

Lecture Notes in Civil Engineering

Elham Maghsoudi Nia
Mokhtar Awang *Editors*

Advances in Civil Engineering Materials

Selected Articles from the
7th International Conference
on Architecture and Civil Engineering
(ICACE 2023), Putrajaya, Malaysia

Editors:

- [Elham Maghsoudi Nia](#),
- [Mokhtar Awang](#)
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- Presents selected articles from the 7th International Conference on Architecture and Civil Engineering 2023 (ICACE 2023)
- Provides recent advances in circularity, energy retrofitting, building materials, and transportation innovations
- Includes contributions from both industry and academia

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About this book

This book showcases the latest research in civil engineering and architectural materials, with a specific focus on the following key areas: circularity, energy retrofitting, building materials, structural advancements, and transportation innovations. The research findings and advancements presented in this book are a part of the 7th International Conference on Architecture and Civil Engineering (ICACE 2023), held on 15 November 2023 at the Everly Hotel Putrajaya, Malaysia. This conference serves as a prominent platform for researchers, professionals, and industry experts to exchange knowledge and ideas in order to advance the fields of civil engineering and architecture.

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Applicability of Architectural Design Features in Contemporary Luxury Houses



Mervyn Wong Hsin Jyi, Joy Natalie Cotter,
Mohd Afzan Noorawavi B. Mohamed, and Leng Pau Chung

Abstract This paper investigates the applicability of architectural design features in luxury houses through a case study methodology. This study aims to identify and understand the design principles and aesthetics that influence the design of luxury houses. The case study approach involves the analysis of three luxury contemporary houses in Sarawak, each with unique architectural designs. According to the research, seven elements of designing a luxury house were explained. These include security factors, the volume of space, building materials, façade design, interior design, courtyard, and landscape design. These design aspects are achieved by paying close attention to detail and focusing on creating an atmosphere that promotes the resident's way of life. The research also emphasizes the significance of implementing sustainable design approaches, which contribute to environmental sustainability and increase the value of luxury home designs. In the context of creating more resilient architecture in the future, passive luxury house design can be an effective way to mitigate the risks of extreme weather conditions. Several passive design strategies were implemented and discussed in this paper to create an energy-efficient, comfortable, and healthy building without relying on active systems such as heating and cooling. This study provides an in-depth analysis of the design elements that are considered essential in luxury house design. The findings of this study can be useful for architects, interior designers, and developers in creating more resilient and sustainable luxury houses that meet the expectations of discerning clients.

Keywords Luxury house · House design · Resilient architectural · Home

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1 Introduction

Luxury private houses are a symbol of prestige, wealth, and exclusivity. These homes are designed to offer an exceptional living experience, with luxurious amenities, high-end finishes, and unparalleled comfort. While luxury homes are not a new concept, the increasing affluence of the global population and the rise of new technologies have contributed to a new era of luxury private houses. The concept of luxury is normally associated with higher prices, exceptional quality, pleasure, exclusivity, aesthetic beauty, and strong emotional and symbolic attachments [1]. Today, luxury private houses are more than just grandiose mansions; they are a reflection of the owner's personality, lifestyle, and values.

Luxury houses are defined as residential properties that offer a high standard of living, exceptional design, and top-notch amenities. These homes typically boast a larger than average size and are strategically situated in exclusive neighbourhoods or private estates. Luxury homes can be found in a variety of architectural styles, from contemporary to classical, and feature upscale finishes, state-of-the-art technology, and expansive, spacious outdoor spaces. High-Net-worth individuals are increasingly looking into safeguarding their wealth by investing in real estate opportunities. Over the years, this has increased demand for luxury private mansions in secure, prime locations. The appeal of luxury private houses is bolstered by the calibre of its design and architecture. The aesthetic appeal of a luxury home is a critical factor that decides its overall value and attractiveness. The architecture style and design play a major role in creating a sense of grandeur, opulence, and sophistication that can distinguish the property from other homes in the market.

