

Chapter 5

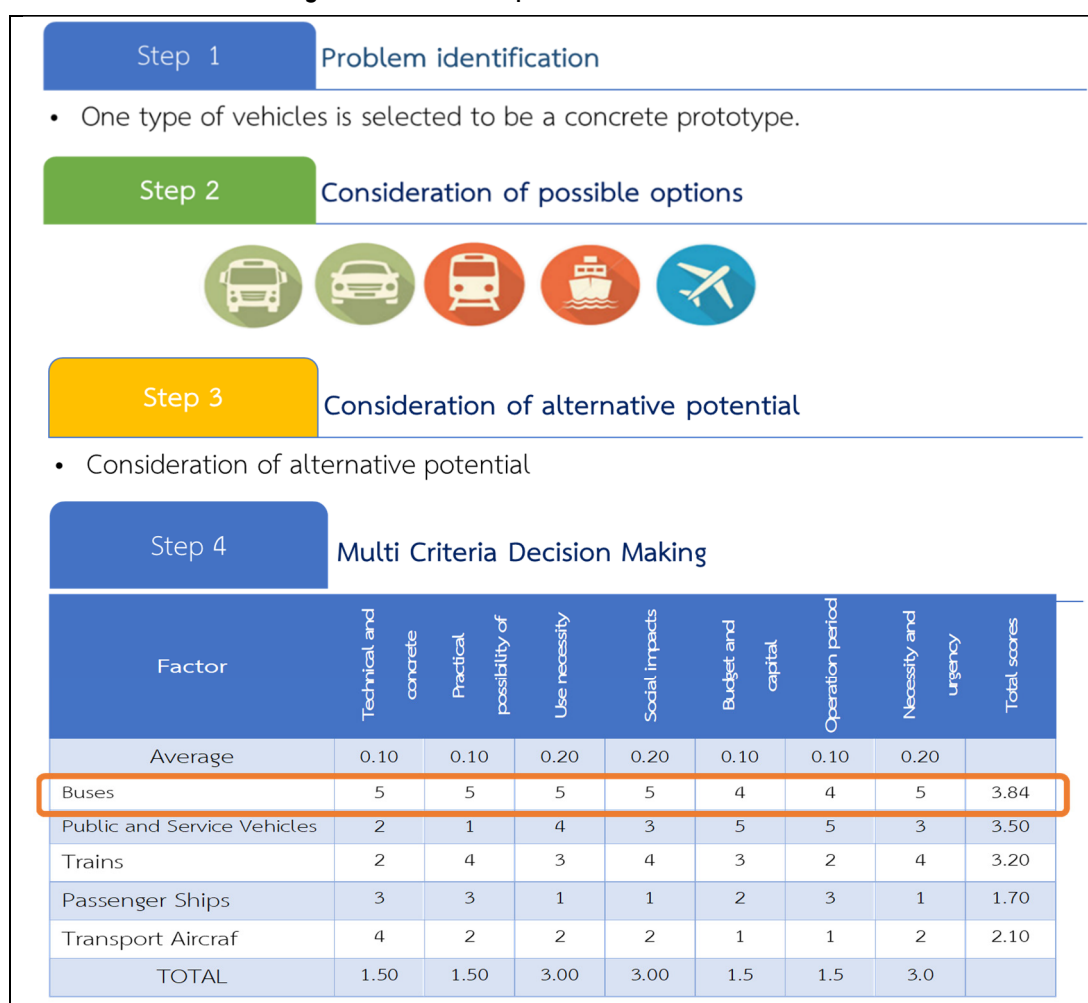
Vehicle Prototypes

To push for a concrete operation, vehicle prototypes and facilities were prepared in accordance with the procedures, selection of vehicle prototypes, design, list of main equipment and the requirements of the selected vehicles in the project Terms of Reference. The details are:

5.1 Vehicle Prototypes and Selection Method

Vehicles selected to be a prototype for the project operation include fixed and non-fixed route buses. The procedures for selecting vehicles consist of the following four major steps:

