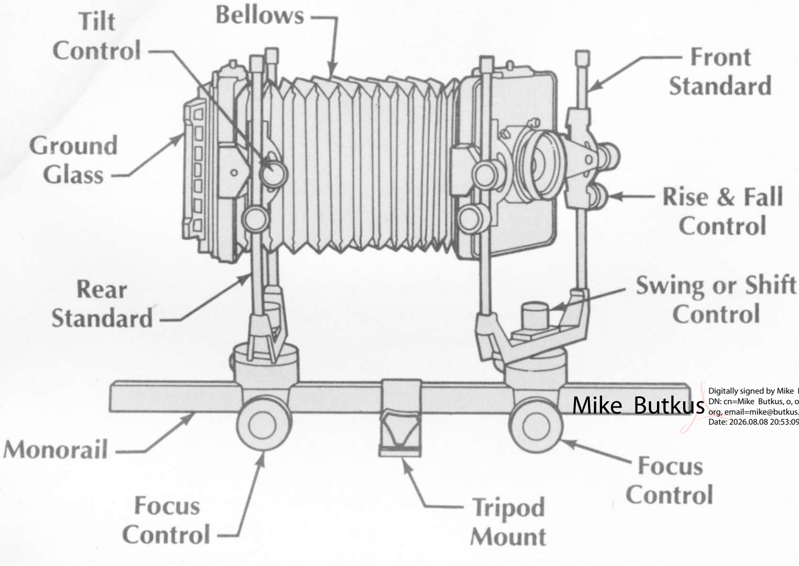
Understanding the view camera also means understanding a new "language" of terminologies, which may seem foreign at first. The key to overcoming these new obstacles is patience. As with learning any new technical operation; patience, practice and experience will eventually make you a master of your craft and its tools.

Keep in mind that part of the joy associated with large format photography is the calculating consciousness it imparts on your photographic style. View camera operation is slow and methodical, and requires a certain amount of patience every step of the way. However, the rewards that are offered and the benefits you'll achieve are well worth your efforts.

By studying each section of this workbook, you will become familiar with the vocabulary of the view camera and large format lenses, learn how to load film holders and see the cause and effect of each camera movement. But don't stop there. Practice makes perfect, and practice you must. The more you realize what this camera can do for you, the more you can do with it. The view camera truly is the joy of photography.

Chapter 1 ANATOMY OF A MONORAIL VIEW CAMERA

One of the first things you will notice about a view camera is its simplicity. There are no mirrors, batteries, electronic circuits or mysterious enclosures. While each brand and model has its own features and nuances, all view cameras primarily share the same principle controls and operations. Each section of the camera serves a certain purpose and can be identified by the following terms:



What makes the view camera truly unique is its flexibility. Each of its controls is designed to ultimately provide you with greater image control. The following is a list of the basic components common to most view cameras and a brief description of their functions:

MONORAIL

Most studio view cameras are of the monorail style. The monorail is the main support of the other view camera components and also serves as a focusing track. The standard monorail length is between 16" and 20". This is sufficient for focusing most general purpose lenses (135mm to 210mm) from infinity to at least a life-size (1:1) reproduction ratio.

For larger reproduction ratios or longer focal length lenses, it may be necessary to use an extended-length monorail or join two monorails together. Shorter rails can be used for wide angle work where a long rail would either project into the image area covered by the lens, or would interfere with the photographer's ability to focus.

FRONT AND REAR STANDARDS

The primary function of the view camera's standards is to provide anchoring points for the lens, bellows and ground glass. But it is also the standards which provide the view camera with its image control movements.

View camera standards are designed in two basic configurations: "U" or "L" shaped. Most "U" shaped standards feature the tilt pivot point either around the lens or ground glass center or, as in the case of most flat bed (field) camera designs, at the base of the standard. Both require some refocusing after a tilt movement is performed, though the base tilt is more exaggerated and may require recentering the image as well. "L" shaped standards offer the advantage of true on-axis lens tilts and therefore require little if any refocusing or recentering.

The front standard holds the lensboard and the lens, and controls the plane of focus, or depth of field by its ability to swing and tilt. The rear standard holds the ground glass back, which is where the film holder is inserted, and its swing and tilt movements control the shape of the image.

BELLOWS

This flexible vinyl or leather housing connects the front and rear standards with light tight integrity. The bellows' "flexibility" allows you to move the front and rear standards closer together and further apart for focusing at a wide range of distances with a wide range of different focal length lenses and makes it possible to utilize the view camera movements. The standard bellows is pleated for strength and rigidity, extends to approximately 18" to 20" and is sufficient for use with most general purpose lenses.

A wide angle, or "bag bellows" is most commonly used with shorter focal length lenses, which require less lens-to-film distance or "bellows draw." Since the front and rear standards are so much closer together in this situation, a compressed standard bellows would restrict camera movement. Therefore a wide angle bellows is made shorter and over-sized in its diameter to allow for more camera movement.

In close-up or macro situations, the distance between your front and rear standards may exceed the maximum length of a standard bellows. Some camera manufacturers offer an "extended-length bellows" to accommodate this problem. Or it may become necessary to connect two bellows together with a connecting frame and use a longer monorail.

GROUND GLASS BACK

The ground glass is where the image projected from the lens is formed for focusing and composition. Most view cameras have grid lines etched or screened on the ground glass to aid in vertical and horizontal alignment of the subject. The image you see will be upside down and reversed from side to side.

There are basically two different types of ground glass backs: a spring back and an international, or "graflock" back. The spring back cannot be removed from its frame. Most folding, wooden field cameras have this style of back. The international, or "graflock" back is designed to allow you to remove the ground glass frame so that you can attach roll film holders and other accessories to your view camera.

Several view cameras incorporate a "revolving back adapter" into the back standard which allows you to switch from vertical to horizontal formats or make horizon adjustments without removing the ground glass back assembly from the camera. This reduces the possibility of dropping the ground glass and breaking it.

TRIPOD MOUNT

This attaches the view camera to the tripod or studio stand. Depending upon your camera design, the tripod mount is generally adjustable as to its position on the monorail. This compensates for the change in the center of gravity location when focusing or using different focal length lenses. For general purpose lenses, it is usually placed at midpoint on the monorail. The ability to re-adjust the tripod mount's position can be helpful for focusing the camera when the distance between the front and rear standards is predetermined by reproduction ratio.

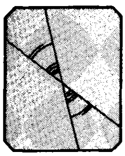
MOVEMENT CONTROL KNOBS

Each view camera movement has its own separate lock or set of locks, with the possible exception of the lateral shift and swing movements, which share locking mechanisms on some camera models. Depending upon the standard design ("U" or "L" shaped) there are either double or single locking knobs for most movements. "U" shaped standards have double locking knobs on rise and fall, and tilt movements. In this case, both knobs need to be released in order to perform those particular movements. "L" shaped standards have single locking knobs which can be released or locked with one hand.

The actual movements of the camera are generally either friction or rack and pinion. Friction movements operate manually in a push/pull manner. Rack and pinion movements offer more precision control and are generally found on more sophisticated camera designs.

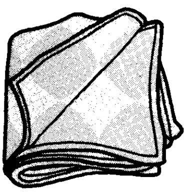
THE VIEW CAMERA SYSTEM

Aside from the image control capabilities of the view camera, another primary asset is its "modular" flexibility. Most 4" × 5" view cameras are just one element of an extensive line of useful accessories and components which can go so far as to allow conversion up to 8" × 10". Some of the most important accessories are listed below:



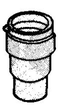
FRESNEL LENS

A thin piece of plastic with concentric rings etched onto one side. When placed in contact with the ground glass, the fresnel lens produces an even distribution of light across the image area. This not only brightens the image, making it easier to focus and compose, but it also compensates for the inherent light fall-off on the ground glass which normally makes it difficult to view the whole composition from one vantage point.



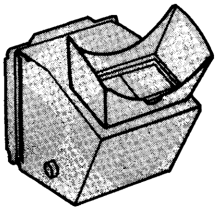
FOCUSING CLOTH

A large opaque cloth which is draped over the camera back and the photographer's head to eliminate extraneous light from reflecting off of the ground glass.



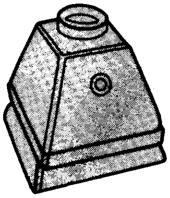
FOCUSING LUPE

Used to critically focus the image on the ground glass. This lupe should be specifically designed for view camera use rather than for slide viewing. It has an adjustable eyepiece so that it can be focused on the inside surface of the ground glass. It also has an opaque barrel which blocks extraneous light. View camera lupes should be between 4X and 7X magnification.



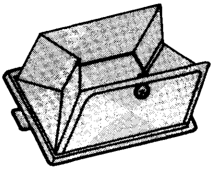
REFLEX VIEWING HOOD

By attaching this accessory to the ground glass back, the image can be viewed right side up (though still reversed from side to side). It incorporates a mirror and a magnifying eyepiece to make focusing and composition easier, and also eliminates the need for a focusing cloth.



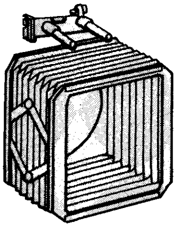
IN LINE VIEWING HOOD

Similar to reflex hood, but without the mirror to invert the image. Used primarily to eliminate the need for a focusing cloth.



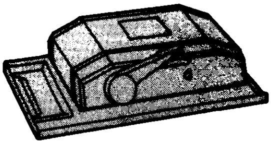
FOLDING FOCUSING HOOD

This collapsible hood is convenient because it can be stored permanently on the camera without getting in the way. It blocks out enough extraneous light to compose and focus, especially when used in conjunction with a fresnel lens.



