
Material is Language: Evaluating the Correlation Between Building Materials and Affordances in the Tropical Environment

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Abstract

In tropical design, the selection and application of building materials are important in enhancing spatial function and adaptation to the climate. Building materials, as a language, communicate the intended use of space to its users through their properties. For example, steel railing may evoke confidence among users due to its durability, whereas glass railings may evoke caution prompting its users to behave differently. This phenomenon reinforces the theory of affordance. In design, affordances are defined as the possible actions of a user on an object's qualities, such as shape, texture, and form. The purpose of this study is to investigate the correlation of materials and affordances in the tropical context and discuss this through the case studies of three different community centers: The Commons Thonglor and The Commons Saladaeng both in Bangkok, and the Corner House in San Juan, Metro Manila. The conclusions were derived through triangulating the data across different methods of procuring information such as archival studies, ocular inspections, and an interview with the architect. The researchers analyze the affordances of materials in these cases by categorizing them into visual, tactile, spatial, and behavioral aspects. This analysis reveals the duality of affordances, distinguishing between intentional affordances (the planned properties proving design effectiveness) and emergent affordances (the unforeseen uses proving design adaptiveness). The findings demonstrate that this duality leverages material properties into architectural design, establishing intentional affordances to guarantee climate and safety mandates, while allowing emergent affordances to promote social resilience. This study proves how materiality influences the creation of spaces to adapt to the tropical climate while optimizing user function and flexibility through spatial interactions.

Keywords: Affordance, Materiality, Tropical Design, Adaptability, Space Utilization

I. Introduction

A. Background of the Study

Architecture in tropical climates is shaped by the need to address heat, humidity, and natural surroundings. In the Philippines, despite being historically heavily influenced by foreign cultures, the architecture shares a common theme - adapting to the tropical climate. The Bahay Kubo, the Bahay-na-Bato, and the Gabaldon all exhibit design features that respond to tropical climate such as cross-ventilation, wide windows, and high ceilings (Lico, 2021). In comparison, the architecture of Thailand has evolved in response to the tropical climate. Traditional Thai architecture employs steep, multi-tiered roofs to deflect rain, as well as elevated floors to protect against flooding. These traditional design practices have evolved over time through Western influence. In the contemporary age, Thai architecture incorporates the use of modern materials and technologies to adapt to the changing tropical climate.

One of the firms that is guided by the principles of modern tropical design is the Department of Architecture. One project - The Commons Thonglor, a community mall that features an expanded metal facade to maximize natural ventilation. Another project, The Commons Saladaeng was built featuring the use of corrugated sheets as a homage to the site's history (Archdaily, 2024). The Department of Architecture later on collaborated with Filipino firm, BAAD Studio to design the Corner House in San Juan. This community mall features white finishes and glass to allow more natural light inside the building. All three buildings highlight how materiality interacts with individuals through the built environment, a phenomenon known as "affordance". According to Gibson (1977), affordance is an opportunity of what a space offers to an individual and how they perceive their environment directly through simple and clear interpretation. In architectural design, affordances can be experienced through the materials to guide how users interact with the space. This theory is important to understand how materials and design strategies influence spatial function.

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B. Statement of the Problem

The need for buildings to adapt and respond to the tropical setting is essential for buildings to withstand the potential effects of climate while optimizing user function. Hence, the general problem for this study is the resistance of applying adaptable building materials in community spaces within the tropical environment. This will be explained through a macro-to-micro approach ranging from community to materiality.

1. The Need for Community Spaces

With the rapid population growth in developing Asian countries due to urbanization, the scarcity of land has become a challenge. In Manila, for example, where the population density is as high as 42,857 people per square kilometer (Rao, 2024), the density is driven by its role as the capital city and a central financial and commercial hub. Given its compact area of 38.55 square kilometers, the city is one of the densest cities in the world (Homer, 2024).

This dense urban environment further exacerbates the challenge of horizontal growth, which puts pressure on available land, which could have negative implications for the environment (National Geographic, 2009), as the remaining available spaces for landscapes are limited. On the other hand, the challenges associated with vertical development include high congestion, limited accessibility, and greater infrastructure demands. Although vertical development is an effective solution for providing additional space in areas with limited horizontal expansion (Zambon et al., 2019), it is primarily driven by profit and tends to be more accessible to specific demographic groups.

As this rapid urbanization continues, there is also an increasing demand for accessible and multifunctional community spaces that promote social interaction, mental well-being, and recreation. Unfortunately, this need is often overlooked, resulting in inadequate design solutions that fail to optimize available land's spatial and social potential. Many urban areas, therefore, miss opportunities to enhance social cohesion and activity in these spaces, which could otherwise serve various communal functions.

2. The Underutilization of Spaces

Urban designers, architects, city authorities, and planners in many cities today face the challenge of creating cohesive environments within urban cores, particularly when developing frameworks for new or redeveloped spaces (Krier, 1979). However, urban development often treats buildings as isolated entities rather than integrating them into the broader urban network of streets, parks, and open spaces (Carmona, 2010; Loukaitou-Sideris, 1996). As a result, public spaces are often poorly designed, turning into decorative fixes for areas that were never meant to be used by the public in the first place (Khalid, 2020). Khalid (2020) also stated that the mismatch between buildings and their surroundings creates what is called "antispaces," an urban area that feels disorganized and lacks a sense of unity. Khalid (2020) discusses the challenge of creating cohesive urban environments in city centers, where poorly planned,

disconnected spaces, or "lost spaces," arise unintentionally during planning. These isolated, underutilized areas often fail to serve their intended purpose (Khalid, 2020). According to Trancik (1991), the concept of "lost space" refers to these residual areas that are inadequately integrated into the urban structure, leading to a sense of disconnection and a lack of coherence in the overall city design. These spaces are left without assigned functions and are located adjacent to spaces with fixed, well-defined uses (Franck, 2006). Tibbalds (2010) argues that lost spaces negatively impact the urban experience, contributing to undesirable conditions such as trash accumulation, graffiti, illegal activities, pollution, and general neglect. Khalid (2020) emphasizes that these spaces often become psychological and physical barriers, disconnecting new and old urban developments, buildings, and activities.

3. The Resistance Towards the Application of Adaptable Materials in Designing Spaces that are Multi-Functional

Despite the benefits of using sustainable materials, several key barriers affect the transition towards adoption. Among these challenges are technical, economic, and regulatory hindrances that often delay the adoption pace (Taylor, 2024). These challenges include the persistence of traditional practices, limited awareness of material options, and a need to understand sustainable construction principles (Mahame et al., 2024). Selection and application of sustainable materials significantly affect their practical use in designing urban multi-functional spaces.

Understanding these barriers enables designers to devise strategies for alleviating their impacts and proactively facilitate the adoption of sustainable practices and the utilization of adaptable materials. By overcoming these barriers, architects can create more resilient buildings, reduce environmental impact, and help establish sustainable practices as the standard for future generations.

C. Research Aim & Objectives

The study aims to evaluate how the use of materials shapes the visual, tactile, spatial, and behavioral aspects of architectural affordances in the tropical context. This will be accomplished through the case studies of The Commons in Thonglor and in Saladaeng and the Corner House. The objectives for this research are formulated in progressive manner (See Section III).

- (1) To identify how materials are applied in the building design strategies.
- (2) To analyze the architectural affordance for each building.
- (3) To evaluate if these architectural affordances address the three problems presented in this study.

By the conclusion of this study, the researchers aim to uncover key insights into the role of materiality in developing functional, climate-responsive architecture suited to tropical environments.

D. Scope & Limitations

The scope of this research will focus on materials and architectural affordance. The extent of materials will encompass form-givers (exposed structural components) and general finishes. Specialty materials used in shops, concealed materials like insulation, are excluded from this study. Likewise, utility components such as lighting fixtures, plumbing, HVAC, and fire suppression systems are also excluded. In terms of spatial aspects, this study will only discuss publicly accessible customer areas, such as dining, lounging or general circulation spaces. Areas like utility rooms, private offices, service zones, and parking facilities are not included. The theory for this research will be grounded in the definition of Don Norman as opposed to J.J. Gibson (see II. Literature Review).

The main limitations of this study are defined by time and logistical constraints. The researchers were provided with a four-month time frame, which includes a single three-day visit to Thailand. During this visit, the team allocated four to five hours each at The Commons Saladaeng and The Commons Thonglor. Access to architectural plans and material specifications was limited, restricting the researchers to site observations. Furthermore, logistical constraints prevented the execution of user-based primary research, such as interviews or surveys. This necessitates the triangulation of the researcher's on-site observations with secondary data, including limited publicly available articles and a single, private Focus Group Discussion (FDG) with the professionals including the architect and contractors involved in the project to infer and confirm design intent.

