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DESIGN OF THE USU FUTSAL SPORTS HALL IN MEDAN USING A GREEN ARCHITECTURE APPROACH

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Abstract

A Futsal is a sport similar to soccer, but played on a smaller indoor pitch and with slightly different rules. Futsal originated in Uruguay in the 1930s and was developed by Juan Carlos Ceriani, who wanted to create a sport that could be played indoors. Futsal has slightly different rules than soccer, such as: a smaller pitch (40x20 meters), a smaller and heavier ball, shorter playing time (2x20 minutes), no offside rules, and free substitutions. In short, futsal is a fun and challenging sport that requires technical skill, speed, and teamwork. A futsal sports hall is a sports facility specifically designed for futsal, a sport similar to soccer but played on a smaller indoor pitch. Therefore, a futsal sports hall is an important facility to support sports and other community activities. Green architecture is a building design approach that considers environmental and sustainability factors to create environmentally friendly and sustainable buildings. The University of North Sumatra is one of the largest universities in Indonesia, with students passionate about sports. Numerous sports tournaments are held by the university or other institutions, attracting students throughout the year. However, other sports, particularly futsal, face difficulties in hosting tournaments due to limited sports fields. Therefore, it is appropriate to provide complete and appropriate sports facilities and infrastructure for students at the University of North Sumatra. A descriptive analysis method was used in the design of the futsal sports hall, involving data collection, synthesis, analysis, and clarification, which served as the basis for the design. A green architecture approach served as the design concept. The planning of the chess school, for tourism, education, and entertainment, emphasized the unity between the building and its surrounding environment to create peace and harmony.

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1. Introduction

Exercise is one way to maintain a healthy body. It is generally known that sports during adolescence have two major benefits: they can develop athletic talent to become champions, and they can also utilize time effectively, rather than being idle, which can negatively impact individuals and society (Sports as a Source of Health, Dr. Jonathan Kuntaraf, 2006).

Exercise is an activity aimed at training the body for physical and mental health. It is also a way to relieve the boredom of daily life. Exercise can be done in groups or individually. The government has even made sports a supporter of healthy Indonesians, by placing sports as one of the development policy directions stipulated in MPR Decree No. IV/MPR/1999 (GBHN), which aims to foster a sports culture to improve the quality of Indonesians, thus achieving adequate health and fitness.

Indonesia is the second largest football-loving country in the world. In a study conducted by Nielsen Sport, 77% of the Indonesian population is interested in the round ball sport, Indonesia is second only to Nigeria with a percentage of 83%. This sport is played by many people, from children to adults (Source: CNN Indonesia, Nova Arifianto, 2017). Futsal is an official sport of FIFA (International Federation of Football Association), namely a ball game

played by two teams, each consisting of five people. The goal is to get the ball into the opponent's goal, by manipulating the ball with the feet. In addition to the five main players, each team is also allowed to have reserve players. Unlike other indoor sports games, the futsal field is limited by lines, not a net or boards (Source: Futsal, Arah Bola, 2018)

According to Bolalob data, Futsal is one of the fastest growing sports in Indonesia today. The achievements of the Indonesian National Futsal Team are quite competitive in the international arena and there is also a competitive Professional Futsal League, thus making the enthusiasm of Indonesian futsal sports fans very high (Source Bolalob, Rissalah Maulana, 2018). According to FIFA Futsal World Ranking data, Indonesia is in the top 50 best countries in the world for futsal sports (Source FIFA Futsal World Ranking, 2019). However, with the very high achievements and enthusiasm of futsal fans in Indonesia, it is undeniable that with the high achievements of Indonesia, it is not followed by the GOR (Sports Hall) Facilities Specifically for Futsal in Indonesia which are very limited. One of them is the city of Medan, the capital of North Sumatra Province.

