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Designing a Binjai City Performing Arts Building with a Tropical Architecture Approach

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Abstract. Binjai is one of the National Centers for Activities (PKN) and includes in the National Strategic Urban Area of MeBiDangRo. While based on RPI2JM 2015-2019, there are fifteen ethnicities in Binjai. This diversity is undoubtedly a capital in developing its traditional arts and culture. However, based on the GRDP, the arts industry has not yet become a source of income, so this research purposes on how to design a better performing arts building and how to apply tropical architecture to the design as support, facilities, and awards for activists and performing arts enthusiasts as a source of income from the tourism sector. The research stage begins with determining the design location, considering the elements and requirements, collecting data, and analyzing data to produce a design concept. Binjai has a tropical climate, so Binjai Performing Arts Building adapts a tropical architectural approach where thermal comfort, air circulation, and the use of materials are selected properly such as maximizing many openings to support air circulation and lighting, using overstacks and secondary skin as an aesthetic shading, and minimizing solar heat radiation into the building. Moreover, this research produces a proportional design for a Performing Arts Building.

Keywords: Binjai, performing arts building, tropical architecture

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1 Introduction

Binjai City is one of the National Activity Center (PKN) that becomes a node for export-import activities, transportation, and national-scale industrial activities. Binjai is also one of the National Strategic Area, located in the International Shipping Conference Route that supports economic development activities in North Sumatera. While based on RPI2JM 2015-2019 [1], there are fifteen ethnicities in Binjai and this diversity is undoubtedly a capital in developing its traditional arts and culture.

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Not only traditional arts, since 2019, many art personnel and platforms have also emerged from the younger generation of Binjai City and even penetrated various art forms ranging from music, theater, photography, videography, literature, dance, and even murals.

The high enthusiasm of the community in the performing arts shows that performing arts can be developed as an industry, especially for the tourism sector, which is engaged in the arts and culture.

Reviewing the 2016 Binjai GRDP through the Binjai Central Statistics Agency, although Binjai has high potential in the arts industry and has become an urban national strategic area, it turns out that from GRDP, the arts industry has not become a source of income. It proves that the art industry and the generation of Binjai have not synergized yet with the Government. Thus, the Performing Arts Building can open up these opportunities, apart from being a shelter for performing arts, as support, facilities, and awards for performing arts activists and enthusiasts and a source of income from the tourism sector.

The Information System for Spatial Utilization of the MeBiDangRo area shows that the City of Binjai has a tropical climate with two seasons, namely rainy and dry seasons marked by the number of rainy days per month. South Binjai District has the highest rainfall of 342.91 mm/16 rainy days and Binjai Kota District of 28.41 mm/10 rainy days. So, to adapt the climate to the building design, a tropical architectural approach will be adopted where thermal comfort, air circulation, and the use of materials that can withstand solar heat radiation are considered [2].

2 Literature Review

2.1 Performing Arts Building

Performance art is a work that involves individual or group action in a specific place and time. It usually involves four elements such as time, space, the artist's body, and the relationship between the artist to the audience [3]. It concludes that performing arts can be said as anything presented or displayed to be enjoyed or seen. The form of performance is a manifestation of several elements of presentation that are used as a communication tool to convey a specific message from the artist to the public in traditional art performances. The traditional art performances are also a form of cultural expression, a vehicle for conveying cultural values, and the embodiment of aesthetic-artistic norms that develop in a particular area [4].

2.2 Performing Arts Building in Binjai City

Binjai Performing Arts Building is a place for performing arts activities such as drama, dance, and modern concerts that can be visited or witnessed by the general public. This building also can be a place for rehearsals, shows, and exhibitions of Traditional and Modern culture [5].

2.3 Performing Arts Group

Traditional Performing Arts

Traditional performing arts are originated from all regions in the archipelago. Furthermore, if traditional art performances are performed on a stage, the atmosphere of the stage placement and the audience must be adjusted to its original state. In this case, the most appropriate is a performance space with an Arena Stage or an Open Stage.

