

The Cigar Box Pinhole Camera

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A pinhole camera is a light-tight box with a tiny hole in one end of the box and photographic paper (or film) on the other end. The distance from the pinhole to the paper (or film) establishes the focal length of the camera--similar to a wide, normal or telephoto lens. The cigar box camera, pictured below, gives the same effect as a traditional wide-angle lens.



Photo 1. Camera with pinhole lens covered with black tape (or lens cap).



Photo 2. Camera opened showing black interior and paper holder

Parts of the Camera

The Lens

The lens used in the cigar box camera is made by drilling a sewing needle into a piece of brass shim. The ideal size of pinhole is determined based on the focal distance of the box. Since this is a very narrow box, you'll be using a size 13 sewing needle (see chart below).

Camera focal length	Needle size	Diameter of hole	Relative f/stop
8"	8	.023"	f/350
6.5"	9	.020"	f/300
5"	10	.018"	f/280
4"	12	.016"	f/250
2.5"	13	.013"	f/190

The Shutter and Viewfinder

The lens cap for the pinhole camera can be a piece of opaque black tape. This is needed because light is continuously entering the camera through the pinhole opening; therefore, you'll need to cover the pinhole (lens) if the camera is loaded with paper (or film) when you are not taking a picture.

There is no viewfinder on the pinhole camera. But with practice, you can estimate the *area of view* (what the camera sees) based on the "focal length" of the camera, which is the distance between the pinhole and the paper (or film). This cigar box pinhole camera will take an extreme "wide angle" view.

Inside the Camera

The inside of the cigar box camera is painted flat black in order to prevent light from bouncing around during exposure. The photo paper (or film) is held in place by sliding the long edge under a wooden strip glued to the inside of the camera and taping down the other edge.

How to load the Camera

You can load the camera with photographic paper (or film). Paper is easier to handle since you can load it into the camera under a "photographic safelight." If you don't have a safelight, you can use a flashlight covered with several thicknesses of red cellophane film while loading the camera with your paper (place the safelight 6 to 8 feet away).

If film is used, it must be handled in total darkness. Your choice of film or paper may depend in part on exposure times. Paper, because it is less sensitive to light than film, will probably require an exposure of about 2 minutes for sunlit subjects. Film on the other hand, may require only 1 or 2 seconds for subjects in sunlight.

You can obtain photo paper (or film) in 4x5 inch size--available in 100-sheet packages, or 5x7 inch size in 25-sheet packages from your photo dealer

If using paper, tape it firmly to the inside of the camera (opposite the pinhole lens). The emulsion side (the shiny side) should be facing the pinhole.

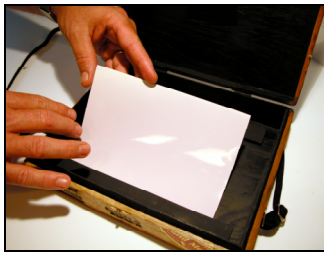


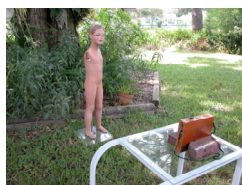
Photo 3, 4 and 5. Loading the cigar box pinhole camera.

Once the paper is in place, close the camera. Remember make sure the lens is covered on the outside of the box (with black tape).

Determining Proper Exposure



To get clear and sharp pictures, you must keep your camera very still. Use bricks, tape or a lump of modeling clay to hold your camera to a table, windowsill, chair, ground or other type of surface.



Once the camera is in place, pull the black tape off to uncover the pinhole lens and keep the lens uncovered for the recommended time. Immediately cover the pinhole with the black tape once the exposure time is met.

Starting Exposure Times To Get You On Track

See the chart below for the recommended exposure times.

<u>Weather Conditions</u>	<u>F/Stop</u>	<u>Using Photo Paper</u>
Bright or hazy sun.	250	17 seconds
A scene with light sand	300	29 seconds
Bright or bright-hazy sun.	250	49 seconds
The shadows are distinct	300	1.3 minutes
Your typical nice, sunny day.	350	2.1 minutes
Weak or hazy sun.	250	2 minutes
The shadows aren't distinct	300	3.3 minutes
An OK type day.	350	5.1 minutes
Cloudy. But bright!	250	5.4 minutes
No sun. No rain.	350	14 minutes
Open Shade/heavily overcast	250	14 minutes
No shadows	300	23 minutes
A grey day	350	36 minutes
Dawn or Dusk	250	38 minutes
Dark outside	300	1 Hour
Early morning	350	1.6 Hours

NOTE: Exposure times in bold closely match this particular cigar pinhole camera--those with an F-stop of 250.

