

Service-Learning Inclusive Design: Sidewalk Redesign for Siwalankerto

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Abstract. Public facilities and transportation infrastructure were very important for all residents including Persons with Disabilities (PwDs). Sidewalk should be safe and easy to use for all kind of user, ranging from elderly, children, and the PwDs included wheelchair users, blind disability, low vision disability, etc. The planning of sidewalk should be safe, meet the standard and inclusive. The Service Learning and research program in Architecture Program Study was conducted with literature study, observation, discussion and interviews with users at Siwalankerto street sidewalk. The design would be implemented in Petra's area in the following year. **Keyword:** Sidewalk, Accessibility, Inclusive Design, Disability.

1 Introduction

1.1 Background

The accessibility issue of Persons with Disabilities (PwDs) in the developing countries, like Indonesia, was not highly considered in the development. Therefore many public facilities, such as pedestrian sidewalk, were not accessible for PwDs because of limited of awareness and budget. On the other hand, Indonesian national regulation on the PwDs such as Act no 19 Year 2011 on Ratification on Convention on the Rights of Persons with Disabilities (UU no 19 Thn 2011 tentang Pengesahan Convention in the Rights of Persons with Disabilities/ *Konvensi mengenai Hak-Hak Penyandang Disabilitas*) [1] and Act no 8 Year 2016 on Persons with Disabilities (UU no 8 Thn 2016 tentang Penyandang Disabilitas) [2].

Indonesian National Statistics Bureau/ Biro Pusat Statistik, [3] in National Socio-Economic Survey (Survey Sosial dan Ekonomi Nasional) showed that in 2000, there were 1.46 million of PwDs in Indonesia (0.74 % from 197 million national population). Currently the PwDs population were projected reaching 6 million. Therefore, the importance of accessibility of PwDs in public spaces, such as: sidewalk, was important.

Surabaya was Indonesian city with the rapid growth. It could be seen from the facilities and transportation which were more advanced such as: highways, flyovers or sidewalks. Unfortunately, some of the facilities were not as accessible because of several reasons:

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limited knowledge of pedestrian planning and design and limited participation of PwDs in the design, construction, operation and maintenance. Therefore, a participatory design for sidewalk redesign process was proposed in Siwalankerto area. The area was developed because existence of Petra Christian University (PCU) and some residential nearby. The area was affected by development of public and governmental, commercial and services buildings in Ahmad Yani Corridor and Jemur Andayani-Kendangsari Corridor as described by Poerbantanoë [4].

The PCU campuses, the elementary schools, the Siwalankerto Sub-District Office created high pedestrian flow in the roadside of Siwalankerto area during morning and afternoon, before and after the school time. Therefore, the accessible sidewalks were essential in the area. On the other hand, the narrow Right of Way of main streets of Siwalankerto created high number of pedestrian-related-accident. These had been solved by the culvert development in the Siwalankerto roadside. But the pedestrian sidewalk in Siwalankerto was not clearly designed, demarcated and regulated to optimize the pedestrian use.

Therefore, the Service Learning Course – Inclusive Design was created in Architecture Program Study and the Siwalankerto's sidewalk redesigning was proposed to solve the problem. This paper discussed the current condition of the Siwalankerto's sidewalk, analyses and solution proposed to redesign based on inclusive design principles. The purpose was to create safe, accessible for PwDs.

1.2 Literature Review

D. Levine (ed) in *The NYC Guidebook to Accessibility and Universal Design*, prescribed guideline for exterior planning that are accessible [5]. The accessible standard was selected considering the limitation of Developing Countries, like Indonesia.

Accessible Key Design Goals were stated such as: designs for outdoor spaces should address needs and preferences. The security and safety of all normal use should be attended.

- Provide a continuous path of travel with no obstacles to any user from site access points to all site destinations.
- Provide security for all users.
- Provide illumination at all parking areas, passenger loading zones and along pedestrian pathways.
- Eliminate hazards to passage

Accessible pathways that should be provided with clear width of at least 36 inches (915 mm). Passing spaces at least 60 inches by 60 inches (1525 mm by 1525 mm) were to be located at reasonable intervals that of 200 feet (61 m) for accessible pathways with less than 60 inches (1525 mm) clear width. Besides that, the stable, firm, and slip-resistant walking surfaces were proposed. The transition height of no more than ¼ inch (6.5 mm) between different flooring surfaces was mandatory. Meanwhile pathways steeper than 1:20 meet different requirements because they are considered ramps. Cross slopes should not exceeding 1:50. Curb ramp and ramp were needed for changes in level are greater than ½ inch (13 mm).

