

OPTIMIZING THE ROLE OF ARTIFICIAL LIGHTING IN COMMERCIAL BUILDINGS

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ABSTRACT

Interior is the most important part in a commercial building because most of the human activity (visitors) happens inside. The interaction between the interior elements with the activity, the behavior, the mood of the visitor takes place in it. Lighting as one of the elements of the interior serves for vision (vision) and create an atmosphere of the interior (aesthetic), in addition to the conditions of a safe and comfortable environment. This paper examines how an artificial lighting system, with the aim of getting an idea of how to optimize the role of artificial lighting in some commercial buildings. The method used is literature study, consisting of lighting theories and the results of research in several commercial buildings.

Keywords: Commercial Building, Interior, Lighting.

1. Introduction

Along with the rate of economic growth in Indonesia, businesses in various commercial fields are experiencing rapid growth with good prospects. Various commercial buildings such as hotels, restaurants, cafes, boutique / clothing stores, art galleries and others grow rapidly. With the development of these commercial buildings, the competition between the functions is also more stringent, so it takes the distinctive characteristics of each - each to try to look more attractive, which among other things is the protrusion on the interior design.

The interior is the most important part in a commercial building, because most of the human activity (visitors) happens inside. The interaction between the elements of the interior with the activity, behavior, mood of visitors occurs inside. The interior elements include floor, wall, roof, furniture, including a variety of material choices, textures, colors and lighting.

Interior design as a unified whole of design elements and principles will create an atmosphere, which is an expression of the desired concept to be perceived by its inhabitants (Hidjaz in Nabella Alatas, Anwar Subkiman, 2014).

Such perceptions within a commercial building will lead to visitors' mood and behavior.

The mood of the visitor is the goal of interior design to be achieved, which provides comfort, satisfaction and experience that imprint so it will encourage to come back or recommend to others to visit. Lighting as one of the elements of the interior serves for vision and create an interior atmosphere (aesthetic), in addition to getting a safe and comfortable environment.

This paper examines how artificial lighting systems in several commercial buildings with the literature study methods of lighting theories as well as research results in several commercial buildings, including restaurants, cafes, clothing / boutique shops, hotels and galleries. The goal is to get an idea how to optimize the role of artificial lighting in commercial buildings.

2. Lighting

Lighting is one of the main parts in an interior. Light gives a huge influence on the performance of human work. Without light, humans can not see, work and feel the atmosphere/atmosphere of space. Poor quality of light will affect the atmosphere of space. Well-planned lighting will be able to support the visual needs inside and outside the room according to the type of human activity.

Darmasetiawan, Christian, et.al (in Nurintan, 2014: 3-4) classifies the lighting as follows:

- A. Natural lighting is a source of illumination that comes from sunlight.
- B. Artificial lighting is the lighting produced by a light source other than natural light.

Artificial lighting has several types based on light source, intensity, placement, direction of light, function and appearance. Luigina de Grands (in Rianto, 2014: 3-4) classifies artificial light as follows:

- A. Based on the light source, it is divided into 3 incandescent, fluorescent light, and light containing phosphorus (fluorescent)
- B. Based on the intensity, divided into 3 ie full irradiance, medium light, and low light or low light,
- C. Based on its placement, it is divided into 5, namely the ceiling (ceiling lamp), hanging from the ceiling (pendant lamp), attached to the wall (wall lamp), on the table (table lamp), and standing with the foot (standing lamp)



Figure 2.1 Ceiling Lamp Brussels Spring Resto and Café (Mitha Nurintan, Enung Rostika, 2014)



Figure 2.2. Wall Lamp Brussels Spring Resto and Café (Mitha Nurintan, Enung Rostika, 2014)

- D. Based on the direction of light, is divided into 3, ie light upwards (uplights), downlights, and spotlight,
- E. Based on the function or needs, divided into 3, namely general lighting (general lighting), special lighting (task lighting), and accent lighting (accent lighting).
- F. Based on the appearance, divided into 2, namely direct lighting (direct lights) and indirect lights (indirect lights).

In planning a lighting system there are things - things that need to be considered to get good lighting, in the sense of fulfilling function so that eyes can see clearly and comfortably.

