# VIDEO & STAGE LIGHTING

*Professional Quality Lighting Techniques*

## VIDEO AND STAGE LIGHTING

Proper video and stage lighting are, for the most part, mutually incompatible.

• **Color Temperature** is the measurement of color in Kelvin (K). The range of daylight is 5000 K to 5500 K. The reason this is called "temperature" is because the measurement comes from a standard, theoretical metal called a "black body radiator." When the black body radiator is heated, its color changes from black to red to yellow to white to blue.

• **Lighting for video** is flat (no shadows) and has a high color temperature (5600 Kelvin = morning sunlight or theatrical florescent lighting).

• **Stage lighting** is dimensional (shape defining shadows) and lower in color temperature (3200 Kelvin = room lighting or a quartz bulb).

• **Lighting for film** requires liberal amounts of both methods. Therefore if it is your desire to have both the subtleties and intimacy of stage lighting, while capturing professional video, it will require compromise.

If you like the way the anchors on the evening news look:

• *Natural appearing colors, especially flesh tones*

• *No shadows under the eyes or neck*

• *Bright and well lit backgrounds*

But, sadly when you view your own indoor video recordings and see:

• *Everything has an orange hue to it*

• *Faces have an unnatural glow*

• *High contrast shadows are everywhere*

• *Color blooming or flaring is evident*

But you wish to produce a better video product, then changes in the type and placement of lights will be required.

### THE EYE, THE CHIP AND THE EMULSION

Naturally the human eye is the most complete system of image capture. We have a real-time processor (our brains) which uses stored information (previous experiences) to analyze and correct for visual deficiencies. For example (using stored information), at home in a familiar but darkened room, we would recognize and therefore visualize an indistinct shadow as a chair. We see subtler colors, finer shades of gray and lower contrast shadows than can be captured on film or video.

Emulsion, the coating on film that actually captures the image, is limited by chemistry and quantity, in its ability to compete with the eye. Of all the forms of image capture, however, film is the closest to the human eye.

Most video cameras use a CCD (Charge Coupled Device), an electronic memory that can be charged by light. CCDs can hold a variable charge, which is why they are used in cameras and scanners. They record images as intensities of red, green and blue, which are stored as variable charges on a CCD or CMOS image sensor chip. (Complementary MOS), pronounced "C moss" which is the most widely used type of integrated circuit for digital processors and memories. Virtually everything is CMOS today. The size of the chip determines the resolution, but the analog-to-digital converter (ADC), which converts the charges to digital data, determines the color depth.

Although CCDs are used in the most professional cameras, CMOS cameras are gaining ground. CMOS-based cameras enable integration of other camera circuits onto the same chip and are typically used in low-end cameras, however, they are improving over time.

The problems with this type of video recording are twofold:

**1.** While CCDs work somewhat like film, they see and

therefore record differently than the human eye. These chips tend to be more sensitive to, and accentuate contrast.

**2.** CCDs are designed for sunlight and have to use a filter for indoor lighting, which in all but the most expensive professional cameras does not give a true color rendition. They tend to give everything an orange hue.

**The Solutions to these problems are:**

- **Professional movie lights** (such as large Fresnels) with day light filters or banks of focused fluorescent lights (like the ones used on the television sound stages), will produce the flat lighting and high color temperature needed for a good video. The Fresnel lens is named for its inventor a physicist, born in France, in the 1700s. The Fresnel lens was originally designed for and is still used in lighthouses, as well as, many other fields.

- If you are using professional stage lighting, the color temperature can be raised by placing daylight color filters (gels) on the lights, and shadows can be minimized (though not as effectively as with the above video lighting) through placement and focus of the lighting fixtures.

**PROFESSIONAL MOVIE VS. STAGE VS. VIDEO LIGHTING**

With current technology, film is the closest form of image capture to the human eye. Movie lights, therefore, vary far more in type and color temperature than video lights or stage lights. Movie lighting and video lighting have more in common than stage lighting. In all three types of lighting there are three basic natures of light produced.

- **Diffused light** casts minimal shadows. For example, using florescent lighting, in a well lit room, there will be a soft general illumination with minimal shadows. Diffused light is predominately used for video recording, for example, the evening news. Diffused light is seldom, if ever, used in stage lighting. This type of light lacks depth and drama.

- **Defocused light** casts soft shadows. A bare light bulb or a stage Fresnel will cast a soft edged shadow. The Fresnel lens is used for fill (general illumination) in film and stage lighting, but it is used for adding definition and depth in video.

- **Focused light**, as found in spotlights, stage ellipsoidal and flashlights, casts a hard edged beam. Rarely if ever used in general video lighting, seldom used in general lighting for film, focused light is the predominant lighting format for stage. Focused light adds drama, depth and definition when viewed, but is too high contrast for image capture.

Color in light is electro magnetic energy of a specific frequency. Electromagnetic radiation that has a wavelength in the range from about 4,000 (violet) to about 7,700 (red) angstroms and may be perceived by the normal unaided human eye. The rainbow is a visual representation of those frequencies.

Color is added in stage lighting through the use of gels (colored plastic lenses). When viewed,these colors add mood, set the time of day and create other special affects. However, when recorded the color is exaggerated and color contrast is very high.

However, if there is an audience, true video lighting will look to blue. Also people and sets will lack dimension (appear flat). So what to do? Use flat, color correct, video lighting for your general illumination. Then use minimal stage lighting for fill and highlighting. If used in just the correct way, the results might look as good as a soap opera (assuming a high quality video camera is being used).

If your videos are for in-house use, overall appearance of the finished product may not be that critical. But, if your goal is a professional or semi-professional looking product, seeking the advise of a theatrical lighting professional is a wise decision.

***Rick Shaw, CSI Multimedia***

*Founded in 1986, Campbell - Shaw, Inc. (CSI) is a California corporation and CSI Multimedia (CSI MM) is its division of Multimedia (sound, video, lighting and projection) Consultants, Designers, Dealers and Integrators. CSI MM specializes in consulting to churches and schools regarding the unique challenges associated with lighting, sound and projection systems in sanctuaries, gymnasiums and on athletic fields. CSI MM's specialty is taming difficult environments.*