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Stackers Cut Sheet

Description

Top hats are cylindrical metal devices that are placed in front of theatrical spotlights to either control stray light beams or to keep light out of the view of the audience or camera.

Purpose

Entertainment lighting fixtures are not optically perfect. Some stray light exists outside of the area where the beam is. Top hats can reduce that "light spill". Top hats can also keep the bright glow of the lens out of view of the audience or camera.

Challenges

20 years ago lighting manufacturers offered one type of top hat per fixture. In other words, a unit like an Altman 360 ellipsoidal reflector spotlight (6" diameter lens) was offered with a top hat that was 6" long. Other sizes and shapes of top hats were not available.

Solution

Why are Top Hats used?

Top Hats serve several important functions in lighting. First is to correct defects that exist in the optical systems in lighting fixtures. Lighting fixtures aren't perfect. Sometimes the lenses and the path of the optics create aberrations and stray light beams. Sometimes the light beam strays outside the path of where it's actually wanted. Top Hats can help control that. Some lighting fixtures are particularly bad at this, such as the Source Four Par in which light extends nearly 180 degrees from the lighting fixture, creating a haze of light on stage around a bright center. This is not apparent under some conditions such as when the stage is brightly lit. But if you have one lighting fixture on a dark stage with everything else off, this would be quite obvious. In a laboratory setting the user can see this: Turn all the lights off in a room, turn the lighting fixture on, hold your hand outside the beam, move it a little bit, you can see the haze of a shadow. Some are better than others, but all show some stray light outside of the beam.

Although one of the functions of the Full Top Hat is to remove stray light outside of the beam, the Top Hats themselves can contribute to this problem if the inside of the Top Hat cylinder is reflective. CTI takes steps to prevent this by coating the inside of the Top Hats with a material that we call flocking to help absorb the bounce from inside the top hat cylinder. Flocking is a furry, black, flameproof material that is applied in a painting process in our factory to the inside of the top hat cylinder, and when the light beams strike it, the light beams are trapped in the flocking and don't reflect as readily outside of the Top Hat.

Another function of a Top Hat is to reduce the viewing angle to the lens. That is, when the viewer or the audience member is able to see the lighting fixtures, it is often distracting to see the bright glow of the lens. A Top Hat can mask the lens from the audience member, or the

camera, or whatever the viewer happens to be. Instead of sitting in a theater and looking up at an unmasked bright row of lighting fixtures on an overhead electric pipe, the Top Hat can serve to prevent the audience from seeing the bright, distracting glow of the lens overhead.

Why so many different shapes and sizes of Top hats?

Top Hats are measured in three ways:

(1) Size of the frame. (E.g., 7.5" x 7.5" or 6.25" x 6.25" or 7.5" round). That first dimension is related to the size of the opening in the lighting fixture, and is actually the gel frame slot dimension. The size of the gel frame holder determines the size of the Top Hat. Therefore, the first important dimension to determine the size of the Top Hat is frame size and whether it is square or round, because CTI manufactures them both ways in some cases.

(2) Diameter of the cylinder. The cylinder diameter is usually equal to the diameter of the lens of the lighting fixture. A lighting fixture that has a 5" diameter lens will have a five-inch diameter cylinder on the Top Hat. A 6" diameter lens will have a 6" diameter cylinder on the Top Hat. This is a good rule of thumb and holds true in most cases.

(3) Length of the cylinder. We often make Top Hats with both a long and a short cylinder. For instance, a Source Four Full Top Hat with 6 ¼" by 6 ¼" frame, a 5" diameter cylinder, we make both 5" long and 3" long. This is because the optics of the lighting fixture affect the length of the Top Hat. A Source Four comes in a variety of beam spreads: 5°, 10°, 14°, 19°, 26°, 36°, and 50°, 70° and 90° with 90° being the widest beam spread and 5° being the narrowest beam spread. Let's examine the case of the 19°-36° lenses. The narrower beam spreads pass quite easily through the 5" diameter Top Hat that is 5" long. The 26° beam spread also does. The 36° beam spread begins to clip the outer edge of the Top Hat. Clipping the outer edge of the Top Hat creates a shadow of a Top Hat and to the viewer makes it look as if the cone of light coming out of the lighting fixture isn't sharp on the edges. CTI makes a 3" diameter Top Hat that makes the 36° Source Four function quite well. The 3 inch long Top Hat is still clipped by the beam of the 50° Source Four and there actually is no Top Hat that will allow the 50°, 70° or 90° Source Four to function well. Other solutions can apply to these lenses such as egg crate or concentric ring top hats, or other custom beam attenuating devices. A good rule of thumb for most lighting fixtures is that to achieve a 45° cutoff angle from viewer to lighting fixture, the cylinder should be the same length as its diameter. Therefore an S4 ellipsoidal top hat would generally be 5" in diameter and 5" long to achieve 45° cutoff. Nearly all lighting devices that utilize an accessory to prevent a viewer from seeing a light source, from an overhead fluorescent fixture in an office, to an egg crate louver on a TV light, utilize the theory of 45° cutoff as a good compromise between light output and glare prevention.