Modern Performing Arts

The structure and processing are mainly based on Western Theatrical techniques. The composition of the script, the way of staging, the style of presentation, the way of approach, and the pattern of thought are mainly derived from Western culture. Based on the above characteristics, the performance space for modern performing arts must have a perfect stage and room technique system in sound, lighting, and air circulation. The proper form of space is the form of the Proscenium Niche Stage.

Contemporary Performing Arts

This contemporary performing art is a performing art that combines traditional art with modern art. Usually, this type of contemporary performance can be performed in any performance space, whether arena theater, horseshoe, or proscenium will depend on the desire of the artists [6].

2.4 Performing Arts Building Overview

There are three parts/places for performing arts and culture provided by the performing arts building in Binjai City. The first is the Auditorium indoor performance room, the second is the Amphitheater outdoor performance space, and the third is an open stage.

Performance Room (Indoor) Auditorium

The performance/performance building is a place and a presentation of performing arts to a group of spectators who desire to meet the soul's needs. In general, performance building in Indonesia is known in three forms. The Performing Arts Building in Binjai takes the form of a performance room Auditorium, where the auditorium is a large building or room used to hold public meetings, performances, etc [8].

Performance Space (Outdoor) Amphitheater and Open-Air Theater

The Amphitheater is an open arena used for entertainment performances and the performance space in Binjai Performing Arts Building is outdoor based. So those art performers who want to show performances are not monotonous and only rely on indoor performance spaces, and also

so that performers can mingle and play freely outside, in which the nature of the performers does not like things that are closed, monotonous, and that is all.

2.5 Tropical Architecture

Tropical architecture is an architectural work that provides solutions to climate problems in its environment [8]. The climate aspect must be considered, especially by the field of Building Science or Architectural Science, to provide more precise and measurable answers to whether a building is categorized as Tropical Architecture. Based on the theory of G.Limppsmeier, the principle used in the design is to consider the orientation of the building, sun protection, vegetation, cross ventilation, and thermal comfort [7].

2.6 Characteristics of Tropical Architecture

The design of the building with a tropical character has the following requirements:

Natural air system

Natural ventilation systems in tropical architecture apply a terraced roof model, proper openings (such as the location of windows, ventilation holes, and clerestories), and void spaces.

Ventilation

The principle of circulating air in buildings is the existence of cross ventilation achieved by placing openings opposite each other and of different sizes. This method can create a pressure difference so the air can flow (the principle of wind). Air movement in tropical architectural design, so it can flow horizontally and vertically.

Aperture

In tropical architecture, there are large windows and door openings. The openings are maximized by creating a terrace around the house.

View and orientation of the building

Tropical architecture has the following view and orientation characteristics, those are facing the direction where sunlight sought to enter the room in the morning and evening and a room with a public function or activity center located in an area that gets direct sunlight, with a protective system that adds to human comfort and using materials or parts that support comfort in tropical conditions, such as Sunshade and Sun Protection. *The sunshade* is a part of the sunlight filter in the opening or ventilation of the room, which is usually found in glass material or building ventilation support. *Sun protection* is a part of protecting or maintaining the inside of a building or interior, with a system or material, increasing comfort.

Window radiation

Window radiation means the influence of materials or systems on openings or windows, both on the interior and the outside / exterior environment of the building [10].

3 Methodology

The research stage begins with determining the design location, namely Jalan T. Amir Hamzah, Binjai, which is directly connected to the Trans Sumatra route. By considering the elements and requirements, such as; municipal utilities, reviewing government regulations for city structures, and spatial plans. Then collect data through literature studies, comparative studies, and field surveys. Then describe, describe, and explain the existing data based on clear facts, then the data is analyzed to produce a conclusion, namely the design concept.

4 Results and Discussion

Design Location

The location for the design of the Performing Arts Building in Binjai City is on Jalan Tengku Amir Hamzah, Kec. Binjai Utara, Binjai City, North Sumatra with a total land area of ±15,000 m^2 (Figure 1).