Spacing in the gratings had to be greater than ½ inch (13 mm) wide and located in one walking direction. Eighty inches (2030 mm) vertical clearance on the pathways had to be provided. Objects mounted to the wall were allowed with bottom edges between 27 inches (685 mm) and 80 inches (2030 mm) high from the floor. The objects also should not protrude more than 4 inches (100 mm) from the wall.

Traffic intersections possessed serious safety concerns for people of all abilities. Improvements to intersections' signage, the condition and length of street crossings should be done. Accessible Criteria of intersection were similar to accessible pathways.

A curb ramp is one tool that can improve the safety and usability of traffic intersections. In addition to enhancing pedestrians' safety, curb ramps permit people using wheelchairs or pushing a stroller to more easily cross the street. Design curb ramps to promote pedestrian safety and provide a smooth transition in level changes. Some Accessible Criteria of intersection were similar to accessible pathways. The curb ramp to be provided whenever an accessible pathway meets a curb. The slopes of the curb ramp should not exceed the 1:12 slope. Maximum slopes of adjoining road surfaces also should not exceed 1:20. The clear width of the curb ramp without the flared sides, should be more than 36 inches (915 mm). And flared sides with a maximum flare slope of 1:10 where pedestrians must walk across a curb ramp. All these guidelines actually could be fulfilled in Indonesian sidewalk context.

Public Works Minister Regulation no 30/PRT/M/2006 on Technical Guidelines on Accessibility in Building and Environment (PerMen PU no 30/PRT/M/2006) prescribed several guidelines for pedestrian [6]. The pathways were accessible for pedestrian and wheelchair users independently, safely, easily, and without barriers. The regulation was the surface should be stable, strong, could endure weather, not slippery, without barrier. The maximum slope allowed 1:8 and every 900 meter distance there should be 120 cm landing area. Resting area should be provided for PwDs. The lamination of man-made lighting should range between 50-150 lux. Maintenance should be conducted. Drainage should be provided perpendicularly to travelling 1.5 cm. The minimum clear-width of pedestrian was 120 cm for one-way and 160 cm for two-ways path. The pathways should be free from trees, poles, drainage holes, other protruding objects. The curbs should be allowed with 10-15 cm height.

Some discrepancy in the regulations were found such as the maximum slope standard. But the latest max slope standards were adopted, which were 1:12 for existing sidewalk or 1:20 for future sidewalk. The other descriptions could be adopted with spatial and economical consideration.

2 Methodology

To create the sidewalk design, several steps were conducted, such as:

1. Literature study
2. Students' simulation as PwDs in Petra Christian University (PCU) area
3. Observation and documentation in Siwalankerto roadside from PCU main campus (Radius Prawiro Building) towards PCU parking area (ANTA sports field)
4. Interviews with PCU students and Public Users.
5. Data compilation
6. Sidewalk redesign based on input of PwDs, senior persons and students.

First, a literature study was conducted to find out the inclusive principles and standards for designing inclusive sidewalk. Then a simulation involving the student was conducted with assistance wheelchair and blind stick in Petra Christian University pathways. This simulation was done to generate experience and understanding of PwDs movement.

Observation and documentation were conducted in the Siwalankerto roadside from PCU main campus (Radius Prawiro Building) towards PCU parking area (ANTA sports field). The accessibility level the existing sidewalk and the problems were analyzed. Furthermore, interview with students and local residents were also conducted with purposive sampling method. And the type of activities, needs and responses to Siwalankerto's sidewalk redesign were finally recognized.

A redesign process was conducted in the team. Existing standards were adopted and integrated into the existing context. For more focus redesign process, a 50-meter-length sidewalk path was selected to fulfil the accessible level as prescribed in the following

regulation. Interim presentation with Lecturer, PwDs, Senior Persons and the Public Works Department agent was conducted. Hopefully, a final design would be finalized in August 2017 involving Sub-District Head, Surabaya's Municipality (Public Works Section, Transportation Section, and Civil Defense Section) and the local residents. Hopefully, the design would be implemented in sidewalk in front of PCU. .

