

# Application of contemporary smart building architecture at the Parahyangan Citywalk Shopping Center in Kota Baru Parahyangan

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## ABSTRACT

Under the development of an increasingly modern era, intelligent buildings and infrastructure need to be built and operated in line with the progress of the future city. The shopping center building is a building that became one of the hallmarks of the city. Therefore the application must be prominent in the surrounding building. The concept is the basis for taking the use of contemporary concepts. The scope of this research is on the design of Shopping Center buildings that follow modern architectural trends and the interaction of trends on public needs in the future. The purpose of this study is to design a shopping center facility that combines the concept of contemporary architecture with the idea of intelligent building as a supporting element so that the building can adapt to the times in the digitalization era of the industrial revolution 4.0. The method used in this research is descriptive qualitative by applying seven principles of contemporary architecture and the concept of intelligent building in designing supporting facilities. The result of this research is a design of a shopping center building in Kota Baru Parahyangan Bandung by applying a combination of contemporary architectural concepts and intelligent building concepts that pay attention to the orientation and aspects of the surrounding environment. The combination of this concept not only cares for its completeness but also accommodates a lifestyle so that this shopping center can attract visitors with its technological innovations and the visual appearance of elegant contemporary architecture.

## ABSTRAK

Sesuai perkembangan zaman yang semakin modern, bangunan pintar dan infrastruktur perlu dibangun dan dioperasikan seiring dengan kemajuan kota masa depan. Bangunan pusat perbelanjaan merupakan bangunan yang menjadi salah satu ciri dari kemajuan suatu kota. Sebuah kota dapat dikatakan memiliki kemajuan apabila memiliki sebuah fasilitas yang baik dan lengkap. Salah satu fasilitas yang harus dimiliki suatu daerah adalah sebuah pusat perbelanjaan. Ruang lingkup penelitian ini difokuskan pada perancangan bangunan pusat perbelanjaan yang mengikuti tren arsitektur kontemporer dan tren interaksi kebutuhan publik di masa depan. Tujuan penelitian ini adalah mendesain sebuah fasilitas pusat perbelanjaan yang memadukan konsep arsitektur kontemporer dengan konsep *smart building* sebagai unsur penunjangnya agar bangunan dapat menyesuaikan dengan perkembangan zaman di era digitalisasi revolusi industri 4.0. Metode yang digunakan dalam penelitian ini adalah deskriptif kualitatif dengan menerapkan tujuh prinsip arsitektur kontemporer dan konsep *smart building* dalam merancang fasilitas penunjang pada bangunan pusat perbelanjaan ini. Hasil penelitian ini adalah sebuah rancangan bangunan pusat perbelanjaan di Kota Baru Parahyangan Bandung dengan menerapkan perpaduan konsep arsitektur kontemporer dan konsep *smart building* yang memperhatikan orientasi dan aspek lingkungan sekitar. Perpaduan konsep ini tidak hanya memperhatikan kelengkapan fasilitasnya saja namun dapat menampung kegiatan gaya hidup penggunanya sehingga pusat perbelanjaan ini dapat menjadi daya tarik bagi para pengunjung dengan inovasi teknologinya dan tampilan visual arsitektur kontemporer yang elegan.

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## 1. Introduction

Nowadays, the world population lives in cities more than half people. One indicator of the progress of the town is to have a variety of excellent and complete facilities. One of the facilities that must exist is a shopping center. The shopping center should be a focal point of an area so that the building must be designed to stand out more than the surrounding buildings. Based on theory, the terminology of shopping centers emerged and developed since the early 1950s. In simple terms, a shopping center can be interpreted as a building that has many store units managed in a single property unit [1]. Today the shopping centers are more complex in terms of type, size, and characteristics. Furthermore, a shopping center is defined as a complex of commercial and public-use buildings that are united by common walking spaces (further referred to as a "connective recreational space") into a single complex system within an urban area called an influence that plays an essential role in people's lives, preferences and ways of life [2].

