Design and Construction of Gazebo

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Keywords: Gazebo, Coconut Timber, Construction, Small Building.

Abstract: Gazebo is functioning as a temporary place for the user to do the different activities as well as enjoy the outdoor area. The location of the gazebo is including a public park, campus, school, tourism area, private areas such as a house, restaurant, and other public areas. Define the characteristic of the gazebo through its type, function, and material is the aim of this research. Data is collected by survey and literature study. Data is recorded through the photo of the design and construction of the gazebo. They are listed based on principle design and standard of wood as construction and proposed design is developed with computer program Auto CAD. Results show that type and function of the gazebo is vary as well as material use. The use of coconut timber for the gazebo structure is interesting due to its unique pattern and possible design and joint system. Yet, the quality of coconut wood needs to be maintained to avoid damage and change of appearance. Further research needs to develop local material and local design.

1 INTRODUCTION

The gazebo is the facility for a temporary place to rest and do activities in an open area. Design and construction of gazebo are varied with mostly consideration of using local material including different types of wood such as coconut timber. Research on timber as a construction material has been done in terms of the development of coconut timber and other types of timber and its design (Makalew et al, 2015, 2020., Runtunuwu et al, 2015, Rumbayan et al, 2019).

Gazebo as a small-scale building with direct intact to the outdoor area such as garden park requires adequate construction system as well as comfortable and interesting design for user. It also needs to protect the user from the impact of bad weather. The material used should be resistant to the natural condition. The texture of the material can improve the quality of the design gazebo. The pattern of timber construction can also enrich the appearance of the gazebo.

To improve the use of local material, local design, and local wisdom there is a need to research the design and construction of the gazebo.

2 LITERATURE REVIEW

Research relates to the production of coconut timber considering rules and industry coordination (Sodangi et al, 2020). The adaptation of using coconut timber as green environmentally friendly material should be considered in the management of its quality (ibid). The type of timber for gazebo including jati wood, coconut timber, trembesi wood, and merbau wood (Hafif, 2016). Moreover, non-structural parts such as columns, floor, and walls can use coconut timber (Kusyanto, 2015).

The location of gazebo based on standards are in the area such as playing park, urban settlement and business area (BSN, 2004). Infrastructure for a housing area, urban settlement, and public area need to consider standards available including standard of neighborhood planning on housing in the urban area (BSN, 2004). The facility of the gazebo should be accessed easily by the public. Criteria in providing facility are related to connection, access, safety, comfortable and clearness (Permen PR, 2012). Pedestrian movement, the space need, and facility for housing areas and urban settlement areas should be a priority in places with a large number of the user (Makalew et al, 2017., 2018., 2019, Makalew 2020).

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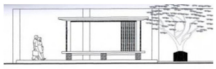
The example of Planning and design of gazebo is a gazebo for a university student activity to study. The materials used for a gazebo are concrete and natural stone (Dewi, 2017). Research on seating area for a gazebo is considered ergonomic aspect due to factor of comfortable in using it (Putri et al, 2021). Design for small-scale buildings with coconut timber is considered the design of railing (Makalew et al, 2015). The type of railing including cross railing, perpendicular railing, railing with 5 cm wide wood and combine railing (Makalew et al, 2015). The use of polyurethane in the finishing of coconut timber can improve the texture (Phebryanti, 2015).

3 RESULT AND DISCUSSION

The research method is survey and literature study. Data is recorded through the photo of the gazebo particularly design and material use. The design and construction of the gazebo are listed based on principle design and standard of wood as construction. Design is developed with the alternative design using AutoCAD and supported program design.

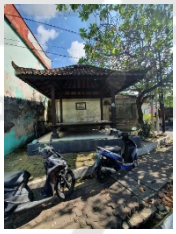
The gazebo can be divided into different types based on its function and place such as park gazebo, campus gazebo, and village gazebo. The design concept of the gazebo based on the literature review can be seen in Table 1.

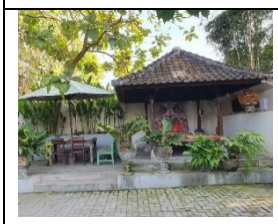
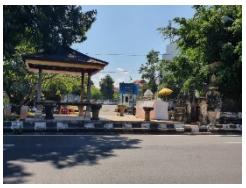
Table 1: Design Concept of Gazebo.

