Rangefinder Magazine
September 2005

Lighting Glass by Dr. Glenn Rand

Glass presents two problems to the photographer that make it difficult to light. First is the reflective nature of its surfaces, and second is the way glass transmits light. While there are several standard approaches to solve the problems involved with lighting glass, understanding the basic nature of light's interactions with the glass gives you an expanded selection of approaches.

Principles
Of the two light interactions with glass, the easiest to deal with, is the reflection of light from its reflective surface. Light acts the same with glass as it does with any other shiny surface. The laws of reflection hold: The angle at which light strikes the surface (angle of incidence) is the same as the angle at which light reflects from the surface (see Figure 1). Dealing with reflections becomes more difficult when the surfaces are not planar. As surfaces bend or are facetted, the light angles cause the light to reflect beyond a simple mirror reflection. Each individual facetted surface or portion of a curved surface reflects the light at various angles according to the angle at which the light hits it.

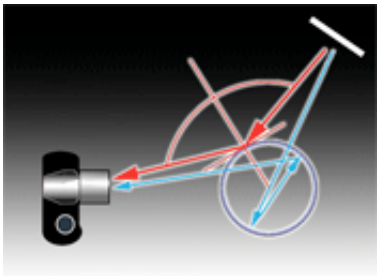


Figure 1

Further complicating lighting glass is the fact that all surfaces of the glass will reflect. This means as the light enters the glass and strikes an interior surface, it will also reflect in relation to the angle of incidence with the interior surface. Since the interior surfaces reflect light directly and reflect light from other interior reflections, the interior surfaces will have multiple reflections from a single light source (see Figure 1).

While it is easier to see the reflections of specular light, diffuse light follows the same rules. However, diffuse light, because of its broader nature, reflects as large patterns or light on all surfaces of the glass. Light coming from a large, bright diffuse source will create larger, brighter and more intense reflections (see Figure 2). A bright reflection on a front surface (the surface facing the camera) will obscure detail or diminish visibility through the glass.

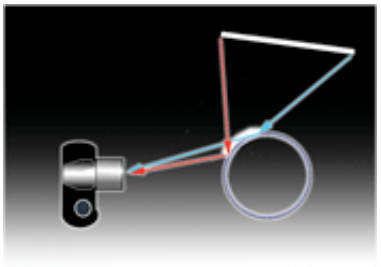


Figure 2

Any light shining onto a glass reflective surface can reflect directly into the camera from both the outside and inside of the glass. In a situation using directional light, hot spots (specular highlights) in the shot are unavoidable, particularly with a surface that has a lot of facets, curve and distortions. If highly directional light is illuminating the glass surface, the speculars are increased, regardless of the surface shape. Therefore, direct light on a glass should only be used when speculars are desired.

The second major aspect of light's interaction that affects photographing glass is that light passes through the glass subject. As the light transmits through glass, a portion of the light will bend. As the angle of incidence increases, a smaller portion of light bends and passes through the glass while a larger portion is reflected. At certain angles, the light can be completely reflected. When the light bends and emerges from the glass, it acts like a light source of its own.


Classic white-line

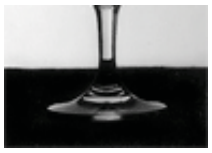
When the light passes through the glass, some of its intensity will be decreased by absorption as well as by bending. The more glass the light passes through and the denser the colorant in the glass, the more absorption takes place, and the light loses intensity.

The light passing through rounded or facetted glass reacts the same as light passing through a lens or prism. A specular light shining directly onto rounded or facetted glass will throw a pattern of redirected or focused light on other areas visible in the photograph.

These two light interaction factors are used to create the major lighting styles for glass. The two forms of lighting are defined by the way the light is seen on the edge of the glass. If there is a bright light on the side and/or on the surfaces closest to the camera, then the lighting is known as "white-line."

When the light passes through the glass with some of the intensity absorbed by the density of the glass and without reflections on the camera-facing surfaces, a "black-line" lighting pattern is created. White-line and black-line lighting are seldom pure. Normally, part of the

lighting will have one characteristic while other portions will reverse.


Classic black-line

The two forms of lighting glass give you different information. With attention paid to the edges of the glass, both give good definition of shape. Black-line lighting shows color, density and thickness of the glass. White-line lighting shows the volume of the glass. The lighting styles are most commonly used in combination. Though some photographers use fixed formulas for both types of lighting, there is only one controlling factor in determining which type of lighting showing on any portion of the glass, and that is the background.

Applying the Principles to the Rule

Step 1: Choose the Type of Lighting

When the glass is the most important subject, you need to establish how the light will be handled as a first consideration. With the glass working as a supporting portion of the shot, define how the glass will support the rest of the image and use this as a guide to lighting style.

Deciding the way you want the glass to look goes a long way to defining everything else you will do in the set-up. Since the background will be the critical issue in determining the lighting style, this should be the first part of the set that is chosen. Even with a complicated set, the background can be lit or darkened to create the proper lighting style.