In Addition, the concept design of the chosen shopping center should be applied to flexible and changing times. The concept is the basis of selecting contemporary architecture to design the Parahyangan Citywalk Shopping Centre. Based on understanding modern concepts, applying this concept is based on quality fixed on a particular architectural grouping. It combines several styles to respond to various technological developments and offers flexible use [3]. Furthermore, a contemporary concept is an architectural style of its time that has the characteristics of a new flow or a combination of several architectural types, freedom of expression, and the desire to display something different [4]. Contemporary architecture could be defined as dynamic architecture created today and will continually change over time [5]. The modern architecture combines various architectural style elements without any stylistic part that stands out. The identity between architecture and local wisdom that comes from the nation's culture in modern times is an important matter to consider in contemporary architecture design. Modern architecture itself has initially been a movement that was a response to technological advances and changing social conditions of society due to the world war. This research is qualitative research using the descriptive method, which is a method that describes the actual phenomena that occur in the field and then analyzes them [6].

Moreover, contemporary architecture could be interpreted as reflecting the architectural flow of the freedom of expression, having a desire to show something different from the others, and a stream of new architecture or can be referred to as a merger of some flow architecture [7-8]. Furthermore, contemporary is an everyday thing that exists and is still ongoing today, and it can also be anything related to the present [9].

The concept of design that supports the use of the contemporary image in technological development also needs to be considered because technological developments have reached the era of the industrial revolution 4.0, which can also be called the digital era [10]. Because the era upholds the principle of efficiency in its application, it can be stated that every structure must adapt to the times. The efficiency is the background for the use of the intelligent building concept. Additionally, the idea of smart buildings has been around for a long time. The brilliant building concept can be maximized in shopping center buildings, particularly on the principle of Service Based Definitions. This kind of service at the Shopping center can keep up with existing technological developments, for instance, utilizing the potential of online taxis by creating a market where visitors can buy goods without getting out of the car. In theory, this service-based would maximize market potential by expanding services so that its application can reach all aspects of visitors to shopping activities [11].

Furthermore, an intelligent building is a direction of building development that applies information technology and control technology into traditional buildings. Smart building results from the information technology penetration and control technology into conventional buildings and is the future development direction of buildings. The intelligent building design of user-centered buildings can achieve sustainable living. The integration of intelligent technology is based on intelligent building design, and it can support sustainable development and improve users' overall satisfaction, happiness, and quality of life. Designers concentrate on a "people-oriented" approach in intelligent building design to provide users with the best interactive experience.

In Addition, the intelligent building is a continuous integration of advanced information technology. This concept allows the building to be operated remotely throughout the lifecycle comfortably, cost-effectively, and energy-efficient [12]. Meanwhile, an intelligent building is defined as a sophisticated building form to be flexible, adaptive, and responsive by utilizing Artificial Intelligence (A.I.) while offering users real-time control [13]. On the other hand, building data systems in intelligent buildings have become increasingly complex and gradually advanced a set of control and management systems, including automatic control systems, intelligent light control systems, multimedia conferencing systems, parking management systems, and others [14].

Furthermore, intelligent buildings result from information technology penetration and control technology and the future development direction of the building. This intelligent building system consists of people, a control system, and electronics. Control systems in intelligent buildings establish intellectual connections between people and electronic products for information transmission and mutual feedback. On the one hand, the performance of the control system determines the intelligence building system. On the other hand, people are included in the main service object of the intelligent building system, and the control system's performance also determines the satisfaction level of people in the intelligent building services [15].

Meanwhile, the intelligent building concept requires incorporating sensors and big data by leveraging artificial intelligence, which promises a new era of urban energy efficiency [16]. Utilizing artificial intelligence in smart buildings can reduce energy consumption through better control, enhanced upgrades, and automation. Smart building is one of the conceptual representations of modern infrastructure, which includes automated control systems using data to optimize building performance and the level of comfort experienced by the occupants. Moreover, the intelligent building provided an efficient environment and optimized structures, systems, services, and management and their interrelationships. Then, the emphasis is on operational efficiency, occupant effectiveness, and information and communication technology [16]. Climate responsive design concepts and systems; With gable roofs and joglo roofs on buildings that allow rainwater to fall quickly, this is one solution for buildings in tropical climates [17].