II. Literature Review

A. Materials and Construction in Tropical Design

The selection of materials in tropical climates is important to address the unique environmental challenges such as heavy rainfall and extreme heat. The effective design and construction in such environments require a detailed understanding of material properties and techniques that can adapt to these conditions.

In order to adapt to the tropical environment materials must exhibit thermal performance, moisture resistance, sustainability, and low maintenance. Houben and Guillard (1994) cite various materials with significant thermal mass such as adobe, rammed earth, and concrete, which regulate indoor temperature by storing heat during the day and releasing it at night. According to Bay and Ong (2006) moisture-resistant materials, including treated timber, bamboo, and composites, are critical for withstanding high humidity and frequent rain, as they effectively resist mold and water damage. Surfaces such as light-colored or reflective materials can further reduce heat absorption, minimizing cooling demand.

Construction strategies should emphasize passive design, elevated structures, natural ventilation and lighting.

According to Riley, Cotgrave, and Farragher (2017) passive design approaches, such as incorporating overhangs, verandas, and louvered windows, mitigate the impact of direct sunlight and heavy rain. Elevated structures, prevent flooding, improve air circulation, and reduce heat transfer from the ground. Building orientation and design strategies like high ceilings and wide openings maximize natural airflow, minimizing use of artificial cooling systems. The use of highly glazed facades in buildings has long been criticized for thermal discomfort and increased energy consumption. Despite these issues, many buildings in warm and humid climates continue to use ordinary laminated glass with inadequate thermal properties (Riley, Cotgrave, & Farragher, 2017).

B. Tropical Design Strategies

Tropical climates present significant challenges such as high temperatures, high humidity, heavy rainfall, and intense solar radiation. The design strategies that will be discussed aim to create comfortable, energy-efficient buildings that respond to the natural environment. Fernandez III (n.d.) discusses the importance of maximizing natural ventilation. It is through this strategy that aspects such as proper wind flow and air circulation are harnessed inside the building through openings such as windows and doors. In design, more openings, especially on both sides, provide cross-ventilation as air enters and exits through the building. This strategy relieves the discomfort caused by still air, high humidity, and the lack of evaporative cooling from sweat. (Fernandez III, n.d.).

Another design strategy is the protection of the building envelope from solar radiation. This involves designing materials and forms that shield interiors from excessive heat. Reflective or insulating materials are used to reduce heat gain, while overhangs, louvers, and other shading devices provide additional barriers against direct sunlight (Fernandez III, n.d.). Vegetation is also a key strategy as a natural modifier of climate; strategically placed trees and plants can shade buildings and cool the surrounding environment.

Adaptable building forms and materials that react to local climate conditions should be applied. For example, lightweight materials that release heat quickly are often more suitable than dense materials that retain heat. Additionally, buildings should be designed to handle the challenges of moisture, which can lead to mold, rust, and material degradation (Na and Park, 2009). Durable and moisture-resistant materials are recommended, particularly in regions prone to termites and fungal growth.

These strategies are important for providing comfortable living conditions, especially in countries where reliance on mechanical systems is not economically feasible for most people. By designing with the climate, architects can design buildings that are both functional and environmentally responsive.

C. Theory of Affordances

In Gibson's book "The Ecological Approach to Visual

Perception" (1979) he defines affordances as the action possibilities offered by the environment which are directly perceived through interaction between users and objects. This theory emphasizes that the actions are done without the need for complex interpretations of an object (Gibson, 1979). This psychological definition was aligned with the aspect of design by Norman (1988). According to Norman, the qualities of an object such as its shape, texture, and structure suggest its function. These affordances not only offer possible actions but also aid in the behavior of how individuals use space (Norman, 1988).

As described by Norman (1988) this suggestion of action may stem from a variety of factors. (1) Visual affordances refer to the qualities of an object that are immediately recognizable through sight. An example would be the use of color that may influence the depth perception of a room.

(2) Tactile affordance refers to the qualities of an object that are perceived through the sense of touch (Frankel, 2023). Take for example, a rough road on which motorists tend to drive slower compared to smooth roads because of the material texture. (3) Spatial affordance refers to how the physical dimensions (height, width, depth) of architectural elements enable or constrain spatial use. For instance, the space underneath an escalator can be used as a retail space. (4) Behavioral affordances refer to forms or configurations that suggest a specific task. In an example mentioned by Norman (1988), the furniture arrangement can guide how people interact based on their proximity and navigating throughout the space.

For the purpose of this study, these general affordances are divided into two categories to analyze the architect's intent versus user response. These are defined as intentional affordances (the planned properties proving design effectiveness) and emergent affordances (the unforeseen uses proving design adaptiveness).

Based on the examples, Norman (1988) shows why affordances are important in design because they guide designers to simplify the interaction between users and objects. In tropical design, affordances can be used to adapt to the climate while optimizing user function through simplified spatial interactions.

III. Research Design & Methodology

A. Research Design

The approach for this study is purely qualitative and descriptive, as this study relies on the affordance theories based on the definition of Norman (1988). According to Creswell (2014), a theoretical model can be used to analyze behavioral or spatial patterns. In this way, the interpretation of the user's interaction with the space remains objective.

The study is based on the case studies of The Commons Thonglor, The Commons Saladaeng, and the Corner House because of their typology as community malls in a tropical country. These buildings were chosen due to their

accessibility and their consistent design approach, as they were designed by the Department of Architecture.

B. Methodology

For the primary source, the researchers employed a three-part methodology to ensure the architectural analysis is robustly grounded and triangulated from multiple viewpoints. The first part involved Ocular Site Inspections, where researchers conducted site visits to observe how materials were applied and to document user interactions. This provided the initial Researcher's Interpretation and empirical evidence for Emergent Affordances. The second part consisted of Secondary Data Collection, including archival research and theoretical analysis, utilized to validate observed data and provide historical and contextual grounding. This material was used to compensate for partial documentation, ensuring the research's integrity. The third part involved Expert Triangulation via a Focus Group Discussion (FDG) with the architect and contractors. This step was essential to validate the researcher's perceived affordances against the Intentional Affordances (proving the design's effectiveness), providing crucial insight into material selection rationale and overall design intent.

For data analysis, the researchers utilized various visualization methods to systematically identify and categorize affordances. This integrated approach, combining researcher observation, the architect's perspective, and archival data, allowed for the clear differentiation of Intentional and Emergent properties, aiding the understanding of the relationship between materials, affordances, and their impact on user experience in the tropical environment.

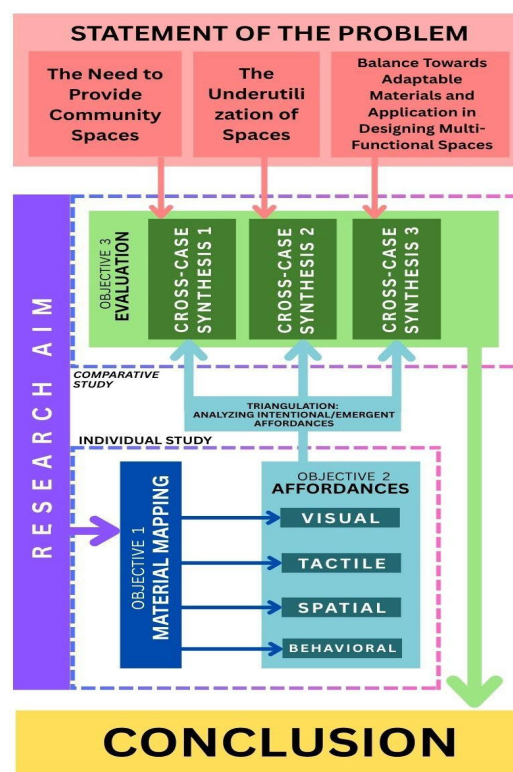


Figure 1 Research Framework

C. Research Framework

This study stems from the three problems identified in the introduction: the need for community spaces, the underutilization of space, and the resistance to adaptable materials for multifunctional designs. To address these problems, the research aim is formulated, which further leads to three objectives. The first objective focuses on identifying the materials used in the design strategies of each building through material mapping and material tabulation. The second objective analyzes the architectural affordances of each building by categorizing them into visual, tactile, spatial, and behavioral aspects. The researchers employed a triangulation of archival studies, ocular inspections, and an interview with the architect, using this process to identify and differentiate intentional and emergent affordances. The third and last objective involves evaluating these intentional and emergent affordances through a cross-case synthesis between all buildings. To conclude, the three initial problems are compared with the analyzed affordances. This holistic evaluation provides insights into the effectiveness of materials in enhancing functionality and addressing key spatial challenges in tropical architecture.