Functionality, beauty, and sustainability are facets of a well-designed luxury property. A well-designed luxury home should be visually stunning and fulfilling the basis of functionality and practicality. The architectural design of a luxury house should consider the lifestyle and needs of its residents, ensuring that the layout, features, and amenities are conducive for comfortable living. For instance, architectural ticket items such as open floor plans, expansive windows, and outdoor living spaces may further enhance and amplify the functionality and liveability of a luxury home. According to Karan, [2] a home is a place of security and comfort, a sanctuary from the outside world where we can relax and be ourselves. It is often closely tied to our sense of identity and self, and the way we decorate and maintain our homes can be regarded as an outlet to express our individuality and personal style. This is especially significant in luxury homes as these properties typically incorporate innovative design features that set them apart from other homes. Recent technological advances have allowed for the use of cutting-edge materials, advanced construction techniques, and technological innovations to establish a sense of modernity and exclusivity. For instance, the integration of smart home technology, energy-efficient systems, and sustainable design features may elevate the worth and appeal of a luxury home.

Table 1 Seven design elements of the luxury experience in contemporary homes that will be discussed

No.	Design elements
1	Security factors
2	Volume of space
3	Building material
4	Facade design
5	Interior design
6	Courtyard design
7	Landscape design

The architectural design of a luxury home should also aim to give its residents a memorable and exceptional experience. The use of distinctive materials, creative spatial layouts, and bold design elements amalgamate to create a standout property, a one-of-a-kind luxury home that is tailored to the needs of the house owner (Table 1).

2 Methodology

This paper observes the case study of three luxury houses designed by award-winning architects, Design Network Architects (DNA), Malaysia. The three sites are located in Sarawak and have the same criteria in terms of climates, material availability, and authority compliance. This will distinctly identify the principles of designing luxury contemporary houses. The identity of the houses shall remain anonymous in this paper and will solely be labelled as A House, B House, and C House hereafter (Fig. 1).

3 Results and Discussion

3.1 Security

Due to their prominence, security provisions are highly essential for expensive houses. From the three houses mentioned above, a common thread is the provision of a perimeter security system such a closed-circuit television system (CCTV) to protect their residence around the clock. All external doors and externally facing laminated glass windows are typically equipped with shatter-proof glass, alongside a highly customizable, heck-proof closed-network alarm system. These houses often employ 24 h security watchmen, providing security guard houses to further reinforce the safety of the residence. Apart from the safety elements that were mentioned above,

Description	Picture
<p style="text-align: center;">A House Year of completion: 2019</p>	
<p style="text-align: center;">B House Year of completion: 2020</p>	
<p style="text-align: center;">C House Year of completion: 2010</p>	

Fig. 1 Shows the houses designed by design network architects S/B

it is commonplace for these bespoke houses to have requisites such as a panic room, panic buttons, electrical fencing, infrared or motion sensors, and other eligible safety systems. These are subjected to and intricately tailored to the frequencies and patterns of the house owner’s daily routine (Fig. 2).

3.2 Volume of Space

According to Ehteshami [3], humans notice spaciousness through the volume of space. Empowering space is one of the fundamentals of contemporary architecture. This design concept primarily embraces the concept of having a gorgeous, warm, and unrestricted interior environment. The incorporation of this design has beneficial properties, influencing the residents’ manner of life in a positive way. A common feature of grand entrances is that they often offer high, lofty, and generous spaces



Fig. 2 Shows the security guard’s house before entering A House

along the entryway, allowing for a grand impression. In the architectural language, when the ceiling is about twice as high as the ceilings in the other rooms, a double-height space is formed, allowing for soaring, open space, and striking natural light. There are numerous reasons why double-height homes have become so popular in-home construction. High ceilings have the propensity to make conventionally sized rooms seem larger and allow for the installation of clerestory windows and skylights, essentially inviting an abundance of natural light into the home and thereby saving electricity whilst reducing overall living expenses. Furthermore, the addition of high ceilings opens a broad range of creative interior design options, adding a distinctive feature to the home. A common attribute is the installation of chandelier lights from the ceiling as a visual focal point to create a luxurious feel for the interior (Fig. 3).