Figure 5.1 – 1 Steps of Vehicle Selection



5.2 Detailed Design

The design and details of vehicle prototypes comprise the following steps:

- 1) Selection of vehicle prototypes
- 2) Survey and design of facility prototypes divided into the following steps:
 - Survey
 - Proposed conceptual design and design according to the design standard
 - Cost estimate
 - Prototype operation in a concrete manner

The Bangkok Mass Transit Authority (BMTA) approved the inspection of a prototype of bus no. A4 (Don Mueang Airport-Sanam Luang) to serve as a vehicle prototype. In addition, the BMTA improved facilities and inspected it on July 11 and 27, 2017. After taking into consideration all relevant vehicles structure and standards specified in the ministerial regulation, the prototype construction and the installation of equipment comprising facilities equipped with the vehicles, e.g., doors, lifting elevators, staircases, automatic ramp systems, signs notifying the name of the next station, wheelchair lock systems and signs of persons with disabilities. Manuals and vehicle staff will be in line with the OTP's standard of facilities.

5.2.1 Design Principle and Facility Standard

The design of facilities in vehicles is based on the universal design and the design standard of facilities for persons with disabilities and older persons in fixed and non-fixed route buses under the Law on Land Transport. The equipment and facilities include doors for persons with disabilities, equipment guiding persons with disabilities or equipment lifting wheelchairs of persons with disabilities up and down from vehicles, size and load in accordance with the standard, ramps, wheelchair parking spaces, wheelchair storage devices, signs displaying equipment or facilities for persons with disabilities and older persons, announcement of the next station for persons with visual disability and text moving signs or signs notifying a name of the next station for persons with hearing or communication disability, seats for persons with disabilities and older persons, etc., as shown in Figure 5.2.1 – 1 to Figure 5.2.1 – 5.

Figure 5.2.1 – 1 Example of Door Design for Vehicle Prototype

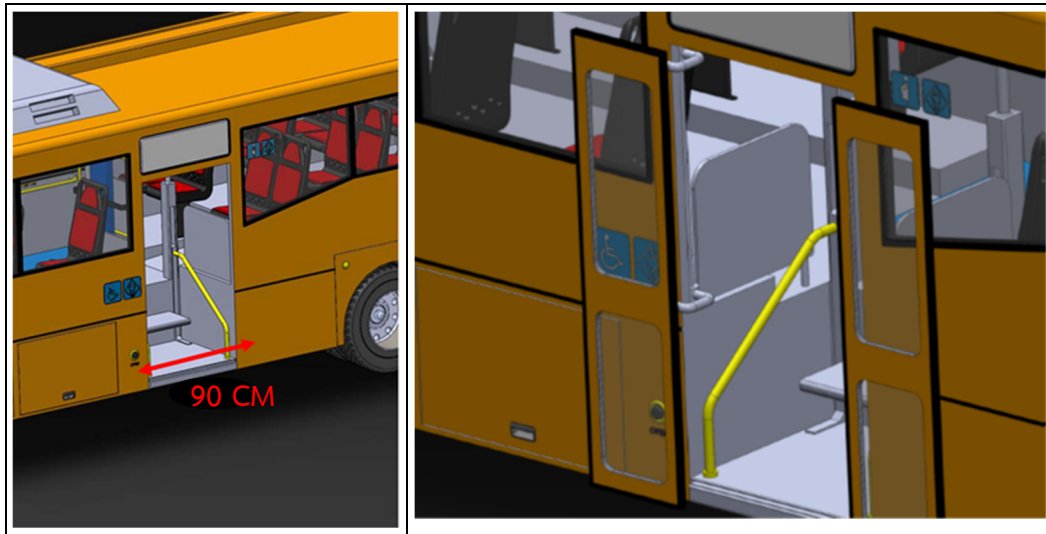


Figure 5.2.1 – 1 Door of the vehicle prototype must be at least 90 cm wide and must be easily closed and opened.

