

Barrier free bus stop design for Taipei senior citizens and weaker passengers

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Abstract

The purpose of this project was to provide barrier free bus stops for Taipei senior citizens and passengers with traffic difficulties e.g. blind, deaf and people with moving problems. The improved solution of a barrier-free environment consists of three aspects, which are a waiting zone, an on-coming bus information and assistive devices for weaker passengers.

This study began with the investigation of the present contextual situation of Taipei City bus transportation systems, by using methodologies of observation, interviews, and documentation of literature. In order to select the most effective solution, a well-defined Ranking and Weighting method was then developed to access the factors of comparative importance. During this project, the Transportation Agency of Taipei City Council (TATCC, 1998) provided their existing bus transportation system for better insight assessments and also the Cultural and Educational Foundation for the Blind, Taiwan, offered the researchers a better understanding of blind people's needs.

This research finally provided an ideal barrier free bus stop design solution for Taipei senior citizens and weaker passengers. Through this solution, all passengers can not only wait for a bus in a safe and comfortable environment, but also be provided with a precise bus on-coming time schedule and useful information about alternative routes. Furthermore, the landscape of Taipei City can be improved considerably.

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Introduction

The existing bus stop in Taipei City is very unfashionable and ugly. It is a design for basic needs, which provides only the basic sheltering from sunshine and rainfall. In an international city like Taipei, these bus stops are the weakest link in the modernized city landscape. They were in strong need of improvement (TATCC, 1998). In addition, their usability is not able to reflect the total citizen requirements. Recently, more and more importance on special needs issue indicates that to provide a special needs' solution, a barrier free bus stop in Taipei City is a major priority (Siedie, 1996).

Aims and objectives

The purpose of this project was to provide a better design solution for barrier free bus stops with a dynamic on-coming bus information and assistive devices for Taipei City commuters especially for senior citizens and weaker passengers. There are four objectives (4E) in this project, i.e. Easy, Enjoyable, Effective and Empowering.

- Easy: The information system should be easy to use and the symbols and signs communications system should be easy to identify.
- Enjoyable: Waiting for a bus should become enjoyable.
- Effective: The information system should be able to provide commuters with alternative bus routes information during travelling. At the same time, it should also be able to inform the bus control center and the bus driver in advance to pay attention to the senior citizens and weaker passengers waiting and to provide assistance if necessary.
- Empowering: This new barrier free bus stop should be one of the highlights attractions in the city landscape in Taipei City.

Research methodology and process

Three research methodologies were used during this project, observation skills, interviews and Ranking and Weighting analysis. Observation skills and expert interviews were two main methods of this project. This journey was focused on the following five points of view, i.e.

- Existing problems in bus service system;
- Drivers' behaviour analysis while parking at the bus stop;
- Design criteria and specification for the shelter;
- Special needs of weaker passengers in accessing bus stop;
- Photos taking of the existing environment (e.g. traffic island, parking bay, passenger-waiting and information service zones).

For better understanding of dynamic on-coming bus information service system and the special needs from Taipei senior citizens and weaker passengers in accessing a bus stop, the experts at Transportation Agency of Taipei City Council recommended that Jen-ai Road in Taipei City would be a suitable location for this study. There were six processes in this observational study:

- (a) To access the recommended bus stop at Jen-ai Road;
- (b) To observe the context of commuters/passengers in waiting for a bus and take photos;
- (c) To observe the context of commuters/passengers in accessing and reading the bus service information system and then take photos;
- (d) To observe the city bus accessing bus stop and take photos;

- (e) To interview some passengers and record their opinion and recommendations;
- (f) To draw relationship between aspects of the existing environment (e.g. traffic island, parking bay, passenger-waiting and information service zones).

Observed reviews and results

From the viewpoints of this observation, there were many long term existing problems with Taipei City bus services.