3 Results and Discussion

The sidewalks were heavily used by the residents, which were mostly women, children and senior persons. They used the sidewalk intensively during morning between 6 - 7 AM, 12 AM – 1 PM, and 5 – 7 PM. They normally use the sidewalk to reach school, mosque, traditional market, etc. On the other hand, the PCU Students and Lecturers utilize the sidewalk between 7 - 9 AM, 12 AM – 1 PM and 3 – 4 PM. They usually walk on the pathways to reach PCU Campus, PCU parking area as well as to buy stationery, food or other things in the surrounding PCU.

The sidewalks in Siwalankerto were not accessible for Users, especially PwDs. This was clearly shown from the observation along the Siwalankerto Road, especially from PCU Main Campus (Radius Prawiro Building) to PCU parking area (ANTA Sports Field). The accessible pathways were found in some areas with minimum clear width of 915 mm. Passing spaces of 1525 mm by 1525 mm were present in certain areas. On the other hand, some narrow passages were present. The stable, firm, and slip-resistant walking surfaces were not found, some vulnerable gratings were found causing danger to pedestrian.

Several barriers blocked the pedestrians, such as: vehicles parking, irregular trees and electricity poles placement, street vendors and etc. Besides that, cross slopes of the sidewalk exceeded 1:50 causing more danger for pedestrian using crutch, walking stick or wheelchair. Therefore, the Persons with Disabilities were found using the street instead of the sidewalk because of this phenomena.



Fig. 1 The accessible pathway were found in front of PCU Main Campus, only there was no curb ramps and traffic crossing serving the PwDs.



Fig. 2 The narrow and inaccessible pathway, the level difference and also vehicle parking and street vendor causing the difficulty to access.



Fig. 3 The accessible pathway were found nearby the PCU Main Campus, only there was no curb ramps and no stable, firm, and slip-resistant walking surfaces. Therefore the non PwDs could access but PwDs would find difficulty.



Fig. 4 The narrow and inaccessible pathway, the vehicle parking and vulnerable gratings causing the difficulty to access for all users.



Fig. 5 The vulnerable gratings causing the difficulty to access for all users.



Fig. 6 The narrow and inaccessible pathway, the level difference and also vehicle parking and street vendor causing the difficulty to access.



Fig. 7 The sidewalk which cross slopes exceeded 1:50 causing more danger for pedestrian using crutch, walking stick or wheelchair.

Traffic crossings and intersections were not present because of the Siwalankerto considered as neighborhood serving street. There was no curb ramp that enhancing pedestrians' safety. Therefore, the sidewalk needed participatory redesign and management to enhance the accessibility.

Therefore, universal and inclusive design was required to make sidewalk accessible for all users especially PwDs. The sidewalk in Siwalankerto was conducted based on 5 inclusive design principles by Tanuwidjaja [7].

The first inclusive design principle was User Centered. It was done with the involvement of users such as: interviews with PCU students and local communities, participatory design with selected resource persons.



Fig. 8 The Traffic crossings and intersections connecting PCU Main Campus and PCU East Campus. The guiding paths were provided to assist the blind disability persons to cross. Integrated bollards and lighting were proposed to prohibit irregular vehicle parking on the sidewalk.

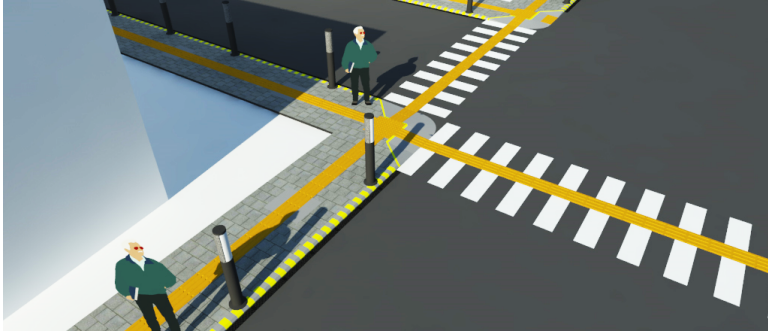


Fig. 9 The Traffic crossings and intersections connecting PCU Main Campus and PCU East Campus. The curb ramps with 1:12 were provided. The additional guiding paths and speed bumps were added.



Fig. 10 The crossing of pedestrian and existing building access, and some vertical greenery installed on the existing walls.



