Characteristic of Shelter for Child Pedestrian

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Abstract: Child pedestrians require an adequate and safe facility to protect during their journey. As there is no standard available yet for child pedestrian facilities, research on its facility is urgent. The shelter is functioning as a temporary place to protect the user from bad weather impacts and as a transit area in using public transport. This research aim is to evaluate the characteristic of child pedestrian shelters as public facilities in the pedestrian pathway in urban areas. The method used is survey and literature study. The survey is done on a selected place in which potential for people to use and the proposed design is tested using the drawing program AutoCAD in the computer laboratory. Results show that there is no particular shelter for child pedestrians yet. The type of shelter to be developed is based on the consideration of child pedestrian movement pattern, child behavior, and available shelter such as transit commuter shelter and concept of shelter function. There is a need for further research of child pedestrian facility which is lead to guideline providing to accomplished pedestrian standard.

1 INTRODUCTION

Child pedestrian shelter prototype is one of the street infrastructure facilities for pedestrians and commuters who travel with different transport modes. In an urban area, a pedestrian facility is an important infrastructure to protect users to be safe and comfortable n their activity. For child pedestrians, activity in walking including playing and running. The child movement needs to be accommodated in child activity including a place for a temporary stop during bad weather conditions and short rest. The shelter is one of facility need for pedestrians, usually for transit to public transport such as a bus. The shelter is also used as a transit area for pedestrians and visitors to the public area. For child pedestrians, a shelter needs to have adequate quality and functioning as a safe place for children to transit and play with or without playing objects as their major need based on their behavior. Shelter for child pedestrians can fulfill child needs as well as learning facility with interesting design, rich of color pattern and local texture. Facility for shelter support safety and comfortable facility for the child who has high risk of accident in the public area. To help create a child-friendly pedestrian shelter It needs to support with suitable material in which is safe, comfort and eye-catching. Therefore, the use of the material should be rich in texture and has a strong character. The use of local materials such as coconut timber and recycle plastic waste can contribute to create a type of shelter with local character and accommodate child activity.

2 LITERATURE REVIEW

Research related to child pedestrian facilities is mostly related to the pathway and child pedestrian behavior. Concerning child pedestrians, standard use including criteria for housing pedestrian areas is comfortable and accessible. Criteria for accessibility is considering ideal distance for walking to public facilities (BSN, 2004). The principle of a circulation system for pedestrians is connection, safety, comfortable and clearness (ibid). Dimension for pedestrian walking area is based on the standard including minimum standard of projection user need, network shape for neighborhood center and its surrounding area, characteristic of the local area, safety and comfort space for pedestrian from the impact of local and regional weather prediction (ibid).

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In finishing pedestrian pathway, criteria include the placement of pathway on the streetside with a material different than the street material such as using paving block, bollard, safety surface material and suitable wide of the pathway for pedestrian.

Student journey as the pedestrian is influenced by environmental and social factors (Zacharias et al, 2017). Pedestrian behavior influences the route choice and space use such as taking the risk in hurry (Charron et al, 2015). Pedestrian behavior is influence by facility available (Sisiopiku et al, 2003). Standard related to pathway wide and land use (APA, 2007), wide, access and facility of the pedestrian pathway (BSN 2004, BSN 1991, Ditjen Bina Marga 1999 and Kementerian PU 2014).

Research on materials for small-scale buildings is including environmentally friendly materials and local materials. Research related to plastic waste such as recycle used plastic water bottles, plastic bags, and bottle lids in making paving blocks (Burhanuddin et al, 2018). The paving block is used for the garden park area. Research on material with plastic waste for part of building construction such as filling element, structural element, and additional element (Winnerdy et al, 2020). The use of coconut timber as a material improves the quality of surface texture to be lighter with a clear pattern using finishing material such as polyurethane, melamine-formaldehyde, and ultra-vernix (Purwanto, 2011).

