

# A GUIDE ON LIGHTING



## Definition of Terms Used in Lighting Technology

### Color Rendering

Expression for the effect that the light has on the color appearance of objects.

### Color Rendering Index (CRI)

of a light source. A scale from 0-100 that describes how natural the color of objects will appear as compared to a standard light source (100 CRI). The standard light sources are Incandescent/Halogen bulbs (100 CRI) for warm sources and Natural Daylight (100 CRI) for cool sources.

### Color Temperature

A term used to describe the “whiteness” of light. It is the temperature of a piece of metal (or black body) that emits the same color light as the compared light source. Unit Kelvin, K.

### Foot-candle (FC)

The amount of lumens falling on an area measured in square feet. One lumen falling on one square foot is equal to one foot-candle.

### Full Spectrum Lighting

There is no official definition of the term “full spectrum” but most agree that it is a source that has a cool temperature and a high color rendering that mimics natural daylight.

### Lumen

The unit of measure for the total amount of light from a light source, regardless of direction. Unit lumen, L.

### Watt (W)

The unit for measuring power.  $W = V \times A$

### Ultraviolet (UV)

Radiation Radiant energy in the range of about 100-380 nanometers (nm). For practical applications, the UV band is broken down further as follows: Ozone - producing 180-220 nm Bactericidal (germicidal) 220-300 nm Erythermal (skin reddening) 280-320 nm “Black” Light 320-400 nm

## Wise choice on lighting

*By Roch Lefebvre, Lighting Expert in Québec (Canada) For commercial, institutional and industrial uses. Companion of 2 small parrots for the past 10 years.*

*When the time comes to set up new lighting, deciding on which type to use is not always obvious. Should I choose a bulb, a fluorescent, a halogen? What about the amount of watts? Do I need a reflector? So many questions...*

I am not a bird specialist but my years of experience working in the field of lighting have allowed me to shed some light (no pun intended) on the practical side of lighting. After working for 20 years in the field, I am now a specialist in the design of lighting systems for commercial, institutional and industrial everyday applications. I am therefore in a position to suggest interesting choices in terms of lighting products available on the market, at the best quality possible.

## The Effect of Lighting

Many studies conducted by experts working with animals or in hospitals have shown some interesting facts regarding the effect of lighting. For example, in the medical field, for the treatment of Alzheimer disease, it is possible to help patients keep a regular schedule by simulating a sunrise. Patients are brought to a room where a very high intensity of light is produced (1,000 to 1,500 foot-candles) so that their brains will register: “Oh! I see light! It must be morning then!” This way the body is fooled into thinking that the day is just starting and it allows people to live according to a more normal schedule.

Lighting sells. Proper lighting, for example in a fast food restaurant, will produce an intense light so that people will eat rapidly and leave to make room for other customers. A four star restaurant will use a soft and subdued lighting so that people will take their time to enjoy the food and stay for a drink after their meal, creating a comfort level similar to what is found at home.

Proper lighting increases production. Take the example of laying hens. A certain light intensity will stimulate the hens to lay more eggs.

On the other hand, a low intensity light will help calm down chickens raised for their meat so that they gain weight more rapidly by exercising less.

## Reproducing Natural Light

Nowadays, there are many ways to create lighting according to everyone’s needs. Lighting manufacturers can make artificial light that reproduces sunlight as closely as possible.

In order to create a similar lighting to what a parrot might find in its natural environment, we try to reproduce the sunlight that not only gives out the colors red, orange and yellow, but also green, blue and purple, which are often non-existent in the light spectrum of commercial fluorescent lamps.

Kelvin (K) is the unit used to measure the color temperature produced by a lamp. By using lamps with 5,000 Kelvin or more, it is possible to allow a bird to detect, according to its sight, part of the color normally missing from conventional lighting.

### The ability of a light source to reproduce colors on objects is called the “Color Rendering Index” (CRI).

Based on a scale from 0 to 100, the higher the number, the more colors can be seen clearly. The CRI is critical when we want to reproduce a light that is as natural as possible. A CRI which is too low will produce a generally uncomfortable lighting while a high CRI allows a better definition of the lighted space and as such, becomes even more comfortable. It allows us to feel better and therefore, become more productive.

We now know that the ability that birds have to detect colors is different from our own. **It seems that human beings can detect 3 main colors while birds detect 4, including UVA rays.** In this case, a CRI that is high and well-adapted is of a major importance. The chosen lighting must also allow ultraviolets (UV) to pass through for the well-being of the birds. Additionally, we have learned that some types of lights block UV rays.