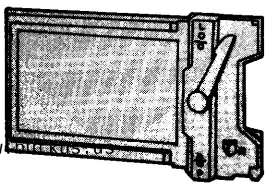
COMPENDIUM LENS SHADE

Considered to be the only camera accessory to actually improve the optical performance of your lens. This flexible bellows shade attaches to the front standard and blocks off-axis light from your lens, which would normally cause lens flare. This shade is pliable to allow you to twist or aim it in the most effective direction, and yet it can be locked into any position. More sophisticated versions of this hood come complete with gelatin filter slots and holders.



ROLL FILM HOLDERS

By attaching a roll film holder to the "graflock" back of the camera it is possible to take advantage of the view camera's image control functions with the more economical roll films. Holders are available in 6 × 7cm (2¼" × 2¾"), 6 × 9cm (2¼" × 3¼") and 6 × 12cm (2¼" × 5") formats.

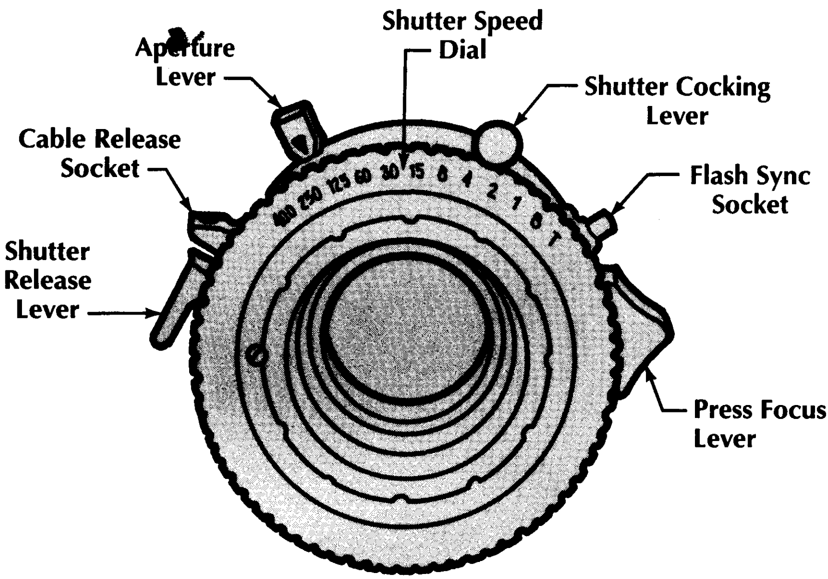


POLAROID FILM BACKS

In order to test exposure, composition, focus and lighting, the Polaroid film backs are essential to large format photography. These holders are inserted into the camera in the same manner as a sheet film holder. There are three models available for 4" × 5" cameras. Both the #550 and #405 holders accept film packs which hold eight exposures. The #550 holder produces the largest image (3.5" × 4.6") of all three backs, while the economical #405 holder produces the smallest (2.9" × 3.8"). The #545 takes individual sheets of Polaroid film, which gives you the advantage of changing emulsions or switching from black and white to color conveniently. The #545 holder produces a 3.5" × 4.5" image. The #545 holder also offers the largest selection of film types, including a new transparency film.

Chapter 2 THE VIEW CAMERA LENS

One of the first things you will notice about large format lenses is that they include all of the controls you usually associate with the lens and the camera body of a 35mm or medium format camera. The view camera lens includes a shutter mechanism which has the shutter speed controls and cocking lever, the diaphragm (or aperture) adjustment lever, the flash sync connection, the cable release socket and a press focus lever. The diagram below illustrates the location of each of these controls on a typical lens.



Large format lenses can be discussed from two aspects: their mechanical properties and their optical characteristics. Let us begin with the former.

A view camera lens contains a shutter and the image forming components, which are usually a series of glass elements. While lens design, focal length and covering power are determined by the number, size and configuration of the glass elements, the shutter has less variables and is common to all types of lenses.

THE SHUTTER

There are currently three basic shutter sizes available for most modern view camera lenses: #0 (small), #1 (medium) and #3 (large). Generally the focal length dictates which shutter is used with which lens. Shorter focal length lenses are usually supplied with #0 shutters, general purpose lenses, such as a 210mm lens, are in a #1 and long focal length lenses, most commonly used with 8″ × 10″ cameras, are usually in #3 shutters. All three sizes feature leaf shutters which have the advantage of being able to synchronize with electronic flash at any shutter speed. However, the high end, or shortest shutter speed will vary with each shutter size. All three shutters have a T (Time) and B (Bulb) settings, with few exceptions.

The press focus lever opens the lens for focusing and for depth of field preview. When focusing it is recommended that you make sure that your aperture is wide open for the brightest possible image.

NOTE: *The shutter cannot be tripped when it is in this preview mode.*

LENS DESIGN

There are literally hundreds of large format lenses from which to choose. Not only are there a variety of lens manufacturers, but there is also a wide variety of lens "types." By first understanding how to read lens specifications, you will begin to learn which lens is best suited for your particular needs.

As an example, we will use the most common focal length lens for the 4″ × 5″ camera: the 210mm lens.

Focal Length	Type of Shutter	Aperture Range	Lens Construction	Multi-Coating	Filter Size	Image Circle	Angle of Coverage	Format Size
210mm	Copal 1	5.6-64	6-4	Yes	67mm	301mm	72°	5″ × 7″

FOCAL LENGTH

The focal length of a lens is equal to the lens-to-film plane distance when the camera is focused at infinity. A 210mm, or 8½″ lens therefore requires approximately 8½″ of camera extension to focus at infinity. It is important to note when buying a lens that your camera's bellows extension is long enough to accommodate this requirement.

With most lenses a flat lensboard is used. However because short focal length, or wide angle lenses require such a short distance between the front and rear standards when focused at infinity (3½″ or less), a recessed lensboard is recommended or is, in some cases absolutely necessary for these lenses. The recessed board places the lens closer to the ground glass, while allowing the front standard to remain a greater distance away from it, thus making it possible to focus at infinity and utilize more camera movements.

TYPE OF SHUTTER
Knowing the shutter size will help you determine the diameter of the hole to be drilled in your lensboard for mounting the lens. Remember, there are only three shutter sizes used for all current lenses — #0, #1 and #3.

APERTURE RANGE
The larger the maximum aperture, the brighter the image on the ground glass will be for focusing and composition.

NOTE: *In cases where the same focal length lens is offered in different maximum apertures, the faster lens will have a larger image circle, which provides greater camera movements and a more even distribution of light across the film plane.*

LENS CONSTRUCTION
The first number (6) designates the number of lens elements, and the second number (4) refers to the number of groups they are cemented into. In general purpose and wide angle lenses, the higher these two numbers are, the better corrected they are for distortions.

MULTICOATING
This reduces the possibility of lens flare, thus producing better image contrast and color saturation.

FILTER SIZE
This tells you the diameter of the front lens housing for proper filter selection.

IMAGE CIRCLE
The diameter of the cone of usable (i.e. producing good definition) image area projected by a lens. This is generally measured with the lens focused at infinity and at a particular aperture (usually f22). While this is discussed in greater detail later in this chapter, it is important to note that two lenses of the same focal length may have different size image circles, the largest allowing you greater movement and evenness of illumination.

ANGLE OF COVERAGE
Angle of coverage is the angle formed by lines connecting the image nodal point (where light leaves the rear of the lens) to opposite sides of the image circle. A 4″ × 5″ view camera lens should have at least a 70° angle of coverage if ~~full~~ camera movements are to be used.

Angle of coverage is directly determined by lens design, not focal length. Therefore it is entirely logical that different focal length lenses of the same design would have the same angle of coverage. This angle will vary with changes in aperture, and should be referenced to a given f-stop (usually f22 in most manufacturer's specifications). The greater the angle of coverage, the greater the amount of view camera movement.

FORMAT SIZE
Provides you with the recommended maximum film size covered by a lens.

VIEW CAMERA OPTICS

When it comes time to choose which lens is best for a specific application, there are several factors which need be considered. In some respects, this decision is no different than selecting the proper lens for a 35mm or medium format camera. The effects are the same; only the numbers are different. However, since view cameras come in a variety of format sizes — including 2¼" × 2¾", 4" × 5" and 8" × 10", the term "view camera lens" can be misleading unless some basic principles are understood.

PERSPECTIVE

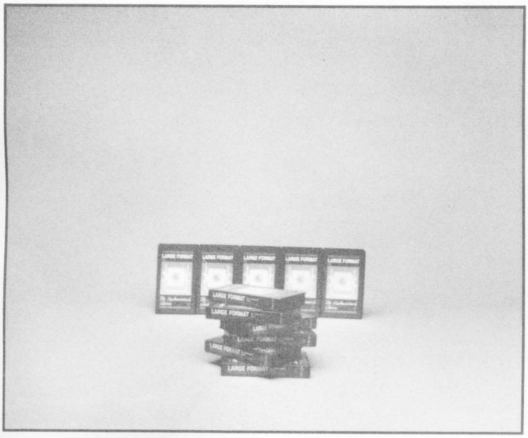
Before you decide which lens to use for a given scene or situation, you must first try to pre-visualize how you want that scene to look on film. And part of how it will look depends upon the perspective you wish to create. Perspective refers to the relative size relationships of the different elements within a scene, and is a factor of where you position the camera in relationship to those elements.

All lenses have the same perspective, only the angle of view changes, which is what controls the image size within the frame. The illusion that a short focal length, or wide angle lens causes a foreshortened perspective is actually due to a closer camera-to-subject distance. Conversely, the illusion that a long focal length lens causes a compressed perspective is actually due to a greater camera distance from the subject.