The shelter is functioning as a protected place to avoid the impact of bad weather conditions. A shelter as an evacuation facility that is used during a tsunami needs to be resistant to an earthquake, tsunami and can accommodate a large number of people (Yuhanah, 2014). A shelter for a commuter is a place for transit and a waiting area. The use of shelter as public transport facility is related to distance, accessibility, waiting time, placement, facility, land use, pedestrian facility, and easy accessibility to public transport (Sitohang et al, 2019). In the public areas of bus shelters, it needs to fulfill the facility for pedestrian and pedestrian bridges (Sitohang et al, 2019). The facility in the shelter including size based on standard, identity, route board, light, chair, rubbish bin, bollard, and advertisement board (Sitohang et al, 2019). The shelter setting place and design improve the service to public transport commuters in which it is still functioning and some need to be replaced (Rusmandani et al, 2020). Requirement for transit commuter place including the identity of shelter, traffic sign, information board, light, and chair (DPDJPD, 1996). Pedestrians use the shelter as a temporary place to protect themselves from the impact of weather conditions or to transit to public transport or continue to walk. For child pedestrians, shelter functions as a temporary place during walking journeys including playing. There is no available standard shelter for child pedestrians therefore there is a need to do research on shelter for child pedestrians.

Previous research on a pedestrian is related to the use of the material including material fly ash (Makalew et al, 2020) and development in using plastic in design paving blocks for material in pathway surface (Makalew et al, 2020 and Supit et al, 2019.) The design small scale building is using coconut timber is explored to find possibility patterns (Makalew et al, 2015)

Space need and child pedestrian patterns show different characteristics in the urban and rural areas (Makalew et al, 2017., 2018). A potential area for pedestrian with a large number of pedestrians is school area (Makalew et al, 2018) in which front school area need a facility for school entrance and consider child pedestrian pattern. The area needs child pedestrians including a pathway and playing area (Makalew et al, 2020) as can be seen in Figure 1

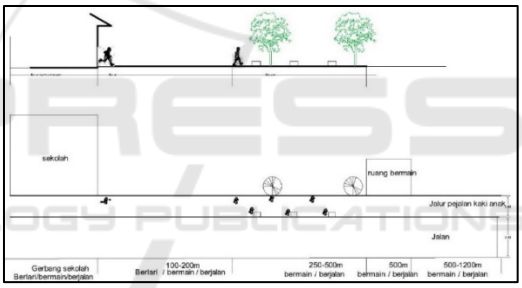


Figure 1: Facility for child pedestrian pathway and playing pocket area (Makalew et al, 2018).

3 RESULT AND DISCUSSION

Define the characteristic of shelter is drawn based on survey and literature study. A survey on shelter is important in finding the type, function, and material use as well as evaluation on how the public uses them. The research method used is survey and literature study. The survey is done on a selected place in which potential for people to use shelters such as bus stops, intersections, and public facilities. The object of the survey is recorded with photos and video in terms of material use, function, and maintenance. The proposed design is tested using the drawing program AutoCAD in the computer laboratory. The shelter design is based on research in the different field yet focus on shelter as a transit place for commuter and visitor. The method used for design a shelter is varied

to create a comfortable and safe area. The result of the characteristic design of the shelter based on a literature review can be seen in Table 1.

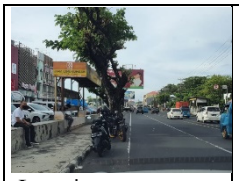
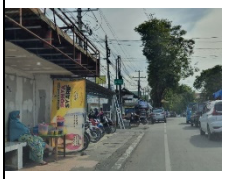
Table 1: Design of Shelter.