I. Overview of the Buildings

A. The Commons Thonglor

In 2015, The Commons Thonglor was built to respond to the increasing need for community spaces that cater to the lifestyle of its users. It is located in the neighborhood of Thonglor, which has a reputation for being a cosmopolitan neighborhood with upscale dining options, boutique shops, art centers, and a vibrant nightlife (Archdaily, 2016). The site has an approximate area of 1,800 square meters and is surrounded by mid to low-rise residential blocks and a few high-rise buildings. The community mall is accessible via Soi Akkhara Phatsadu, a two-way road.

According to ArchDaily (2016), the building's design concept is to create a vertical open-air public space that seamlessly integrates with its tropical surroundings. The structure comprises four floors, with circulation spaces being outdoor while shops, restaurants and activity centers are indoors. The zoning of the structure can be distinguished from high to low commercial activity: the first two floors house dining and retail establishments. The third floor is dedicated for leisure activities such as yoga, a gymnasium, and a children's playhouse; and the fourth-floor features more passive activities.

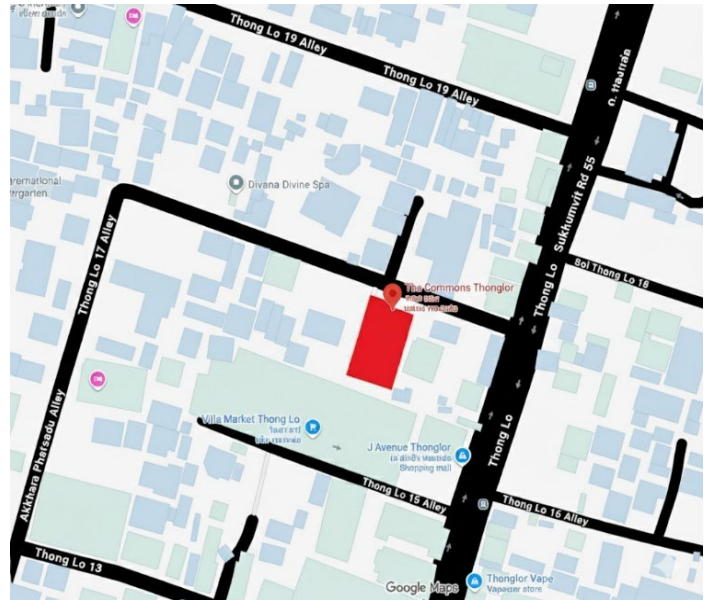
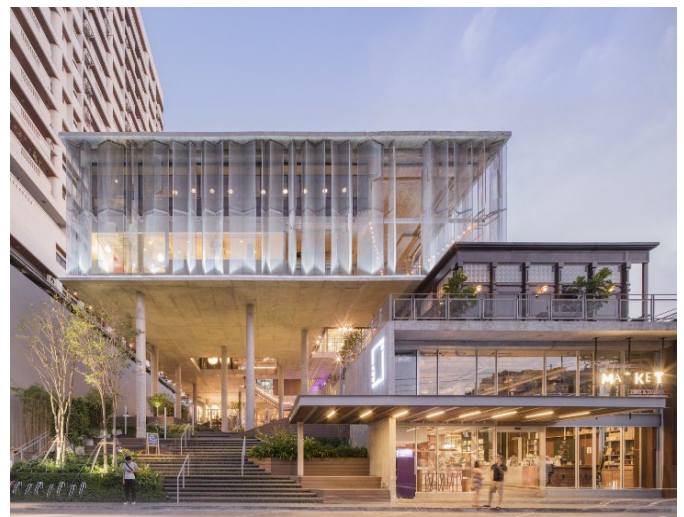


Figure 2 Map of The Commons Thonglor.

Note: Enhanced Google Maps imagery. From [Google Maps of The Commons Thonglor], by Google, n.d. (<https://www.google.com/maps>). Copyright 2025 by Google.

Figure 3 Exterior view of The Commons Thonglor.



Note. View of the central courtyard and circulation. From The Commons / Department of ARCHITECTURE, by ArchDaily, 2016. Photograph by W Workspace. Copyright 2016 by Department of ARCHITECTURE.

B. The Commons Saladaeng

The Commons Saladaeng opened in February 2020, five years after Thonglor was established. According to Shelby (2023), both the Commons Thonglor and Saladaeng aim to bring back urban space for the community. This approach aligns with the second statement of the problem where there is a need for accessible public spaces in urban areas like the building's location in the Silom-Saladaeng neighborhood. The site of the Commons Saladaeng is approximately 1,500 square meters and is easily accessible via Soi Saladaeng. Unlike Thonglor, the immediate surroundings are characterized by dense, older commercial buildings and narrow service alleys, emphasizing the site's role as a sheltered, pedestrian oasis in a high-traffic urban core.

According to the architect, the architectural concept of the building pays homage to the area's historical railway station through the use of red gable roofs, while parts of the building include open-air communal areas (A. Luphaiboon, personal communication, October 26, 2024). The building has three floors that can be accessed through terraced outdoor spaces. These tiered terraces form the main, generous circulation path, which also functions as an amphitheater-like seating area. Unlike the one in Thong Lor, The Commons Saladaeng offers a more limited range of commercial activities, primarily focused on food and beverage. However, the establishment also organizes community activities such as yoga classes, cooking workshops, and monthly jogging events.

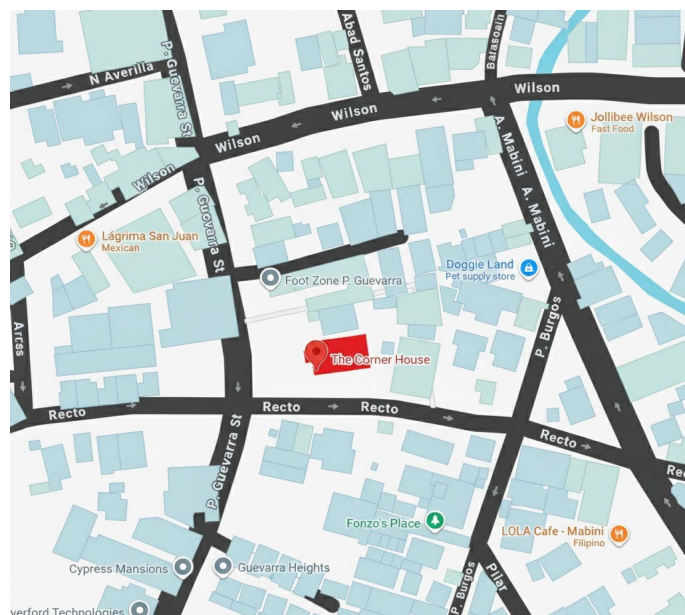


Figure 6 Map of The Corner House.
Note: Enhanced Google Maps imagery. From [Google Maps of The Corner House], by Google, n.d. (<https://www.google.com/maps>). Copyright 2025 by Google.



Figure 4 Map of The Commons Saladaeng.
Note: Enhanced Google Maps imagery. From [Google Maps of The Commons Thonglor], by Google, n.d. (<https://www.google.com/maps>). Copyright 2025 by Google.

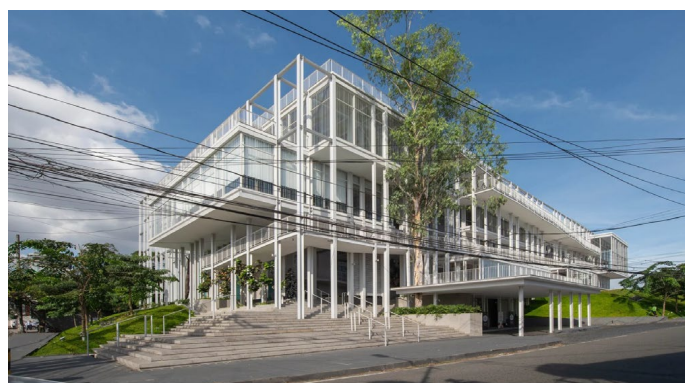


Figure 7 Exterior view of The Corner House.
Note: The facade design featuring a rhythmic arrangement of vertical fins to mitigate solar heat. From The Corner House, by Kanto, 2024 (<https://kanto.ph/>). Photograph by Ed Simon. Copyright 2024 by Department of ARCHITECTURE and BAAD Studio.