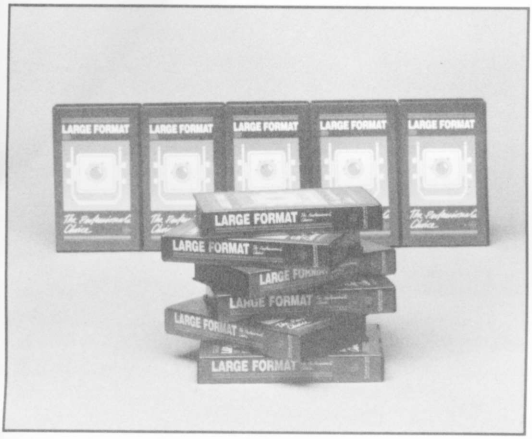
Once the position of the camera is determined — based upon the perspective you wish to achieve — you can then choose the lens focal length which will give you the proper image size.

IMAGE SIZE

Assuming that your perspective is pre-determined, it is your choice of focal length which will affect the relative image size of your subject within the image frame. If you have chosen a perspective which gives you more background than you want and a smaller subject than you would like with a 210mm lens, then a longer, or telephoto lens is in order. Remember, if you were to move the camera in closer to correct for this, your perspective would change.



Subject shot with a 90mm wide angle lens



Same subject shot with a 210mm "normal" lens

A 300mm telephoto lens produces this image size

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ANGLE OF VIEW

Technically speaking, the angle of view is that angle formed by lines from the image nodal point of the lens to two opposite corners of the film when the camera is focused at infinity. It should be noted that there are actually three angles of view: horizontal, vertical and diagonal. The important point here is that angle of view is determined by the lens focal length and a particular format size. Understanding the relativity of this term when comparing focal lengths of different format sizes can be confusing. The comparison chart illustrated below is useful when visualizing the area to be included in a photograph with a particular focal length lens:

35mm		6 × 6 cm		6 × 7 cm		4 × 5 in.		8 × 10 in.	
Focal Length	**Angle of View***	**Focal Length**	**Angle of View***	**Focal Length**	**Angle of View***	**Focal Length**	**Angle of View***	**Focal Length**	**Angle of View***
								120mm	**92°**
20mm	**84°**					65mm	**86°**	135mm	**85°**
24mm	**74°**					75mm	**78°**	150mm 165mm	**79°** **74°**
28mm	**65°**	40mm	**69°**	50mm	**69°**	90mm 100mm	**68°** **62°**	180mm 210mm	**69°** **61°**
35mm	**54°**	50mm	**58°**	65mm	**56°**	120mm	**53°**	240mm	**55°**
44mm 50mm	**44°** **40°**	60mm 75mm	**49°** **40°**	75mm 80mm 90mm	**49°** **46°** **42°**	135mm 150mm 165mm	**48°** **44°** **40°**	300mm	**45°**
55mm 58mm	**36°** **34°**	80mm 100mm 105mm	**39°** **31°** **30°**	105mm 120mm 127mm	**36°** **32°** **30°**	180mm 210mm	**37°** **31°**	360mm 450mm	**38°** **31°**
85mm 105mm	**24°** **19°**	120mm 135mm 150mm	**26°** **23°** **21°**	140mm 150mm 180mm	**27°** **26°** **22°**	240mm 300mm 360mm	**28°** **23°** **19°**	480mm	**29°**
135mm 180mm 200mm	**15°** **12°** **10°**	250mm	**13°**	360mm	**11°**	450mm 480mm	**15°** **14°**		

*Horizontal Format

You may be better at relating to image sizes produced by different focal length lenses in the 35mm format. For example, a 28mm lens on a 35mm camera has an angle of view of 65°. If you look at the chart above, you will find that a similar angle of view in the 4″ × 5″ format is produced by a 90mm lens (68°).

COVERING POWER

A lens projects a circular cone of light which can be discussed in two different terms. The diameter of the circular area within which the lens is capable of forming an image with acceptable definition is referred to as the **image circle.** The angle formed by lines drawn from opposite sides of this image circle to the lens is the **angle of coverage.** There are four factors which affect the size of the image circle:

1. Focal Length: The diameter of the image circle is *approximately* equal to the focal length of the lens. This holds true for most conventional lens designs, but is not the case with wide angle, telephoto and other special purpose lenses.

2. Aperture: By stopping the lens down, the image circle will increase.

3. Lens Design: This will affect the ratio of the image circle to the focal length.

4. Lens-to-Subject Distance: The image circle, usually specified with the camera focused at infinity, will increase as the lens-to-subject distance decreases.

The most important factor to consider when choosing a lens is that it has sufficient covering power to include the entire format, or film dimensions, you are using. A 4″ × 5″ sheet of film is 161mm (approximately 6½″) across its diagonal. Therefore, the image circle of a lens to be used on a 4″ × 5″ camera must be at least 161mm or more for the image to completely cover the film.

In order to take advantage of the view camera's primary asset — its ability to adjust the lens and film planes to control plane of focus and image shape — the image circle must be considerably larger than the minimum 161mm. An image circle of 230mm will give you enough room to use the shifts, swings and tilts.

NOTE: *Since the image circle is calculated with the lens at infinity, closer focusing distances will mean even larger image circles. For example, a 135mm lens with a normal image circle of 200mm will easily cover the 323mm diagonal of the 8″ × 10″ format when the subject is reproduced at life size. A general rule to follow states that if you double the bellows extension required for a lens to focus at infinity, you will double the size of the image circle.*

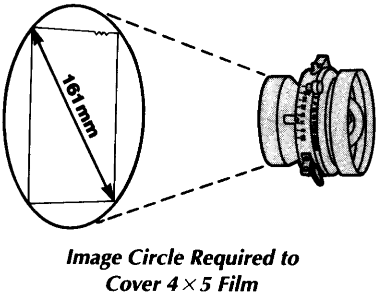
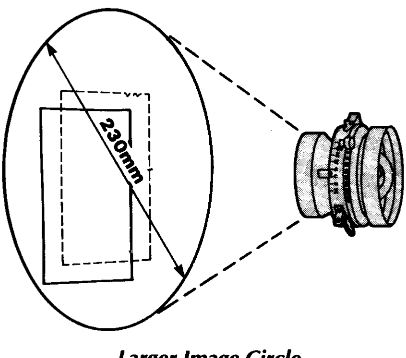


Image Circle Required to Cover 4 × 5 Film



Larger Image Circle Provides Room For Camera Movements

SPECIAL PURPOSE LENSES

Aside from the traditional wide angle, normal and long focal length lenses that are available for view cameras, there are several types of special purpose lenses from which to choose which further enhance your image control capabilities.

SOFT FOCUS LENSES

These lenses are designed to create controllable and predictable soft focus images. Grid disks, along with intentional spherical aberration of the lens elements create the equivalent of two images on one film plane. This results in a blending of highlight and shadow which smooths out skin tones, creating a luminous appearance. The intensity of the softening effect for individual images can be varied. These lenses are most commonly used for portraiture, but also can be applied to other situations, such as product photography.

FLAT FIELD LENSES

Also called copy or process lenses, these are designed to produce outstanding corner to corner resolution, texture rendition and light transmission. These lenses produce optimum results at life-size reproduction ratios (1:1) and are excellent choices for close-up or high magnification work. Apochromatic correction is sometimes employed by these lenses to produce exacting copy work and color separation negatives.

TELEPHOTO LENSES

These uniquely designed long focal length lenses will focus at infinity with significantly less bellows extension than their standard lens design counterparts. This makes them ideal for use on cameras with restricted bellows extensions, such as field cameras.

Chapter 3 LOADING FILM HOLDERS

The sheet film used in a view camera is first loaded into film holders — two sheets per holder. The loading process takes place in a completely light-tight environment, such as a darkroom or changing bag. The film holder is then inserted into the camera, the darkslide is removed and the exposure is made. This is a slow, methodical procedure, but the results are well worth the effort. If you follow these step-by-step instructions and *practice* them a few times with a scrap sheet of film with the lights on, this seemingly complex procedure will become second nature to you.

First, a brief description of your primary tool, the dual sheet film holder. Available in all popular sheet film format sizes, these holders consist of a body and two removable darkslides, which when inserted into each side of the holder provide light tight protection for the two sheets of film.

The body of the holder has two sets of "channels" or guides on each side. The upper channels on the inside walls of the holder are guides for the dark slides. The lower channels on the base plate of the holder are retaining guides for the film. Two hinged flaps are located at the film loading end of the holder. These are to be opened when inserting the film and closed before inserting the dark slides.

Each dark slide has a handle with two distinctly different sides: one side is black, while the other side is white with several raised bumps on it. The *black* side is designed to designate *exposed film* or *empty holder.* After the exposure is made in the camera, the dark slide should be re-inserted into the holder with this black side facing out. The *white* side designates *unexposed film* is in the holder. Dark slides should *always* be inserted with the proper side out when you are working with them so you have a *safe* reference point.

NOTE: *One word of caution — cleanliness! This sums up the single most important thing to remember when loading film. Any dust particles or fingerprints that get on your film will cause spots or markings on your negatives or transparencies. A few extra moments spent cleaning your holders before you load them will save you a multitude of problems in the long run.*

TWO COMMON LOADING ERRORS

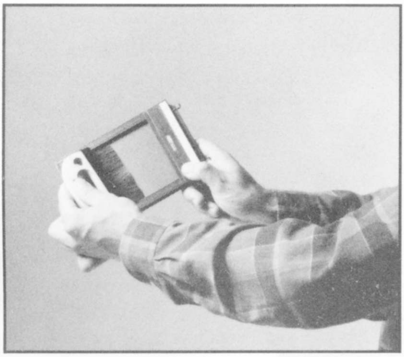
1. Not pushing the film all the way down into the holder. In this case it is unlikely that the flap will close.

2. Putting the film into the dark slide guide rather than the film channel. This results in not being able to push the dark slide in. When this happens, the film is usually damaged, and should be discarded and replaced with a fresh sheet.