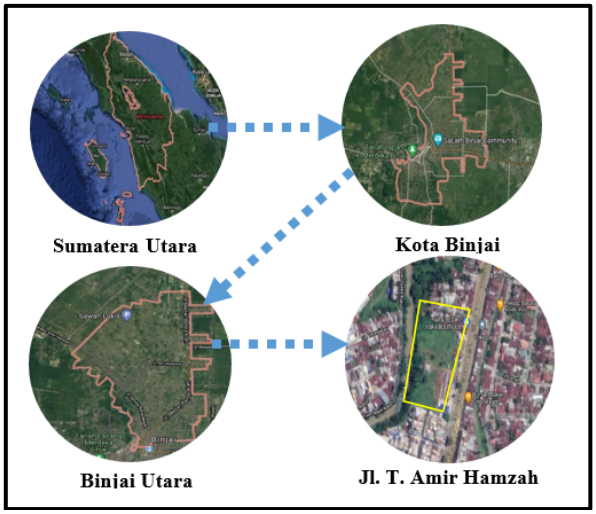


Figure 1 Design Location

Space Requirement

The space program at the Performing Arts Building in Binjai City is divided into four main facilities, supporting facilities, service facilities, and parking facilities. Space program sourced from architect's data, Ernst Neufert, Time-Saver Standard for Building Type, Yoseph De Chiara & John Callender, Comparative studies or surveys, Assumptions, and studies of spatial size. So that the result of the amount of space that built on the site is obtained in table 1.

Table 1 Space Requirement

No	Zone	Area requirement (m^2)
1	Main Facilities	5544
2	Supporting facilities	2289
3	Service Facilities	232
4	Parking Facility	1972
	Total	10,037 m^2

Zoning Concept

Zoning is divided into four sections: Public, Semi-public, Private, and Service areas. The public area in the Amphitheater is an open stage, while the semi-public area is used as an Auditorium and also other supporting facilities. Private areas include management rooms and warehouses. And the service area as a place for building utilities (Figure 2).

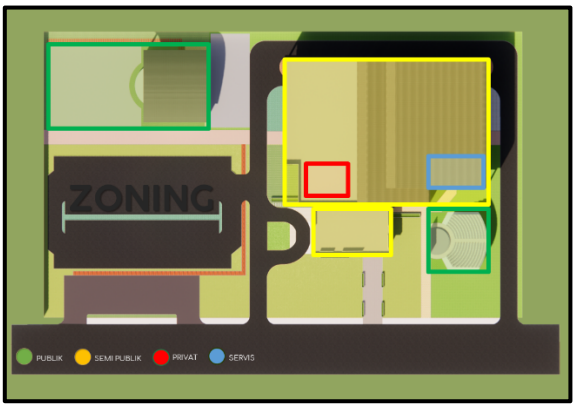


Figure 2 Zoning

The design applies a multi-mass concept that is divided into four main functions, namely Auditorium, Open Stage, Amphitheater, and parking area (Figure 3).

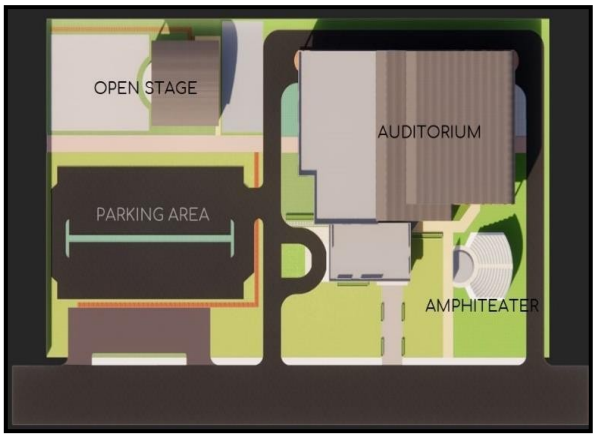


Figure 3 Mass Management

Accessibility

There is only one access to the building, namely from Jalan T. Amir Hamzah, which is the main entrance accessed by all users, both pedestrians, and motorized vehicles (Figure 4).

