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# Lighting Consistency of Master Bedroom Casa Jardin Bekasi with Ergonomic Level of Bedroom Lighting

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***Abstract.***

*To create a livable space, it is necessary to include interior design elements. For all the interior elements, what I want to emphasize here is the lighting element. If there is no light in an interior, it can be said that the interior is a "numb" design. With that, designing the right bedroom lighting design is very important to make a comfortable and decent space to rest from a tiring day. Bedroom lighting must be designed with attention to functionality and space capacity. The purpose of examining this design in more detail is to create a livable master bedroom with good interior elements, to suppress the consistency of ergonomic residential design, and to adapt the insights of interior designers who are fixated on the aesthetics of the room to be more thorough in many factors such as lighting. Design of the Master Bedroom Casa Jardin Bekasi applies the Rosemary Kilmer design method to find a design approach that suits the needs of the client, Casa Jardin. The application of standard lighting requirements at a minimum level and also the requirements for a good light layout can affect the health aspect, especially ergonomics in the design of the Master Bedroom. Master Bedroom Casa Jardin Bekasi has a fairly optimal match with existing parameters and was compiled by experts to get good results for health and ergonomics.*

***Keywords****. Lighting, Consistency, Master Bedroom, Casa Jardin, Ergonomic.*

## INTRODUCTION

Designers always put more focus on the aesthetics of their designs. A few ignore the existence of space lighting that should appear in their designs. To create a livable space, it is necessary to include interior design elements. According to Francis D.K Ching (2012), aspects of the interior design must consist of layout, floors, walls, ceilings, windows, doors, furniture, decorations, lighting, and air temperature. What want to emphasize here is the element of lighting. Lighting can affect the character of a space. The intensity of light is also determined by the types of activities that exist in the space for the convenience of users. Artificial light or sunlight that enters an interior is the essence of a design that has been designed according to its function and beauty. If there is no light in an interior, it can be said that the interior is a "numb" design. All about the rooms in the house, the bedroom is one place to spend time when you want to relax. Accordingly, designing the right bedroom lighting is essential for comfort and rest from a tiring day. Bedroom lighting must be designed with attention to functionality and space capacity. The research subjects of this journal took samples from one of the residential rooms of Casa Jardin Bekasi which had passed the programming to design stages. It is hoped that Casa Jardin can maintain its consistency in residential design with good lighting. Because good lighting provides a plus for all modern residential designs.



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The problems that appear from the discussion raised above are (1) How is the consistency of the condition of Casa Jardin's master bedroom with a livable bedroom? (2) How can interior designers create a livable master bedroom? And
(3) How do interior designers maintain consistency in their designs for residential spaces? After that, the purpose of this design discussion in more depth is (1) To create a livable master bedroom with good interior elements (2) Emphasize the consistency of ergonomic residential design and (3) Adjust the insight of interior designers who are fixated on the aesthetics of the room to be more accurate for many factors such as lighting.



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## METHOD

This design project runs according to the design method that has been researched, namely the design method according to Rosemary Kilmer.

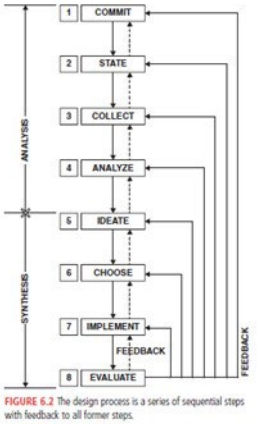


**FIGURE 1**. Rosemary Kilmer Design Method Process

First, there is a "commit" that recognizing a design problem and doing it is the first step a designer does in the design process. Second, is the "state" in which the designer tries to approach a new problem with all the perspectives that is, they do not allow preconceptions of previous problem solutions to interfere the new solutions. Also, there is a "collect" used by designers who already have a clear understanding and definition of the problem, they will collect information related to the design. After that, there is "analyze" which is where a designer has to look at all the information gathered about a problem and organize it into related categories. The fifth is "ideate", looking for different creative ways/ideas to solve problems and define the overall design concept. However, ideas should be generated only after gaining a thorough understanding of the problem, as outlined in the previous step. [2]

Sixth, "choose", where the designer chooses the most appropriate or best option by returning to see how the chosen concept fits the client's budget, needs, goals, and desires. After all the schematic drawing options have been explored and one has been selected, the designer begins the preliminary drawing. Next is "implement" which refers to carrying out or taking action on the chosen idea and giving it a physical form. This step communicates ideas through final drawings, plans, renderings, and other forms of presentation to the client. The design process does not stop at creative ideas or solutions but continues at the action stage to turn ideas into reality. At last, there is the "evaluate" stage, which is the stage of evaluating the design process, reviewing and making a critical assessment of what has been achieved to see if it solves the original problem. Furthermore, after all the stages above have been passed by the designer, then the next stage is the design stage with the output in the form of the results of the design/finalization of the initial design. [2]