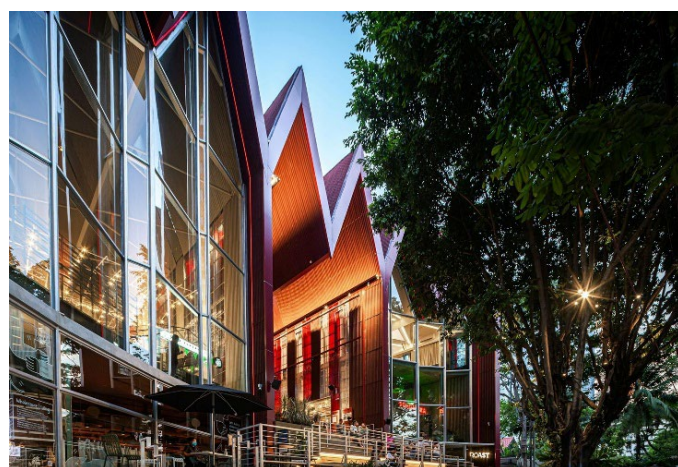


Figure 5 Exterior view of The Commons Saladaeng.
Note: Exterior view From The Commons Saladaeng / Department of ARCHITECTURE. <https://www.archdaily.com/944699/the-commons-saladaeng-department-of-architecture>

C. The Corner House

The Corner House opened in 2023 where construction took place during the pandemic (Concengco, 2024). The architect first visited San Juan in 2016 to study the local conditions and ensure the building would thoughtfully respond not only to Manila's predominantly warm climate but also to its often-challenging wet seasons (A. Luphaiboon, personal communication, October 26, 2024). The San Juan area is surrounded by smaller commercial establishments and upscale subdivisions, creating a unique establishment within the area. The structure is situated on a sloping site and occupies a 2,000-square-meter lot. The sloping topography means the ground level is accessible both via a main street-facing entrance and a secondary, higher-elevation entry point at the rear.

The architect envisioned an alternative to traditional

shopping malls—a space where children can play, people can reflect and socialize, and residents can jog (Kasingking, 2024). The Corner House features two floors of parking, four levels of leasable commercial spaces, and a rooftop designed to host special events. The commercial floors are wrapped by open, covered walkways that function as public balconies, prioritizing peripheral circulation and exposure to the external climate. On weekends, the building's lobby transforms into a pop-up market selling handcrafted souvenirs and pre-loved clothes, which are particularly popular among young adults.

V. Analysis of Materials & Affordances

A. Visual Affordances

A.1 Visual Permeability in The Commons Thonglor

The application of concrete in The Commons Thonglor significantly influences visual perception based on how its finish interacts with light. For instance, polished concrete reflects more light due to its smooth texture. This finish is mainly used on walls facing outdoor areas. Conversely, the bare concrete ceiling at the ground floor is illuminated at night by lighting poles pointing toward the overhead surface. This additional light enhances the space's brightness through the resulting diffused light from the ceiling (Figure 8).

Beyond concrete, other materials offer specific visual affordances. The steel angle bar railing's slenderness and the expanded metal facade's permeability increase the visibility of the building vistas while securing boundaries. Glazing materials like tempered glass for the shops ensure transparency between indoor and outdoor spaces. Similarly, acrylic sheets beneath the louvers and industrial fans diffuse natural light (Figure 9).

In a tropical context, the steel and glazing materials permit natural light to penetrate the entire building, enhancing the interior view. The overall result of these material choices is that the structure achieves thermal efficiency while maximizing views. The strategy uses the reflectivity of the polished concrete and upward-facing lighting to brightly illuminate the underside of the main slab. This illumination directly supports the architect's concept of a "floating volume" and industrial theme. The alignment of materials, design strategies, and the architect's concept provides clear evidence of an intended affordance.

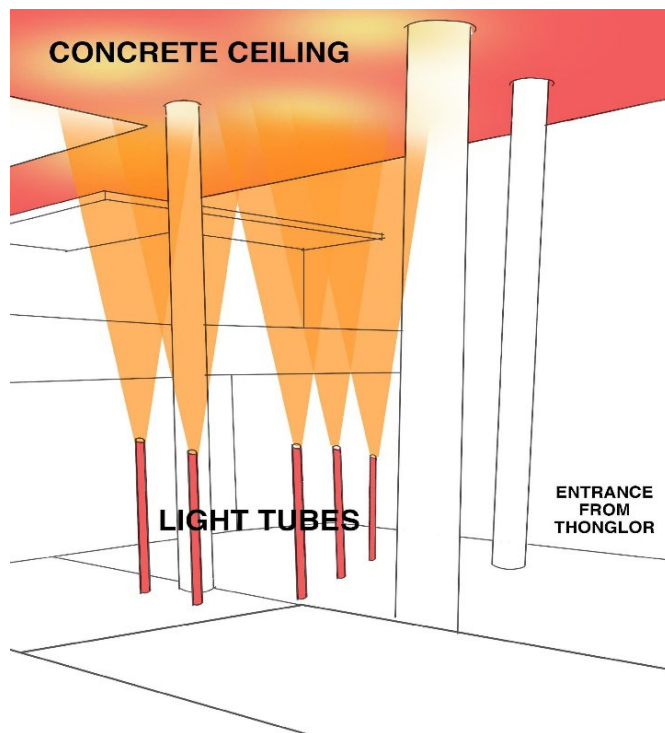


Figure 8 Diagram of light tubes illuminating the ceiling.

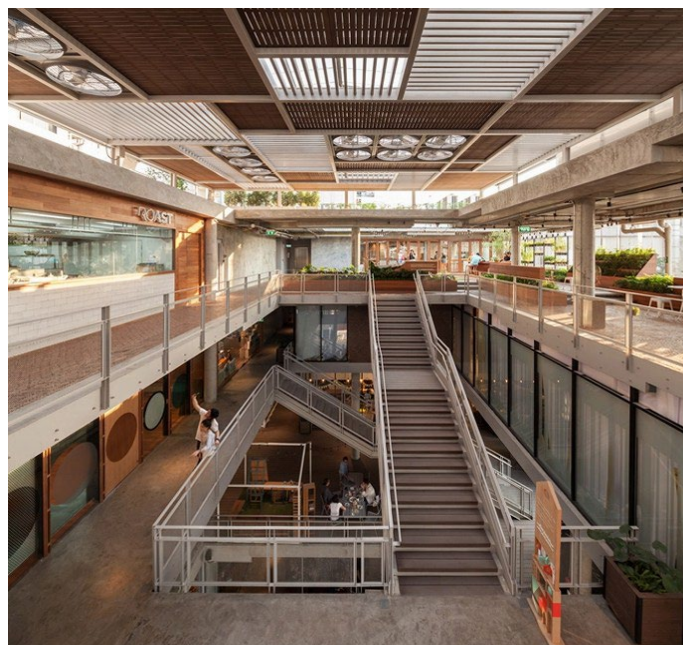


Figure 9 View of the atrium showing the building's ceiling with louvers and industrial fans.

Note. From The Commons Saladaeng / Department of ARCHITECTURE.
<https://www.archdaily.com/944699/the-commons-saladaeng-department-of-architecture>

A.2 Color and Transparency in The Commons Saladaeng

The Commons Saladaeng utilizes corrugated sheets for its walls and ceiling, a deliberate choice with strong historical associations. The material references the former Paknam Railway station that characterized the Saladaeng community, where it was extensively used. Beyond this

historical value, the material's affordances are multifaceted.

Its color is a key signifier differentiating indoor and outdoor functions. Specifically, red is applied to outdoor spaces, while white covers indoor areas (Figures 10 and 11). The communal areas use transparent corrugated sheets for walls and skylights, which provide a critical visual affordance by maximizing the penetration of natural light. The use of glass offers a similar visual affordance regarding light but further maximizes exterior views from the facade.

The material selection is also crucial for adapting to the tropical climate. Corrugated sheets are typically made from polycarbonate or acrylic, materials known for their high durability and resistance to UV radiation and weathering (Tjandraatmadja et al., 1999). In addition to natural light, the transparent materials contribute to energy efficiency by reducing the reliance on artificial lighting. The architect explicitly noted these material choices as a historical homage to the site; the incorporation of the red corrugated sheets and the building's gable form directly reference the former 'red pavilion' railway station (A. Luphaiboon, personal communication, October 26, 2024). This combination of visual design strategies, which enhance both functionality and social relevance, is a clear manifestation of an intended affordance.

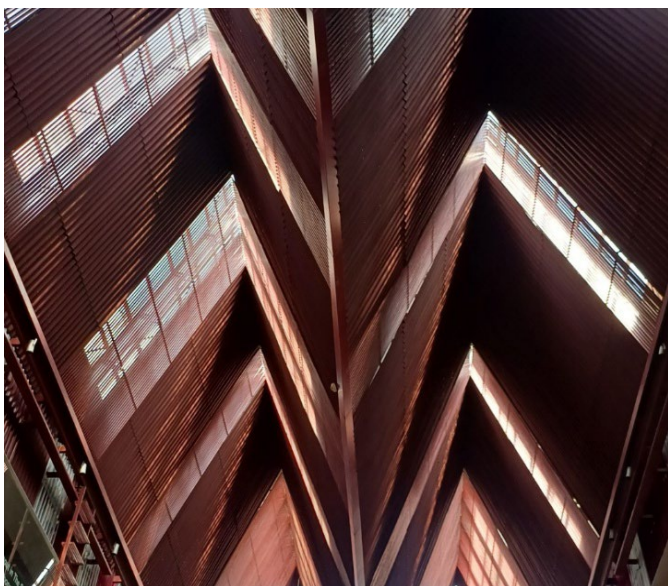


Figure 10 View of the common area ceiling of The Commons Saladaeng.