Darmasetiawan, Christian.et.al (in Nugraha Saputra, Edwin Widia, 2014: 4) said there are 6 criteria that influence each other in producing optimal lighting quality, namely:

- A. The quantity or amount of light on a particular surface (lighting level) or the strong level of illumination
- B. Light density distribution (luminance distribution)
- C. Limitations for light not to dazzle the eye (limitation of glare)
- D. Lighting and shadow direction (light directionality and shadows)
- E. Light color and reflection color (light color and color rendering)
- F. Condition and climate of space

3.OPTIMIZING THE ROLE OF ARTIFICIAL LIGHTING IN COMMERCIAL BUILDINGS

Until now natural lighting is still needed by humans because it is a source of very much, cheap, and humans can enjoy the quality of natural light. In the modern era today after the invention of modern lighting (electrical energy) many facilities such as offices, industries, shops and other commercial buildings, get quality light through electrical/artificial lighting. Research on the role of lighting, especially in commercial buildings has been done. This is partly due to the development of commercial buildings as a means of meeting the needs of the community.

The increasingly intense competition due to the development of commercial buildings encourages the owners to attract visitors to its commercial area which one way is to optimize the role of artificial lighting. There are several factors that need to be considered to get the optimal lighting, among others:

3.1 Good lighting systems and designs

Lighting is an important element in interior design, especially in relation to the role of light as the viewer of form, color, shape, texture, and material objects around it. Good lighting will always be a consideration for a commercial building design to be both functionally and aesthetically, making it an attraction for consumers to purchase products.

Mitha Nurintan and Enung Rustika (2014) through their research at restaurant Brussel Springs Bandung concluded that "Good lighting, comfortable atmosphere, can be created so that the consumer consideration to buy the product". While Steffi Julia Soegandhi, Hedy C Indrani, et al (2014) who conducted research at Budget Hotel Surabaya, concluded optimization of artificial lighting system as follows: The optimization result shows that the most optimal lighting design on:

- A. The lobby area is by combining general lighting system, accent, and task lighting. The interaction between functional and decorative lights can create a comfortable and inviting atmosphere.
- B. Restaurant is by combining general lighting system, accent, and task lighting.
- C. In the desk area, the most suitable lighting is to use task lighting as it can create a private area on each seat and provide more focused lighting.
- D. At the meeting room that is by using general lighting system. The general lighting system provides good enough light spreading to illuminate the reading and writing areas above the workbench.
- E. In the bedroom is by using a combination of direct lighting in the form of general, task, and accent lighting. Lighting in the bedroom should be able to create an atmosphere as comfortable as possible without any disturbance of lighting such as glare

While Nur Laela Latifah, et.al (2013) through their research at Sunaryo Selasar Gallery concluded Localize lighting system, task lighting task lighting, and direct light distribution in accordance with the function of space as a showroom so that objects can be seen clearly as well as the texture of the work can be captured in the eye Optimal and visual comfort in space can be achieved.

3.2 Space conditions and atmosphere

In principle, interior design can not be separated from the role of lighting systems that are applied, especially artificial lighting that is easily manipulated as desired. One important part of lighting is the armature, which houses a lamp that embodies the light source. The function of the armature is to manipulate the light produced by the lamp as desired. Besides the armature design can also be used as an aesthetic element as an amplifier atmosphere / atmosphere space and design theme.

Some research results prove that the armature design can be the attraction of visitors to commercial buildings. Here are the results of research in some commercial buildings:

A. Armature design can attract visitors to come enjoy (Mitha Nurintan, Enung Rustika, 2014)



Figure 3.1. Armatur Lamp Brussels Spring Resto and Café (Mitha Nurintan, Enung Rostika, 2014)

B. Unique armature design, eyecatching. The establishment of this room (center) is a point of interest, a hanging lamp mounted using a custom made design, made of woven rattan that extends into its own beauty and adds a traditional touch (Nabella Alatas, Anwar Subkiman, 2014)



Figure 3.2. Armatur Lamp at the restaurant of Sambara Bandung restaurant (Nabella Alatas, Anwar Subkiman, 2014)

