

# Discussion of Building Electrical Lighting Energy-saving Design

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**ABSTRACT** This paper mainly for the construction of electrical energy-saving lighting design analysis, discussed the importance of building electrical lighting energy-saving design, and specifically describes how electrical energy-saving design, in order to provide reference for the construction of electrical energy-saving design.

## KEYWORDS

Electrical construction  
Lighting  
Energy-saving design

## 1. Introduction

With the deepening of the concept of energy saving buildings, building electrical design work began to pay more attention to energy-saving design, energy-saving design to adopt rational design method proposed effective energy-saving program, and then for the construction of electrical energy conservation effective basis.

## 2. Analysis of electric lighting energy buildings

For the development of this country, buildings consume very large. According to statistics, China's consumption in the construction of the equivalent of the world on an equal consumed in developing countries more than three times. In civil construction, the ratio of power consumption is roughly: air-conditioning power consumption accounts for 40% to 50% of the building's electricity, water pumps and other electrical equipment accounted for 10% to 15%, and electricity for lighting accounts for 15% to 25% comparing the proportion of each civil electrical consumption, consumption of electricity for lighting is an important aspect, so in order to save energy, energy-saving lighting is particularly important. In construction, look for energy savings from lighting sources, lighting equipment, lighting the way, line losses in these areas is very clear, not only to save energy, but also to protect the environment, bring huge

economic benefits [1].

## 3. Electrical lighting energy-saving design principles

### 3.1. Principle to meet the functional requirements of the building

Different buildings have different requirements for lighting, entertainment venues such as buildings require very eye-catching, and the business district buildings are required to have adequate lighting area, building requirements for residential lighting. Different buildings have different functions, only to meet their functional lighting makes sense, therefore, the electrical lighting design, to meet the functional requirements of the building is the first principle.

### 3.2. Satisfy the principle of economy as a whole layout

When designing the building, the building is in need of financial cost of inputs, the economic costs of maintenance, as it must create enough economic interests, or can not meet people's needs, then carry out the electrical lighting design must understand that it is only economic control a ring, if you use energy-saving lighting design caused a large economic waste, it also does not meet the people's needs, therefore, it requires a reasonable arrangement lighting settings is the second principle.

### 3.3. Reduce energy loss principle meaningless

In a building, if the arrangement of excessive lighting settings, or improper use of lighting equipment in place, or the design and installation method is unreasonable, then make no electrical lighting equipment to maximize efficiency, it will cause a lot of energy wasted, according to the principle add up, if waste over many years, they form a huge economic cost, will become a heavy burden on society, thus avoiding pointless energy losses is the ultimate

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goal of electric lighting energy-saving design.

## **4. Discussion on energy efficiency in building electrical design lighting**

### **4.1. High efficiency energy saving lamps**

Lighting efficiency is the ratio of luminous flux under normal circumstances within luminaires and lamps flux emitted from all light emitted, which reflects the lamp light utilization efficiency, in order to take full advantage of the light emitted by the light source, priority should use high-efficiency lamps. Under normal circumstances, the efficiency of indoor lighting should not be less than 70%; the efficiency of outdoor lighting should not be less than 55%, depending on the use of premises, should adopt reasonable control of light fixtures. In addition, in order to heat generated by lighting utilized, can be integrated lighting fixtures and air conditioning. When used in a variety of light sources are rarely used alone, it must be equipped with the appropriate lighting, so as to realize the true value of the light source. Therefore, when the lighting design must be high efficiency and good capacity control light fixtures, high-efficiency lighting can reduce power consumption, greatly save operating costs and investment costs, thus saving plays a vital role, If Once the inefficient lighting, it will lose a considerable part of the power to the energy waste. In addition, at the time of lighting design, be sure to height and area of the room corresponding analysis, calculate the RCR value and the reflection coefficient of the room, so scientific computing can determine how to choose lighting, lighting choice wrong, cannot achieve the role of energy conservation [2].