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## Literature Study

### *Lighting Definition*

According to KBBI, lighting is a process, method, act of giving light. Light is a prerequisite for human vision, especially in recognizing the environment and carrying out its activities. There is a basic difference between lighting and illumination. Lighting emphasizes the properties of lighting that an interior designer must learn. The application of good lighting cannot be separated from the optimal use of natural and efficient artificial light. While illumination only makes the room bright. [3]

### *Types of Bedroom Lighting*

General lighting or also known as ambient lighting is "common" lighting that evenly illuminates a room. To produce an even and all-over light, usually the lamp will be installed in the middle of the room or at several points with a symmetrical pattern. Also, there is task lighting, which is a room lighting system that is directed and centralized, having more light intensity than the surrounding light. Furthermore, accent lighting or what can be called decorative lighting is a room lighting system that is directed and able to create something interesting visual effects.

Accent lighting is used specifically to highlight certain areas in a room, such as paintings, displayed carvings, plants, and other decorations. The last one is the dimmer. Dimmers not only allow designers to add an extra dimension to a room's environment, they are also multifunctional. For general lighting, you can use downlights, pendant lamps, chandeliers, etc. Frequently, used task lighting such as reading lamps above the table, lamps in kitchen cabinets, chandeliers or ceiling lamps in the kitchen and dining table. Examples of accent lights that are often used include track lighting, cove lighting, canister lamps, wall lamps or wall sconces.



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*Introduction Casa Jardin Bekasi Project*

This research chose Casa Jardin as the sample which as the name implies, lives in the Casa Jardin housing estate which is inhabited by a lifestyle that is close to natural beauty, greenery, a house surrounded by fresh green gardens. Delivering a distinct style usually means very limited space utility and offers serenity from the hustle and bustle of metropolitan cities. The first Casa Jardin is located on Daan Mogot Raya Street. The second Casa Jardin will be built in Bekasi City. This project is quite large considering that Bekasi is a satellite city with the largest population in Indonesia and also a city that is quite "hot" according to merdeka.com. In other words, Casa Jardin will make a good impact with its green housing concept.


**FIGURE 2**. Casa Jardin Bekasi Project

*Furniture Layout Casa Jardin Bekasi*

The master bedroom is next to the living room. The main master bedroom is also placed near the toilet as well as the bedroom. This space gets a fair amount of sunlight from outside because it is located next to the inner terrace. Which means facing the outside of the house. Has 2 large windows facing out and can directly see the front foyer.

**FIGURE 3**. Layout Furniture Casa Jardin Bekasi



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*Master Bedroom Design Casa Jardin Bekasi*

Casa Jardin chose to apply a modern industrial style. Modern Industrial is more accentuated with iron and metal wood accents. The shape of the furniture takes a very real modern style that is simple and sleek.

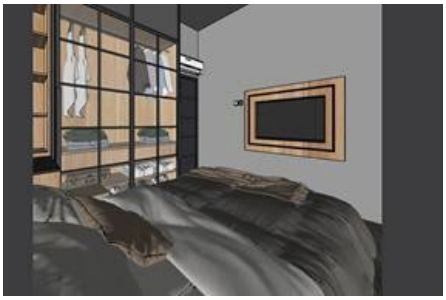

**FIGURE 4**. Master Bedroom Casa Jardin Bekasi Design

The size of the Master Bedroom, which is 2.7m x 3.5m, must accommodate light of around 120-150 lux or <10 watts/$m^2$. This is to avoid dark spots on each side of the room. The master bedroom has good enough natural lighting on the side facing the front terrace. It also has a dark spot at the entrance of the room caused by the wardrobe.

## Assessment Parameters

*Recommended Minimum Lighting Levels by BSN*

Each country has its standards. Theories from experts can also differ from the standards that have been set. They, BSN have set agreed standards through written media. Following the recommended minimum level of lighting and color rendering for various room functions as shown in table 4.1.2 page 5 of SNI 03-6575-2001. But only the designated part of the house is appointed. The level of lighting recommended by the National Standardization Agency for bedrooms is around 120-150 lux. For the color rendering category, it is definitely in group 1 and 2. It can be seen in more detail in tables 2 and 3. The grouping of color renderings aims to create a balanced atmosphere with the functionality of the area and the room. Color rendering can be measured according to the temperature and atmosphere to be achieved with the Ra value and color temperature. [1]

| Fungsi Ruang | Tingkat Pencahayaan (Lux) | Kategori Renderasi Warna |
|---|---|---|
| Teras | 60 | 1 atau 2 |
| Ruang Tamu | 120 – 150 | 1 atau 2 |
| Ruang Makan | 120 – 150 | 1 atau 2 |
| Ruang Kerja | 120 – 150 | 1 |
| Kamar Tidur | 120 – 150 | 1 atau 2 |
| Kamar Mandi | 250 | 1 atau 2 |
| Dapur | 250 | 1 atau 2 |
| Garasi | 60 | 3 atau 4 |