C. General Lighting in section d implements a decorative armature of Japanese culture-shaped paper ball, as well as adequate lighting, good for eye health, as well as the element of romantic atmosphere by showing the aesthetics of the lamp (Nugraha Saputra, Edwin Widia, 2014)



Figure 3.3. Armatur Lamp in section d Café Cocorico Bandung (Nugraha Saputra, Edwin Widia, 2014)

D. Lighting decorative lighting is able to create a warm atmosphere and dramatic shadow effect so that more visitors are interested (Anastasha Oktavia et.al, 2014)

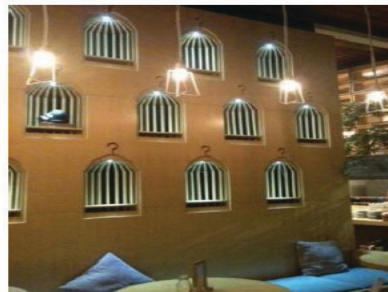


Figure 3.4. Wall treatment resembles a bird cage parlor Café Hummingbird Eatery Bandung

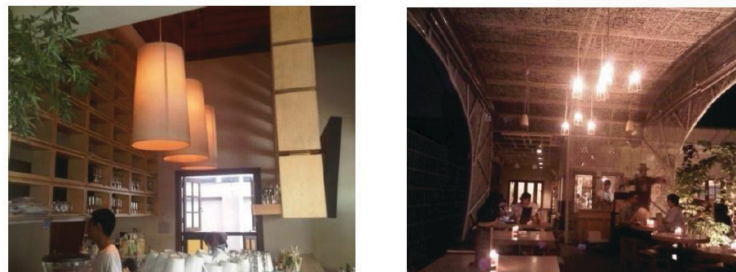


Figure 3.5. Armatur in mini bar area and outdoor area of Café Hummingbird Eatery Bandung (Anastasha Oktavia et.al, 2014)

E. Artificial lighting has the effect of making a product look more memorable. The use of spotlight lights with moderate lighting is able to provide visitors with a comfortable atmosphere; With such psychological circumstances will invite interest to buy the product (Mohamad Putra Rianto Effendy, Abraham Seno, 2014)



Figure 3.6. Spotlight at the Apparel Store Store Altos Kemang
(Mohamad Putra Rianto Effendy et.al, 2014)

F. Spotlight illumination (the effect of the lighting focus on the object) and wallwash (the lighting that is highlighted on the wall, the effect is evenly on the collection object) as a space shaper. Artificial lighting is not only to illuminate collectibles, but also affect the atmosphere of the room and its appearance, it implies that lighting will affect the appreciation of the gallery visitors (Muhammad Fauzi, 2015)

3.3 Color of light and reflection of color

In general, the design elements that can form the atmosphere and image in commercial buildings is divided into 2, namely the part that is not intangible (intangible) and teraga (tangible). The elements included in the category include interior lighting, walls, floors, ceilings and colors. From various studies proves that the color of light raises the perception of visitors to commercial buildings. One of the results of research conducted to see the role of artificial lighting in the formation of atmosphere and image of commercial space (case study on the interior of some thematic restaurant in Bandung) concluded that: "Selection of yellowish light color will create a warm atmosphere, the use of white color from the source Neon or fluorescent light will produce a clean and bright atmosphere, while the use of light blue, red, or green will produce a fresh atmosphere (Mila Andria Savitri, 2007).

The same thing was also conveyed by Nabella Alatas and Anwar Subkiman (2014) based on their research at Sambara Bandung restaurant that "color halogen lamps create a warm and inviting impression". Research on other commercial building objects also yields the same conclusion. Jocelyn Hadiano, et.al (2013) examines the effect of artificial lighting on the visual

comfort of visitors to the interior Boutique Banana Republic in Surabaya concludes that:

- A. Lighting as an atmosphere builder can help in influencing the visitor's desire to buy the products sold
- B. The predominantly yellow artificial lighting creates a pleasant, intimate atmosphere and makes the room feel more cramped.

A review of the lighting system that affects visual comfort is also performed by Nur Laela Latifah, et.al of the Sunaryo Selasar Gallery room. The study was conducted with the aim to know the visual comfort that is formed so as to know the worth and not the showroom. The visual quality review by researchers is limited to strong elements of illumination / lighting levels, color quality, and glare levels. Special color of light and reflection of the color, concluded that: "The application of artificial lighting system is good enough, because the use of white light color neutral light, so the color on the object looks like the original".

