

# Artificial Lighting Design in The Japan Foundation Library

## Study Case: The Japan Foundation Library Design, Jakarta

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### ABSTRACT

Abstract: Japan Foundation is a cultural center dedicated for handling international cultural exchanges through educational activities, Japanese language studies and so on. A library is an important facility for a Japanese cultural center, it provides the basic to advance information about the culture itself. In designing a library there are several aspects that need to be considered, especially lighting. This consideration based on the activities on the library, which is writing, and reading. These activities are classified as high visual activities. Lighting affects several aspects of space both in terms of atmosphere and visual comfort of the audience. Qualitative descriptive method is used through a study of the type of lamp used, its specifications, and the role of the lighting in the room. The conclusion of this design is that artificial lighting does not only play a role as a tool to light up the room, but it also serves to give the impression of a space that can make visitors more comfortable.

**Keywords:** *Lighting, Library, Artificial Lighting*

### 1. INTRODUCTION

Japan Foundation is a cultural center located at Summitmas 2 1st - 2nd Floor Building, Jl. Jend. Sudirman Kavling 61-62, RT.5 / RW.3, Senayan, Kebayoran Baru, South Jakarta City, Jakarta 12190. Japan Foundation is a cultural center dedicated for handling international cultural exchanges through educational activities, Japanese language studies and so on. A library is an important facility for a Japanese cultural center, it provides the basic to advance information about the culture itself.

In designing a library, there are several important aspects that need to be considered, one of which is lighting. This consideration based on the activities on the library, which is writing, and reading. These activities are classified as high visual activities. Therefore, there are several standards that need to be followed in order to achieve visual comfort.

#### A. Artificial Lighting

Artificial lighting is lighting that is not natural lighting. The function of artificial lighting is not to replace natural lighting but to help the room get the light it needs when natural lighting is insufficient.

#### B. Elements of Light

According to Kelly the three fundamental elements of light are:

- 1) Ambient Light or General Lighting
- 2) Focal Glow, is directive light, creates a bright center, and it tells us what to look at, organizes, mark the most important element.
- 3) Sparkle (play of brilliants), this light attract human attention, and create a feeling of curiosity, passion, and

increase alertness. Play of brilliants can make a distraction or entertainment. [2, pp.27-29]

#### C. Lighting Application

The application of artificial lighting in the room is divided into two type of application:

##### 1) Direct Lighting

Direct lighting will provide strong, bold shadows. For example: direct light to the wall will make the room feel spacious and dramatic.

##### 2) Indirect Lighting

Indirect lighting provides an even, soft light that does not cast shadows in the vertical and horizontal planes. But the similarity of light often causes a room to look monotonous, especially the in white room [5, pp. 207, 209].

#### D. Indoor Lighting Level Requirements

Indoor Lighting Level Requirements according to SNI (Indonesian National Standards SNI-6197:2011 concerning energy conservation in lighting systems. Indoor lighting level requirement for libraries is 300 lux [1].

#### E. Glare and Visual Comfort

According to Gordon "glare is contrast or excessive lighting and is distracting and annoying" [2, pp. 49]

Based on the type, there are 2 types of glare that are detrimental to visual performance:

- 1) Direct glare, which is caused by the lighting system; it is defined as excessive light misdirected toward the eye.

- 2) Reflected glare, which is caused by excessive uncontrolled luminance reflected from objects or surfaces in the field of view.

Gordon also said that “the term visual comfort refers to the critical need to eliminate glare and distracting brightness from your field of view” [2, pp. 158].

Visual comfort can be achieved in the following ways:

- 1) Using a finish or material that has a lower glossiness level.
- 2) Add diffuse transmission material to increase light source diffusion.
- 3) Place lighting outside of the reflected field of view.
- 4) Using the right armature to reduce glare. For example, armature Parabolic reflectors which are generally used in general lighting.