### Choice of Lights

Note that all fluorescent lamps produce UVA and UVB rays within a safe range. UVA can be reduced in intensity according to the use of the lamp. Changing the light annually will help maintain the maximum level of UV required for breeding birds. On the other hand, replacing the light every 18 to 24 months for our pet birds will be greatly appreciated.

“Threaded compact fluorescent” bulbs will produce the proper light for our pets, at a low cost, as long as you can find a bulb with 5,000 Kelvin or more. This type of bulb can be installed in existing lighting fixtures. This means that you can simply screw them in to replace the usual bulbs. We are referring to the “Tornado” type shown on the table above. This alternative would be the most cost effective way.

Do not use the type of bulb that looks like a cartridge since it prevents UV from escaping from the lamp. “Linear” fluorescent lamps require a lighting fixture equipped with a ballast. Thus, the costs are higher. Current government standards are strict as to the efficiency of available sources on the market. An electronic ballast will provide good energy savings and offers a longer- lasting lamp.

## Types of Lighting Fixtures

In the case of lighting specifically for birds, I recommend the type of lamp that uses a linear fluorescent. It requires a specific lighting fixture that can be installed in different ways. Here are two:

I recommend the use of a fixture with a wire guard to ensure that our parrot friends do not have access to the lamps or other electrical components. A fixture with a lens would be perfectly safe but should not be used since the lens blocks most of the ultraviolets (UV) which are beneficial in the type of lighting that we are trying to achieve. Please note that to feel the benefits of UV rays, the source has to be visible, which means that the parrot must be able to see the lamp and that it should not be covered.

In the case of “**threaded compact fluorescent**” lamps, they can simply be used in our existing fixture to replace the usual bulbs. You can also install fixtures such as these top right.

Fluorescent Lamps

The table below shows how to choose a lamp according to the information provided by the number found on a linear lamp (in relation to the number written on your lamp). Each number or letter means something. For example, “F” means “fluorescent lamp”, “32” means “32 watt capacity”. Thus, a lamp indicating F32 would be a 32 watt fluorescent which is automatically 48” long. F17 would indicate a 17 watt fluorescent which automatically measures 24”.

At present, lamps marked T8 and T10 meet the current standards on the market. They represent the best choice. Here are some choices for linear lamps, made by known manufacturers and easily available from electrical distributors around the world and pet supply retailers.

F	32	T8	TL	8	50
					50 = 5000 kelvin
					Colour Rendering Index
					8 = 80% 9 = 90%+
					Linear tube
					Dimension of lamp 8 = 8x 1/8”
					thus 1” diameter
					32 watt capacity = 48”, 17 watt
					capacity = 24”
Fluorescent Lamp					

KELVIN VERSUS COLOR RENDERING INDEX (CRI)

It is important to note here that a good choice in a lamp lies with a high Kelvin, but it must be combined with the highest Color Rendering Index (CRI) possible.

It is a must to combine both. Remember that to reproduce sunlight, we need 5,000 Kelvin or more. It is possible to find lamps on the market with higher Kelvin such as for example, a light previously called Daylight with 6,500 K and with a CRI normally between 60 and 75% (less acceptable) which will create a blue effect instead of white. A low CRI is not adequate to reproduce a comfortable natural light. Lamps available on the market with the proper CRI are those that have between 5,000 K and 5,500 K. Therefore, if you find lamps with a higher Kelvin rating than 5,500 K, you must make sure that the CRI is high enough.

Unless the information regarding the Kelvin and the Color Rendering Index is listed on the lamps then our choice would be left to chance. A lamp that gives out a purple light or too much blue can indicate that the Color Rendering Index is not satisfactory.

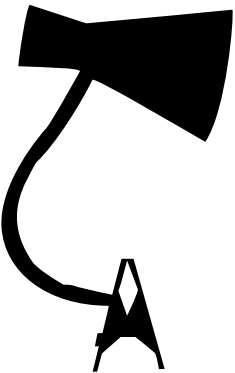
To my knowledge and until now, most fluorescent lamps found in pet shops had been developed to meet the needs of aquariums or reptiles and are usually low in CRI. Therefore, a parrot with bright yellow feathers such as the sun parakeet would loose the nice yellow coloration under a light with too much blue. This could result in the bird looking green. The human brain can always compensate in the presence of an uncomfortable color. But the environment is still uncomfortable. Thus, CRI and K (Kelvin) go together. Good companionship with your feathered sweethearts in a sunny environment!

THREADED COMPACT FLUORESCENTS


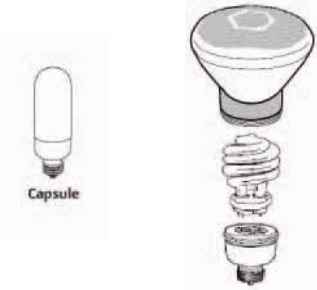

You can notice here that these lamps offer a CRI of 82% and not the ideal 90%. There could be others on the market. It is therefore important to read the labels.