The application of this intelligent building will later be accommodated in this Parahyangan Citywalk Shopping Centre design combined with contemporary design concept where the concept itself emphasizes flexibility in design. The modern application of this innovative building will be very relevant because of the area's potential. This building stands on the planned city of Kota Baru Parahyangan Bandung, as shown in Figure 1, which will later become a city with high tourist attractions. The innovative city concept running in several cities in Indonesia, especially Bandung City, aims to create a town that functions optimally in managing various city resources effectively and efficiently [18]. Additionally, the innovative city concept running in several cities in Indonesia, especially Bandung City, aims to create a town that functions optimally in managing Infrastructure development is one of the vital aspects to accelerate the national development process, especially in Java, which significantly affects economic and population mobility, especially in 2025 when the people will reach around 151 million people [19]. Therefore, this study aims to describe the application of Islamic architecture to the mass of the Cipaganti Mosque building, where the Cipaganti Mosque is one of the historical heritage buildings called heritage buildings in the city of Bandung [20]. The research variables discussed include basic form, unity, proportion, balance, rhythm, and emphasis [21].



Figure 1. Kota Baru Parahyangan 3D planning [22]

## 2. Research Method

The method used in this research is descriptive qualitative by applying seven principles of contemporary architecture, namely dynamic composition, transparency concept, harmonization of outer and inner spaces, transparency of facade, the convenience of all aspects of the user, exploration of landscape elements, and application of solid structures [23]. However, the Parahyangan Citywalk shopping center applies only five principles of the seven principles, including transparency concept and convenience of all aspects of the user. In Addition, the application of the intelligent building concept uses three innovative building principles, namely, performance-based, service-based, and system-based [24]. On this building, only apply two principles, namely, performance-based and service-based. The analysis and discussion are described from the data from interviews and surveys and cross-checked whether it is according to applicable standards and regulations through tables and explanations [25].

The site location is in Kota Baru Parahyangan, Padalarang, Bandung Regency, where Bandung is the capital city of West Java province in Indonesia. Kota Baru Parahyangan is one of the urban concepts of a smart city. A challenge for the development of this city will also develop several functions that are related to one another, including apartments, educational institutions, office parks, recreational facilities, golf courses, jogging tracks, and art markets. Resorts, housing, and hotels dominate Kota Baru Parahyangan because of the location of Kota Baru Parahyangan, which has potential views. Figure 2 shows the zoning environment at the Kota Baru Parahyangan site location surrounded by commercial, educational, and hospital areas.

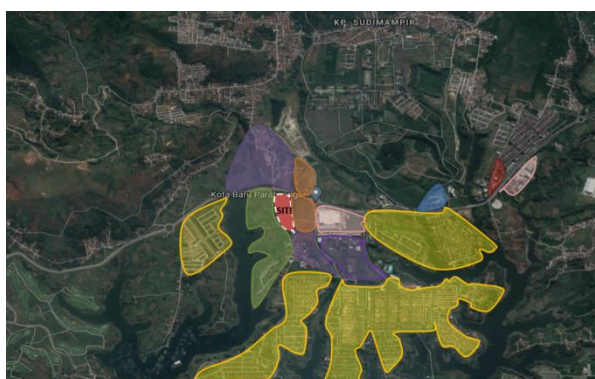


Figure 2. Zoning environment at Kota Baru Parahyangan [26].

## 3. Result and Discussion

### 3.1. Theme Elaboration

The concept of the Parahyangan Citywalk shopping center uses the concept of contemporary architecture. Contemporary architecture is an architectural concept based on quality and combines several styles to respond to various developments over time. This building concept combines modern architecture with a brilliant idea to solve building problems technologically and design intelligence. A building should prioritize ease of use and achievement with several infrastructure technologies or problem-solving in any other method. The intelligent building could be defined as a building technology consisting of sensors, actuators, information and communication technology, intelligence techniques, and technology to control and optimize resources and infrastructure and offer the best comfort for inhabitants [27].