First of all, there were serious delays and/or damage at the installed boards/screens of on-coming bus information, bus route indicators, bus stop symbols, signs and location equipments and ticket identification machines, which have to be repaired and re-installed regularly all year round. Secondly, unqualified bus drivers' behaviour and service attitudes were also main service problems observed from the journey. In the quality concerns of passenger services, sometimes, for bus drivers' own convenience, they always parked at the improper boarding entrance.

In this project, a proper path of drive way was recommended and re-organised to enable the bus driver to stop at the reserved parking bay and provide a safe and comfortable travel environment for Taipei senior citizens and weaker passengers.

During interviews, the experts in the Transportation Agency of Taipei City Council indicated their existing problems of design criteria and specification for bus stop shelters. The dimensions of bus lane and traffic island were related to total traffic capacity. The more traffic jam happened, the more bus lanes needed, therefore, the bus lane will become narrower and narrower. Many public facilities and spaces constructed in Taipei City were planned by copying from overseas and sometimes forgetting or ignoring the manner of Taipei City. So when you travel in Taipei City, you may lose your Taipei feelings.

After the observation and expert interview studies, a well-defined ranking and weighting method was developed and followed to analyse the importance of factors for bus stop environment. Figure 1 presents the important factors for the bus stop environment, which need to be first solved and re-design. Dynamic bus information services system (i.e. on-coming bus information, bus route indicator, and bus stop sign and location) shows its most importance with 45% among all factors. Lighting follows the importance of 19% as second priority. The passengers waiting space of 16% and railing of 12% also present their importance.

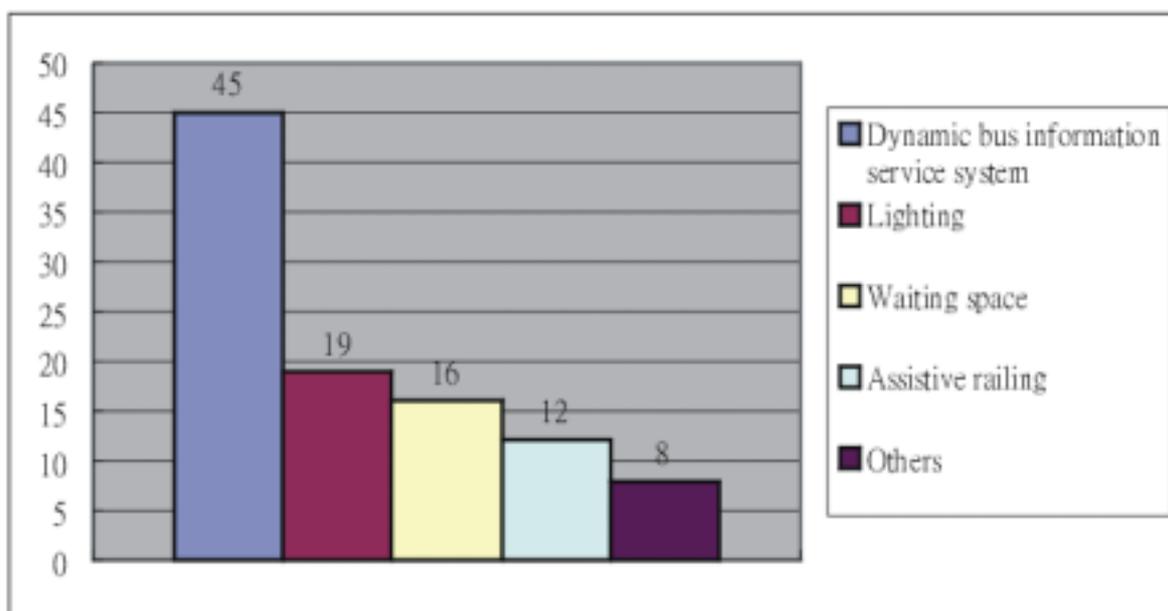


Figure 1: The importance of factors of bus stop environment.

According to the results of the ranking and weighting analysis, the design specification and criteria of this project were drawn by the researchers as follows.