(a)

| Kelompok Renderasi Warna | Rentang Indeks Renderasi Warna (Ra). | Tampak Warna |
|---|---|---|
| 1 | Ra > 85 | dingin |
| | | sedang |
| | | hangat |
| 2 | 70 < Ra < 85 | dingin |
| | | sedang |
| | | hangat |
| 3 | 40 < Ra < 70 | |
| 4 | Ra < 40 | |

(b)

**FIGURE 5.** Table Recommended Minimum Lighting Level Chart by BSN



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**FIGURE 6.** Table Color Rendering Grouping by BSN

| Lampu | Temperatur warna (K) | Ra |
|---|---|---|
| Fluoresen standar | | |
| White | 4200 | 60 |
| *Cool daylight* | 6200 | 70 |
| **Fluoresen super.** | | |
| Warm white | 3500 | 85 |
| *Cool white.* | 4000 | 85 |
| *Cool daylight.* | 6500 | 85 |
| Merkuri tekanan tinggi. | 4100 | 50 |
| Natrium tekanan tinggi | 1950 | 25 |
| Halida Metal | 4300 | 65 |

**FIGURE 7.** Table Ra Value and Color Temperature (K) for Some Types of Lamps

## *Ergonomic Lighting Levels for Bedrooms*

Ergonomics related to lighting, basically having the right amount and location of lighting for daily activities. Limits on the strength of light in a room that has general lighting in the hallway or a room that does not carry out reading/seeing objects are concentrated at 100–300 lux. The light level for reading can be increased to 500–800 lux, for the concentration of light on the surface to be focused on can be at a level of 800 to 1,700 lux. For adult bedrooms require lower lighting to neutralize the user's body during sleep, around 100-300 lux for general lighting and 500 lux for task lighting. On the other hand, a child's bedroom tends to be a place for learning and also a child's sleep, so ambient/general lighting and task lighting will require around 500 lux (general) and 800 lux (task). For small needs such as dressing, make up, or reading a book that requires lighting from a table lamp or chandelier. This is often called task lighting where placing a chandelier or chandelier above the bed should be about 8-12 inches from the ceiling and can provide a beautiful decorative focal point. [5-8]

Then, add some lighting accents on various sides of the room, to create a calming and relaxing atmosphere. The use of lighting must also think about the atmosphere or 'color' of the lights used. Blue and white light can increase alertness and hinder sleep, while 'warmer' yellow light is more soothing, making it the perfect choice for a bedroom. To make general lighting in the bedroom, it can be like (1) overhead central lighting must be able to radiate light evenly throughout the room and must be connected to a dimmer switch, (2) there are floor lamps/floor lamps and chandeliers if they do not have lighting at a certain point. For task lighting, (1) special work areas, a desk lamp with a cooler color temperature can give more focus to the work at hand, (2) wardrobes and dressing tables, where wall sconces/LED strips positioned in front of the mirror can provide lighting to help a dress or apply makeup without creating harsh shadows. For accent lighting, (1) spreading light and setting the mood around the room will make the space feel bigger and more balanced, (2) use a chandelier or lampshade to complete the look, tie in fairy lights, or place LED candles around the room for a warm glow. [8-10]



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**TABLE 1.** Parameter Assessment based on National Standardization for Master Bedroom

| Category | Minimum |
|---|---|
| Lighting Levels | 120-150 lux |
| Color Rendering | Ra>85 atau 70 <Ra< 85 |
| Color Lighting | warm white or something warm |
| Color Temperature | 3500-4000K |
| Type of Lighting | have many layers |

**TABLE 2.** Parameter Assessment based on The Lightblub Company for Master Bedroom

| Category | Minimum |
|---|---|
| Lighting Levels (General;Task) | 100–300 lux ; 500-800 lux |
| Lighting Layers (type) | Floor lamp, Wall Sconces, or LED Strips |
| Lighting Layers | Another type of lamps |



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| | |
|---|---|
| Installation Distance | 8-12 inch/ 20-30 cm from ceiling |
| Misc. | even light in all corners of the room |

## RESULT AND DISCUSSION

From the results of the study of theories and methods obtained, all of them will be tested and tried to be compared with the design of the Casa Jardin Bekasi Main Bedroom.

