

# Lighting Basics

## Introduction

Light is an incredibly important aspect of film & video production, in fact, without it, there would be no film & video. Unfortunately, the light is often neglected when students make their productions, using just the available light with no attention paid to how it looks or how it could improve the overall look of their work.

Good lighting can improve a film greatly while bad lighting (usually) looks awful.

## Health and Safety

Lights bring their own hazards to the film making process and these hazards should be taken very seriously as they could cause serious injury or death. The main points to be wary of are as follows:

**Electrical hazards:** If the lights are damaged in any way, there is a risk of electrocution from mains powered lights. Always check to make sure the lights and the cables are not damaged at all before plugging them in. If you see any damage, do not use them, but return them to the department for repair/replacement. You are required to check your equipment when you take it out anyway, so add this check into your routine when collecting from the equipment store. Also, ensure that you do not overload electrical mains sockets. See individual notes about each of our lights on page 4.

**Heat hazards:** Most light sources produce heat, some more than others. The heat generated by most of our lighting kits can and WILL burn you if you touch the lights while they are on (or shortly afterwards). When handling lights that have been switched on for even a short period, ALWAYS use protective gloves. Again, check that these are in the lighting kits when you collect your equipment. The heat from these lights can also burn or melt objects which are close by, so keep them away from other objects, walls, ceilings, curtains etc.

**Fire hazards:** The lights can cause fires if operated incorrectly. If damaged, they could create sparks which could ignite flammable materials. If placed near flammable materials, the heat alone could cause a fire to start.

**Trip hazards:** The cables and the stands are both trip hazards and need to be kept tidy and out of the path of people involved or just passing by. Any cables that must cross where people may walk should be taped down with Gaffer Tape.

**Light hazards:** If you look directly at some of the more powerful lights, you WILL damage your eyesight.

The light stands become less stable the higher you put the lights, due to a raised centre of balance. Adding weight to the base of the stand can lower the centre of gravity and make it more stable, we have sandbags in the store, so take a few with you. In an emergency, you could Gaffer Tape the feet down to the floor to reduce the risk of them falling over.

Above all, treat lights very carefully - they can be very dangerous if misused!

## Types of light source

There are many types of light source, from the sun to the LEDs in your mobile phone. Each type has its own properties which make it different from the rest, so it's important to understand which of these properties is more desirable to your use.

### *Brightness*

The brightness, or power, of a light is important. If you want to light a large space, you will need a lot of power; for a small room, much less light is needed.

### *Hardness*

The hardness of a light can be seen in the shadows it creates or, more accurately, in the edges of the shadows it creates. Hard lights create hard edged shadows, soft lights create very soft (or even no) shadows.

The (apparent) size of the light source determines its hardness. As the sun is a long way away, its apparent size is very small and, therefore is considered a hard light. The smaller lights that we have in the department are also considered hard lights. Lights with a larger surface area give a much softer light. Hard lights can be made softer by putting (heat resistant) diffuser material over them to enlarge the apparent size of the light. Clouds in the sky diffuse the sunlight, making the whole sky into the apparent light source and, therefore, making it the biggest softlight you could possibly get!

### *Directionality*

Bulbs give out light in all directions (omnidirectional). As, most of the time, you do not want to light everything in the area, the lights are designed to direct the light in a more controlled way. Using a curved mirror behind the bulb and a lens in front causes the light to be much more directional. Also, black metal flaps (called 'barn doors') on the front of a light help to stop the light spilling into areas you don't want lit up. Devices called 'honeycombs' or 'egg crates' can be added to the front of a light to make the light even more directional. Sunlight is very unidirectional (one direction) because of its distance away from us.

### *Hot spots*

Because of the way light works (see **Inverse Square Law below**), often the light will be brighter in the centre of the lit area than around the outer areas. This bright area is known as the 'hot spot'. Some of our newer lights have been specifically designed to have little or no hot spot at all, so give a very even lighting across the entire lit area.

### *Colour temperature*

Every light has a colour temperature and, although the human brain ignores the difference between two light sources (e.g. the sun and a desk lamp) a video camera cannot. Daylight appears blue and artificial light often appears yellow (some fluorescent lights appear green). The colour of a light is called 'colour temperature' because it is defined as the temperature you would have to heat metal to, to produce light of that colour (hot metal often glows red first, then orange, yellow, white etc.) However, the blue from daylight is also due to atmospheric conditions. The colour temperature is measured in Kelvin (K). See

[http://en.wikipedia.org/wiki/Color\\_temperature](http://en.wikipedia.org/wiki/Color_temperature) for more info.