Figure 5.2.1 – 2 Equipment Guiding Persons with Disabilities or Equipment Lifting Wheelchairs of Persons with Disabilities up and down from Vehicle Prototypes

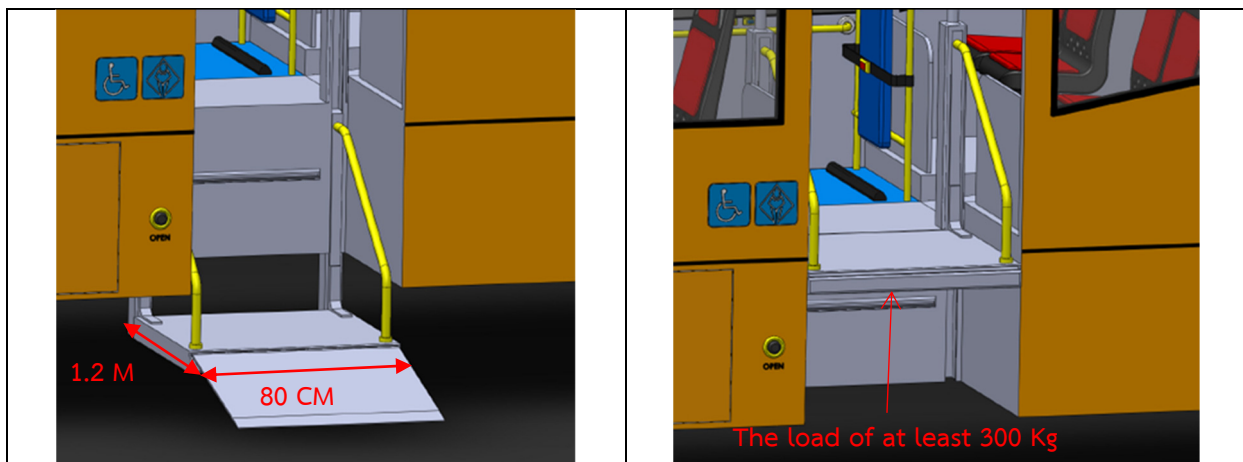


Figure 5.2.1 – 2 Size of equipment guiding persons with disabilities or equipment lifting wheelchairs up and down from vehicles (lifting pad must be at least 80 cm wide and 1.20 m long and must bear the load of passengers and wheelchairs of at least 300 kg safely).

Figure 5.2.1 – 3 Wheelchair Parking Spaces and Wheelchair Storage Devices
for Vehicle Prototypes