### 3.2. Site Zoning Concept

Figure 3 shows zoning arrangements on the site are dominated by public areas where this general area is the selling point of the building. The segmentation of the division of this zoning site is placing the public area on the main road area because the general area has no effect on noise and placing the private space in the middle of the shared room and the service as a buffer for the intimate area itself from outside the building. The placement of the service area should be placed at the very back to facilitate the circulation of goods distribution services while still not disturbing public activities [28].

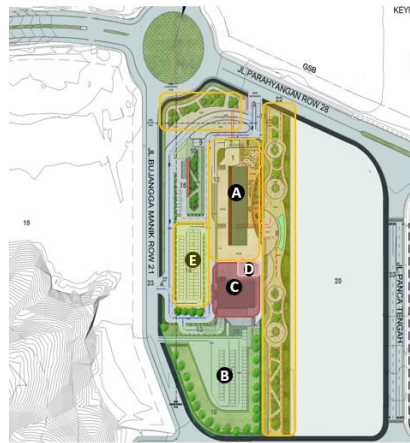


Figure 3. Zoning block plan

Parahyangan Citywalk Shopping Center has two entrances: the main entrance facing the Parahyangan Row road and the side entrance facing the green spine, as shown in Figure 4. The main hall in the drop-off area has an increase of 60 cm to avoid possible flooding. While on the side entrance, the green spine is an indentation. At the side entrance to the pool are an LED fountain which is a selling point and a show from the landscape. With this problem, a concept of urban green building emerged. Urban Green Building is a network/system created to reduce/overcome urban areas and climate change problems by involving nature. In addition to increasingly productive population activities, the need for housing increases and becomes a problem, especially in urban areas [29].

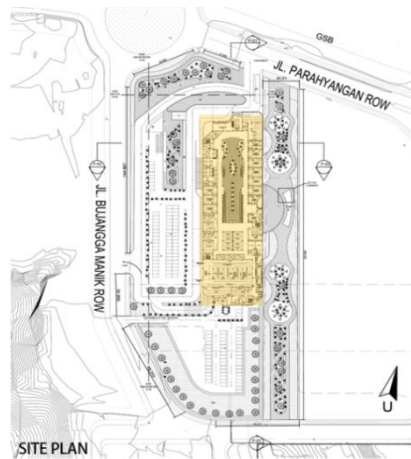


Figure 4. Hardscape detail

3.3. Mass Zoning Concept

Gambar 5 menunjukkan area publik mendominasi penataan zonasi di lantai 1 dengan 85% bangunan, karena area lantai satu merupakan area komersial yang paling potensial. Apart from the price offered for high commercial spaces, the ground floor area can also be an attraction separately for the Parahyangan Citywalk Shopping Center. The use of tenants on the 1st floor is dominated by fashion stores and furniture and anchor tenant areas, including book stores, restaurants, and drive-thru markets. This research was conducted in one construction company in Indonesia. The company was facing several problems, and many projects that had already ended had delays [30].