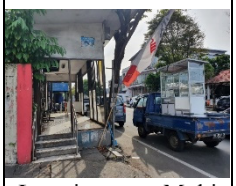
Type of shelter	Design	Method use
Bus Shelter	• The size of the shelter is 7x3x4 m3 • Lighting at least 3 pieces • Colour use is red and blue • Stair's size 12 cm height and 30 cm wide • Frame material made of concrete • Chair material made of stainless • Information board	Quality Function Deployment (QFD) (Hasibuan et al 2020)
Bus Shelter	• Suitable of dimension. Scale and space • View, lighting, and open up to potential crime place • Connectivity within facilities	Rhyme concept for anti-vandalism and crime problem (Marta et al 2013)
Bus Shelter	• Ramp design should not be high yet comfortable for disability • Size fits all users including wheelchair • Suitable Distance between shelter and cars • Adequate seat area available •	Ergonomic (Toghas 2015)
Bus Shelter on campus	• Seat area, ramp, wall, canopy, floor, color, setting, information board, light, rubbish bin • Space available 11 m2 • Consider the design of the main building	Iconic and local wisdom concept (Apdeni 2019)
Type of shelter	Design	Method use
Public service area shelter	• User is age 2 to 60, student and worker • Size 10m x 4m x 3m • Facility for disable • Colour creates a fresh and comfortable area	Comfortable, discipline, and independent (Kurniawan et al 2011)
	• Material environment friendly such as metal, aluminum, plastic polythene, LED light, and low E glass • Solar panel for energy and technology for information	
Evacuation shelter	The public facility as a shelter for tsunami Can be used for public activity including a multi-function entertainment area and praying area.	Mitigation (Alifah et al 2020)
Evacuation shelter	Structure, evacuation floor, public service, capacity 1 m2/ person, location, and accessibility	Mitigation (Yuhanah 2014)
Evacuation shelter	• Location in potential area • Use of public facilities such as mosques, schools, public health centers, government buildings, and shopping centers.	Mitigation (Husa et al 2019)

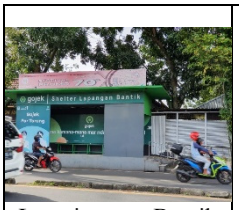
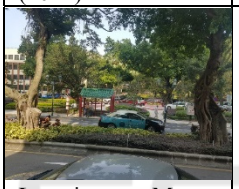
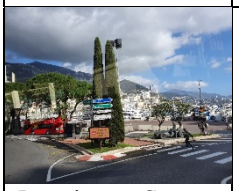
The function of shelter and its material use is varied when the shelter is constructed in a public area. based on the survey, shelter in which is a function for transit areas of public transport commuters has changed gradually considering users in the area and aspect of maintenance. Function and material use including evaluation of available shelter can be seen in table 2.

Table 2: Function and material of Shelter.

Picture	Function	Material Use
 Location: Manado Town Square, Manado (2021)	Bus and microbus Shelter Available use for pedestrian transit and commuter for online transport	Structure: Steel Seat area: Concrete The floor is ceramic with texture and color. In good condition
Picture	Function	Material Use

Picture	Function	Material Use
 Location: Boulevard, Manado (2021)	Bus and microbus Shelter Available use for pedestrian transit and visitor for short rest	Structure: Steel Seat area: Concrete Floor concrete No maintenance: Column and frame is rust. Floor is damage
 Location: Mega Mall, Manado (2021)	Bus and microbus Shelter Existing use for street vendor and visitor	Structure: Steel Wall: brick Floor: concrete No maintenance: ceiling, wall, and floor are damage
 Location: Mega Mall, Manado (2021)	Bus and microbus Shelter Abandon area	Structure: Pipe Steel Seat: concrete Floor: Paving block No maintenance: no ceiling and structure is the rust
 Location: Denpasar, Bali (2021)	Shelter for online transport commuter Available use for pedestrian transit and commuter for online transport	Structure and Seat area: Metal with eye-catching color
 Location: Denpasar, Bali (2021)	Shelter for commuter and visitor	Structure: Concrete Traditional design Information board

Picture	Function	Material Use
Location :  Megamall, Manado (2021)	Shelter for commuter and visitor	Structure and Seat area: Metal with eye-catching color
 Location: Tikala Manado (2021)	Seating area for pedestrian and visitor	Chair: Metal
 Location: A.A. Maramis, Manado (2021)	Shelter for commuter	Structure and Seat area: Metal with eye-catching color
 Location: A.A. Maramis Street, Manado (2021)	Shelter for commuter Bus Damri Manado Abandon area Ceiling and wall damage	Structure: Metal
 Location: Samratulangi Street, Manado (2021)	Area for visitor and pedestrian Open structure without a roof Highly use by pedestrian and visitor	Structure: Metal Chair: Concrete
 Location: Multi mart, Wolter Monginsidi Street, Manado (2021)	Shelter for commuter Bus Damri Manado Abandon area Ceiling and wall damage	Structure: Metal Wall: glass Chair: Metal