STEP-BY-STEP LOADING PROCEDURE

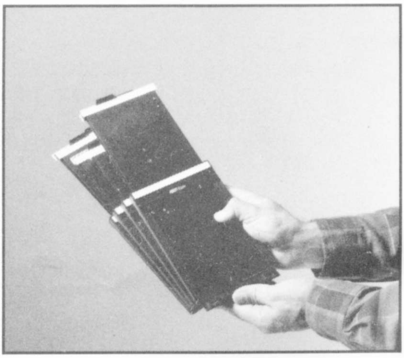
(Steps 1 thru 3 can be done with the room lights on.)

1. Remove the dark slides and open the flaps at the bottom of the holder. Tap the edge of the holder with a static removing brush and use the brush to wipe the interior of the holder and the dark slides clean. Compressed or canned air also works very effectively.



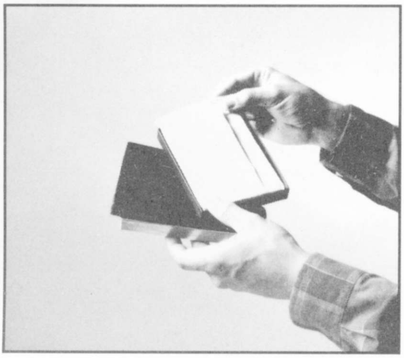
2. Insert the dark slides about an inch into their channels on both sides of the holder with the *white* side facing out. Again, this is very important to indicate that the film in the holder is *unexposed.*

3. Stack the clean holders near the closed box of film.

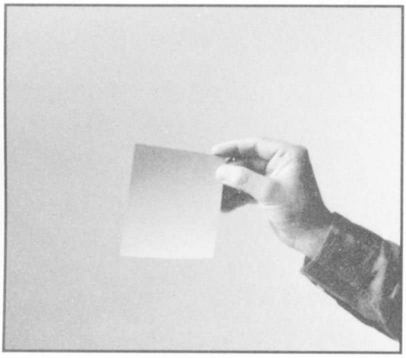


(Steps 4 thru 9 *must* be performed in ***total darkness!***)

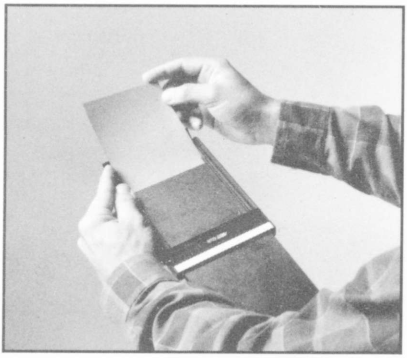
4. Open the box of film and remove a single sheet of film from the inner foil package.



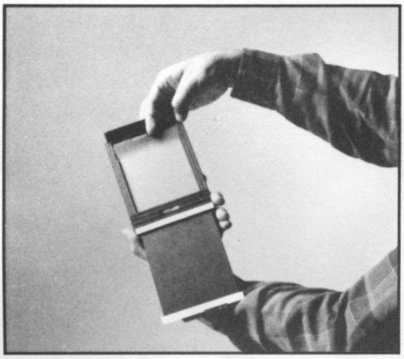
5. Locate the *notched* corner on the film and place it in the upper right hand corner while holding it in your right hand. This indicates that the emulsion side of the film is facing you.



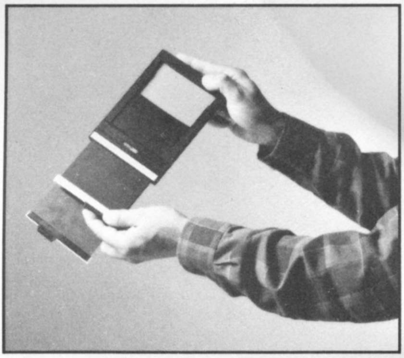
6. Pick up the film holder in your left hand with the protruding dark slides pointed down. Using your left thumb, open the flap and gently slip the film into the film retaining channels of the holder.



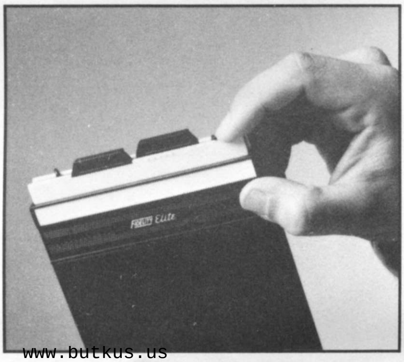
7. With your right index finger, gently push the film until it is completely in place. As a safety precaution, it is a good idea to check proper seating of the film by slipping a fingernail under the top edge of the film. If it is in both of the channels you will feel a slight tension.



8. Close the flap and push the dark slide all the way into the groove of the flap. You may wish to check to make sure that the flap is locked into position by the dark slide.



9. Swing the dark slide lock on the holder over the top of the handle to insure against accidental removal of the dark slide.



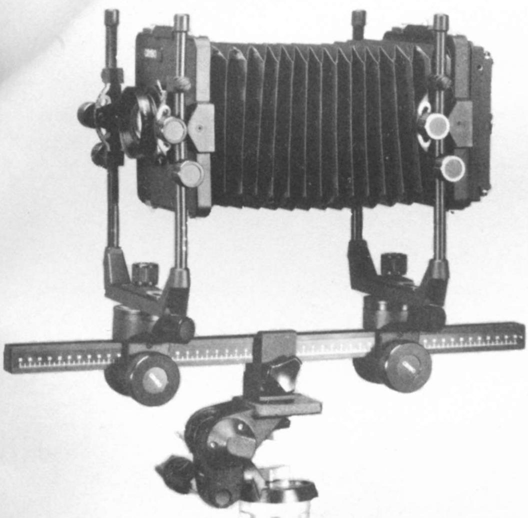
Repeat this procedure for the other side of the holder.

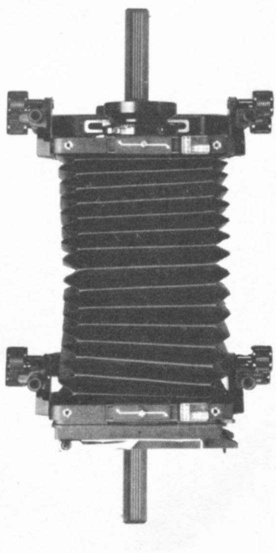
Chapter 4 VIEW CAMERA MOVEMENTS

The real advantage to the view camera is its flexibility and its ability to mold the final image in ways that no other camera can. The image control movements are called swings and tilts, shifts, rises and falls. With these movements you can achieve creative freedom by controlling vertical or horizontal distortion, plane of focus, perspective and composition.

These primary movements can be used individually or in conjunction with one another to give you the ultimate in image control.

NOTE: *Before you get started, you should first set each movement at its neutral reference point. This is called the* ***zero position.*** *Zero position is generally designated by a benchmark or by clickstop detents on your camera. All movements should be centered in this neutral position as illustrated below:*





LENS STANDARD MOVEMENTS

CONTROLLING PLANE OF FOCUS

The lens' standard **swing** and **tilt** movements are used to control the subject's plane of focus. A lens can only focus with maximum sharpness on a two dimensional object plane, that plane being parallel to the lens plane and perpendicular to its axis. However, many times your subject doesn't cooperate with this limitation, and adjustments must be made. A simple stopping down of the lens to increase the depth of field may not do the job, especially in close-up situations. The front swing and tilt movements on a view camera allow you to alter the plane of sharp focus so that it coincides with the plane of interest of your subject, and thus keeping it in focus.

CONTROLLING IMAGE POSITION AND RELATIONSHIP

The front **rise, fall, and lateral shift** alter the position of the image with respect to the film. Through these movements, the subject can be repositioned up or down and left or right on the ground glass or film plane. These movements can come in handy for minor changes in composition, especially with image shifts resulting from a swing or tilt movement.

These movements will also affect the relative position relationships between objects close to the camera and those further away. This change in perspective occurs because lateral and vertical front movements are effectively changing the position of the "eye of the camera:" the lens. As it moves, or shifts to one side of the object, more of that side will be seen or revealed, and it will change that object's relative position to the background.

NOTE: For ease of explanation and understanding, all examples that appear in this section are shown as they appear in the final print. The image that appears on the ground glass is upside down and reversed side to side, therefore directional references to the final print are the opposite of those seen on the ground glass. Also note that the reference point for all movements (i.e. left, right, forward and back) is from the rear of the camera, facing the subject.

BACK STANDARD MOVEMENTS

CONTROLLING IMAGE SHAPE

The back standard **swing** and **tilt** movements are used to control the shape of the image. By pivoting the film plane, the shape of the subject will become elongated either horizontally (by swinging) or vertically (by tilting). Such reshaping of the subject can convert a circular object into an eliptical object and square object into a trapezoidal object.

In most instances you will want to keep the back standard parallel to the subject so that they *do not* become distorted from their normal shape. This is most evident in architectural photography, where great care must be taken to keep the camera back parallel to the lines of buildings so they do not appear to converge. However, since most buildings are higher than your camera position, the camera must be pointed in an upward direction. In order to keep the back standard parallel to the lines of the building, its top edge must be tilted forward, or towards the lens. *(See page 42 for detailed example.)*

Since most "table top" photography requires the camera to be pointed downward, image shape control comes into play quite often. The grid lines on the ground glass can be very helpful in determining when a correction is necessary and when sufficient movement has been applied, especially with subjects containing parallel lines. Irregularly shaped objects may be more difficult to correct, but are done so with the same movements.