(a)

(b)

**FIGURE 8.** Rendering Master Bedroom Bed View Casa Jardin Bekasi

**FIGURE 9.** Rendering Master Bedroom TV View Casa Jardin Bekasi

Look at picture (b), a rendering of the main bedroom of Casa Jardin Bekasi designed with layered lighting. There is general, task, and accent lighting. Everything has been carefully calculated to the total lux in this bedroom. The total lux for the general public in this room is 200 lux and 500 lux for duty. The color of the lights used is cool white (general) and warm white (task & accent) to give a warm impression. This is because all the lamps used must have a temperature of around 3500-4000K and create a sense of calm.

There is no table lamp in this bedroom because this room have not a working area. Then, there is no installation of wall sconces in the mattress and makeup area. There is an LED strip on the wardrobe shelf that attaches to the dressing area. There is a chandelier that mounts on the nightstand and a strip of LED light that is tucked into a wardrobe shelf.



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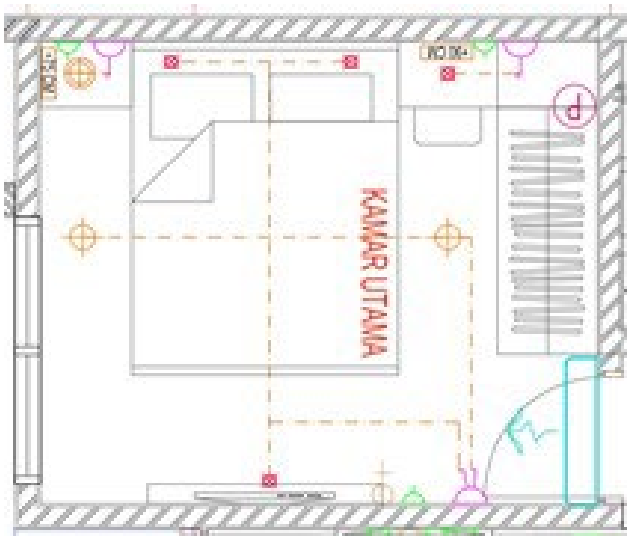


**FIGURE 7**. MEP Master Bedroom Casa Jardin Bekasi

Downlights are installed only at 2 points, this results in uneven lighting to the darkest point. There are no floor lamps or wall sconces either. However, they were replaced with pendant lamps on the nightstand and spotlights on the bed. This makes a very suitable substitute.

Following the data above, the research on the Minimum Lighting Level Recommended by BSN and the Ergonomic Level of Bedrooms Lighting was carried out in the master bedroom of Casa Jardin Bekasi by comparing all the theories

on trusted and researched websites. So the similarities between the standardization of BSN and Lightbulb Company with the reality in the design of Casa Jardin Bekasi will be described in the following tables.



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**TABLE 3.** Comparison of the Minimum Bedrooms Lighting Level Parameters with The Existing Lighting in The Master Bedroom Casa Jardin Bekasi

| . Parameter Assessment based on National Standardization for Master Bedroom | The Current Condition of Casa Jardin Bekasi's Main Bedroom | Compatibility with Parameters |
|---|---|---|
| Lighting Levels | 200 lux (general) ; 500 lux (task) | Compatible |
| Color Rendering | cool white (general) dan warm white (task& accent) | Compatible |
| Color Lighting | cool white (general) dan warm white (task& accent) | Compatible |
| Color Temperature | 3500-4000K | Compatible |
| Type of Lighting | Apply general, task and accent lighting. | Compatible |

**TABLE 4.** Comparison of the Parameters of the Ergonomic Level of Bedrooms Lighting with The Existing Lighting in the Master Bedroom Casa Jardin Bekasi

| Parameter Assessment based on The Lightblub Company for Master Bedroom | The Current Condition of Casa Jardin Bekasi's Main Bedroom | Compatibility with Parameters |
|---|---|---|
| Lighting Levels (General;Task) | 200 lux (general) ; 500 lux (task) | Compatible |
| Lighting Layers (type) | LED Strips on wardrobe racks | Compatible |
| Lighting Layers | Pendant lamp is above the nightstand and spotlight | Compatible |
| Installation Distance | The chandelier above the nightstand is installed 2m from the ceiling | Not Compatible |
| Misc. | Downlights are installed only at 2 points and are not evenly distributed | Not Compatible |

## CONCLUSION

The conclusion of this research is based on the data that has been collected. The main bedroom of Casa Jardin Bekasi is quite consistent with the existing parameters and compiled by experts to get optimal lighting design results in the future. The years keep changing, the design style also follows the trend and must also follow the existing standards as summarized by BSN and Lightbulb Company as a parameter.



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