Medan is a city with many futsal fans. Medan boasts futsal fields scattered throughout the city, but most are outdoor; only a small number are indoor, with stands for spectators. The University of North Sumatra, one of Indonesia's largest universities, boasts a strong student body with a keen interest in sports. Numerous sports tournaments are held by the university or other institutions, attracting students throughout the year. Although the University of North Sumatra Mini Stadium serves as a venue for tournaments, other sports face difficulties due to limited field space, particularly futsal. Therefore, it is appropriate to provide complete and appropriate sports facilities and infrastructure for students at the University of North Sumatra.

In accordance with the explanation above, a university as large as the University of North Sumatra requires an adequate Student Sports Hall that can be used for purposes such as the Student Sports Week and futsal events.

Through the Campus Autonomy program established by Government Regulation (PP) No. 66 of 1999 concerning Higher Education and reinforced by PP No. 61 of 1999 concerning universities as legal entities, it is hoped that each university can manage all its own needs. This provides an opportunity and encourages each university to seek alternative funding for its educational delivery. Therefore, the modern and representative USU Futsal Hall can be used as a means to raise funds by renting it out to parties in need.

2. Literature Review

2.1Sport

The word "sport" comes from the French word "desport," meaning recreation (to relieve fatigue). According to Geraint John and Helen Heard in their book (Handbook of Sports and Recreational Building Design Vol. 2, 1981), sport is a physical and mental activity related to play and involving struggles against oneself and others.

2.2Type of Sport

According to Geraint John and Helen Heard in their book (Handbook of Sports and Recreational Building Design Vol. 2, 1981), sports can be divided into several classifications, including:

1. Classification of sports based on the purpose of the sports activity
2. Classification of sports based on their branches
3. Classification of sports based on the scope of activity
4. Classification of sports based on where the activity is carried out

2.3Classification of Sports Arenas

According to the Standard Procedures for Technical Planning of Sports Buildings issued by the Department of Public Works, sports venues are divided into three types:

1. Type A sports venues are venues that serve a provincial/first-level region.
2. Type B sports venues are venues that serve a district/municipality.
3. Type C sports venues are venues that serve a sub-district.

Table 1 Sports Hall Spectator Capacity

Sports Hall Spectator Capacity	Number of viewers (people)
Tipe A	3000 – 5000
Tipe B	1000 – 3000
Tipe C	Maximum 1000

Source: Standard Engineering Planning Procedures (Sports Buildings)

2.4Green Architecture

Green architecture is defined as architecture that uses the least amount of natural resources, such as energy, water, and materials, and has the least negative impact on the environment. (Tri Harso Karyono, Green Architecture, 2010) According to Kusumawanto, environmentally friendly areas are related to the implementation of sustainable development. Green architecture is a building design approach that seeks to minimize negative impacts on human health and the environment. The elements contained in sustainable green architecture, as a basic understanding, are landscape and interior, forming a single architectural unity.

2.5Principles of Green Architecture

According to Woolley (2006), simple construction is a building approach that meets the needs of the times, the height and importance of which will continue to increase.

1. Reality. There is no wind because a well-designed passive solar home or building is highly energy efficient. In winter, the extra sunlight from south-facing windows makes it more cheerful and pleasant than a traditional home.
2. Finance. Passive solar construction is no more expensive than conventional construction and, if handled well during the design stage, can save on material costs.
3. Cosmetics. Passive solar buildings can have a traditional exterior while incorporating passive solar features on the interior that make them bright and attractive.
4. Consider the surrounding environment. Passive solar housing can significantly reduce heating and lighting fuel consumption. By incorporating passive cooling strategies into the design, summer air conditioning costs can be reduced.

3. Comparative Study by Object

The comparative study based on the object took Bangkok Futsal Arena in Thailand, because this GOR is one of the Sports Halls in Thailand that is of international standard and is often appointed as a venue for international futsal matches such as the 2012 FIFA Futsal World Cup and the 2015 AFF Futsal in Thailand.