For the normal passengers:

- Dynamic bus information services system (i.e. on-coming bus information, bus route indicator, and bus stop sign and location):
To re-organise the bus service route monitors/screens, loud-hailers, video camera (CCTV) and aerials.
To adopt new durable materials to avoid rust and collision damage to the outer covering.
- Symbols and signs communication system:
No matter when day-time or night-time and no matter where on the pavement or bus, the symbols and signs communication system should be easy to identify.
- Lighting:
It should have sufficient lighting and enhance the landscape at night.
- Passengers waiting space and railing:
To re-arrange the proper waiting space and using path for Taipei senior citizens and weaker passengers.

For people with special needs (senior citizens and weaker passengers):

Speech sounds systems:

During interview, the experts and practitioners at Cultural and Educational Foundation for the Blind suggested that the most difficult problem for the blind to take bus is on-coming bus identification, which means that they did not know the route (or number) of the on-coming bus while waiting for it. From this point of view, to design a dynamic bus information services system with sound or speech announcement system is very important. These interviewees also indicated that this facility can provide the blind with a total barrier free and highly secure travelling environment.

Design protocol

According to the recommended bus service route by the Transportation Agency of Taipei City Council (1998), Jen-ai Road was selected as the basic design platform for this project (as shown in figure 2). There are three phases of design processes in this study, which are concept design, detail

design and prototype phases.

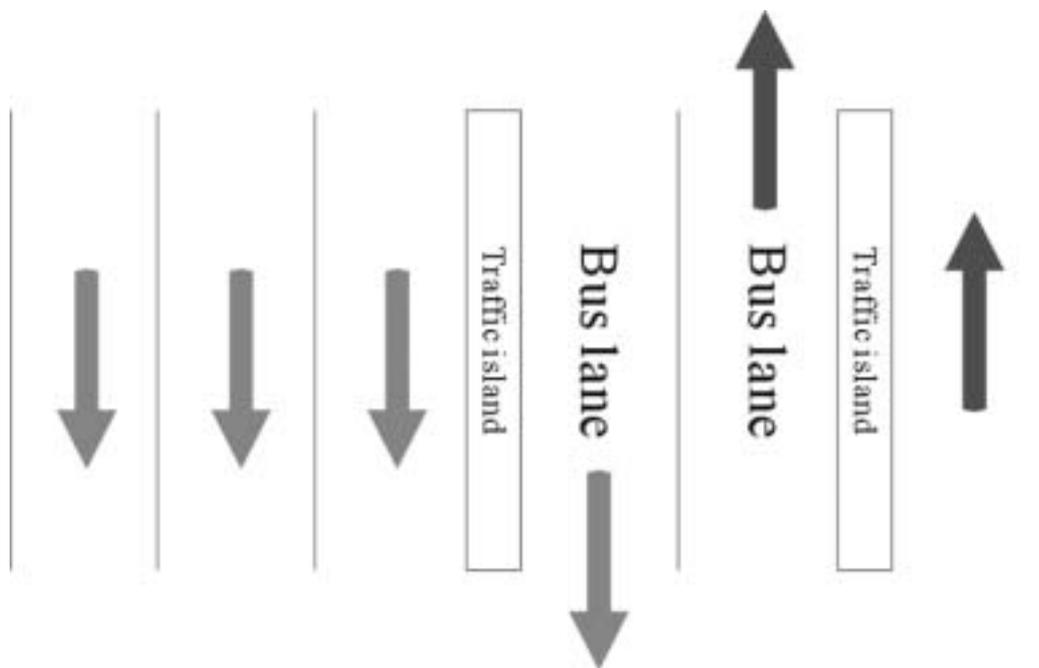


Figure 2: The basic design platform for this project (Jen-ai Road, Taipei)

Concept design phase:

Concept 1: (as illustrated in figure 3)

- Non specific waiting zone and boarding zone for Taipei senior citizens and weaker passengers.
- The traffic island is divided into three boarding (on/off) zones.

Concept 2: (as illustrated in figure 4)

- Non specific waiting zone but do provide a specific boarding zone for Taipei senior citizens and weaker passengers.
- The traffic island is divided into three boarding (on/off) zones.
- Providing a specific waiting zone only when senior citizens and weaker passengers are waiting.