A.3 Play of Light and Color at the Corner House

The Corner House predominantly uses white paint on most building elements like columns, ceilings, and walls. This choice for vertical and overhead horizontal surfaces maximizes the reflection of natural light, brightly illuminating the interior. The enhanced brightness creates a visually open environment.

This white color also complements another design strategy:

colored acrylic sheets applied to skylight boxes on the fourth floor (Figure 12). The transparent, colored properties of these fixed boxes, which penetrate the ceiling, allow for a dynamic interplay of colored light to enter from various angles. The white surfaces make this colored light easily traceable, enhancing spatial perception and ambiance through light dynamics.



Figure 11 View of the interior space.

Unique among the three buildings, the Corner House features patterned decals on its glass. These decals are strategically spaced to provide shade, blocking harsh, direct sunlight at specific sun angles. This visual affordance simultaneously maintains indoor privacy and preserves a sense of openness.

For the architect, these color choices are complementary: the white finishes act as a highly reflective, neutral canvas to maximize ambient light, while the colored skylight boxes introduce a dynamic visual feature and enrich the ambiance through controlled colored light (A. Luphaiboon, personal communication, October 26, 2024). In tropical design, the Corner House effectively uses light and color to passively enhance brightness and strategically optimize spatial function and comfort. This highly controlled visual strategy, synthesizing reflective surfaces with dynamic colored light and climate-responsive shading, conclusively demonstrates the architect's intended affordance.

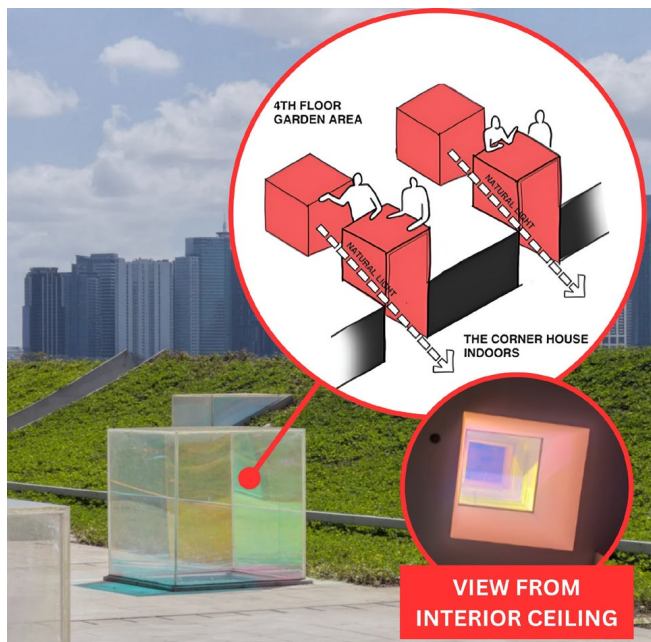


Figure 12 Diagram of how the skylight box works.
Note: Adapted from a photo by Kanto - Creative Corners, enhanced with additional diagrams.

A.4 Conclusion for Visual Affordances

In tropical design, visual affordances are critical for maximizing natural lighting, thus leading to energy efficiency. Beyond light maximization, the strategic choice of materials extends to thermal comfort, where tactile affordances regulate heat and counteract light absorption. The consistent use of materials like reflective concrete, historical corrugated sheets, and chromatic acrylic successfully realizes the architects' goals for light maximization and thematic identity across all three case studies. Furthermore, the result demonstrates the architect's mastery over material properties; visual decisions, such as high reflectivity and optimized transparency, were precisely calculated to passively manage light and heat. This conclusively establishes that the intended visual effect is inseparable from thermal performance, proving that maximizing views and brightness is a deliberate and integral part of energy-efficient design.

B. Tactile Affordances

B.1 The Polished Concrete and Pavers in The Commons Thonglor

The flooring materials in The Commons Thonglor serve functional purposes based on its surface property. The polished concrete applied in most of the dining areas at the ground floor provides easy maintenance because of its non-porous surface, which minimizes the accumulation of dirt, dust, and moisture. Since the space is for dining, the tactile affordance of its smooth surface enables easy cleaning. The last floor at The Commons Thonglor features brick and pavers for the flooring with various vegetation on select areas (Figure 13). The rough texture complements the passive use of the area, where users are meant to engage in sedentary activities such as gardening and dining (Figure 14). This

tactile affordance uses its texture to signify its purpose in encouraging mindfulness and deliberate interaction within the space.

The materials discussed realize the architect's intent to define distinct zones within the communal space based on their surface properties, which also includes efficient heat management and moisture resistance for the tropical climate. The tactile affordance of the materials, therefore, uses texture to signify purpose by ensuring low-maintenance cleaning in dining areas while encouraging slow, deliberate interaction and mindfulness in the passive upper-floor garden spaces. Collectively, this distinction of tactile zoning is a case of intended affordance because the material properties were purposefully selected to realize the architect's goal of managing distinct spatial functions.



Figure 13 The pavement flooring at the garden area.

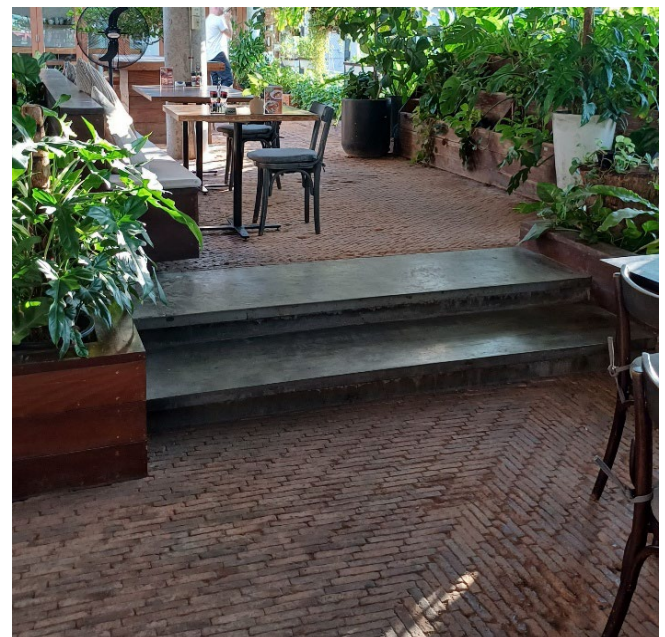


Figure 14 The pavement flooring in the garden area.

B.2 The Application of Pebble Wash Flooring in the Commons Saladaeng

The Commons Saladaeng has similar flooring materials to Thonglor. Most of the communal spaces use polished concrete with a similar affordance mentioned previously. The rougher surface however, like the pebble wash flooring at the garden area is a unique material for the building. Considering its location on the last floor surrounded by plants, the area is prone to moisture (Figure 15). The components of pebble wash consists of small stones or pebbles mixed with a cement or resin binder. These properties provide a tactile affordance of making the surface slip resistant, hence improving safety by reducing the risk of falls, particularly in wet conditions.

The use of pebble wash as a flooring material strategically realizes the design's intent to differentiate the passive garden space with a high-friction, naturally textured surface (A. Lupaiboon, personal communication, October 26, 2024). In this building, the intended affordance is manifested through the material's surface texture contrast and the spatial zoning that prioritizes safety and longevity in a wet, tropical



Figure 15. The pebble wash flooring at the garden area.

B.3 The Application of Earthcrete in the Corner House

The main flooring material for the Corner House is Earthcrete, used mostly for the outdoor common spaces (Figure 16). It is composed of a mixture of earth, cement, and natural fibers, hence creating its rough surface. This material is suitable for the building because it is exposed to weather conditions, where maintenance and durability would otherwise be an issue given the numerous openings of the façade. Critically, the rough texture of Earthcrete provides the tactile affordance of resistance to slippage, making the

continuous inclined paths and communal spaces safe to use. The use of Earthcrete, a textured architectural topping with a rough surface, serves a dual functional and climatic purpose. For tropical environments, its specific composition provides an ability to regulate temperature and humidity, aiding in the thermal comfort of the naturally ventilated spaces.

The use of Earthcrete, a textured architectural topping, strategically realizes the architect's intent to provide a durable, climatically adapted, and safe common space (Nas C., personal communication, November 4, 2024). The material achieves this by regulating temperature and humidity while offering the tactile affordance of superior slip resistance, which is critical for the continuous, high-traffic surface of the outdoor ramp and promenade. While tactile variations in the Corner House is limited compared to the other two buildings, the use of Earthcrete with its contextual use, material properties and architect's intent is an example of an intended tactile affordance.