Table 2 Bangkok Futsal Arena Facilities

Bangkok Futsal Arena Facilities	Complete Information
	Futsal Field & Single-Seat Spectator Stand The stadium features a futsal field and single-seat spectator stand that meets FIFA international standards for hosting national and international matches.
	Athlete Changing Rooms and Official Rooms Futsal must have two player changing rooms, one for each competing team. The FIFA standard minimum area for a changing room is 60 m2, with all required facilities. The official match room is designated for referees and their assistants before and after matches.
	Club merchandise Club merchandise is available inside the Bangkok Futsal Arena to attract visitors.
	Food Court The food court's atmosphere is nearly identical to that found at an airport. This is a draw for visitors, as it offers a unique experience. The food court is located both indoors and outdoors, allowing guests to choose whether to enjoy their meals inside or outside, depending on their preferences.

	Parking There is a very large parking area, considering this facility is mandatory and meets standards due to the high visitor capacity.

Source: Bangkok Arena, 2017

4. Method

The descriptive method is a design solution method used to help designers develop their design ideas. Descriptive methods, which include explanations/descriptions of the phenomena that occur, are one of the methods used. The development model requires several stages of analysis, as well as a review of literature supporting the theory. Data collection methods are carried out in several ways, namely

A. Primary Data

a. Observational Study (Field Survey) This observational study involves information obtained directly from the subject for accurate data collection.
b. Documentation: Information about existing conditions in the form of photographs used to illustrate the information used in the analysis, supporting the method.

B. Secondary Data

a. Literature Review: This literature review provides information for architectural and non-architectural design research, drawn from books, journals, and relevant design literature. The method used is the investigation of design problems through problem-solving, theory assimilation, and the use of reference information deemed relevant, contextual, and supportive of the design process.
b. Comparative Study: This method compares problem approaches, problem-solving methods, and cases involving the same problem or issue from different sources. Comparative research is divided into two parts: based on similarities in activities and topics.

c. Other References: Data is obtained from various existing sources, such as government regulations, supporting images, and other related sources.

5. Result and Discussion

5.1 Site Location

Figure 1 Site Border

The location of this design is on Dr. A. Sofian Street and University Street, Padang Bulan, Medan Baru District, Medan City, North Sumatra 20157

The boundaries of the project site are as follows:

A. East: Suara USU Student Press
B. South: USU Lecturer Complex
C. West: FISIP Football Field
D. North: Faculty of Law

5.2 Site Analysis

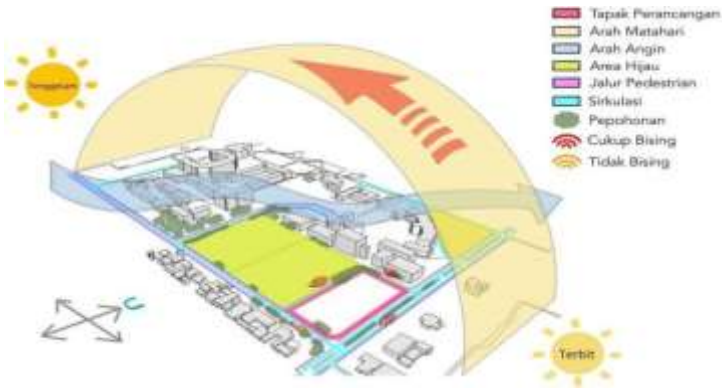

Figure 2 Site Analysis source: personal data 2023

Some of the aspects analyzed in the site conditions are as follows:

1. Sun

   Based on the data, the right side of the building's facade is exposed to a lot of morning sun and the left side of the building is exposed to a lot of afternoon sun. UV rays are not good for human health. Based on the direction of the sun, the building's facade will face south so that the sun does not directly hit the front of the facade. The use of glass materials will minimize UV rays entering the building. The use of glass is a form of implementing green architecture.

2. Wind

   According to BMKG data, winds pass through the gust zone at speeds of 10-20 km/h. The wind blows from the southwest to the northeast. The wind responds through vegetation, such as areca nut trees, palms, and other tall trees, which break through the zone. Furthermore, they must also create a circulation path to keep the

wind flowing (through the zone).