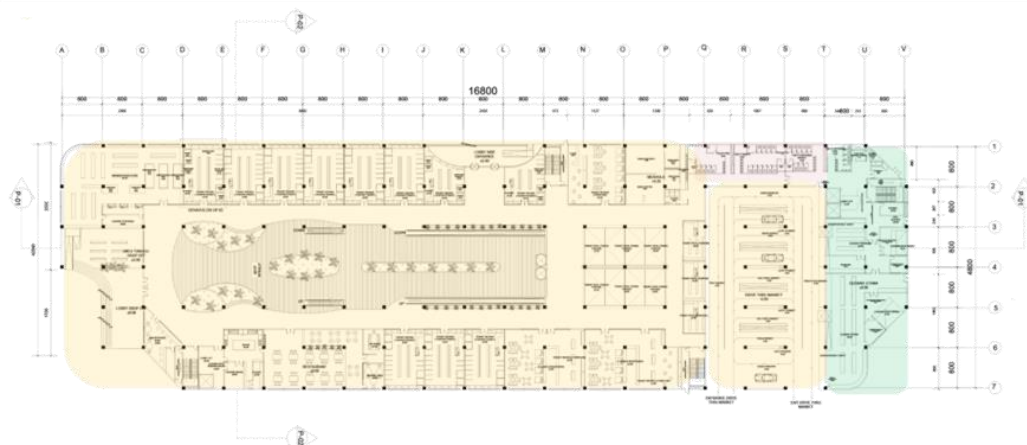


Figure 5. First floor plan

Figure 6 shows the space zoning arrangement on the 2nd floor is also dominated by public areas with 85% of the building. This is because the second-floor site has a potential selling value on the side of the rooftop plaza. Electronic tenants and several fashion tenants dominate the commercial zoning area on the second floor. The second-floor site has three main anchors: a game center, coffee shop, and supermarket. The service area on the second floor is a warehouse for goods focused on supermarkets, while the private area on the second floor is an office area containing staff and managers.

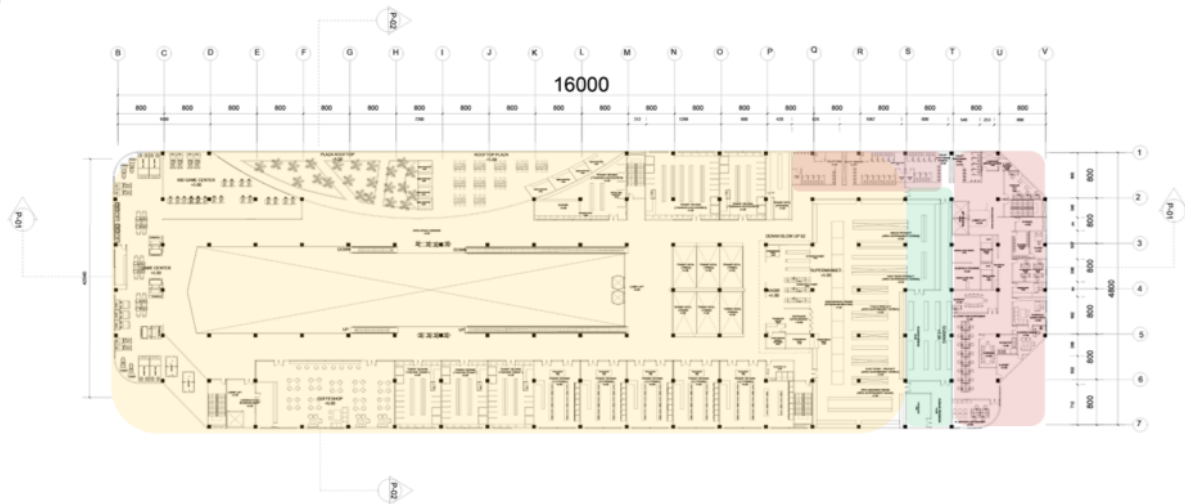


Figure 6. 2<sup>nd</sup> floor plan

The 3rd-floor plan shown in Figure 7 is dominated by food court tenants, where the 3rd-floor area is designated as a dining and drinking area. On the 3rd floor, there are two main anchors, namely a cinema and a coffee shop, while the rest are electronic and fashion tenants. The service area on the third floor is only located in the food court, while the back area only has a private area as a utility room.