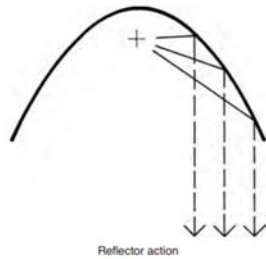


Figure 1 Parabolic Reflector

(Source: Gordon, 2014, PP.162)

#### F. Impression of Light

Lighting can give the visual impression of the space that make a person perceive and behave as the light affects the human being. The effects of artificial lighting on humans are divided into:

- 1) Visual Perception, the perception (interpretation) of human visual when seeing something.
- 2) Visual Impression, the impression when humans see something.
- 3) Visual Imaginary, parables or visual imagery.[4]

Light can create a certain impression on the environment, by using several ways, such as:

- 1) Broad impression, which is produced by making the wall lighting intensity higher than the general lighting of the room.
- 2) Clear impression, which is produced with spreading a high intensity white light evenly.
- 3) Relaxing impression, this impression produced by avoiding glare.
- 4) Pleasant impression, which is created by using a variety of lighting [5, pp.212-213].

#### G. Color of Light

The color of light in space also affects human perception. Flynn said “Visual impression for lighting with a temperature of 4100 K (cool color temperature) gives an impression of visual clarity, while for lighting with a temperature of 3000K (warm color temperature) gives an impression of comfort[2, pp.61].”

Table 1: Effect of Lighting Temperature on Human Perception

Color Temp	Kelvin	Effect
Warm	3000K	Friendly Intimate Cozy
Cool	4100K	Neat Clean Efficient

Source: Gordon, 2014

#### H. Contrast

The comparison between ambient light and focal glow determines the level of contrast of a space. Contrast serves to provide a subjective impression (atmosphere) of a space. For example, a room that receives the same light emphasis in each area, the contrast will be lost. The lost contrast in the space will create a cloudy room atmosphere that makes users feel depressed and lethargic over time. On the other hand, humans will become more energetic and positive when the weather is clear, which is characterized by clear highlights and shadows. This sunny weather scene can be created with a play of contrasts.

According to Gordon, there are two type of contrast environment:

- 1) Low - contrast environment, is an environment that receives evenly distributed lighting, so there is no hierarchy in a room. A room that has low contrast can make a person feel comfortable, focused, and relaxed. A low contrast environment can be created with a combination of a large proportion of diffuse light and a small amount of focused light.



Figure 1 Low - contrast environment

(Source: Gordon, 2014, PP.25)

- 2) High - contrast environment, a high - contrast environment space usually used to give the impression of a hierarchy between the object and the background. A space with a high level of contrast is usually used to direct someone to an object or space. A space like this

can be created using a combination of a little diffuse light and a lot of focused light [2, pp.24-26].



Figure 2 High – contrast environment  
(Source: Gordon, 2014, PP.26)

## 2. METHOD


This study uses a qualitative-descriptive method. This method is use through the study of the type of lighting and lamps used and their effects on the room.



The data collected in this study are literature data, and technical data. The technical data include the types of lamps, armature and placement of the lamp in the designed library. All the data obtained is used as a reference for Artificial Lighting Design in this project.

## 3. RESULT

The Artificil Light used in designing this library is:

Table 2: Artificial Lighting

No.	Figure	Explanation
1	 Figure 1 LED bulb (Source: www.lighting.philips.com/)	General lighting in this design uses light bulbs that have specifications of 2500 lumens and 2700K

2	 Figure 2 Pendant Lamp Light (Source: www.lighting.philips.com/)	The lamp used in the pendant lamp is a 6.5W 840 2P G24d-2 PLC LED lamp. With specifications of 650 lumens and 3000K
3	 Figure 3 LED Strip (Source: www.lighting.philips.com/)	For ambience lighting, we use indirect lamp technique with LED strip lights which have specifications of 18W and 3000K

(Source: Personal Document)