Concept 3: (as illustrated in figure 5)

- Providing a specific waiting zone for senior citizens and weaker passengers.
- Improving the height of the assistive railing to prevent the senior citizens and weaker passengers from falling down from the traffic island.
- The traffic island has one boarding (on) zone, and one boarding (off) zones in front of the specified waiting zone.

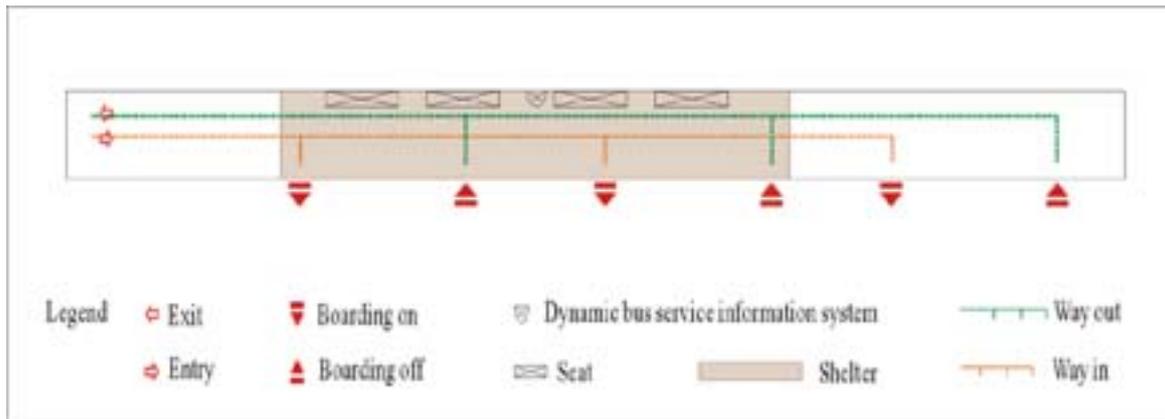


Figure 3: Concept 1

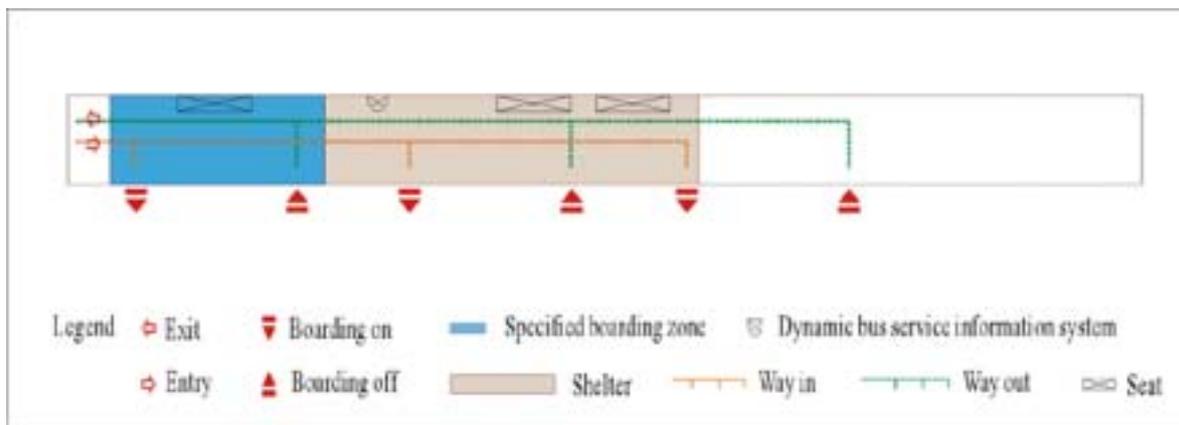


Figure 4: Concept 2

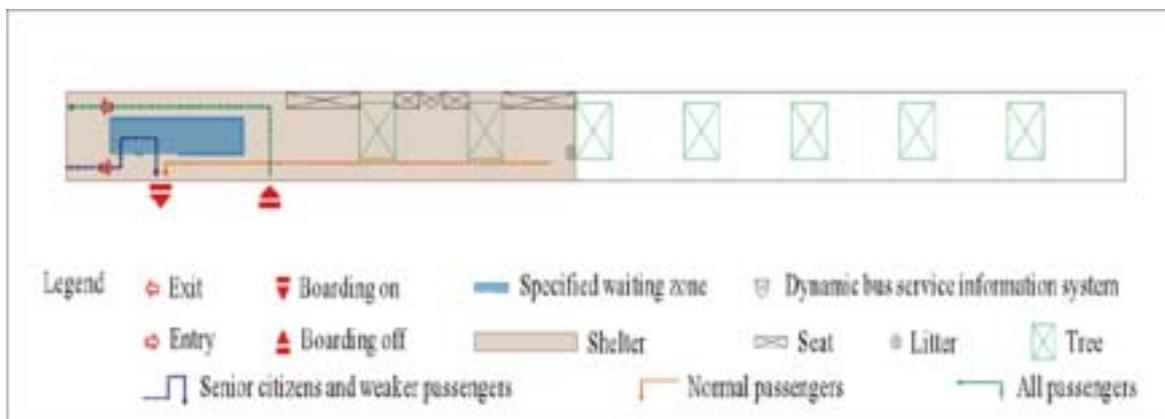


Figure 5: Concept 3

Detailed design phase: (as illustrated in figure 6)

- The detailed design is developed from main concept 3, which is a specified waiting zone with one separated boarding on and off zones in front of the specific waiting zone.