### **4.2. Optimization of lighting control**

In the construction of electrical in reasonable lighting control can play a relevant role in power, when the energy-saving design should be based on the degree of natural light illumination to determine the brightness and range of illumination. In addition, you can also add the appropriate switch point, thus facilitating the effective control of lighting, such as a room, some building good lighting and windows larger, they can try to choose natural light, light enough if some buildings is good, you should choose lighting opening control, in order to achieve the purpose of optimizing lighting control. Lighting for public buildings such as schools, hallways office buildings, hotels, shopping malls, stadiums, theaters, lounges, waiting rooms and industrial buildings, stairwells, lobbies and other public places, should adopt centralized control, according to the building conditions of use and natural lighting situation to take the partition, packet control measures. For residential buildings such as stairways, walkway lighting, should adopt energy-self-extinguishing switch, energy self-extinguishing switch should increase the use of infrared motion detection and light control switches, emergency measures should be mandatory emergency lighting illuminated.

### **4.3. Selection importance transformer**

Due to another voltage transformer which is the use of electromagnetic induction principle, to a voltage and current AC power is converted to the same frequency, the current AC power. In the power system, the use of step-up transformer electrical energy economically transported to the electricity area, re-use step-down transformer reduces the voltage, available to users. Thus, the transformer power supply system is crucial to a core device, once it is loss to some extent will affect the situation of energy-saving power supply, therefore, pay attention to the selection of the transformer is a key factor in the realization of energy-saving lighting. Today, in the electrical construction, the transformer or there is a corresponding problem, some transformers are not able to meet the requirements of economic operation, the transformer appears the case of high wear and tear. Because of varying voltage loss mainly in copper loss and iron loss above electric, so I want to reduce the variable voltage loss, you must select high-quality materials and have a low consumption rate of the transformer, which would greatly reduce the loss of the transformer. In addition, the transformer is also affected by the wiring and load characteristics, so the choice of transformer when we must strive to be close to the actual load transformer design load, so as to ensure the normal operation of the transformer, improve the efficiency of the transformer.

### **4.4. Energy-saving motors**

In the construction of electrical, and under normal circumstances the motor is warm road and waterways and other types of equipment together, so when designing must use inverter, use the inverter can effectively regulate the speed to this to improve motor efficiency at light load time, you can also use soft starters, soft starter voltage changes can be adjusted to a certain extent, you can limit the AC current, while soft-start large starting torque, this to the role of energy conservation [3]. In addition, the motor is the input electrical energy is converted to mechanical energy of the rotating equipment, improve the efficiency of the motor itself, such as the motor self-cooling fan to fan him cold, disable the cooling fan motor load is small or when outdoors, help to reduce energy consumption.

### **4.5. Improve the lighting system power factor**

In architectural lighting system, due to some electrical equipment has inductance element, it will generate reactive power to a certain extent, so that energy cannot be effectively utilized. For this reactive power can be used to improve the power factor of the device case, to achieve the purpose of reducing, in addition, can also use the electronic ballast, in order to compensate capacitor, so that the reactive power transmission lines and equipment on the relative reduction, so as to achieve energy-saving purposes. In some electrical construction, the use of transformer low voltage side of the centralized way of compensation,

although you can reduce high-voltage reactive power transmission in the region on the way to a certain extent, improve reactive power factor, but for users, cannot be a relative reduction of reactive power transmission, so there is no way to save energy, and therefore reactive power compensation device should be installed in place in order to achieve spot compensation [4].

#### 4.6. Rational use of natural light energy saving

Natural light is cherished and make full use of energy, in the construction of electrical, lighting design should make full use of natural light to achieve energy saving and the use of natural light changes, to effectively determine the illumination range, in order to play a role in energy conservation of natural light. Natural light into daylight and the sky astigmatism two fractions, Sun belong by the direct sunlight out of the beam, the sky is the astigmatism particles in the air to scatter sunlight. Thus, the natural light energy of nature, is inexhaustible, rational use of natural light, when the natural light into the building, can be used as supplementary light source, in order to reduce people's

lighting energy consumption.

#### 5. Conclusion

In summary, building energy efficiency must be carried out, taking specific energy-saving design programs to know the building electrical construction, so building electrical energy efficiency must advance reasonably designed to ensure energy-efficient construction building electrical protection.

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