Product	Kelvin	Colour Rendering Index	Hours	Cost
Vita-lite	5500	91%	28,000 hours	\$\$\$\$
F 3 2 T 8 / T L 9 5 0 Philips	5000	98%	20,000 hours	\$\$\$
FO32/850XP/ ECO Osram	5000	80%+	18,000 hours	\$\$
F 3 2 T 8 / S P X 5 0 / E C O GE	5000	86%	20,000 hours	\$\$
Glo Life-Glo- 48”- 40 Watt  (Rolf C Hagen Inc. )	6700	88%	20,000 hours	\$\$

Suspended or extra fixture where a threaded compact fluorescent lamp can be used



There are different types of fluorescent lamps

Compact fluorescent, “threaded”( 120 volts)	Compact fluorescent, “threaded”( 120 volts)	“Linear”f luorescent
		
Existing light ----- Not for use with a dimmer	Existing light - Do not use since it cuts UV from the lamp ----- Not for use with a dimmer	Requires lights with ballast ----- Can be used with a dimmer, with special ballast



The number of watts chosen really will depend on the intensity level required. To replace your 60 watt bulb, you need to choose a threaded compact fluorescent lamp of 15 watts.

### Which Intensity and for How Long?

People often ask me: “How many watts do I need to light my room?” So let’s start at the beginning.

In human beings, our metabolism reacts not only to color temperature but also to the intensity. Simply said: more light = more activity; less light = less activity. We are more productive under high intensity lighting.

A fluorescent lamp has this particular feature: the longer a lamp is, the more power is being produced. The unit used in lighting to measure the power of a light is called “footcandle”. It indicates the results or the amount of light produced. This result mostly relies on the power used (in watts) and the length of the tube.

This measure unit is very complex because it also depends on the room being lighted, the size of the room and many other aspects. Simply said, you only need to deal with the amount of watts and the length of the fluorescent tube.

If you wanted the lighting required to look like a clear mid-afternoon day in July, the natural sunlight would be around 2,000 footcandles (measure unit). It is not recommended to try reproducing this level inside a room because the lighted environment with artificial light is much more aggressive than that of the sun. If you compare a commercial office building, the average footcandles would be around 50 while it would be around 80 to 100 footcandles in a shopping centre or a store.

To mention an example relating to the birds: if we look at the light produced by a fixture equipped with a reflector, 2 tubes of 48” (32 watt T8), and located at about 4 feet from the bird cage, we

could get about 60 footcandles which would light a 7 to 8 ft diameter around the fixture.

The needs in terms of lighting vary according to the intended use. A breeder may choose the type of lighting with a higher intensity to provide better conditions required for breeding. But the owner of a pet parrot may choose a lower intensity lighting that will offer the same benefits as long as the Kelvin and the CRI are respected and without permanently exciting the bird. The choice of lighting is always related to the space to be lighted and the effect that you expect. You have to use common sense. It is impossible to propose a general type of lighting since too many factors depend on the final results. However, a lighting system located too close to the cage or even on the cage is to be avoided, in my opinion, so that the bird won’t be continuously excited. Imagine yourself with a light permanently stuck to you. A good distance would be to install the light at about 4’ above the cage.

It is important that the parrot have some sort of shelter from the light. The cage should not be completely or evenly lit since our pets enjoy taking a nap during the day. Think about adding a shaded area.

As for the time recommended for such a lighting system in daily use, I believe that it should not exceed 10 hours. Our brains need to relax before going to bed. Humans need about 4 hours of low intensity light (5 footcandles or less) to gradually relax before going to bed. We should respect the same period of relaxation for our pets. I don’t know too many people who can go from a high intensity light to a relaxation period, and fall sleep quickly. Our bodies would not get enough rest since our endocrine glands would continue to produce the energy required to move for a while longer.

### Dimmers

After a bad experience a few years ago with our mitred parakeet, I have come to realize a certain fact about lighting: the dimming effect. We had taken our bird outside but a small incident allowed to bird to escape. We were in a panic to have lost this beloved pet. But our friend, with his great intelligence, stayed near our house. We could tell where he was by his call alone. However, time was flying by without any sign of being able to catch him. At sunset, our Coco also got ready for the night; he settled down and moved slowly to the top of the tree where he had been. The same thing happened at the first light: at daybreak he quietly ate the stems of some leaves (beginning of activity) then once the sun was up, he began to call (gradual increase in his activity) which attracted many wild birds curious to find out where that mysterious call was coming from. Crows, among others, came for a visit. The bird activity was then at its peak, in full sun. Fortunately, this adventure ended when Coco returned safely home after 24 hours spent in the wild.