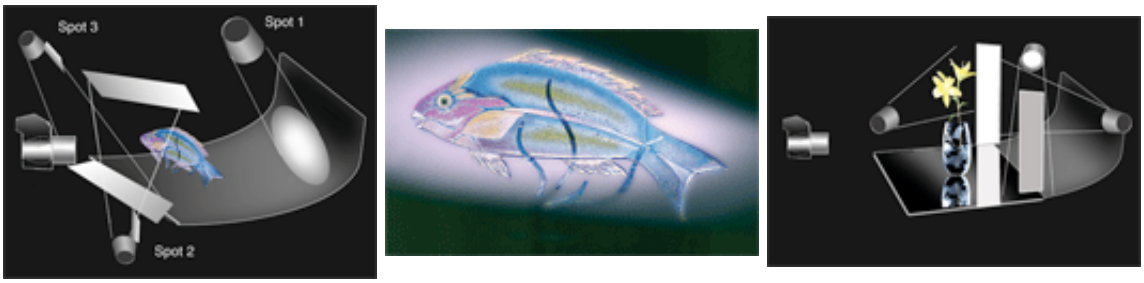


Figure 3

Step 2: Establish Lighting for the Glass

If a “black-line” lighting is chosen, the background lighting should be considered first. The background that needs to be considered is only that part directly behind the glass. The distance that the background material is behind the glass is not as important as that light can get to and reflect or diffuse from the surface. It is not uncommon for photographers to attach reflective or diffusing surfaces to the back surface of the glass. This allows the glass to be placed in front of other objects without losing the black-line quality of the glass.

For “white-line” lighting, the background tone needs to be lessened in comparison to reflections placed on the glass. This does not mean that there is no light in the background, just that it is less than the reflections on the glass. Increasing the light intensity for the light creating the reflections can make the reflected light (and therefore the glass itself) stand out from the background.

The classic white-line lighting above was created using tall thin fill cards on each side of the glass (see Figure 3). Each fill card was positioned behind the glass in relation to the camera and lit with a spotlight that was controlled to avoid direct light reaching the glass. The left-side fill card was given more light by having the light closer to the card, this created the differential light intensities on each side of the glass. Since the background is black and the glass is positioned on black Plexiglas®, the reflections (the white lines) in all parts are bright. Flags were used from the camera back beyond the glass on both sides to keep reflections from appearing on the front surfaces. Finally, a flower was added to the shot, and it was lit separately to avoid additional light reaching the glass. (Photograph by Glenn Rand.) Note: All the glass used for this

article was by Mary Marshall of Crystal Glass Studio in Carbondale, Colorado.

Too often reflections are created by using available light fill cards that may not be the size or shape needed. Fills can be customized in shape, intensity and positioning.

Also, the lights need to be adjusted so that light hits the fills or background in a way that creates the intensity levels to give the desired lighting effects. Since the camera needs to be steady (on a tripod or shooting stand), the lighting effects can be seen through the camera's viewing system.

Step 3: Remove Unwanted Reflections.
While the reflections will be what we see (or don't see) in the photograph, the removal of unwanted reflections will make the photograph. Avoid these reflections by using flags (dark material) positioned in areas of the set that would otherwise create unwanted reflections.

Step 4: Set Exposure
A spot metering is most helpful for lighting glass. For black-line, the spot meter can be read through the glass to set the level of exposure of the color or tone of the glass. With white-line, the meter can be either read from the reflection or read from the fill card. If the desire is to have a pure white-line or reflection, add three stops exposure to the reading of the reflection or fill card.

With the use of an incident meter, the light for white-line can be read at the fill card. In this case, point the incident meter dome toward the light and not at the camera. An incident meter is not as useful for a black-line pattern but can be used to measure the light behind the glass and in front of the background showing through the glass to adjust the light.

General Dos and Don'ts
• Specular light tends to be more problematic than diffused light with lighting glass.
• Front reflections need camera side lighting material.
• Top (rim light) and side (white-lines) reflections require lighting material farther back than the glass.
• The finer the white light desired, the smaller the reflectors you will need to use.
• When adding directional or camera side lighting, check specular reflection to make sure it reflects away from the camera and not into the scene.
• Flags (gobos) are as important as fills. Flag areas that need to stay clean to allow transmission of light from behind the glass without reduction from flare.
• Wear dark color clothes if you may reflect into the glass—you may become a reflector or fill.

Lighting for Parrot Fish
This photograph (opposite page) was made in a totally darkened studio. A dark gray seamless was set up with about a six-foot sweep from the subject to the vertical back.

Spotlight #1 was focused to form an oval of light on the background. Even though the seamless was dark gray, the intensity of the light was strong enough to record as very light gray during exposure. The light gray background light pattern will allow a black-line treatment for the colored glass.

Spotlight #2 was barndoored and aimed at a long white fill card above and in front of the glass fish. This reflected off the top fin showing off its dichroic glass and creating front/top white-line effects. With the light pattern on the background aligned with the top edge of the glassware, it provided a strong white-line effect for the top fin.

Spotlight #3 was also barndoored and aimed at a white fill card positioned below on the camera side of the glass. This was used to create reflections on the bottom details of the fish. Since the intensities of the reflections were brighter than the background light pattern, they show as white-line and reflect off the silvered mouth.

Dr. Glenn Rand received his Bachelor and Master of Arts from Purdue University with a Doctorate from the University of Cincinnati. Photographs by Dr. Rand are in the collections of over 20 museums in the U.S., Europe and Japan. He has published and lectured about photography and digital imaging, ranging from commercial aesthetics to the technical fin points of black-and-white photography. Presently Dr. Rand teaches in the graduate program at Brooks Institute of Photography.

Print this Page - **Close this Page**