NOTE: *Rear swing and tilt movements will usually affect the sharpness of the image and may require altering the lens standard or stopping the lens down to correct for this.*

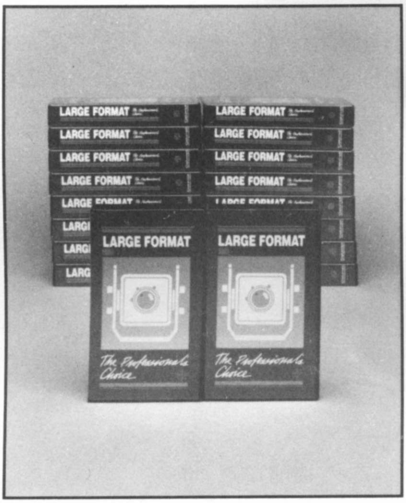
CONTROLLING IMAGE PLACEMENT

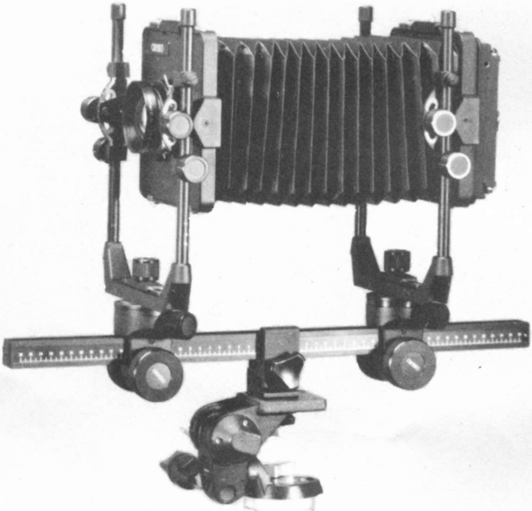
The rear **rise, fall and shift** movements control the position of the image on the ground glass. However, unlike the same movements on the front standard, they DO NOT change the camera's perspective in relation to the subject. In this case it is the film that is moved, and not the image itself. Therefore, it is with these movements that most compositional and framing corrections are made.

While the rise and fall move the image up and down on the ground glass, the lateral shifts move the image side to side. These movements can be time and labor saving alternatives to lifting and moving the camera and tripod.

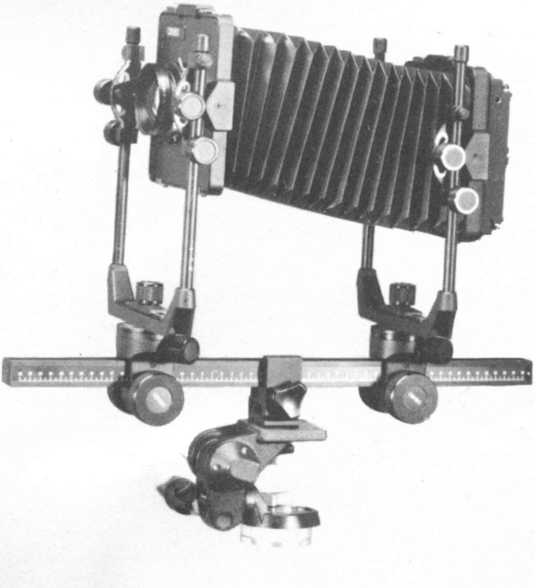
FRONT RISE/FALL

Zero Position: In this example the tops of the front boxes are cutting through the center of the titles on two of the rear boxes, a somewhat distracting fashion.



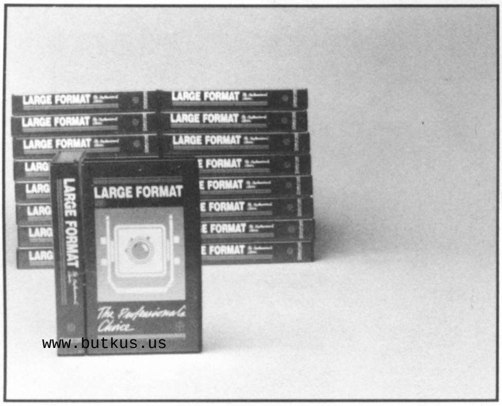


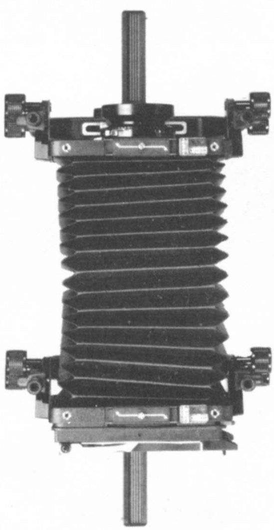
Front Rise/Fall Correction: By raising the front lens standard, we have, in effect, raised the camera. The tops of the front boxes no longer obstruct the title letters of the rear boxes. This movement also lowers the subject on the negative. If you were to lower the lens, the image would be higher on the negative.



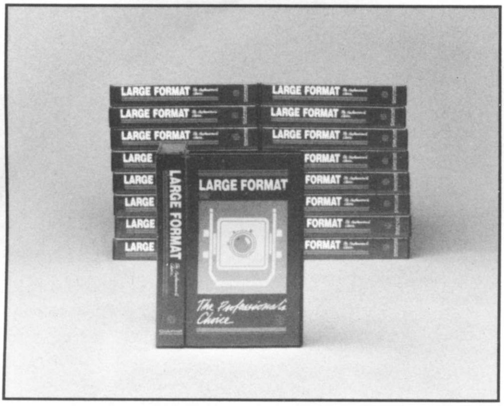
FRONT LATERAL SHIFT

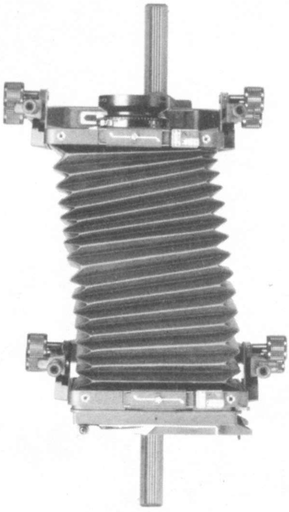
Zero Position: In this example, the front boxes are obstructing portions of words on the rear cartons, showing only "Larg" on one side, and "e Format" on the other. The subject is also off center, to the left of the frame.





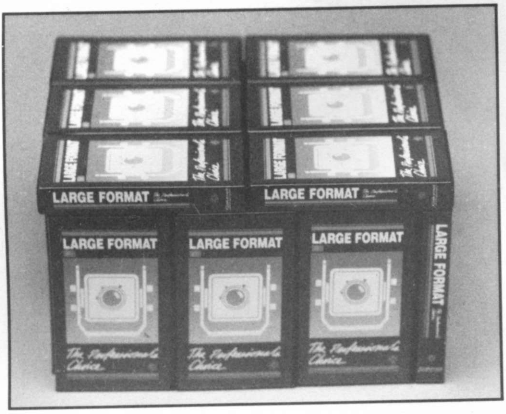
Front Lateral Shift Correction: By shifting the front lens standard to the left, we are able to read "Large" on one side, and "Format" on the other. The subject is also shifted to the right on the negative, and is now centered.

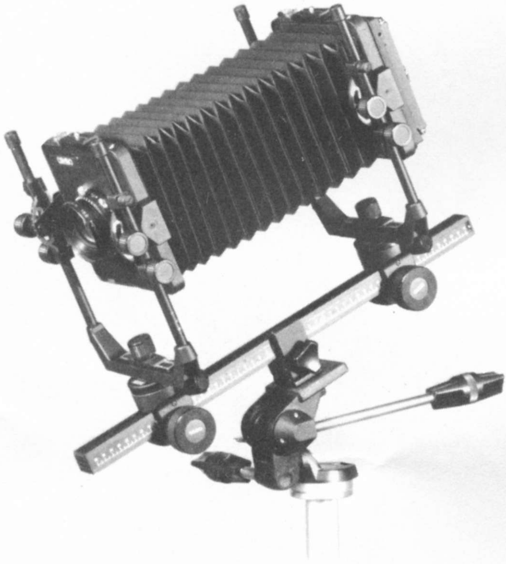




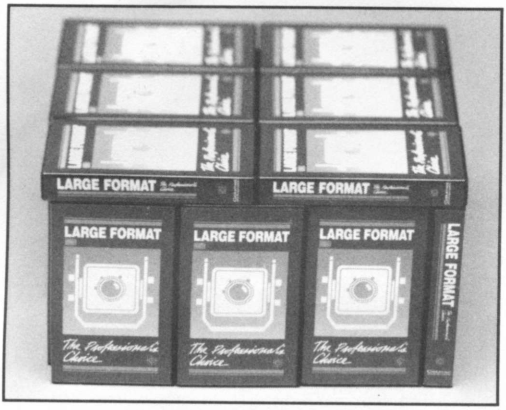
FRONT TILT

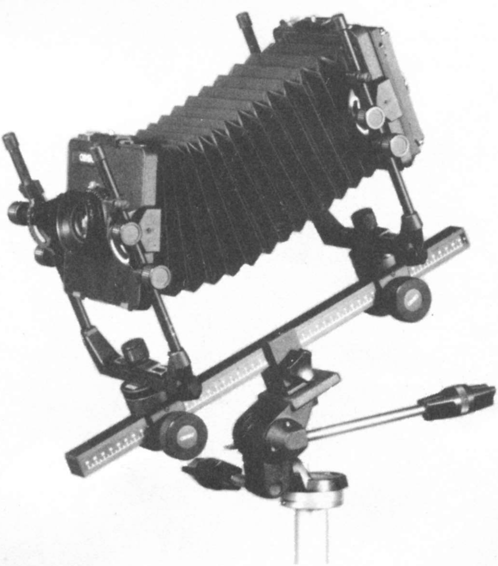
Zero Position: With the camera pointed down towards the subject and focused at the top corner of the subject, the bottom and back end of the subject are out of focus.