So, the gradual increase of light seen in the natural brightness of day and the reduction seen at nightfall has an effect on the behavior of birds. This is referred to as “dimming”.

It is possible to find some dimmers on the market that can reduce the light from 100% to 0% (called “fade out”) in a variable preset time, preferably over a 1 hour period, to simulate the sunset. This allows us to get our pet birds ready for sleep without rushing them.

However, a dimmer with a “fade out” can cost around \$250 (CAN). A dimmer can work with regular bulbs only and not with threaded fluorescents.

You can also use a timer and the costs will be a lot lower. It all depends on the intended use. A timer automatically shuts off the light at the preset

time, with an on/off switch but it doesn’t have the capacity to gradually lower the light. Only a system with a dimmer can do that.

A dimmer can also work with a linear fluorescent which makes it possible to have the dimmer as well as the Kelvin and the CRI. Then, the cost can climb to between \$400 and \$600 (CAN) because of the dimmer and special ballast required. An electrical appliances distributor can help you design such a sophisticated system.

To continue with the explanation about the dimmer lamps shown on the previous table: halogen lamps or PAR halogen lamps provide a really white light, around 3,200 K. This light is whiter and more concentrated than a standard incandescent lamp (a regular bulb provides 2,700 K). Halogen lamps with 3,200 K produce a lot of heat. About 80% to 90% of the energy produced by the lamp is infrared heat, the remaining 10% is used for lighting. This can be useful when you want to provide a bit of heat to your sick birds, temporarily, but not at night.

For a prolonged use in the case of a sick bird, there are special heating lamps with infrareds. Infrareds allow for a deeper, more beneficial sleep to help our pets heal better and get back to health. Infrareds are better suited, when needed, for both daytime and nighttime applications.

### Summary

Below is a summary of lighting choices (many possibilities available) listed from the least expensive to the most expensive.

- Install a dimmer with a “fade out” on an existing fixture. It has the advantage of simulating the sunset. However, it does not reproduce daylight.

- Use a threaded fluorescent lamp of 5,000 K or more (with high CRI), such as the “Tornado” threaded compact fluorescent as a replacement for regular bulbs. The only cost involved is the

cost of the lamp. However, it is not possible to install a dimmer.





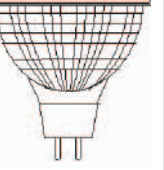

- Use a threaded fluorescent lamp but keep the regular light as well. Add a dimmer equipped with a “fade out” on the regular light. Then at night, shut off the fluorescent lamp and activate the “fade out” to simulate the sunset over a 1 hour period.
- Install a “linear” fluorescent lamp. These require a ballast and fixture. The costs are much higher. It is even possible to install a dimmer on these types of fixtures. These fluorescents can simply be added to the room or replace existing fixtures.

- Keep the existing lighting but add a dimmer with the “fade out” option on the existing bulb. Then add another fixture to the room such as a linear fluorescent. Thus at the end of the day, it is possible to shut off the fluorescent and at the same time reduce the intensity of the light in the room. First, the effect will be to calm down our pet birds and then, by using the dimmer with the “fade out” option, it will gradually reduce the brightness over a 1 hour period, just like the sunset. While this option is the most expensive, it provides the most adequate lighting for our companions on a day to day basis. I must add that most fixtures are not necessarily designed for birds and they will require some work to protect the electrical components (light and electrical cords) from the birds. If the birds are loose, they will find it pleasant to sit on top of the fixture, especially if it produces some heat. The fixture can represent all the comfort of a new toy and should be avoided. You can find the items mentioned at electrical distributors listed in the yellow pages. The items mentioned above are now the best on the market based on the quality/cost ratio. Other products are also available on the market. It is important to choose a color temperature of at least 5,000 K combined with the highest possible

CRI, preferably above 90%, to provide the maximum ultraviolet light allowed and offer the proper help our cherished companions need. You have to remember one thing, our companions are not machines intended to produce, they are above all else our friends. It is important not to continuously subject them to a lighting that is too intense. The proper lighting, good activity periods combined with rest time, a healthy nutrition and time spent with them will contribute to the happiness and well-being of our friends.

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Here are some existing bulbs that can be used with a dimmer (compatible with a dimmer equipped with a “fade out” or not). However, not available in 5,000 Kelvin:				
Incandescent	Incandescent BR or RP	Halogen AR	Halogen MR16	Halogen T3
 				
These bulbs do not have the 5,000 K or the CRI but can be used with a dimmer.				