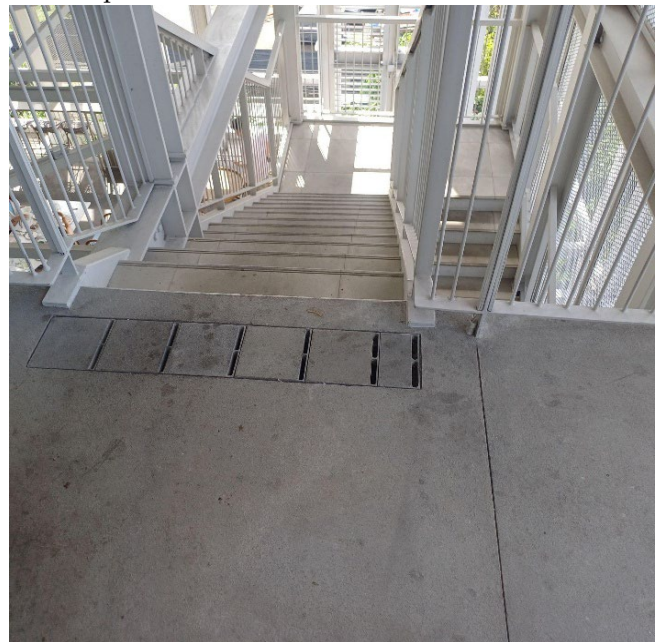


Figure 16 The earthcrete flooring at the common areas.

B.4 Conclusion for Tactile Affordance

The buildings discussed indicate how haptic sensation shapes the perception and functionality of a space. The various materials may vary in texture but share similar affordances because of their non-slip, weather resistant and durable properties. What distinguishes each material usage is based on its location, exposure to weather and spatial use. In tropical design, the variety of material textures can either regulate heat and resist moisture that reduce thermal absorption and probability of slippage when wet. These thermal properties have an immediate effect on the users because the interaction involves coming into physical contact with the material surface.

The consistent selection of materials, including polished concrete, pavers, pebble wash, and Earthcrete, confirms a high degree of architect's control over the user experience.

This establishes that tactile decisions are intentional and non-negotiable, prioritizing user safety and maintenance by engineering the surfaces to withstand moisture and high traffic. Furthermore, this material selection proves that the intended haptic experience is inseparable from climate mitigation, establishing texture as a primary thermal regulator in effective tropical design.

C. Spatial Affordances

C.1 The Concrete and Flat Slab Construction in the Commons Thonglor

As mentioned previously in this study, concrete is extensively employed for The Commons Thonglor. However, its use is not just material finish but also the main structural element of the building (A. Luphaiboon, personal communication, October 26, 2024). The researchers observed the building's use of flat slabs (Figure 17). This construction technique is capable of wider spans without the use of beams, hence provides a spatial affordance of wider unobstructed spaces.

With the vast space provided, an atrium was placed at the center of the building. On the succeeding floors, the main circulation space is placed around the perimeter of the atrium, thereby making user movement easier.



Figure 17 The use of flat slab columns.

In tropical design, these spatial affordances aid in air circulation. The flat slab construction increases ceiling height by eliminating large beams, which improves thermal comfort. Additionally, the atrium complements the flat slab by creating a stack effect, enhancing air circulation and keeping the building thermally comfortable. This use of structural elements for passive climate control directly realizes the architect's conceptual goal of the stack effect and maximized ceiling heights essential to the "floating volume" and semi-outdoor market concept (A. Luphaiboon, personal

communication, October 26, 2024). This architect's concept aligns with the use of flat slab and atrium to generate unobstructed space and passive cooling which justifies its intentional spatial affordance.

C.2 The Steel Terraced Form of the Commons Saladaeng

The Commons Saladaeng uses steel as its primary structural element, which facilitates its distinct, continuous gable form. This material allowed for larger spans by minimizing column and beam dimensions. This form provides a large, unobstructed view of the front tree and a high ceiling throughout the outdoor area. The decision to use this specific structural system directly addresses the architect's intent of having a large span to accommodate contemporary commercial space. To achieve this dual goal, the architects engineered a specially designed, prefabricated steel "M-shape roof structure" (A. Luphaiboon, personal communication, October 26, 2024; Figure 18). This system simultaneously provided the wide, column-free spans essential for a flexible modern floor plan and achieved the traditional aesthetic of small, continuous gables.

The architect maximized the usability of the terraced form, extending its functionality to the space beneath the upper floor. This creates a usable retail space within the building due to the beam's dimension while still retaining ample headroom, thereby optimizing the building's functionality (Figure 19). The spatial affordances in The Commons Saladaeng are a result of maximizing space enabled by steel construction. Similarly, the tropical response mirrors that of The Commons Thonglor, where increased ceiling height and wide, unobstructed spaces optimize natural ventilation by enhancing air circulation. This strategy of creating flexible, column-free commercial space while optimizing thermal comfort justifies the intentional spatial affordance of the building.



Figure 18 An upper view of the building showing the "M-Shape roof structure"

Note. From The Commons Saladaeng / Department of ARCHITECTURE. <https://www.archdaily.com/944699/the-commons-saladaeng-department-of-architecture>

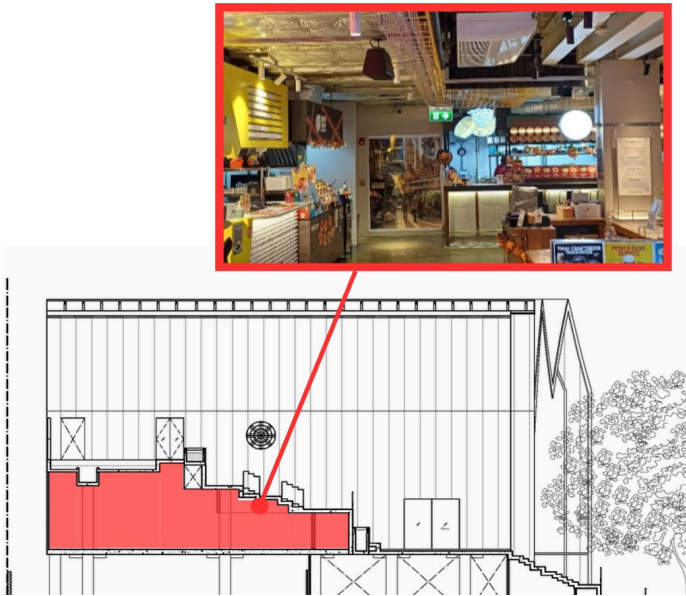


Figure 19 A section drawing showing the location of the commercial spaces underneath.

Note: Adapted from an architectural drawing by the Department of Architecture Co. Enhanced by the researchers.



Figure 20 A view of the interior showing the location where the spatial affordances were applied.

C.3 The Steel Elements in the Corner House

The Corner House utilizes the same steel framing construction technique as The Commons Saladaeng. However, The Corner House's spatial affordance maximizes space even through the material's form. For example, the void between the flanges of the steel I-section columns provides convenient locations for power outlets and storing fire extinguishers (Figure 20). This highlights that the columns serve more than structural support; the void is used for additional storage and installation.

Several spatial affordances are also found in the railings. Steel angle bars used for handrails integrate strip lighting inside, effectively illuminating pathways and staircases while concealing the fixture. Additionally, the steel rods of the upper-floor safety railings are designed to encase plant boxes. This provides additional vegetation without obstructing circulation space. The steel rods' slenderness secures the plants and allows easy maintenance access (Figure 20). While steel framing offers spatial flexibility, the architect also intended it to improve the building's structural integrity against frequent seismic activity in the Philippines. The Corner House's spatial affordances demonstrate that steel's material capabilities were maximized not only for wide, unobstructed spans but also by intentionally optimizing the material's form and dimensions so every element serves a dual purpose beyond its structural role. This juxtaposition between the architect's intent and the actual use of space creates an emergent spatial affordance.

C.4 Conclusion regarding Spatial Affordance

Spatial affordances demonstrate how to effectively utilize space for its capabilities, enhancing functional appeal and balancing architectural form and function. Understanding these affordances benefits tropical design. Design

strategies, like open plans and increased ceiling heights, promote airflow for thermally comfortable environments with minimal energy use. Affordances guide users in maximizing space while immersing them in the tropical climate.

The analysis shows intentional and emergent findings. Intentional use of advanced systems, like flat-slab construction and lightweight steel framing, achieves unobstructed spaces and enhanced thermal comfort. However, few emergent spatial uses highlight steel's material capability beyond its structural purpose. This confirms that while spatial planning is intentional, advanced materials allow for unexpected optimization of space and function.