- This provides a safe and comfortable waiting space for senior citizens and weaker passengers. Furthermore, it can also prevent the bus driver from hurrying his parking at the improper place.
- For safety concerns, an assistive railing can be provided (designed) to prevent the senior citizens and weaker passengers from falling down from traffic island at the front area of the specific zone.

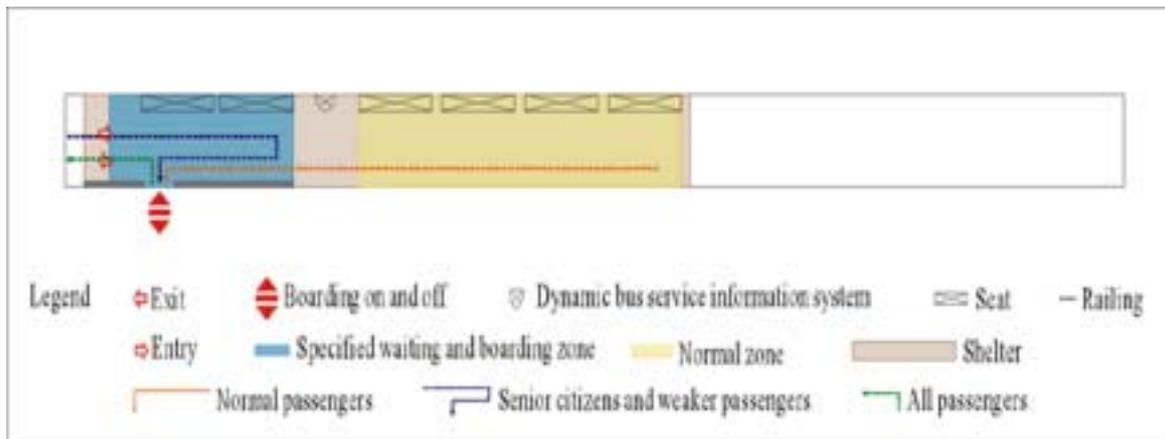


Figure 6. Final detailed design

Prototype phase:

In this stage, the specified waiting zone is re-considered for special needs. It provides Taipei senior citizens and weaker passengers with barrier free boarding on/off spaces with assistive devices. These are the key points of the design solution, as illustrated in figure 7.