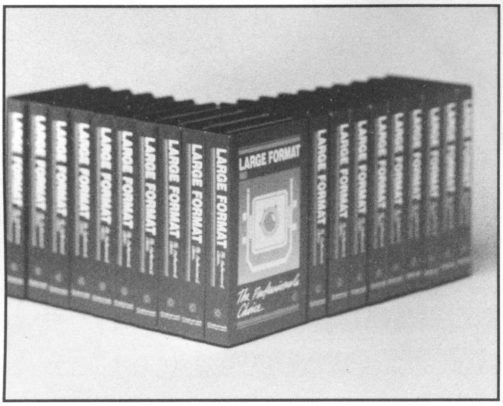
Front Tilt Correction: By tilting the top of the lens standard back, or parallel to the front facade of the subject, the fronts of the horizontally stacked boxes are completely in focus. By tilting the lens standard in the opposite direction, the boxes laying across the top would all be in focus.

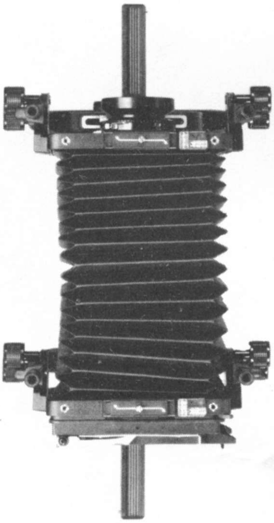




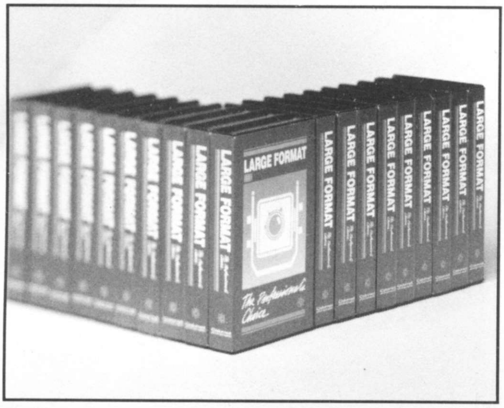
FRONT SWING

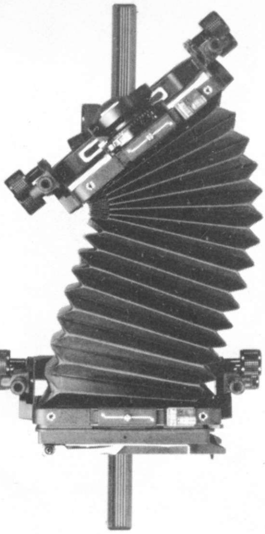
Zero Position: The box at the front of this subject was the primary focusing point for this example. Notice that the lettering on the boxes gets progressively more out of focus as they recede further from the front.





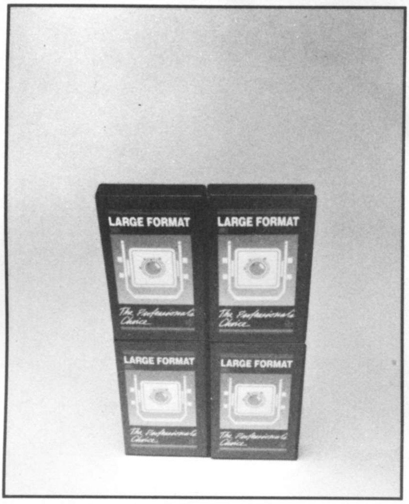
Front Swing Correction: By swinging the front standard to the left so that the right side or plane of the subject, the lens plane and the film plane meet at one common point, we are able to bring the entire right side into sharp focus. Similarly, the left side or plane could be brought into focus by swinging the front standard to the right. ***NOTE:*** *Only one side can be controlled at a time.*

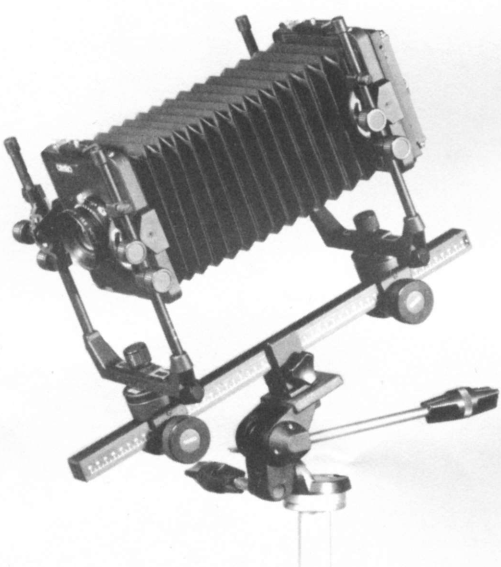




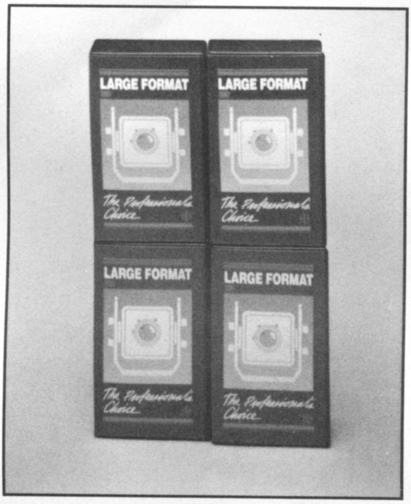
BACK TILT

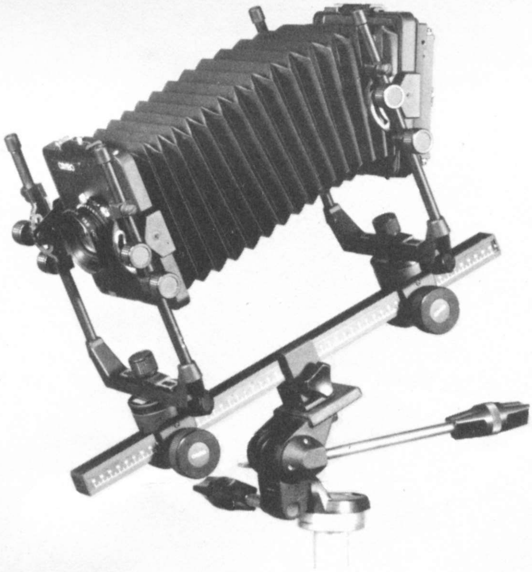
Zero Position: This example was photographed from a high viewpoint, with the camera pointed down towards the subject. The results show a distortion of the subject, with the sides of the boxes converging or tapering at the bottom.





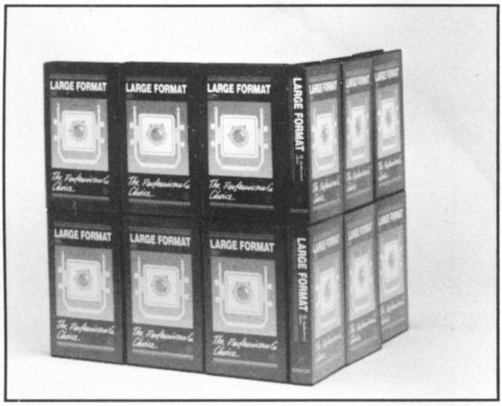
Back Tilt Correction: By tilting the back standard up, or parallel to the front facade of the boxes, the rectangular shape of the subject is restored.

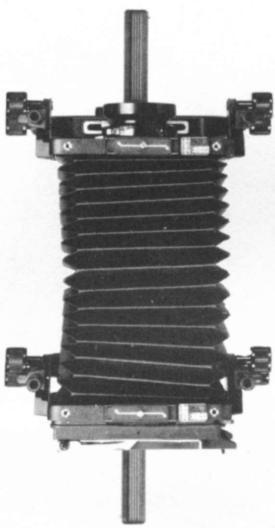




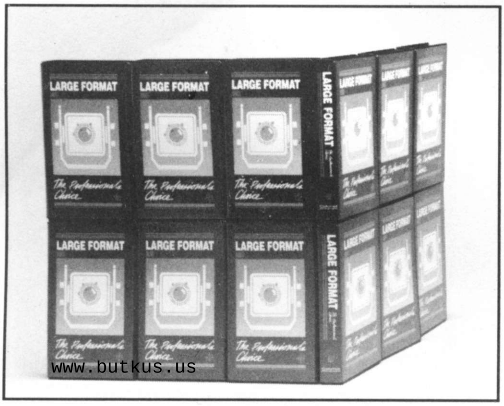
BACK SWING

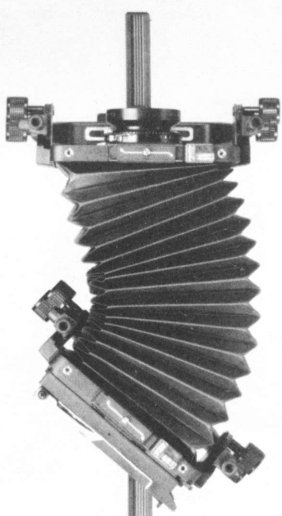
Zero Position: In this example the row of boxes on the left appear to converge or taper towards the far left end.





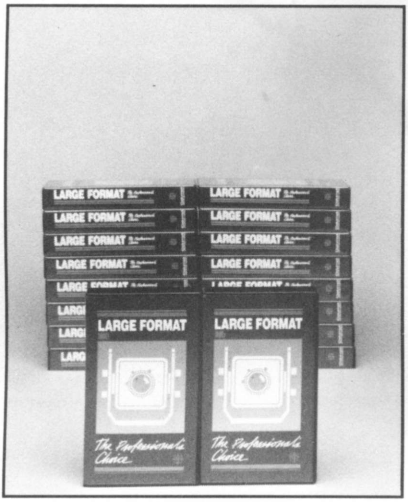
Back Swing Correction: By swinging the rear standard towards the right, or parallel to the row of boxes on the left, the convergence is corrected and the boxes in that row appear the same size.