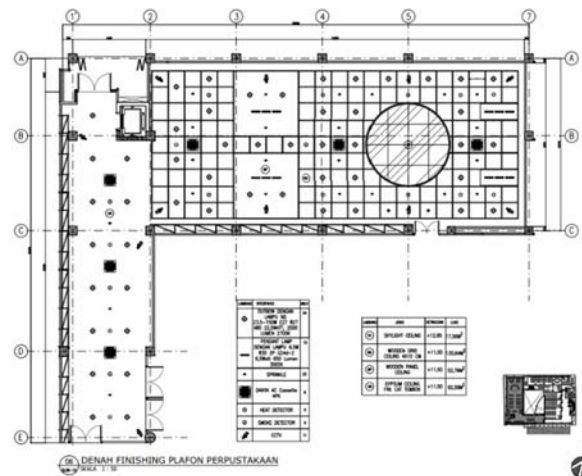


Figure 4 Reflected Ceiling Layout  
(Source: Personal Design)

This library is designed using an LED bulb with an out-bow type armature with a parabolic reflector as general lighting. The LED lamp used has a lumen of 2500

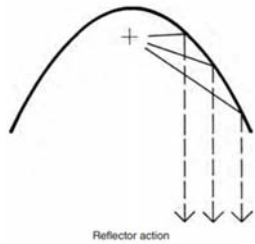


figure 9 Parabolic Reflector  
(sumber: Gordon, 2014)

Armature with a parabolic reflector used to control the glare. Armature with a parabolic reflector tend to gives an impression of low brightness from normal angles of view because most of the light is directed downward, with minimal light directed toward the eye, and make little reflected luminance that occurs in the cross-view of these reflectors.

The lighting used is distributed to 54 points to achieve a lighting level of 300 lux which is in accordance with the Indonesian National Standard on energy conservation in lighting systems (SNI 6197: 2011, 2011). The placement of the lights is based on the level of lumen emitted by the lamp and the utility coefficient of the lamp reflector.



Figure 5 Library Perspective 1  
(Source: Personal Design)

In this area the use of general lighting is combined with the LED strip light in bookshelves and on the grid of the bookshelves to display contrast, so the space won't feel boring.



Figure 6 Application of LED Strip on the Bookshelves  
(Source: Personal Design)

The use of this LED strip also serve as a highlight of the must-read book collection in this library and it also gives a welcoming impression to find out more about the Japanese culture.



Figure 7 Library Perspective 2  
(Source: Personal Design)

The impression of welcoming can be seen more clearly from the perspective above. This impression happened due to the use of a higher contrast at the rear side of the library to encourage visitors to enter and find out more about the Japanese culture. According to Gordon "Attention is involuntarily drawn toward areas of brightness that contrast with the visual background. When person approaches an unfamiliar space or activity, brightness contrast and color contrast help to establish an initial response and it can be used for guiding the circulation of people entering an unfamiliar room [2, pp. 26]".

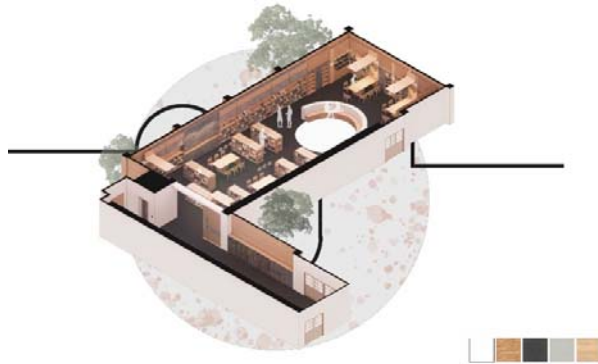


Figure 8 Library Axonometry  
(Source: Personal Design)

#### 4. CONCLUSION

Artificial lighting plays an important role in interior design. it supports visitor activities as a support light for natural light to illuminate the room so that visitors can do their activities without distraction. In addition, artificial light also plays a role in forming the impression of a space. For example, in this design, high contrast in some areas is used to create a welcoming impression, while low contrast in some areas gives the room a relaxing feel.

#### 3. ACKNOWLEDGEMENT

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