D. Behavioral Affordances

D.1 Social Interaction and Movement at The Commons Thonglor

The Commons Thonglor integrates materiality to enhance user comfort and function. A prominent element is the main staircase leading to the dining area. Several steps are skewed to allow seating while maintaining circulation. This form allows an interplay of dining, circulation, lounging, and plant placement. This behavioral affordance, rooted in the form, influences the proximity between people, supporting interactions from public gatherings to social dining (Hall, 1966). The material is a wood plastic composite (WPC) panel, chosen for its ability to cover wide spans and its weather-resistant properties outdoors (Archdaily, 2016).

Other practical features facilitate specific actions. The angle bar and expanded metal used for the stair and safety railings provide security due to their durability. With this material, users tend to position themselves near the edges to view the atrium. The forms created from the stairs enhance

multifunctionality for circulation and seating. The durability of steel near the atrium ensures stability and safety, reinforcing user confidence. These materials adhere to the tropical climate; the WPC covering is weather-resistant, and the steel railings (Figure 21) lessen the obstruction of airflow. Alternatives like glass, wood, or concrete would compromise durability, permeability, climate adaptability, security, and use of space.

Ultimately, the architect intended the large, skewed steps to occupy 70% of the frontage to act as the primary, active urban landscape, transforming vertical circulation into an area for flexible outdoor urban life. This design was proven structurally generous when it accommodated massive gatherings, such as the International Jazz Festival with 600–700 people. The Commons Thonglor has manifested both intentional and emergent behavioral affordance: the design for flexible social interaction unintentionally turned it into a large-scale performance venue.

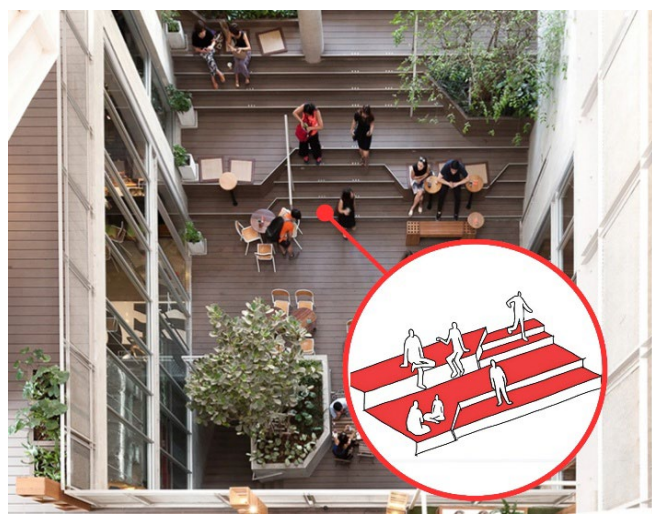


Figure 21 View of the skewed stair steps showing different ways it was used

Note. Adapted from a photo by Archdaily.com, enhanced by the researchers

D.2 The Multifunctional Forms of the Commons Saladaeng

The Commons Saladaeng utilizes unique architectural forms to offer numerous behavioral affordances. The ground floor cafe features wooden, stepped stairs that cleverly integrate seating with circulation space, a stepped-pyramid corner (Figure 22) that defines distinct proximities for solo users or small groups (two to four people).

Another key element is the use of removable wooden pallets at the entrance and second floor (Figure 23). These pallets can be stacked and reconfigured for various purposes, providing flexibility for extra seating, an elevated marketplace platform, or a stage. The architect explicitly designated this system as a "tool" to adapt the space for many scenarios, including the marketplace, a stage, and "fun platforms for kids to climb up and down" (A. Lupaiboon, personal communication, October 26, 2024).

Succeeding floors feature an outdoor terraced space that can function as a venue for theater-like events. Here, the

behavioral affordances are evident in the details of the design strategy. The steel section safety railings have adjustable panels that double as seating or tables (Figure 24). Horizontally positioned steel rods allow users to comfortably and securely sit by resting their legs at the edge (Figure 24). Additionally, the stair railing in this area features a stepped form unlike conventional slanted designs which allows users to lean their elbows for event engagement or casual socializing.

The Commons Saladaeng demonstrates both intentional and emergent affordances. The wooden pallet system and its shifting functions were architect-intended, while the adjustable steel railings doubling as seating and tables were emergent behavioral affordances.

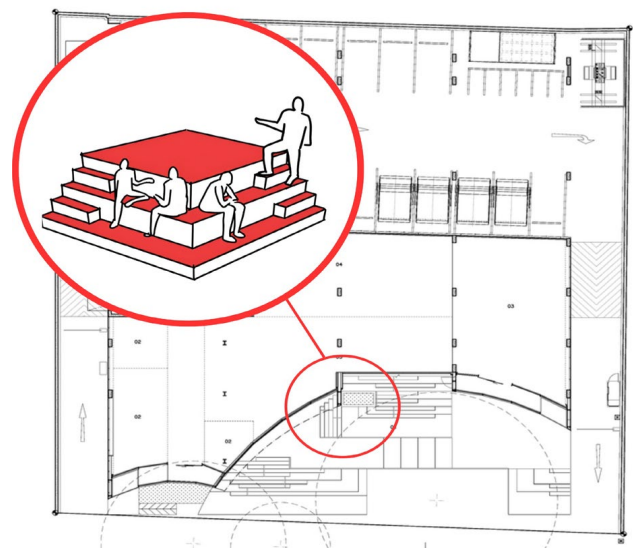


Figure 22 Ground floorplan showing the location of pyramidal steps for additional seating.

Note. Adapted from an architectural drawing by the Department of Architecture Co. enhanced by the researchers.

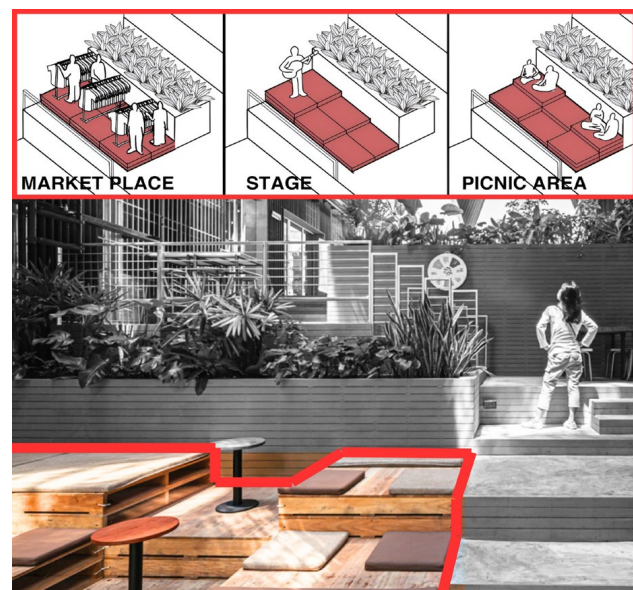


Figure 23 Diagram and photo show how the wooden pallets were reconfigured.

Note. Adapted from a photo by Archdaily.com, enhanced by the researchers

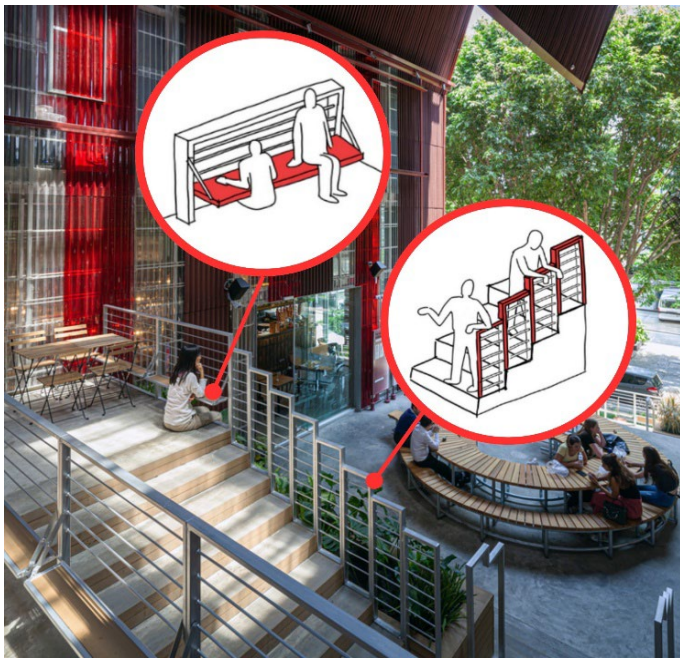


Figure 24 Diagram and photo the safety railings and the moveable panels.
Note. Adapted from a photo by Archdaily.com, enhanced by the researchers.

therefore, manifests both intentional and emergent behavioral affordances.



Figure 25 People using the ramp at the Corner House.
Note. Concengo, J. (2024, February 25). *Corner house in San Juan: The new architectural pride.* Spot.ph.