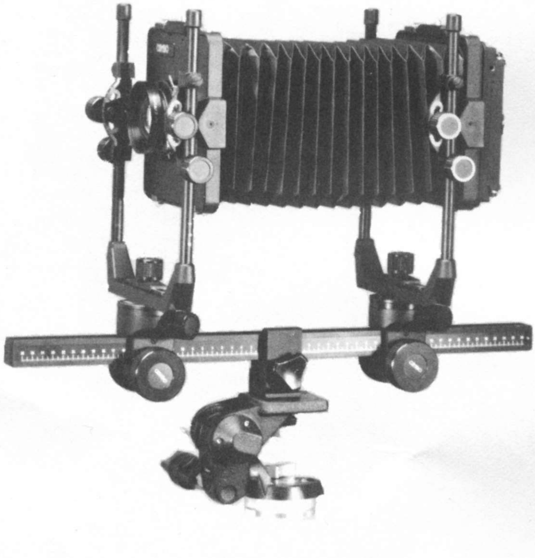




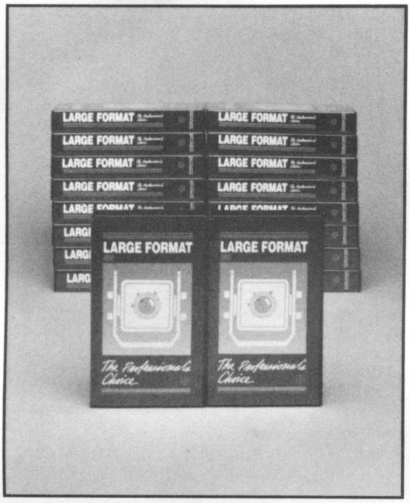
BACK RISE/FALL

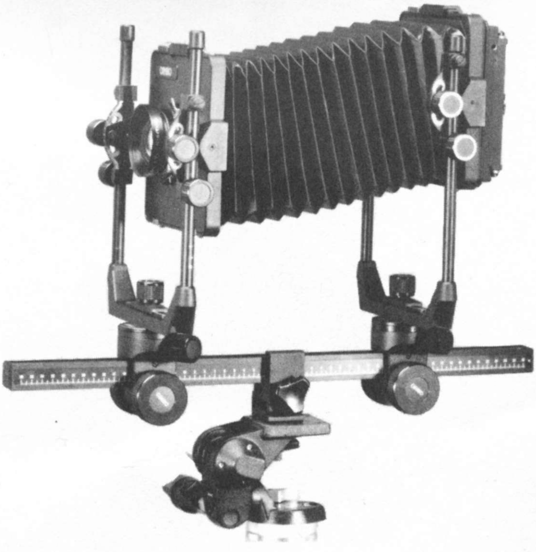
Zero Position: This example shows the subject cropped too closely at the bottom of the frame, with excess space at the top.





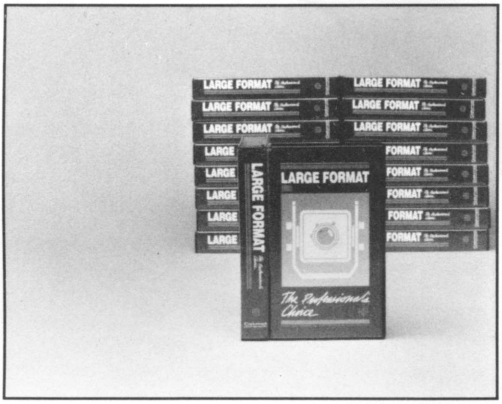
Back Rise Correction: By raising the back standard, the image on the negative also moves up. Reversing this movement would lower the image on the negative.

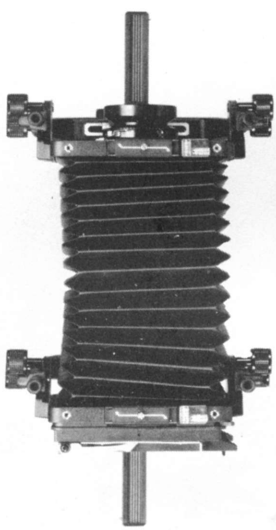




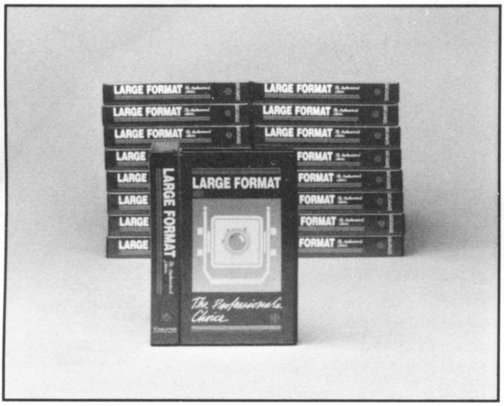
BACK LATERAL SHIFT

Zero Position: This example shows the subject off center, to the right of the frame.





Back Shift Correction: By sliding the back standard to the left, the image moves left, or to the center of the negative. This movement can also be reversed for the opposite effect.



Chapter 5 CHECKLIST

In order to work effectively, and efficiently with a view camera, it is a good idea to establish well organized work habits. If you follow this step-by-step CHECKLIST each time you use the view camera, you will avoid some of the potential pitfalls which could cause time-consuming mistakes. Remember, you want to take advantage of the view camera's slow, methodical nature and concentrate on its ability to control the image.

✔ 1. ZERO POSITION

Once you have chosen your subject, established the camera position and decided upon the proper focal length lens, all movements of the camera should be set at zero or neutral position.

✔ 2. FOCUS

Bring the subject into sharp focus by opening the shutter with the aperture set at its widest opening. While the camera can be focused with either the front or back standard, it is generally recommended that you use the back standard, since it does not alter the image size of your subject.

✔ 3. SHAPE ADJUSTMENT

Check for any distortion in the shape of the subject. Any corrections to be made are done so by changing the rear standard position with a swing or tilt movement.

✔ 4. SUBJECT PLANE

If your subject plane is not parallel to the lens plane, you will need to adjust your front standard.

✔ **5. ADJUST PLANE OF FOCUS**
Swing or tilt your lens plane to match that of your subject.

✔ **6. REPOSITION BACK STANDARD**
If it is not possible to swing or tilt the front standard enough to match the subject plane, you may have to swing or tilt the back standard.

✔ **7. REFOCUS**
Check again to make sure your intended plane of focus is sharp.

✔ **8. LOCK CAMERA MOVEMENTS**
Check to make sure all of the camera's locking knobs are securely tightened and positively locked.

✔ **9. DETERMINE EXPOSURE**
Be sure to calculate for any exposure increase required due to bellows factor. *(see page 44).*

✔ **10. CHECK SHUTTER**
Set your shutter for the proper aperture and shutter speed combination, taking into account desired depth of field, which can be checked on the ground glass. Cock the shutter.

✔ **11. CLOSE THE LENS**
Make sure the lens is closed before inserting the film holder.

✔ **12. INSERT FILM HOLDER**
Pull the ground glass frame back by placing your thumb against the back standard and your index finger against the frame. Carefully slide the holder into position making sure it is seated all the way into place. A raised ridge on the film holder must fit into the groove in the back of the camera. Remove the dark slide closest to the front of the camera.

✔ **13. WAIT**
Make sure that any camera vibrations have subsided and the camera is perfectly still before making your exposure.

✔ **14. MAKE EXPOSURE**
Fire the shutter with a cable release to reduce the chance of causing any camera movement.

✔ **15. REPLACE DARK SLIDE**
Insert the dark slide with the BLACK side facing out to indicate that the film has been exposed.

✔ **16. REMOVE HOLDER**
With the dark slide in position, remove the holder from the camera. It is a good idea to re-check your focus at this point to make sure the camera wasn't moved while loading the holder.

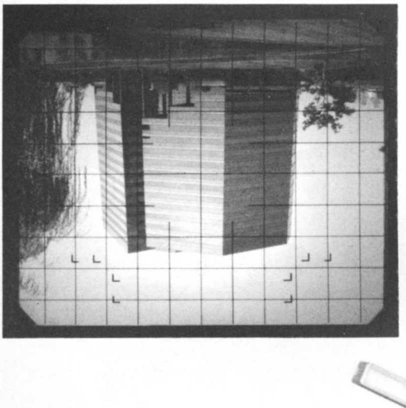
Appendix SPECIAL APPLICATIONS

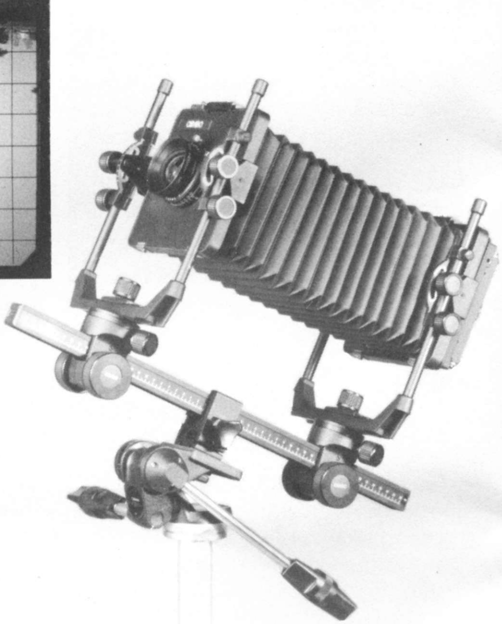
ARCHITECTURAL CORRECTIONS

As mentioned earlier in Chapter 4, a high percentage of architectural exterior photography requires the view camera to be angled up in order to include the whole building in the composition. What makes the view camera the "ideal" architectural camera is its ability to correct for the vertical distortion this angle creates. Since it is the back standard which controls the shape of the subject, a back tilt is used to correct for the converging vertical lines of a skyscraper. A back swing will control any horizontal distortion created by photographing a lower building from a corner perspective. Additional front movements are also used to control plane of focus and composition. The example below illustrates a situation where corrective movements are required:

ARCHITECTURAL PROBLEM

With the camera pointed upwards and all movements in zero position, you can see the converging vertical lines of the building as seen through the ground glass (the image is upside down and backwards). The grid lines on the glass act as easy references in determining this distortion.