## **Mixing light sources**

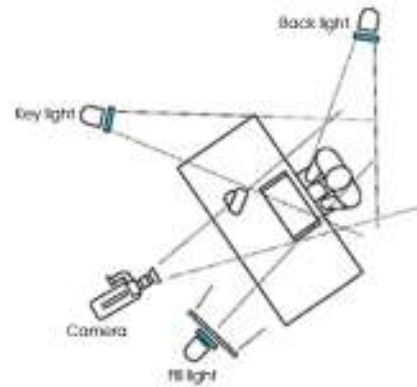
As different sources have different properties, working with more than one type of light can bring extra complications. The most obvious issue to address is that of colour balance, matching the colour temperatures of the lights. If the sun is coming into a room and you have a light inside, it is likely they will be different colours. To match an electrical light to the sun, you will need to add coloured gels to the front of the light to change its colour temperature. For most lights, this gel would need to be blue, though, with fluorescent lights, it may need to be magenta (to cancel out the green)

## **Lighting Kit**

When taking out lights, you should check that the kit contains RCD power breakers and gloves, you can also take out coloured gels (for balancing your light colour temperature or for adding colour effects), bulldog clips or wooden clothes pegs to attach the gels to the lights, 'black wrap' (a black foil used to block the light falling where you don't want it to), diffuser (Dedo lights & KinoFlos already come with diffusers), reflectors (useful for bouncing light & filling in shadows without using extra lights) and Flag kits (for blocking/diffusing lights).

## 3 point lighting

The most common lighting set up for filming a person is one called three point lighting and involves (unsurprisingly) three light sources. These are called the 'key light', the 'fill light' and the 'back light'. This is not the only way to set up lights, but it can be used as the basis of many other forms of lighting set up.



### Key Light

The key light is the most important light and provides the main lighting for the subject. It also creates the shadows on the face and, therefore defines the depth in the image.



### Fill Light

The fill light is usually a soft light which isn't as bright as the key light. It serves to lighten up the shadow areas created by the key light. Making this light brighter reduces the impact of the shadows and can be used creatively to soften the appearance of the subject. For example, harder, darker shadows are fine for rugged or aged people as they show character and enhance wrinkles etc. Softer, brighter fill light is better for creating a gentler, softer feel for your subject.

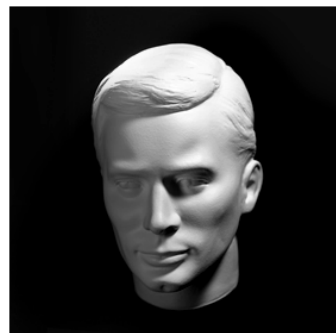


### Back Light

The back light is primarily used to separate the subject from the background, it can create a rim of light around the subject's hair or create highlights on their shoulders to exaggerate the edges so they don't disappear into the background.



### All three lights



## What is available

Currently, the department has four types of light source that you can take out: Fresnels, Dedo Lights, KinoFlos & Arri.

### Fresnel Kits

Medium sized Tungsten lights with Fresnel lenses to focus the light. They do not have dimmers and they get very hot. They have a mild hot spot in the centre of the light beam. All three can be used on one (appropriately rated) multiway adaptor. 2 x 300W & 1 x 650W.

### Dedo Lights

Small tungsten lights. These have dimmers attached via the cable. They also have barndoors and focus control. The light from these units is very even across its spread, but the beam does not get as wide as some of the others. These do not get as hot as Fresnel kits or the Arri, but can still burn once they have been on for a while. Because of their power rating, you can have up to four of these plugged into a socket at the same time, via an appropriate multiway adapter. 150W each.

### KinoFlos

Large Fluorescent lights. These lights are designed to run cool. They still generate heat, but nowhere near as much as any of the others. They use fluorescent tubes and you have the option of using either tungsten or daylight balanced tubes to match any other lighting you are using. These take a while to reach full brightness and tend to have a slightly pink colour to them until they reach full power. The lights are dimmable and you can switch between 2 and 4 bulb modes for even more control. They have two barndoors rather than four, they are much heavier and more cumbersome than the other lights in our collection. They give a very soft light which can be made more directional using either the 'egg crates' that come as standard or the optional 'honeycombs'. As these lights are very efficient, you can plug up to four of these into one socket, via an appropriate multiway adapter. 220W.

### 2K Arri

Large lights that are very powerful and get very hot. They use the same Fresnel lenses as the lower powered Fresnel Kits. They are supplied with a third party dimmer pack and use 16A connectors. Only one of these should be plugged into any socket and, due to the current drawn by these lights, you need to check the location's circuit breakers are capable of supporting 20Amps or more if you wish to use two lights on the same ring main. 2000W

## Inverse Square Law (the technical bit)

OK, now we get to the technical stuff. You don't need to fully understand this, but it helps to at least understand the basics. Light falls off (gets less bright) exponentially, the further the subject gets from the light. If a subject is placed 1m away from the light, it receives four times as much light as a subject that is 2m away from the light. This is because, at double the distance from the light, the beam of light now covers four times as much area (see diagram below). You can reduce this effect by focussing the light down to a narrower beam.