Fig. 11 The Detail of guiding path in the crossing of pedestrian and existing building access. The dot-pattern - guiding path reminded the blind disability persons to stop before carefully crossing. Meanwhile the strip-pattern – guiding path assisted the blind disability to continue the travel direction.



Fig. 12 The total width of 150m was provided in all sidewalk. Meanwhile clear-width of 100 cm was provide in all areas. Some areas were still dedicated for street-vendor activities, bollards and vertical greenery that installed on the several walls.

The second inclusive design principle implemented was Equitable but Reasonable Use. Siwalankerto Sidewalk was proposed with a 5-cm-height-difference to the road level. This recommendation was made because considering limited width of the sidewalk and requirement of 1:12 slope of curb ramps. Because of that, the curb ramps just needed 60 cm length.

Applying the second principle, sidewalks would also be equipped with guiding path in the center of the sidewalk. This would reduce the potential crossing with existing activities such as street vendor, bollards, fences, and other street furniture. The minimum of 1.50 meter width of sidewalk was proposed for wheelchair maneuver and 2 persons walking side by side. Meanwhile the exit ramps for access of houses and shops was proposed. To increase pedestrian safety and deterring illegal vehicle parking, some integrated bollard-and-street-lamps, with 1.20 m height, were proposed the sidewalk edge.

The third inclusive design principle adopted was Simple and Intuitive Use. To achieve it, guiding paths with international standards were proposed. Guiding path was a line to indicate the direction using a point-specific dots to give a warning to stop or caution.

The Low Physical Effort was the fourth principle of inclusive design to apply. The 5-cm-level difference and curb ramps with slope of 1:12 were applied. This was to create easier transportation of wheelchair users from pedestrian to the road with 60-cm-length ramp.

Lastly but not least, The Prohibition of Usage Error was also implemented. To give caution to blind disability persons, at the edge of the sidewalk the yellow-and-grey line were drawn with spotlight paint. The paint would reflect during night informing the driver and pedestrian on the boundary of the sidewalk and road.

The Fifth principle was applied with non-slippery flooring. Responding to Surabaya seasonal high rainfall so the ceramic applied was the non-slippery with certain ceramic coatings. Therefore two main selected material for the sidewalk floor component.

For the sidewalk material, Niro Granite Porcelain Tiles (Grandino Type) was proposed. The material had a slightly rough surface so it prevented slipping. It was important for crutch or walking stick users because of the good foothold in the.

Some of the specifications of this story are:

- Origin of material: Indonesia

- Material: Porcelain with rough finishing to prevent slippage
- Color: Beige, Maroon, Grigio, Nero
- Size: 30 x 30 cm



Fig. 13 The Non-slippery tiles Grandino Type, by the Niro Granito, source: www.nirogranite.com

The Guiding path material selected was important. The texture was important for the total blind disability persons, meanwhile the yellow colors for guiding the path and it should be in contrast with the color of the sidewalk. The guiding path specifications were:

- Material Origin: Shandong, China
- Material: PVC / TPU (Thermoplastic Polyurethane) / rubber / plastic
- Color: yellow, orange, gray, or be able to order
- Size: 30 x 30 cm

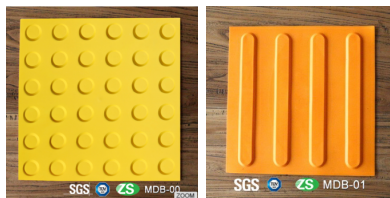


Fig. 14 and **Fig. 15** The dot-pattern and strip-pattern guiding path, source: http://www.alibaba.com/product-detail/Rubber-tactile-tile-guide-path-rubber_60334306539.html

4 Conclusion

Sidewalk in Siwalankerto was not accessible for Persons with Disabilities. There were many barriers present such as: vehicle parking, trees, etc. The accessible sidewalk provision was not only the government duty to provide, but also all stake-holders duty. The undergraduate students, as one of stake-holder proposed a better sidewalk with the Service Learning (SL). The SL also increase students' caring and contribution for Siwalankerto residents, especially the Persons with Disabilities.

The design would be disseminated to the Surabaya Municipality as well as Persons with Disabilities NGO to be widely implemented in many areas of the Surabaya city. The current sidewalk design could be amended using this sidewalk model.

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