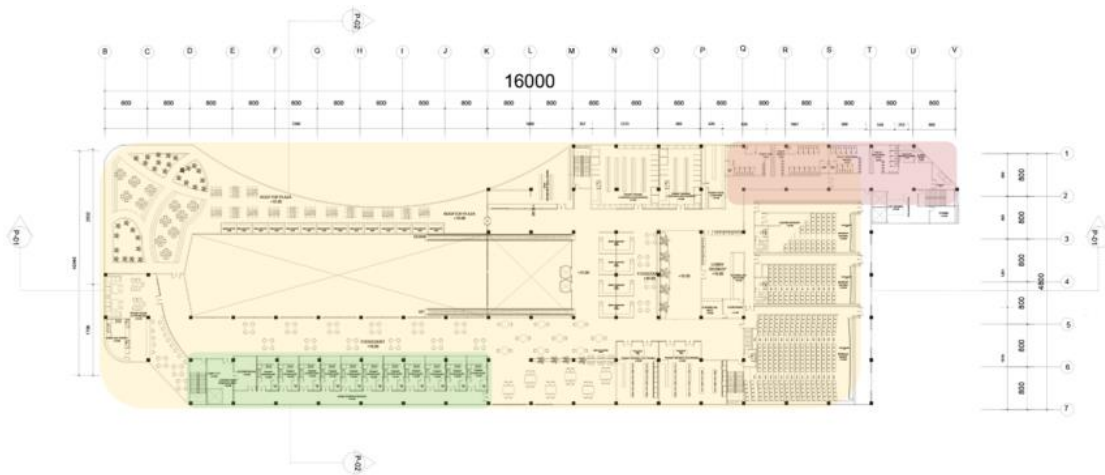


Figure 7. 3<sup>rd</sup> floor plan

3.4. Building Facade Concept

The facade of the Parahyangan Citywalk Shopping Center building, represented in Figure 8, uses a contemporary architectural concept that adapts the principle of harmonization. The east side of the face of this building provides a rooftop plaza so that visitors from the building mass and the site can be integrated. On a particular side of the facade, this building highlights the theme of an intelligent building, namely the use of 4D LED Videotron as a commercial attraction and the use of automatic windows and intelligence skin as an adaptation of brilliant building performance-based definitions.



Figure 8. Building facade

3.5. Concept of Building Structure

The building structures at the Parahyangan Citywalk Shopping Center uses composite concrete on their columns and beams because the height of the mall building is not too high and only has three floors, as shown in Figure 9. A pile foundation is used in the sub-structure section of the Parahyangan Citywalk Shopping Center building because it is located on slightly contoured soil. Then, in the mid structure, the structure uses a composite column measuring 60 cm x 60 cm and a beam of 40 cm x 70 cm. The design on the roof uses a space frame on the top and concrete on the other roof.