The study of artificial lighting effects for commercial buildings was also carried out by Muhammad Fauzi (2015), he observed the Jakarta textile museum and Pekalongan batik museum as the object of his research. Artificial lighting analysis described as follows: for special lighting (task lighting), the type of lights in the Jakarta textile museum using spotlight and downlight, while the Pekalongan batik museum using spotlight lamps. As for general lighting (general lighting) type of lights in the museum textile Jakarta is ideal, while the Pekalongan batik museum using the ideal light but not maximal.

From the observation and assessment of the researchers concluded that "Jakarta Textile Museum and Pekalongan Batik Museum has not been ideal on all elements - interior elements and lighting". The important researcher's recommendation is "Lighting using LEDs makes the light clearer and focuses gently on visibly improved artwork, color and depth and no harmful UV rays emitted."

Based on the results of the research - the above research, reinforces that the color of light and color reflection into one method to produce optimal lighting quality for commercial buildings.

3.4 Lighting and Shadow (Light Directionality and Shadow Direction)

Good interior design in principle can not be separated from the role of lighting systems that are applied, especially artificial lighting that is easy to manipulate. Artificial lighting properties that can be manipulated, in addition to strong light and light colors, as well as direct, indirect light direction.

In a study titled lighting review at Sambara Bandung Restaurant, Nabeela Alatas and Anwar Subkiman observed lighting system in several areas such as reception area and reservation. In this area the applied lighting is the arrangement of the recessed lights on the ceiling. The researchers concluded

that "The warm colored downlight that is directed to the wall and sky area refracts the room light evenly and is warm and inviting".

Based on the results of the research, it can be understood that the directed lighting becomes one of the ways to produce optimum lighting quality.

3.5 Limitations for light not to dazzle the eye (Limitation of Glare)

One of the possible lighting problems in a commercial function, both technically and non-technically, is the inappropriate selection of intensity (light strength) for a type of commercial function that causes glare, and can not optimize the function of a room in a commercial area.

Research conducted by Nur Laela Latifah, et.al, 2013 at Sunaryo Selasar Gallery is less able to provide definite results because the level of glare is measured qualitatively because of the limitations of measuring instruments. The result of research is only based on the opinion and observation of the researcher, so the value of subjectivity is quite high. Based on these observations, the researchers concluded that "the glare that occurs in this gallery is not dazzled, so it does not interfere with visual comfort to visitors". Although the results of the research are less accurate, it is understood that the limitation of light is not blinding the eye into one of the lighting factors that simultaneously influence each other in producing optimal lighting quality.

4. Conclusion

4.1 Accumulation of research results in the application of artificial lighting in commercial buildings, concluded that the factors that need to be considered for optimizing the role of lighting there are 4 factors, namely:

- A. Good lighting system and design
- B. Spatial conditions and atmosphere
- C. Light color and color reflection
- D. Limitations for light not to dazzle the eye

4.2 Theoretically the factors influencing the optimization of the role of lighting are 6 factors that affect each other and can not stand alone separately because each factor depends on each other in producing optimal lighting quality. (Darmasetiawan, Christian, et.al, 1991). Factors that have not been subject to study by researchers include:

- A. Light density distribution (luminance distribution)
- B. The quantity or amount of light on a particular surface (lighting level)

4.3 The role of artificial lighting systems studied by each researcher focuses on different, and limited, factors that theoretically all factors affecting the optimization of the role of lighting should be assessed as a whole

5. SUGGESTIONS

To obtain the role of artificial lighting in optimal commercial buildings, comprehensive research is needed for future researchers, including the following factors;

- A. Artificial lighting systems and design are good
- B. Spatial conditions and atmosphere
- C. Light color and color reflection
- D. Limitations for light not to dazzle the eye
- E. Light density distribution
- F. Quantity or amount of light on a particular surface
- G. Other factors that may affect the optimization of the role of artificial lighting in commercial buildings. With comprehensive research it is possible to strengthen or even the occurrence of anomalies of existing theories.

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