Type of Gazebo	Design Concept	Source
Park Gazebo 	Anthropometry Dimension based on human movement and space average distance Natural material Shape	Pahlawan et al (2020)
continued	Semiotic traditional Sunda house: Djulang Ngapak	
 Campus Gazebo	Design gazebo Structure concrete K-225 Reinforce D10 and dia 14 Stone ornament	Dewi (2017)
 Village Gazebo	Observation and Community service approach Farming rest area	Rahmawati et al (2020)
 Restaurant gazebo	Local material coconut timber	Makalew et al (2015)

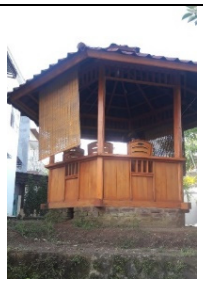
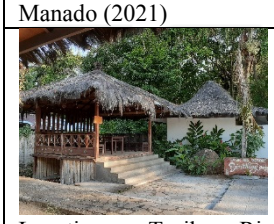
Survey on places with the facility of gazebo show different type, function, design and material use. The area with a gazebo including public places such as beaches, streets, and public buildings. The gazebo can also be found in the front area of the restaurant, hotel, and private house. The function and design of the gazebo can be seen in Table 2

Table 2: Function and Design of Gazebo.

Picture	Function	Material & Design Concept
 Location: Denpasar, Bali (2021)	Waiting area for visitor Lobby Elevated floor Highly used and well maintenance	Wood Traditional design
 Location: Denpasar, Bali (2021)	Waiting area for visitor Lobby Seating area with a set of quest chair Highly used and well maintenance	Wood and concrete Different color use Traditional design

Picture	Function	Material & Design Concept
 Location: Denpasar, Bali (2021)	Waiting area for visitor Lobby Elevated floor Highly used and well maintenance	Wood and concrete Traditional design
 Location: Denpasar, Bali (2021)	Waiting area for visitor Elevated floor Highly used and well maintenance	Coconut Timber and concrete Traditional design
 Location: Denpasar, Bali (2021)	Waiting area for visitor Elevated floor New construction at the gazebo production factory	Wood Traditional design
 Location: Denpasar, Bali (2021)	Waiting area for visitor Entrance of place Elevated floor Highly used and well maintenance	Wood Traditional design
 Location: Denpasar, Bali (2021)	Rest area for the visitor at the beach Highly used and well maintenance	Wood Traditional design Floorplan: square

Picture	Function	Material & Design Concept
 Location: Denpasar, Bali (2021)	Waiting area for visitor Elevated floor New construction at the gazebo production factory	Jati Wood Develop traditional and modern design
 Location: Denpasar, Bali (2021)	Waiting area for visitor Can be used as a private space Elevated floor New construction at the gazebo production factory	Wood Develop traditional and modern design The roof for paddy storage
 Location: Denpasar, Bali (2021)	Waiting area for visitor	Metal Modern design Floorplan: square
 Location: Denpasar, Bali (2021)	Seating and leisure place for visitor Highly use and well maintenance	Metal with traditional material for roof Floorplan: circle

Picture	Function	Material & Design Concept
 Location: Private house, Manado (2021)	Rest and home activity Well maintenance	Wood Traditional design Floorplan: square Short wall with part of the railing
 Location: Private house, Manado (2021)	Rest and home activity Well maintenance	Wood Traditional design Floorplan: hexagon Railing with pattern
 Location: Tasik Ria Resort Minahasa (2019)	Visitor rest area Well maintenance	Coconut Timber for structure and rumbia roof Traditional design

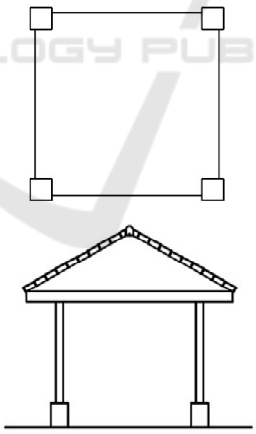
Gazebo as a small-scale building is a potential area for user activity in the open area. The design and construction have been developed with many of them are highly used. The standard for small-scale buildings is limited. The exploration of the character of design and construction of gazebo based on a literature study and the survey on different public and private places. Define its characteristic can help improve the quality of design and construction. The evaluation of the gazebo in terms of its characters can be seen in Table 3.