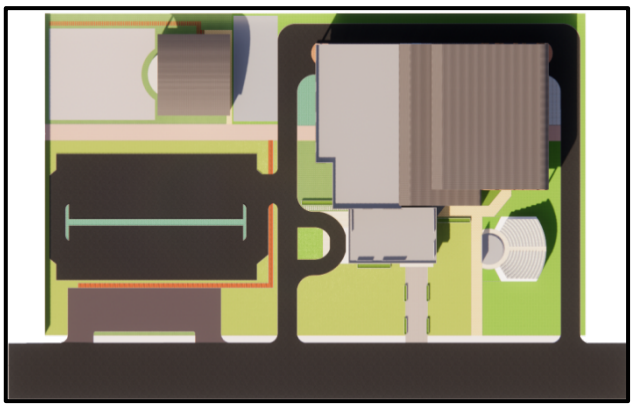


Figure 4 Accessibility

Circulation Concept

The circulation concept is divided into 3, namely circulation for pedestrians, circulation for cars and motorbikes, and circulation for buses where each circulation is interconnected (Figure 5).

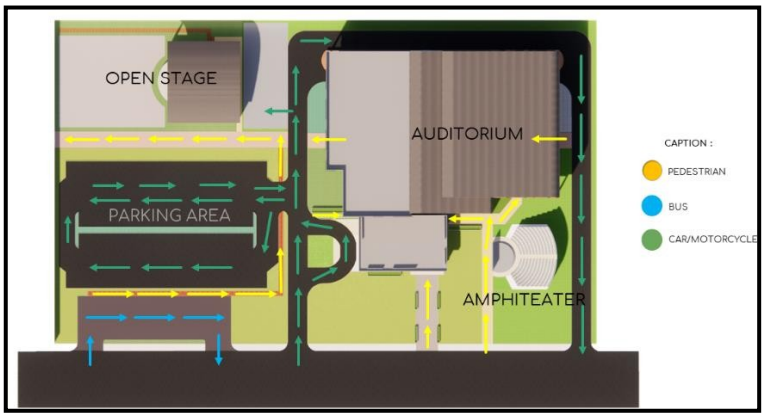


Figure 5 Circulation

Response to site

One of the problems at the site location is congestion because the site is close to the balance of the Binjai Monument. Therefore, the primary door access to the building is designed a little further from the intersection to avoid traffic jams. In addition, the site faces east and west, which is the part that is exposed to the sun longer. Therefore minimizing openings are in the east-west area, applying secondary skins, and overstacks.

Tropical Architecture Approach

Building Orientation

The orientation of buildings in tropical climates must consider the direction of movement of the sun to avoid the heat of solar radiation entering the building. The orientation of the building is best facing north and south so that the light entering the building is not direct sunlight. However, Binjai Performing Arts Building is oriented to the east and west, considering that access and circulation to the site are only found in that part. Nevertheless, on the main facility function, the Auditorium, Amphitheater, and open stage face the north and south sides so the facility does not expose to direct sunlight (Figure 6).

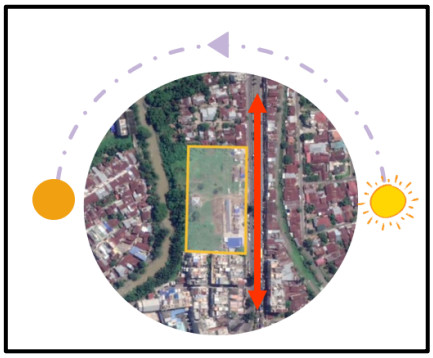


Figure 6 Building Orientation

Sun Radiation Protector

Protection from direct sunlight can be done with several alternatives, such as using secondary skin, overstacks, vegetation, and long corridors that can prevent the sun from entering the building directly. The Performing Arts Building in Binjai City applies the above elements to buffer the sun heat that will enter the building (Figure 7).