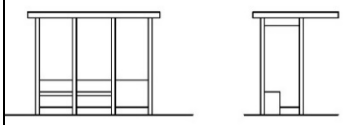
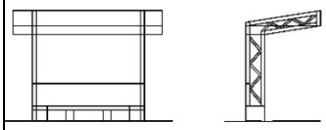
 Location, Bantik Park, Malalayang Manado (2021)	Shelter for commuter reconstructed from shelter for Bus Damri to public transport including online commuter	Structure and Seat area: Metal with eye-catching color Wall: panel
 Location: Ahmad Yani street, Manado (2021)	Shelter for commuter public transport	Structure and Seat area: Metal with eye-catching color Wall: panel with the information board
 Location: Macau (2019)	Shelter for commuter bus	Structure: Wood with eye-catching color
 Location: Cannes, France (2019)	Area for visitor and pedestrian Open structure without a roof Highly use by pedestrian and visitor	Structure: wood
 Location: Cannes, France (2019)	Shelter for commuter bus Well maintenance	Structure: Metal
 Location: Amsterdam, Holland (2019)	Shelter for commuter bus Well maintenance	Structure: Metal
Picture	Function	Material Use

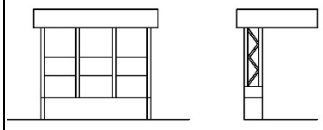
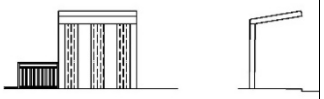
 Location: Tourism Water Village, Giethoorn, Amsterdam (2019)	Shelter for commuter bus Well maintenance	Structure: Metal
 Location: Amsterdam, Holland (2019)	Shelter for commuter bus Well maintenance	Structure: Metal
 Location: Geitthoorn, Holland (2019)	Shelter for commuter bus Well maintenance	Structure: Metal
 Location: Perth, Australia	Shelter for commuter bus Well maintenance	Structure: Metal
 Location: Freemantle, Australia (2017)	Shelter for commuter bus Well maintenance	Structure: Metal
 Location: UWA Perth, Australia (2017)	Shelter for commuter bus Well maintenance	Structure: Metal Wall: glass Information board
Picture	Function	Material Use

 Location: Perth, Australia (2017)	Shelter for commuter bus Well maintenance	Structure: Metal Wall: glass Information board
 Location: Perth, Australia (2017)	Shelter for visitor Well maintenance Eye-catching design	Structure: Metal, wood
 Location: Perth, Australia (2017)	Shelter for the visitor with child Well maintenance Eye-catching design	Structure: wood
 Location: Perth, Australia (2017)	Shelter for train commuter Well maintenance	Structure: Metal

From surveys on shelter in many places, it is found that there are many types based on design and function for shelter. The main part of a shelter is structure, seating area, material use, open plan, or boundary with wall and information board. Based on the types of shelter which have been used, the example of design front and side elevation can be seen in Table 3.

Table 3: Design and Construction of Shelter.

Front And Side Elevation	Design And Construction
 Shelter for bus commuter	Glass wall two parts Seating area with metal material Flat roof, Metal structure Transparent walls can be developed for child shelters with a different color.
 Shelter for bus commuter	Brick half wall one part. Seating area from the concrete Continuous structure from Roof to column, Metal structure with a frame. For child shelter, Seating areas can be developed into areas for playing while seating. Continuous design is attractive as a child shelter.
 Shelter for parents and kids	Open floor plan, no wall Seating area from wood, Structure from timber Seating areas with timber can be developed for children playing boxes in child shelters.
 Redesign shelter for bus Damri to Shelter for online and public commuter	Multiplex Wall combine half and full part Wall for the information board Seating area from the metal. Structure from metal. Design and color are attractive for child shelters. The information board is for children information of knowledge with pictures.
 Shelter for online and public commuter	Glass wall three parts. Wall for the information board Seating area with metal material Flat roof, Metal structure Function and facility are suitable o be developed for child shelter.