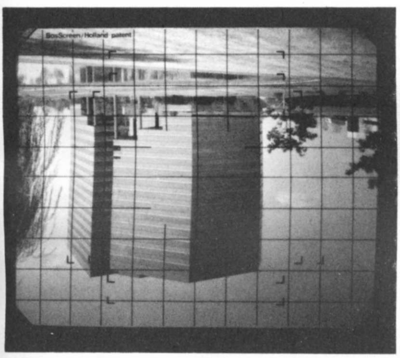


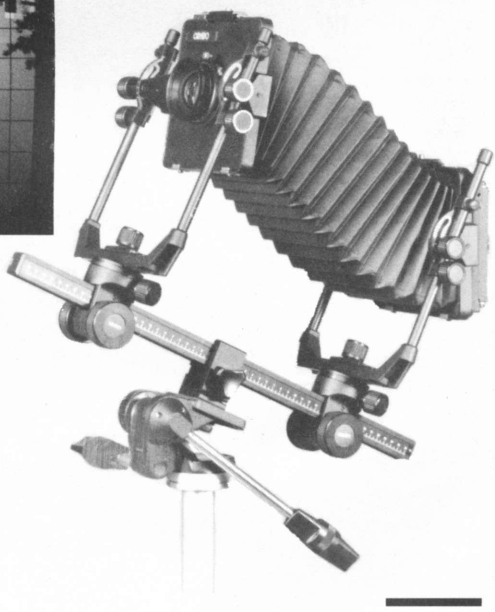


ARCHITECTURAL SOLUTION

To correct for this distortion, you tilt the back standard forward until it is parallel with the facade of the building. To insure a sharp plane of focus, tilt the front standard until it is parallel with the back standard. A front rise or fall may also be necessary to eliminate foreground obstructions or make minor adjustments in composition.

NOTE: *The distance you raise the front standard creates equal displacement on the film when viewing objects at a distance. (i.e. a 1" front rise will raise the distant subject 1" on the negative.) It is a good habit to check the corners of your ground glass for light falloff, or vignetting after making a rise or fall movement.*





BELLOWS FACTOR

As the camera is moved closer to the subject, the bellows extension increases. As a result, the light entering the camera thru the lens has to travel a greater distance to the film, and by the time it reaches the film it has lost some of its intensity.

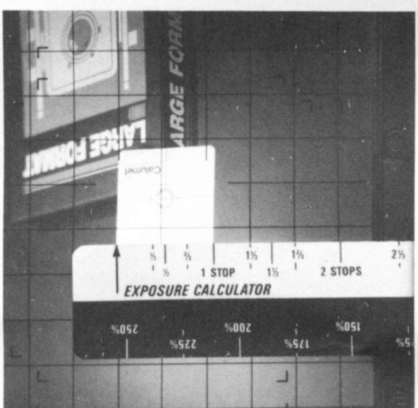
In order to compensate for this loss of light, additional exposure is required, which can be calculated for by what is called a **bellows factor.** This bellows factor comes into play if the distance from the lens to the subject is less than 10 × the lens focal length. For example, if you were to focus a 210mm, or 8½″ lens on a subject less than 85″ away from the lens, you would have to increase the exposure from what was indicated by your light meter.

The following formula can be used to determine just what this exposure increase should be:

$$\frac{\text{BELLOWS LENGTH}^2}{\text{FOCAL LENGTH}^2} = \text{EXPOSURE INCREASE}$$

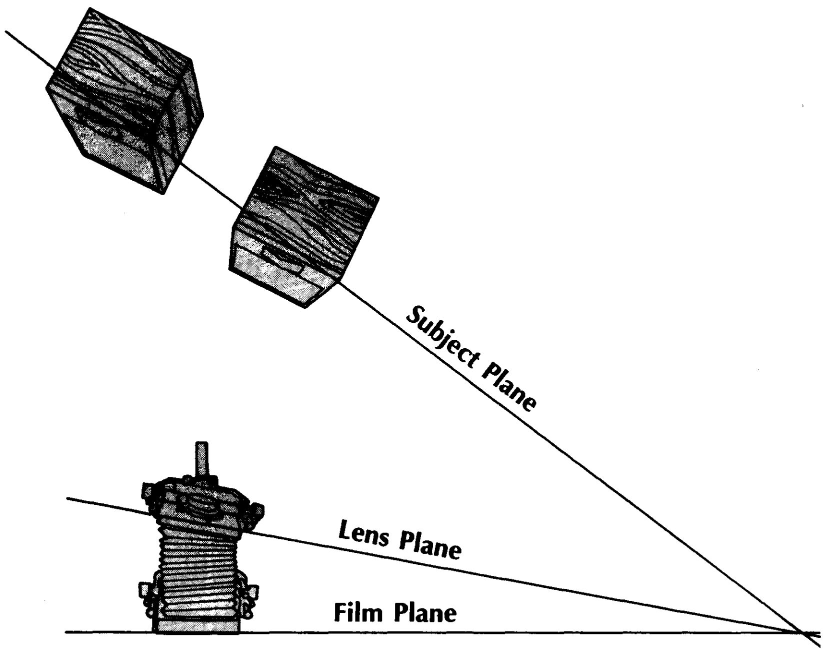
CALUMET EXPOSURE CALCULATOR

A much simpler method to determine exposure increase which does not involve mathematical calculations is to use the Calumet Exposure Calculator, which is included with this workbook. To use this calculator, place the square target chip next to the subject you are photographing. Then place the calculator ruler on your ground glass and line up the arrow with one edge of the target. Your exposure increase will be indicated by the line that comes closest to the other end of the target.



SCHEIMPFLUG RULE

Once you have corrected the plane of focus by either tilting or swinging the lens plane, it is no longer parallel to the film plane, and therefore not in focus. It is here that the **Scheimpflug Rule** need be applied. This rule states that in order to obtain this overall sharp focus, the plane of the subject, the plane of the lensboard and the plane of the back, or film must all meet at one common point, as illustrated below:



This Scheimpflug Rule can be applied to any two points within the subject. Simply draw an imaginary line between them, and that line becomes your subject plane. Then you begin by tilting or swinging your lens standard until both points are in focus at the same time at maximum aperture.

Finally, you tilt or swing the film plane, or rear standard until an imaginary line drawn from it intersects at the same point where the subject and lens planes converge. There are unlimited possibilities of controlling the plane of focus by applying this rule to different planes within the subject. So it is a good idea to practice with a variety of situations and setups until you are comfortable with the concept.

Glossary

Aberration: The inability of the lens to render a theoretically perfect image of the subject over the entire image area.

Achromatic: Lens systems that have been corrected to focus two of the three primary wavelengths to precisely the same point. This type of color correction is found on the majority of lenses in all formats.

Angle of Coverage: The angle formed by lines connecting opposite sides of the image circle and the rear nodal point of a lens when focused at infinity. This angle is a factor of lens design, and not focal length. Therefore a 210mm and a 150mm of the same lens design can have the same angle of coverage even though they have different angles of view.

Angle of View: The total image forming angle of a given focal length lens for a given format. Angle of view is determined by focal length and format size only, and is not affected by lens design.

Aperture: The relative diameter of the opening in the lens iris. By changing the size of this opening, the amount of light passing through the lens can be controlled, thus affecting the exposure.

Apochromtic: Specifies lens systems that have been designed to focus all three primary wavelengths of light to the same point. Specialized copy lenses are routinely corrected to this degree.

Bag Bellows: An accessory bellows used in place of the normal bellows which is designed for maximum flexibility at short extensions to allow for movement of the camera with short focal length lenses. Also called wide angle bellows.

Chromatic Aberration: The inability of a lens to bring light from the same subject plane but of different wavelengths (colors) to a common focus point.

Depth of Field: The distance between the nearest and the farthest points of a subject which is acceptably sharp. Depth of field is determined by a variety of factors, including aperture, focal length and lens-to-subject distance.

Film Plane: The position of the emulsion side of the film. On a view camera, the film plane is equal to the position of the ground glass before the film holder is inserted.

Flare: Non-image forming light which in a camera is generally caused by reflection from a lens surface or reflective interior camera surface. The effect of flare is reduced overall contrast, or in extreme cases an unwanted highlight. Flare can usually be reduced or eliminated with the use of an effective lens shade.

Focal Plane: An imaginary plane perpendicular to the optical axis which forms the plane of sharp focus.

Focal Length: The distance between the rear nodal point of the lens and the image plane when the lens is focused at infinity.

Format: The actual dimensions of the film used in a given camera.

Fresnel Lens: A thin piece of plastic or glass used in contact with the ground glass to distribute the brightness of the image evenly over the entire ground glass area.

Image Circle: The maximum area of useable image that a focused lens will produce. Image circle is determined by lens design and is affected by aperture and lens-to-subject distance. Most published lens specifications show an image circle measured at either f/22 or f/16 with the lens focused at infinity. Image circle size will determine the amount of camera movement a lens will allow.

Nodal Point: Two nodal points exist in a lens system. The front nodal point is where the rays of light entering the lens appear to aim. The rear nodal point is where the rays of light appear to leave the lens.

Perspective: The relationship of the size and shape of a three-dimensional object represented in two-dimensional space.

Sheimpflug Rule: States that maximum sharpness is obtained only when the subject plane, the lens plane and the film plane intersect in a single line (or, when graphically illustrated in a two dimensional drawing, at a common point).

Spherical Aberration: A lens defect which does not allow a lens to focus parallel rays of light falling on the lens at different heights at a common point.