Processing the Image

Once your paper has been exposed it is time to process the image. This will need to be done in a photographic darkroom or a light tight room under a red safelight. The chemicals depend on the type of paper used; generally for black and white paper, you will have 4 steps to complete in order to process it. Refer to the photographic paper instructions for chemicals needed and suggested temperatures and processing times.

Supplies Needed:

- 4 - Processing trays--slightly larger than the photo paper
- 4 - Tongs
- A clock or timer
- Measuring container
- Black and white paper developer
- Indicator Stop Bath or plain tap water
- Fixer
- Wash-Water
- White light (enlarger light)
- Piece of glass slightly larger than the paper used
- Black and white photo paper



Step 1: In a dark room, remove photographic paper from the camera.

Step 2: With the shiny side up place the paper in the first tray or developer. Gently agitate the paper in the chemical for 2-3 minutes. The image is going to appear like a negative and the tones will be reversed.



Processing the paper--making a paper negative.

Step 3: Using the tongs to move the paper to the second tray of stop bath or water. Leave in tray for 30 seconds. Gently agitate the paper in the tray.

Step 4: Using the tongs move the paper to the third tray, which is Fixer. Leave paper in the fixer gently agitating the tray for 5 minutes.

Step 5: Wash paper for 30 minutes to one hour in running water depending on the type of paper used. Once the photo is washed it will need to dry before making a positive image.

Step 6: To get a positive image you will need to contact print the paper negative with a new piece of unexposed photographic paper. This step requires the use of an enlarger or a white light bulb. Many people will like the negative image and do not feel the need to proceed.



Paper Negative

Step 7: To make a positive image place the paper negative face to face with a new piece of photo paper. You want to sandwich them emulsion side to emulsion side. With the paper negative on top, place a piece of glass on top of the papers to press the negative to the positive during exposure to white light. Turn on the light for 1-2 seconds.



Paper Positive

Take the newly exposed sheet of photo paper and process as described before. The image will now be 'reversed' or look like a traditional photo (a positive image).

NOTE: These instructions are very general. For more information on B/W paper processing, refer to appropriate books addressing this topic or try searching the Internet.

Common paper negative problems

1. If the paper is blank, white or the image is very faint.
 - Paper loaded in camera backwards
 - Tape not removed from over lens--no light got in to expose the paper.
 - Exposure not long enough. Try again and double exposure time.
 - The paper fell forward in the camera, wasn't attached to the film board; therefore didn't get exposed to the right amount of light.

2. If the paper image is very dark or black.
 - The camera has a light leak.
 - Paper exposed to white light in loading or unloading.
 - Exposure was too long. Try again and cut exposure time in half.

Resources

If you would like to learn more about pinhole photography check out these organizations, books and websites.

Pinhole Organizations

The Pinhole Resource

Pinhole resource is a non-profit organization that maintains a collection of 3,000 pinhole images from photographers worldwide. They also publish the Pinhole Journal and sell a variety of products for pinhole photography.

www.pinholerresource.com

(505) 536-9942

Books

Pinhole Photography: Rediscovering a Historic Technique by Eric Renner
Third Edition, Published in 2004 by Focal Press, 272 pgs. 8-1/2" x11"

The Camera Obscura by Abelardo Morell

Vermeer's Camera: Uncovering the Truth Behind the Masterpieces
by Philip Steadman

The Beginner's Guide to Pinhole Photography by Jim Shull

Adventures With Pinhole and Home-Made Cameras: From Tin Cans to Precision Engineering
by John Evans

How-To Make Three corrugated 8x10 Pinhole Cameras: Wide-angle, Normal, Telephoto
by Anita Chernewski

Websites

Pinhole cameras made from paint cans that can be ordered <http://www.paintcancamera.com>

Pinhole photography and camera design calculators
<http://www.mrpinhole.com/>

Artist Abelardo Morell
<http://www.abelardomorell.net/>

Pinhole Community the art of pinhole photography
<http://www.pinhole.com/>

The pinhole gallery
<http://www.pinhole.org/>

Worldwide Pinhole Day
<http://www.pinholeday.org/>