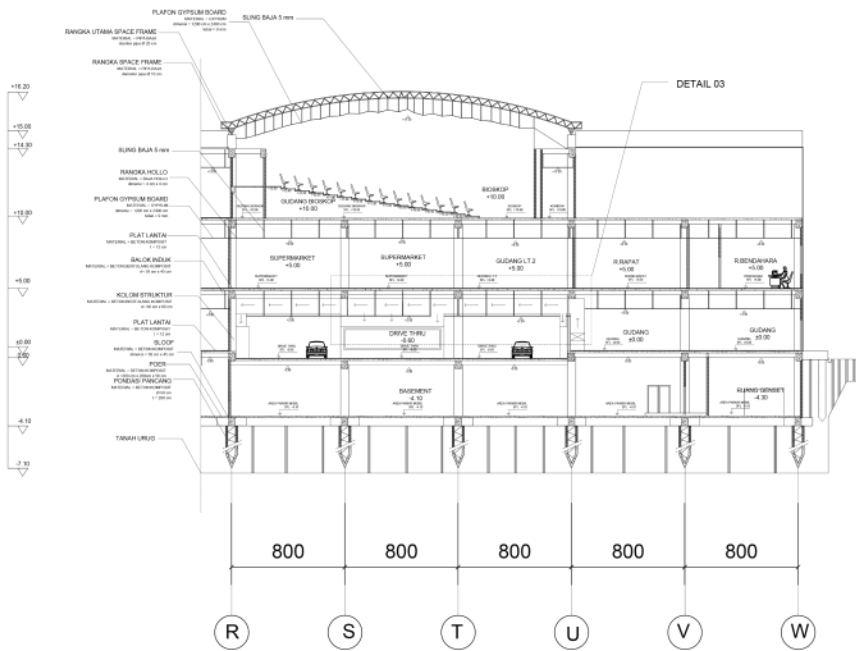


Figure 9. Building section

3.6. Application of Smart Building

Figure 10 shows the intelligence skin facade on the glass tenant glass is controlled automatically with the sensor detector windows located behind the fins of the second skin. Windows sensor detector will respond to commands from the operator with the wireless system and will move the hinge of the secondary skin fin to open and close. The material of the fin itself is made of an aluminum panel with a wood texture so that it can last even when exposed to rain. One of the most basic needs in water resource development and management activities is the availability of water [31].

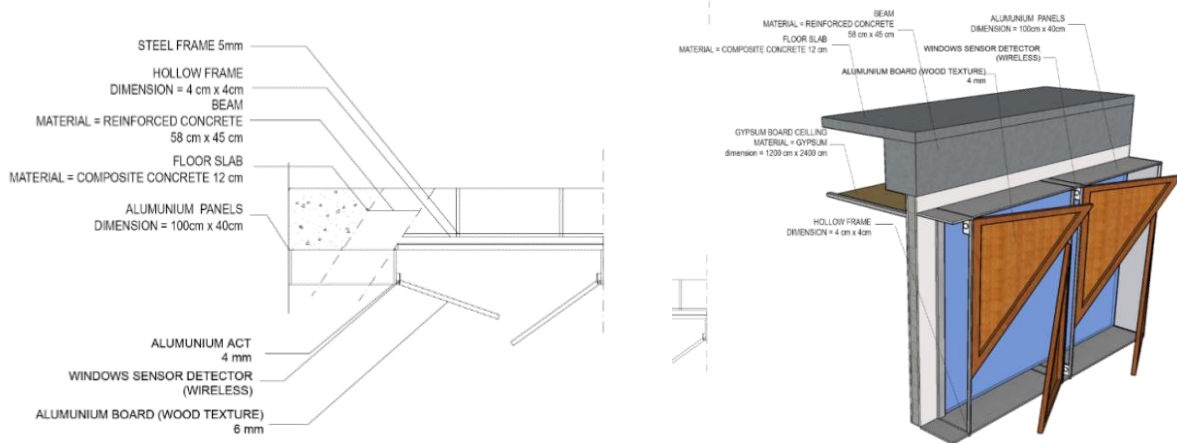


Figure 10. Intelligence skin

Figure 11 shows that the drive-thru market is one solution to technological advances in anticipating a pandemic. The system on the drive-thru allows users to shop without having to come into direct contact with other people in the room. In principle, the distribution of the drive-thru market itself is distributed from the warehouse through a belt conveyor and goes to each rack which the belt conveyor directly distributes. The warehouse operator distributes and regulates each item to ensure that there are no errors in shelf placement.

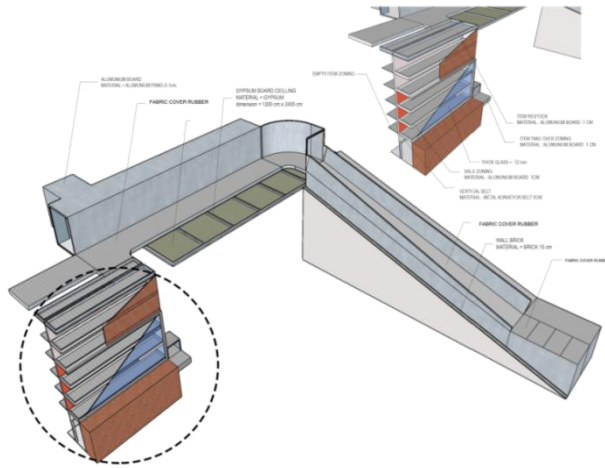


Figure 11. Drive-thru market system

Virtual self-checkout shown in Figure 12 is one of the technologies applied to fashion stores where. This virtual self-checkout allows buyers to measure the clothes of their own choice without going to the locker room. The use of virtual self-checkout is like a mirror that can show the whole body with various available settings. This facility will minimize queues from product buyers. At the same time, virtual payment is a facility where buyers only show the barcode on the sensor at the cashier. So there is no need to queue. The barcode will later be integrated with each user's ATM, as shown in Figure 13.