Fig. 3 (Left) A House with chandelier lights hanging above the formal living space. (Middle) B House with feature pendant lights hanging above the family living space. (Right) C House with a double-storey feature wall and pendant lights at the entrance lobby



Fig. 4 (Left) A House with onyx stone with a light penetrating through at the bar counter, while marble flooring is used as their main material for flooring. (Middle) A House with a glass lift and teak wood as flooring in the living area. (Right) B House with a teak wood door and marble flooring at the entrance lobby

3.3 *Building Material*

The selection of building materials plays a large part in creating a luxurious environment within a place of residence. Ticket items such as aluminium doors and windows, roofing materials, timber doors, ironmongery, sanitaryware, and various floor, wall, and ceiling finishes are selected from a higher range. This is to ensure that the built quality remains on par with the aesthetics. Natural resources such as stone, marble, and granite are used as feature items, showcasing their beauty and elegance. Natural materials like timber also add value and longevity to the aesthetic of a building. Some timber variants such as Merbau wood, teak, and oak are often utilized as internal flooring. Other quality variants favoured for outdoor use include Belian and bamboo decking (Fig. 4).

3.4 *Façade Design*

Another crucial aspect of luxury residences includes the design of the Façade. Facades play a significant role in defining the overall identity and to a larger extent, the functionality of the building. Façade design is also a vital component of contemporary architecture. Facades are not only crucial in dictating the outward appearance of the building, but also serve to balance the internal comfort level of the house. In contemporary architecture, the design of the façade depends on a number of factors, including but not limited to the building's location, and innovative advancements in the fields of materiality and technology. The amalgamation or study of these aspects then leads to the creation of energy-efficient, visually striking facades. The field of facade design encompasses sustainability, art, and science, resulting in buildings that are visually breath-taking yet practical. This paper will briefly discuss some of the crucial aspects of constructing luxury houses (Fig. 5).



Fig. 5 (Left) A House with a cantilever seam roof in which the roofing edge extends beyond the house’s exterior walls. (Middle) B House with a facade sunscreen attached to the exterior of the house. (Right) C House with a big canopy roof over the external faces of the house that provides an aesthetic form of shading from the hot climate

3.5 Interior Design

In luxury architecture, interior design works to create a space that is a reflection of the owner’s personality and lifestyle while also providing comfort and functionality. A common thread among the three houses mentioned above is the focus on high range materials, delicate, fine craftsmanship, and attention to detail. The cohesion of these factors comes together to form an elegant space that seamlessly complements the building exterior. In contemporary houses, neutral colour palettes and simple shapes are often put into play, and strong pops of colour and texture are used to draw attention and create visual interest. The overall role played by interior design is to create spaces that are both stylish and practical. Contemporary homes place a strong emphasis on open floor layouts and place priority on ample natural lighting (Fig. 6).



Fig. 6 (Left) A House with a double volume space and interior finishes clad with wallpaper laminated panelling and anodized gold colour stainless-steel panels. (Middle) B House with a warm interior concept in bathroom by applying timber finishes into the space. (Right) C House with a living space that embraces the natural elements and harnesses the sun and wind as part of the living experience



Fig. 7(Left) A House with a courtyard planted with *Diospyros buxifolia* and water feature clad with lava stone. The courtyard also serves as a private play area for the family members. (Middle) B House with a *Tristania obovata* tree planting with surrounding limestone ground cover. (Right) C House courtyard offers a Belian timber table and seating shaded with *Cratoxylum*