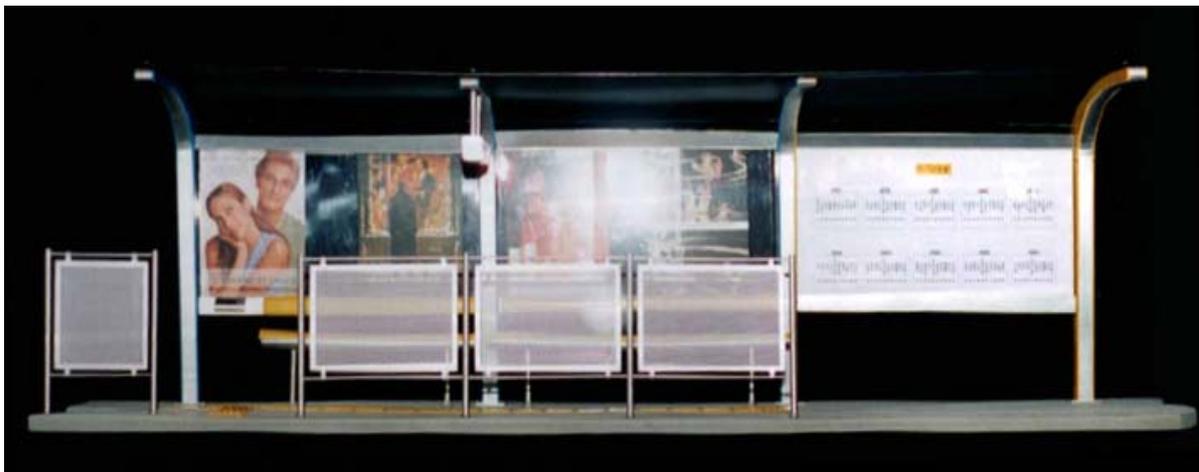


Figure 7: Prototype

Discussions

Design characteristics:

- Barrier free waiting zone: The traffic island is divided into two zones i.e. yellow and blue zones, the yellow zone is a public access area for all passengers (normal passengers) and the blue zone is the place specially for those senior citizens and weaker passengers. There is only one boarding on/off area in front of the blue zone to provide a better service without chaos.
- Furthermore, there is also a special guidance paving constructed on the ground surface to assist the blind passengers during boarding on/off the bus safely.
- There are double layers designed at the roof of the bus stop shelter. The upper layer of the roof is designed by using a special opaque aluminum material with net construction to enhance the strength of the roof. The second (lower) layer is designed by using a transparent Polypropylene (PP) material for lighting consideration.
- To adopt the height of the railing at 130cm (International Labour Office, 1996 and Leibrock, 1993) for senior citizens and weaker passengers to prevent them from falling down.

Dynamic bus service information system:

- “You Are Here” board and bus service route monitors/screens are designed at the yellow zone for passengers. Also design a dynamic bus information services system with sound or speech announcement system for special needs at the blue zone.

Special needs facilities:

- As mentioned, a special guidance paving constructed on the ground surface only at the blue zones to assist the blind passengers during boarding on/off the bus safely and settle themselves at the specified zone of blue while travelling.
- As illustrated in figure 8, 9 and 10, the assistive devices were introduced to two systems, one is the “GOTO Input System” (i.e. on-going bus number input device), and the other is “GOTO Display System” (i.e. on-going bus number display input device). Senior citizens and weaker passengers can easily access these systems to indicate their direction.
- And this message will also be passed to both the bus service control centre and on-coming bus driver to understand that there are weaker passengers waiting at the blue zone of next bus stop.
- While the bus arrive the bus stop, both of speech/sounds and screen announced for special needs.



Figure 8: The GOTO Input/Display System



Figure 9: The GOTO Input System



Figure 10: The GOTO Display System

Conclusion and recommendation

This research finally provides an ideal barrier free bus stop design solution for Taipei senior citizens and weaker passengers. Through this solution, all passengers can not only wait for a bus in a safe and comfortable environment, but can also be provided with a precise bus on-coming time schedule and useful information about alternative routes. Furthermore, the landscape of Taipei City can be improved considerably.

Acknowledgement

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