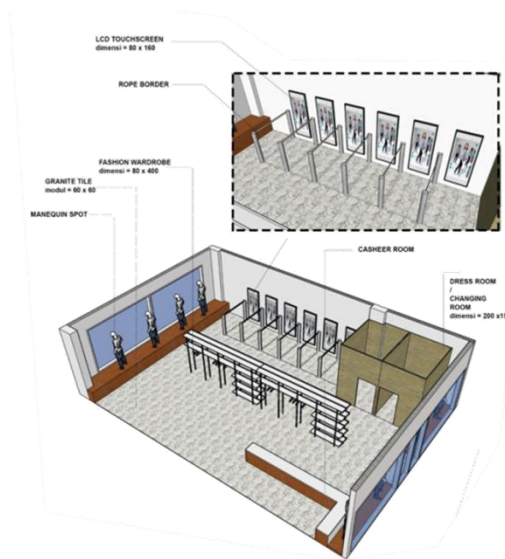


Figure 12. Interior of virtual self checkout

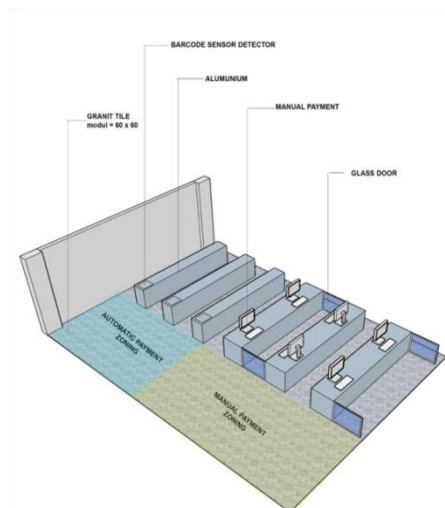


Figure 13. Virtual payment

### 3.7. Exterior and Interior

Figure 14 shows the exterior of the Parahyangan Citywalk Shopping Center building is integrated with the rooftop plaza area on the east side of the building. This is so that the green spine area comes alive with the rooftop plaza. The West and East facades have different treatments, whereas the East facade exposes large openings due to the attractiveness of the green spine and integration. In contrast, the East facade is closed using intelligent skin to minimize sunlight.



Figure 14. Exterior perspective

The interior of the Parahyangan Citywalk Shopping Center building is dominated by white to show an elegant impression and increase each operating tenant's selling value, as shown in Figure 15. The atrium's interior is deliberately expanded so that natural lighting from the skylight can directly lead to the building. The interior concept applies one of the seven principles of contemporary architecture by Schimbeck, which harmonizes outer and inner space [32].



Figure 15. Interior perspective

## 4. Conclusion

Parahyangan Citywalk Shopping Center is a shopping center building concept that applies a contemporary design style with a semi-indoor approach. This shopping center design has been created good facilities and accommodates with other life activities to attract visitors. This design concept is dominated by the use and maximizes the potential that exists around the building. The contemporary design process includes smart buildings design are used to create an innovative shopping center to become a reference in intelligent building technology. This concept was created because shopping centers face pretty heavy competition in the era of industrial revolution 4.0, where the influence of digital media is getting more intense, so people will think twice about going to shopping centers. Therefore, the combination of this intelligent building and contemporary concept accommodated in the Parahyangan Citywalk Shopping Centre is expected to be an attraction for the Parahyangan Citywalk Shopping Center building for the next few years. Additionally, applying innovative, intelligent building technology for performance and service can compete with others in the development of the digital era.

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