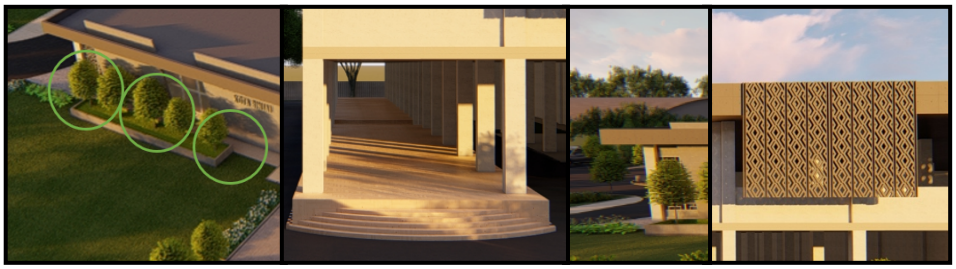


Figure 7 Application of Sun Protection

Air Circulation and Cross Ventilation

Cross ventilation functions to flow air smoothly from outside into the building, then quickly exits the building again so that the air change process runs smoothly. The Performing Arts

Building in Binjai City applies openings with window elements and breathable walls in certain areas that produce good air circulation in the building. Besides that, it also applies open corridors that can be passed freely by the wind to circulate in the building (Figure 8).

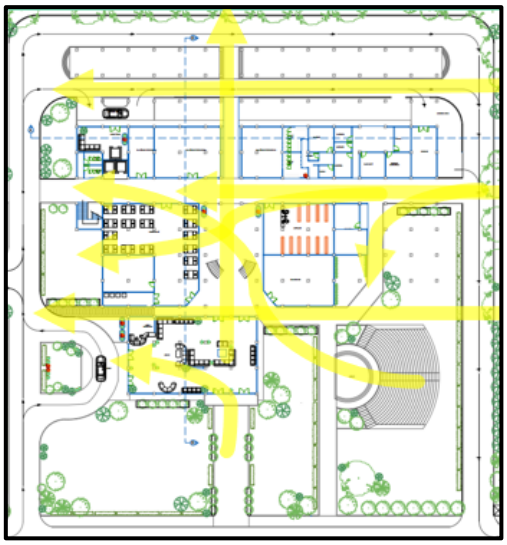


Figure 8 Application of Air Circulation

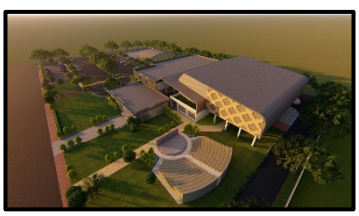
Natural Aperture and Light

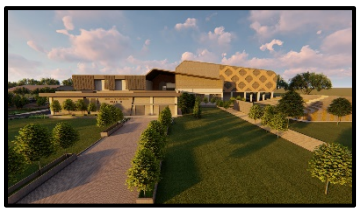
There are openings in several building areas as a source of natural lighting during the day inside the building. At the Performing Arts Building in Binjai CityMinimize the openings on the east side and maximize the openings on the north and south sides. There is a void in the middle of the building that can enter sufficient sunlight into the building. Moreover, in the food court area, it is designed to be semi-open to take advantage of natural lighting.

Use of Materials that are Resistant to Tropical Climate

Binjai Performing Art Building uses durable materials that can withstand tropical climates such as concrete finishing, ceramics, aluminum frames, and glass. It also uses earth tone color finishing for a relaxed and calm vibe. The application is shown in Table 2.

Table 2 Application of Tropical Architecture in Buildings

No	Picture	Application of Tropical Architecture
1		In each orientation of the main building, the Auditorium, Amphitheater, and open stage avoid the East and West side to expose more extended sunlight.

No	Picture	Application of Tropical Architecture
2		The roof has 30 degrees slope which makes the rainwater easier to flow.
3		Minimizing opening on the east and west sides and maximizing opening in areas where the wind passes to make air circulation in the building remains maximal.
4		Applying overstacks, secondary skin, roasters, and corridors in the building to minimize direct sunlight entering the building.
5		Using durable building envelope materials and extreme weather: concrete Ceramics: glass and using earth tone colors that provide a relaxed and calm atmosphere.

5 Conclusion

Binjai Performing Art Building adopts a tropical architectural approach as it is planned to accommodate many visitors with a tropical climate, thermal comfort, and air circulation. This plan applies many openings to support air circulation and lighting, overstacks and secondary skin are also made as an aesthetic shading and minimizing solar heat radiation into the building.

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