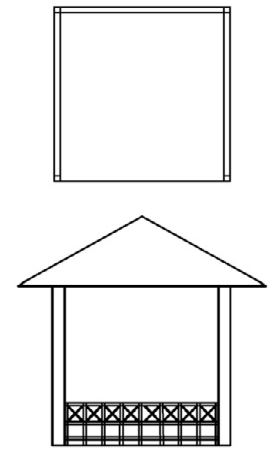
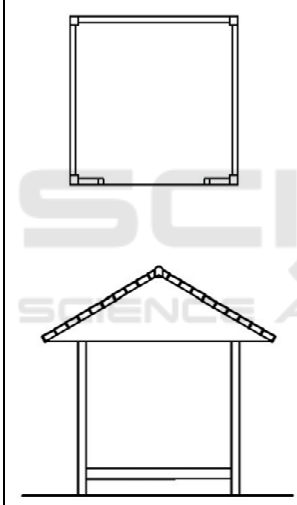
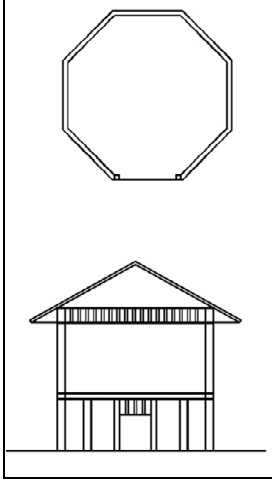
Table 3: Characteristic of Gazebo.

Characteristics	Potential Design	Potential Construction
Multi-function	With or without boundary, facility for any activity	Construction with or without wall or railing
	Adequate space for user	
Facility seating area	Comfortable and adequate space	Separate or part of the main structure
Traditional and modern design	Different design, mix design, different floorplan shape	The pattern in-wall and railing
Strong material	Compact design	Material resistance for the impact of excessive weather
Local material	Texture and color from a natural material	Coconut timber

The proposed design and construction for the gazebo is developed in considering the type, function, material use, and detail design. The proposed gazebo design and construction can be seen in table 4.

Table 4: Proposed Design and construction of Gazebo.

Floor Plan and Front Elevation	Design and Construction
	Square type of floor plan Open plan design with the foundation from concrete

Floor Plan and Front Elevation	Design and Construction
	Square type of floor plan Railing along three sides Combine cross and square joint system on the railing
	Square type of floor plan Railing along three sides Elevated floor plan
	Hexagon type of floor plan Railing along seven sides Combine half wall as railing and railing with square joint system

The use of coconut timber as material for small types of building such as gazebos is wide including part of the structure and construction. The characteristic of coconut timber based on the survey on a selected object including the quality of the wood pattern, joint system, and its treatment can be seen in Table 5.

Table 5: Construction design of Gazebo.

Picture Of Coconut Timber Construction And Joint System	Possibility of Construction Design
	Join with other material, other wood types, light steel
	The joint system with screw nail
	Different size joint for alternative design
	Different size joint for alternative design
	Cross joint system for alternative construction system

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Picture Of Coconut Timber Construction And Joint System	Possibility of Construction Design
	Curve cutting for alternative design
	Pattern joint system for alternative design

Coconut timber, on the other hand, needs to be treated and maintained well in its construction such as joint system and weather impact. The quality of coconut timber can be degraded which influences the strength and appearance of the gazebo. Based on the evaluation of the joint system and surface performance of coconut wood, the change due to the impact of the surrounding environment can be seen in Table 6.

Table 6: Evaluation of Damage of coconut wood.

Picture of coconut timber use	Evaluation Damage on Construction System
	Break due to nail system
	Break due to nail system
	Break due to joint system
	Break due to joint system with different wood type
	Break due to moist on material
	Moss on the surface due to humid gradually
	Uneven surface due to movement joint
	Break at joint system with nail

Picture of coconut timber use	Evaluation Damage on Construction System
	Complex damage due to moist surface
	Change the color of the surface
	Break and moss near joint system due to complex impact
	Change surface color due to higher use

4 CONCLUSIONS

Based on the preliminary study on the design and construction of a gazebo, there are different types of gazebos including the gazebo for the garden park, campus gazebo, village gazebo, private gazebo, entrance gazebo, and lobby gazebo. The material used for the gazebo is varied such as wood, coconut timber, metal. The design approach for gazebo including modern design and traditional design. The use of coconut timber for the gazebo can create an interesting design due to its unique pattern and the possibility of a joint system. However, the impact of the surrounding area on coconut timber requires treatment to maintain its quality. Development of gazebo in design and construction should be a further study in considering of local potential.

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