3. Accessibility

This analysis is useful for determining the visitor access route into the building. Access to this access route starts from Jl. Dr. Mansyur then enter gate 1 to Jl. Universitas and other access from Jl. Dr. Mansyur then enter gate 4 to Jl. Tri Dharma then turn left to Jl. Dr. A Sofian. To reach the site, you can use a motorbike or car.

4. Noise

Noise levels are not significant at this location, as vegetation separates the buildings, dampening the noise from several other buildings. The south side is particularly pleasant, as there's a lecturer housing complex that doesn't emit too much noise that would disturb the site.

5. Vegetation

The image shows various vegetation scattered around the site. Therefore, the site's greening potential must be carefully maintained. If trees are cut down, they will be replaced with vegetation around the building.

6. Rainfall

The average rainfall in Medan City is high because it is in the tropics. The annual rainfall in Medan city is around 2,200 - 2,800 mm. In addition, rain generally occurs in 180 - 200 days per year. The design strategy applied is to use a sloping roof on the building to drain rainwater for storage (rainwater harvesting).

5.3 Program Space Analysis

The spatial program analysis in the design of the USU Futsal Sports Building in Medan can be seen in the spatial program table below:

Table 3 analysis of space program

Room Name	Number of Rooms	Standard	Capacity	Area
Spectator Stand	-	1,2x0,6	500	-
Main Field	1	40x20	50	80
Practice Field	2	40x20	25	1600
Museum Room	1	16x8	50	128
GOR Tour	1	16x8	30	128
Changing Room	2	9x5	25	90
Coach/Official Room	2	9x5	5	90
Press Room	1	10x16	1	160
Team Briefing Room	2	13x10	30	260
Head Manager's Office	1	4x10	1	40
Employee Office	1	10x10	10	100
Security Post	2	4x4	1	32
Ticket Counter Ticket	1	2x2	1	4

Foodcourt	6	6x10	30	360
Musholla	1	13x10	20	130
Men's/Women's Restroom	2	13x10	10	260
Store Merchandise	1	10x16	20	160
Parking Pay Area	1	2x2	1	4
Fitness Room	2	16x8	20	256

source: personal data 2023

5.4 Basic Concepts for Applying Themes

The concept of green architecture is an approach to building design that considers environmental and sustainable factors. Here are some of the key concepts of green architecture:

1. Energy Efficiency: Using energy efficiently and reducing energy consumption through appropriate building design, the use of green technology, and the use of renewable energy sources.
2. Effective Water Use: Using water effectively and reducing water consumption through rainwater harvesting systems, the use of water-saving technologies, and the use of water recycling systems.
3. Sustainable Material Use: Using sustainable and environmentally friendly materials, such as recycled materials, natural materials, and renewable materials.
4. Adaptive Design: Designing buildings that can adapt to environmental changes, such as changing weather, changing user needs, and technological changes.
5. Good Air Quality: Creating good air quality inside buildings through effective ventilation systems, the use of non-toxic materials, and the use of air filtration technology.
6. Waste Reduction: Reducing building waste through effective design, the use of renewable materials, and the use of waste recycling systems.
7. Use of Green Technology: Using green technologies, such as solar panels, wind turbines, and other renewable energy systems, to reduce energy consumption and reduce environmental impact.

By applying these concepts, green architecture can create buildings that are environmentally friendly, sustainable, and healthy for their occupants.

6. Conclusion.

The design of the USU futsal sports hall in Medan using a green architecture approach can create an environmentally friendly, sustainable, and healthy building for its users. By implementing green architecture concepts, such as energy efficiency, effective water use, sustainable materials, and adaptive design, the futsal sports hall can be an example of a sustainable and environmentally friendly building.

Some of the benefits that can be obtained from designing a green futsal sports hall using an architectural approach are:

1. Reducing negative environmental impacts
2. Saving building operational and maintenance costs
3. Improving the quality of life for users
4. Increasing the building's value

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