To recap, the three means by which we measure a Top Hat are the size of the frame, diameter of the cylinder, and length of the cylinder, and that is one reason why we have so many different types of Top Hats. CTI also manufactures a small variety of round Top Hats. This is because the Source Four Par is a roundish looking fixture and looks better with a round frame than a square frame. We think of it as a frame used in architectural applications. The material of most of our Top Hats is cold rolled steel sheets that are fabricated, rolled, spot welded, and painted. All of our Top Hats are made in our facility by our craftsmen.

What are Stackers™ Tapered Top Hats?

Several years ago, lighting designer Mike Baldassari asked us to make some Top Hats shaped like traffic cones that could stack up during shipping in order to save truck space. We were able to design a very original stacking system that allows our Stackers to stack but to not stick together. Stackers are made from aluminum so they are very light, but strong. They have circular frames so the Half Top Hat Stackers can rotate to put them in the most advantageous position.

We make Stackers in five different diameters: 6 ¼", 7 ½", 10", 12", and 14" and in four different types: Full, Half, Short, and Short Half.

Why are our Top Hats used in theater?

There was a time in theater in America when Top Hats weren't used very much, and lighting accessories in general weren't used very much. City Theatrical helped to create this market by providing a variety of options to lighting designers. On Broadway shows today with conventional fixtures in the theater, nearly every fixture in the theater has a Top Hat in it. Enter any Broadway theatre and look up and you will see dozens if not hundreds of City Theatrical Top Hats. Outside of professional theater and outside of the U.S. they are used less, but the usage is growing.

What is the difference between a Half Top Hat and a Full Top Hat and why would a designer choose a half top hat.

CTI offers a full range of Half Top Hats with nearly all the same frame sizes, cylinder diameters, and cylinder lengths as Full Top Hats. A Half Top Hat is the same as a Full Top Hat except that half of the cylinder is cut away on the vertical axis. There are good reasons to choose a Half Top Hat: If a lighting fixture is in view of the audience and a Top Hat is used, an audience member who looks up at it can often see a glow inside of the cylinder and that can be distracting. A Half Top Hat put into a lighting fixture with the cylinder part facing the audience and with the back of the Top Hat cylinder cut away allows no place for the bounce of the light to occur. When the audience member looks up he sees absolutely nothing. It makes the lighting fixture completely disappear because the front of the Half Top Hat is masking the glow of the lens from the audience and there is no back of the cylinder of the Half Top Hat to reflect the light forward. Most professional designers consider the Half Top Hat the most effective way to mask a light and on most professional productions, the Half Top Hat is used extensively, in fact almost exclusively in both the front of the house and backstage.

City Theatrical also produces every Top Hat and Half Top Hat that it manufactures in white at no extra charge. For instance, a white Source Four Full Top Hat, part #2450, would be designated as #2450w. Not all white Top Hats are held in stock and delivery time for them is about two weeks. All Top Hats are produced with flocking inside when they are black. White Top Hats are not flocked inside since not all users want it. They can be flocked at additional charge and that would be on a quoted on a case by case basis.

What are "Eyelash" Top Hats?

Some people use the term "Eyelash" as a general term to refer to Half Top Hats – and that has become pretty common usage. There are some purists that maintain that an "Eyelash" Top Hat is like the shield on a US traffic signal – a half cylinder where the cylinder is cut on an angle resulting in a curved edge to the top hat. Picture it like the scalloped shields on old

footlights on the front of an antique stage. In function, they seem to have the same characteristics as a regular Half Top Hat – the difference seems to be in nomenclature.

What are Color Extenders?

Color Extenders are Top Hat like devices used to prevent gel from burning in entertainment lighting fixtures. In the front of the cylinder there are ears that are used for holding the gel frame. Color Extenders are not flocked since the inside of the cylinder is not seen by the audience. Gels are pieces of colored plastic that are put in front of lighting fixture in a color frame. Many times the lighting fixture produces so much heat that the gel actually has a hole burned through it. Color Extenders move the piece of gel further forward and away from the hottest part of the beam of light. We make them both short and long. Sometimes a long Color Extender might be obtrusive for some reason. There might not be room for it, so users can use a short one, but a longer one is always more effective. Also in conjunction with the Color Extender, users often use a gel called Heat Shield that filters some of the heat out of the beam and keeps the gel lasting longer. Color extenders come in many of the same shapes and sizes as Top Hats, measured again by the frame size, cylinder diameter, and cylinder length.

Benefits of Top Hats and other accessories

Like accessories in fashion, top hats and other lighting accessories give designers a way of improving, perfecting and personalizing their designs. Lighting designers often rely on CTI to create custom top hats or other beam shaping accessories to help solve specific problems on their shows.

Conclusion

Top hats are cylindrical metal devices that are placed in front of theatrical spotlights to either control stray light beams or to keep light out of the view of the audience or camera. City Theatrical produces the world's most extensive line of beam control devices, and will create or customize any product to suit designers' needs.