D.3 Catering to Outdoor Lifestyle in the Corner House

The Corner House integrates specific spaces tailored to the community's demographics. For instance, addressing the lack of jogging space in the San Juan area (A. Luphaiboon, personal communication, October 26, 2024), the architect incorporated a steel ramp that circulates throughout the building as a jogging path (Figure 25). Steel construction enabled this lightweight, durable structure capable of supporting the continuous path. This gradual ramp also affords additional circulation for walking pets and setting up temporary stalls for special occasions.

Succeeding floors feature a granite countertop on the railing edge, providing extra lounging space. Its linear form primarily caters to solo users or pairs for working or studying (Figure 26). On the last floor, a skylight box serves as a tabletop, intended by the architect to be a bar area with an indoor view, with the cube's form designed for placing objects (A. Luphaiboon, personal communication, October 26, 2024). These boxes engage users in casual alfresco dining, especially at night.

The design strategies such as the ramp, granite countertops, and skylight cubes directly realize the architect's intent to promote lingering, gathering, and a healthy lifestyle. The ramp was primarily intended for exercise as a safe, continuous path (A. Luphaiboon, personal communication, October 26, 2024). While successful in its primary function, its durable, gradual surface also unintentionally afforded secondary uses like pet-walking and temporary stalls. The skylight cube as a tabletop for bar activity, however, is an intended behavioral affordance, designed specifically to enhance the area's social function (A. Luphaiboon, personal communication, October 26, 2024). The Corner House,



Figure 26 Diagram and photo showing location of countertops at the edge of the upper floors.
Note. Adapted from a photo by Kanto - Creative Corners, enhanced by the researchers.

D.4 Conclusion for Behavioral Affordance

All the buildings discussed in this study show how designing forms can shape and encourage specific human actions within a space. These features include integrated seating on stairs, a ramp for jogging, and a railing that affords leaning. The materials used can either enhance or hinder interaction and behavior, while their capacity for various forms helps suggest interactions from public gatherings to solo spaces. For tropical design, behavioral affordances aid outdoor activities like socializing, dining, jogging, and hosting events.

The behavioral affordances show a significant mixture of

intentional and emergent findings. The architects created intentional, flexible spaces like multi-functional steps and movable pallets, translating abstract social goals into adaptable forms. However, emergent uses, mostly for communal gathering, show the structural capacity for functional adaptation. The culmination of both intentional and emergent findings in behavioral affordances shows that the architectural value of a material is proven by its functional adaptability, in meeting the community's evolving needs.

VI. Evaluation

A. Spatial and Behavioral Affordances Enrich Community Spaces

The creation of effective community spaces must address not only social needs but also environmental performance. All the buildings discussed offer enriched community spaces because of the spatial and behavioral affordances used. In the Commons Thonglor, the multifunctional stairs encourage social activities (behavioral) while immersing the users to natural air through the atrium space (spatial). In the Commons Saladaeng, the outdoor areas (spatial) use its terraced form design by introducing removable wood pallets to reconfigure the platform to suit various activities (behavioral). In the Corner House, the creation of a jogging ramp (behavioral) was made possible by maximizing the vertical space through steel construction (spatial). Both spatial and behavioral affordances promote diverse activities and encourage active participation. All of which not only provides a community space itself but enhances the spatial experience of the users by adapting to the environment.

The mixture of intentional and emergent affordances affirms this robustness, demonstrating that the design's built-in adaptive capacity allows the structure to not only fulfill its intended function but also evolve to accommodate the community's unforeseen social needs.

B. Visual and Spatial Affordances Rediscover Lost Spaces

The concept of "lost spaces" highlights the underutilization of spaces due to neglect. Visual and tactile affordances actively counter this by creating a highly imageable, safe, and navigable environment. In The Commons Thonglor, the visual acuity of the outdoor space (spatial) is enhanced through the indirect lighting of the bare concrete ceiling at night (visual). In The Commons Saladaeng, the transparency of corrugated sheets (visual) maximizes natural light, further illuminating the terraced communal spaces (spatial). While in The Corner House, the application of white paint (visual) passively enhances brightness for the outdoor dining and lounge areas (spatial).

With both visual and tactile affordances being intentional, the architecture creates a fixed, reliable sensory foundation that actively counters the conditions leading to "lost spaces." This is achieved by using material properties such as intentional visual cues (color, reflection, transparency) and intentional tactile properties (slip-resistant surfaces,

hygienic finishes) to guarantee high imageability and user safety.

C. Affordances Breaks the Resistance of Adaptable Materials

The reluctance toward applying adaptable or unconventional materials stems from a lack of demonstrable proof regarding their long-term performance in public space. The combined pattern of intentional and emergent affordances observed across the case studies directly resolves this issue by establishing a robust justification-and-validation cycle that effectively breaks down conservative resistance in architecture.

The strong intentionality found in Visual and Tactile Affordances provides the necessary professional warrant for using adaptable materials (such as corrugated sheets for walls or Earthcrete flooring). By subordinating material use to non-negotiable performance mandates, such as guaranteed thermal regulation, visual clarity, and slip resistance, the architects professionally justify the selection. This calculated approach de-risks adoption by proving the material selection is fundamentally sound and essential for client and climate needs.

Conversely, the occurrence of emergent Spatial and Behavioral Affordances serves as the definitive empirical confirmation of the material's unforeseen potential. When a structure designed primarily for seismic stability (Intentional Spatial Affordance) enables new social uses (Emergent Behavioral Affordance), it demonstrates that the material's utility exceeds its conventional limitations. This spontaneous community behavior validates the initial design choice by confirming the material's adaptive capacity and dissolving conservative perceptions of its functional limits. The duality between intentional and emergent affordances thus proves that material adaptation in architecture requires both the professional authority of Intentionality to gain acceptance and the social confirmation of Emergence to reveal full potential.

D. Materials and Affordances in the Context of Tropical Design

Materials in tropical architecture must respond to both environmental conditions and user needs. The materials applied in the studied buildings, such as concrete and steel, use their structural efficiency to increase spatial dimension. This design strategy harnesses better natural ventilation through open unobstructed spaces, thereby minimizing reliance on artificial cooling. The integration of affordance theory further deepens this understanding. For instance, the material characteristics of light-colored finishes and glass with decals in the Corner House optimize light reflection to brighten spaces. This visually affords a comfortable work and study environment while reducing energy consumption. Another example is the lightweight and thermal insulating wood pallets in The Commons Saladaeng, which function as movable platforms reconfigurable for different outdoor events. These affordance-driven cases show how materiality creates functional and engaging spaces that enhance user

experience by adapting to the tropics.

The differences in the projects' contexts further reveal how affordances must adapt to cultural and environmental nuances. The Thai projects (Thonglor and Saladaeng) prioritized maximum communal permeability and flexibility to cater to Thailand's strong tradition of street life and outdoor social gathering, evidenced by open, terraced forms and movable pallets. In contrast, The Corner House in the Philippines demonstrated an intentional response to context-specific needs, such as using robust steel framing for enhanced seismic resilience and integrating the jogging ramp to serve a community lacking safe, dedicated outdoor public exercise space. Thus, the materials and their resulting affordances ultimately reflect a necessary divergence between designs prioritizing social fluidity and those emphasizing structural resilience and specific community mandate.

VII. Conclusion & Recommendations

This study focuses on the problem surrounding the resistance of applying adaptable building materials in community spaces within the tropical environment. Thus, the researchers were able to evaluate how the use of materials shapes the visual, tactile, spatial, and behavioral aspects of architectural affordances in the tropical context. This study was conducted by analyzing three buildings, The Commons Thonglor, The Commons Saladaeng, and The Corner House, by determining the materials applied and analyzing their affordances. The visual affordances show how material properties such as color, transparency, permeability, and reflectivity enhance the function of a space. Tactile affordances influence precautionary measures for users because of the non-slip and weather-resistant properties of the material. The spatial affordances discussed show how material capabilities maximize the space to optimize its function. Lastly, the behavioral affordances show how material forms and surfaces influence activities by shifting user proximity. After a cross-case synthesis, the key finding is the duality of affordances, which shows that intentional affordances (guaranteeing safety and thermal performance) bridge the gap between perception and the use of adaptable materials by providing professional justification, while emergent affordances (supporting unforeseen social uses) provide the necessary empirical validation of long-term success.

Moving forward, the researchers recommend further research to strengthen this Duality model. This includes incorporating user surveys or interviews to quantify the success and frequency of emergent behavioral patterns. Furthermore, deeper analysis of cultural influence, client preferences, and financial limitations needs to be conducted to better understand the rationale behind the observed divergence in design priorities, such as the Thai focus on social fluidity versus the Filipino emphasis on structural resilience and community mandate. This study reinforces the idea that materials shape user perception through their application in the building. This contextual approach in

design not only adapts to the environment but also actively communicates to the user; in this sense, material is indeed a language.

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