3.6 Courtyard Design

Courtyards are an extension of the home that add value to a house beyond giving access to natural daylighting [4]. Courtyards influence the level of affluence within the residence and serve to create an outdoor sanctuary in the midst of a house. Courtyards typically function by creating seamless integration between the indoors and the outdoors, breaking up the monotony of rigid space by introducing organic shapes. Simple and sleek elements like glass walls and sliding doors are leveraged to render a seamless integration with the outdoors. Various rooms in the building may benefit from it if located strategically or centrally. According to Chinedu [5], the benefits of courtyard are far too many. It creates sustainable impact into the building. The incorporation of key elements of greenery, water bodies, and comfortable seating enhances the spatial dynamics to form a tranquil oasis. The outcome is a place that, amid the hustle of modern life, gives privacy, beauty, and a sense of peace (Fig. 7).

3.7 Landscape Design

Landscape design in contemporary houses functions to enhance the relationship between built and natural environments. An idyllic outdoor space that complements the modern aesthetic of the building is fostered from a few key components. In order to achieve a harmonious balance between the formulated environment and the natural landscape, a conscious use of clean lines, minimalistic planting arrangements, and natural materials like stone or wood is employed. Additionally, incorporating attributes such as water features, suitable outdoor lighting, and sustainable design approaches result in a lush green area that enhances the quality of life and increases the property's aesthetic appeal. The homogeneity of these features comes together to form a landscape that is both alluring and conscious of the environment (Fig. 8).



Fig. 8 (Left) A House with a decorative vertical water feature wall for visual and acoustic effect. (Middle) B House with koi fish pond adds a beautiful, tranquil element to the house. The sight and sound of water, fish, and plants can create a relaxing atmosphere that enhances the living space. (Right) B House with a swimming pool that provides a fun and enjoyable outlet for entertainment and relaxation. It can also serve as a relaxing retreat, allowing you to unwind after a long day and providing a peaceful oasis in your own backyard. Additionally, the indoor living area overlooks the courtyard's swimming pool for scenic views

4 Conclusion

In conclusion, luxury house design is a field that involves creating upscale homes that provide the ultimate in comfort, style, and sophistication through innovative design. With a precise attention to detail, luxury residences are meticulously crafted by employing premium materials, and integrating cutting-edge technology and amenities to surpass the highest benchmarks in luxury living. As urbanization and rising affluence lead to a rise in demand for luxury homes, more and more people seek to establish a lifestyle that blends comfort with luxury. A signature mark of luxury homes is a combination of classic and contemporary design elements, creating a personalized yet highly distinctive living space that mirrors the owner's unique tastes and lifestyle.

However, a few challenges are posed while designing a luxury residence. Striking a harmonious balance between opulence, luxury, functionality, and practicality requires meticulous planning and keen attention to detail. To skilfully execute this, an experienced team of architects, builders, and designers plays a crucial role to ensure that every detail is thoroughly considered, and the highest standards of quality are met.

Ultimately, luxury homes are considered to be the pinnacle of design and architecture that offer a sense of comfort, elegance, and style unrivalled by any other. These remarkable places are where one can unwind, entertain, and savour life's pleasures within the comfort of their own home. Luxury house design is a fascinating, constantly evolving field, and with the right team of professionals, it is possible to create an outstanding home that is a work of art.

References

1. Choo HJ, Moon H, Kim H, Yoon N (2012) Luxury customer value. *J Fash Mark Manag Int J* 16:81–101. <https://doi.org/10.1108/13612021211203041>
2. Jain K (2023) Psychology and philosophy of home
3. Ehteshami A (2019) The influence of interior design on house
4. Gunasagaran S, Saw ES, Mari T, Srirangam S, Ng V (2023) Courtyard configuration to optimize shading, daylight and ventilation in a tropical terrace house using simulation. *Archnet IJAR* 17(1):109–123. <https://doi.org/10.1108/ARCH-12-2021-0354>
5. Chinedu Alozie G (2020) Environmental architecture: courtyard as element of sustainable energy efficient building development. *Am Eur J Agric Environ Sci* 20:56–61. <https://doi.org/10.5829/idosi.ajeaes.2020.56.61>