Front And Side Elevation	Design And Construction
 Shelter for public commuter	Brick half wall one part Seating area from the concrete Flat Roof Metal structure with a frame
 Shelter for public commuter	Metal wall one part Wall for the information board Continuous structure from Roof to column Metal structure

Based on the design listed from the data of the survey, the shelter's main design is for a temporary place with adequate space, seating area for rest, an information board for commuters, and different materials and colors used for its construction. Shelter for the bus can be redesign for child pedestrians based on the design principle and function of the object. The material and color are suitable for child pedestrians with attractive designs. Children's preference for an attractive place is based on their activity and interaction with the object. Shelter with information board can be developed to information for children including knowledge and game through pictures and words. Seating areas may be used by children pedestrians for rest yet mostly can be developed into an area for playing while seating.

Child pedestrians require shelter that can support their activity including walking, resting, playing, and running. Based on child behavior, standards available, literature review, and survey on shelter from many places, the characteristic of child pedestrian shelter is evaluated. Evaluation on shelter for child pedestrian is based on child behavior and the pedestrian facility can be seen in Table 4.

Table 4: Characteristic of Child Pedestrian Shelter.

Characteristic	Design and material
Available playing area	Playing objects Playing space
Strong construction and structure	Local material with strong joints and finishing
The protected area from bad weather	Adequate roof and wall with resistant material
The protected area from a traffic crash	Adequate space considering child space need and movement
Available seating area	Chair available with safe finishing
Available information board	Information board for the child considering knowledge development and safety rule
Eye-catching design and color	Colorful, rich in texture, design for child
Well maintenance	Material and design easily maintenance

The design for child pedestrian-friendly shelter is the potential to be developed. Considering the existing condition of the pathway on the study area, characteristics of the pedestrian pathway, and the concept of the construction system, it is possible to create a prototype for the child pedestrian shelter. Major parts of shelter are structure, floor plan with easy access, material and board for public and learning information, area for playing with the object. Alternative concept design for child pedestrian shelter can be seen in Figure 2 and Figure 3.

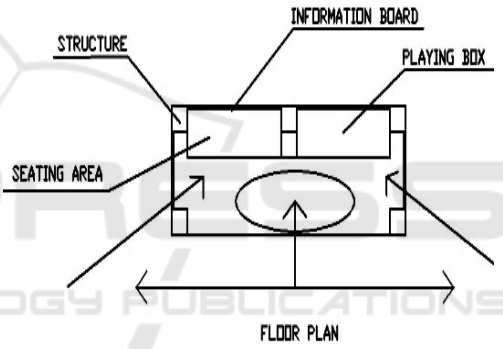


Figure 2: Alternative floor plan concept for child pedestrian shelter.

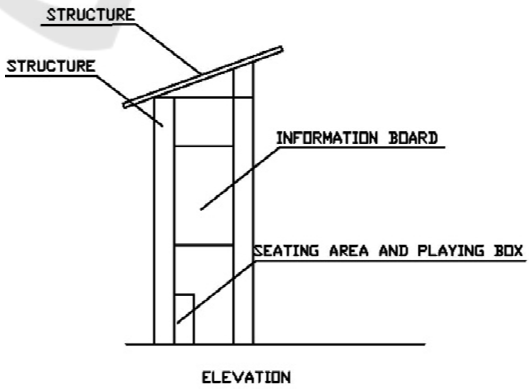


Figure 3: Alternative elevation concept for child pedestrian shelter.

4 CONCLUSIONS

The characteristic of child pedestrian shelters influence by the function, type, and material use. For child pedestrians, the main consideration is their activity should accommodate in the shelter provided. As there is no standard yet for child pedestrian shelter, therefore is a need to do further research to provide an adequate guide in design it and support child pedestrian needs.

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