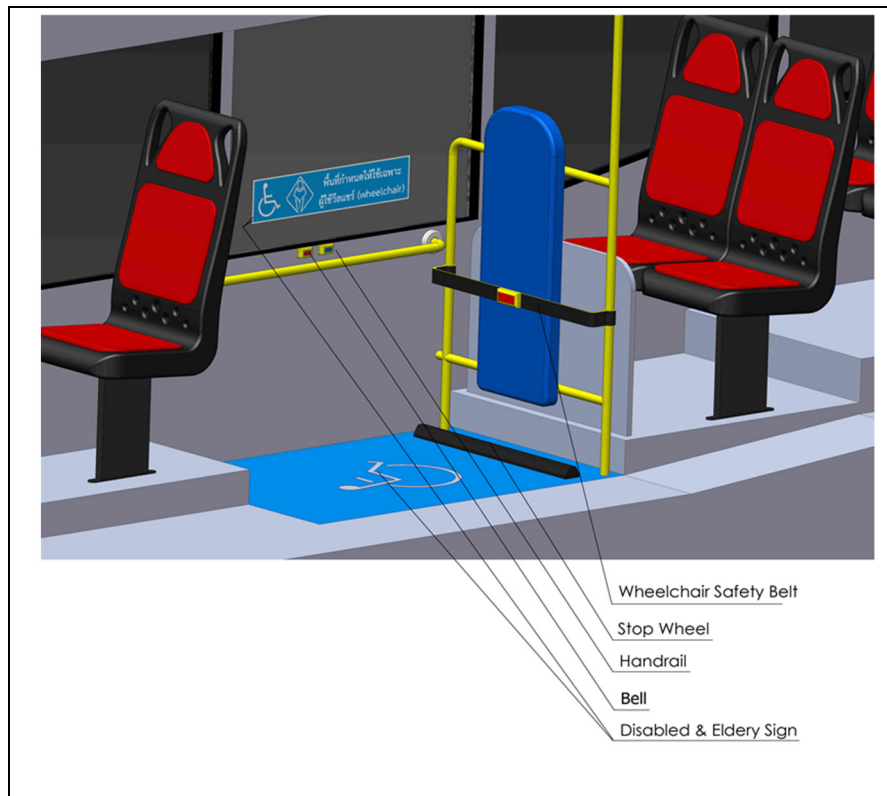


Figure 5.2.1 – 3 Wheelchair parking spaces must be close to the vehicle door and must be at least 75 cm wide and 1.30 m long. Surfaces of wheelchair parking spaces must be made of skid resistance materials. Wheelchair locking systems should be easily removed in case of emergency. Alarms to stop the vehicle should be installed. Handrails made from strong materials must be provided with the signs of persons with disabilities and older persons and the text “**Areas reserved for wheelchairs only**”.

Figure 5.2.1 – 4 Signs Displaying Equipment or Facilities for Persons with Disabilities and Older Persons in Vehicle Prototypes

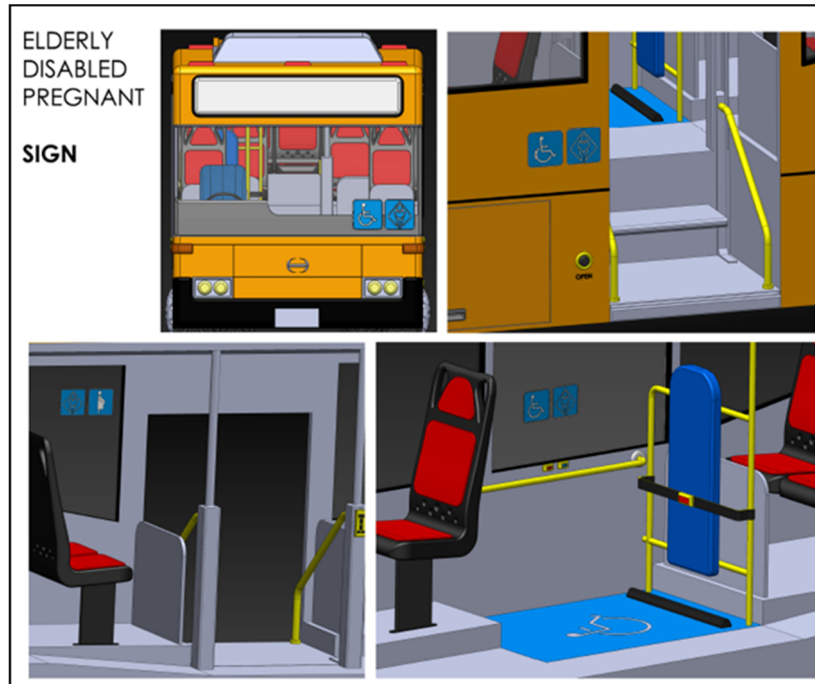


Figure 5.2.1 – 4 Vehicle prototypes with signs of persons with disabilities and older persons, signs showing a direction to equipment or facilities, white letters on blue background or blue letters on white background. Signs displaying equipment or facilities must be a square shape, easily noticed and installed in an easily seen position. The signs of persons with disabilities and older persons must be placed outside of the vehicle, front windshield, rear windshield, and ascending and descending doors, and must be easily seen.

Figure 5.2.1 – 5 Text Moving Signs and Seats for Persons with Disabilities and Older Persons in Vehicles

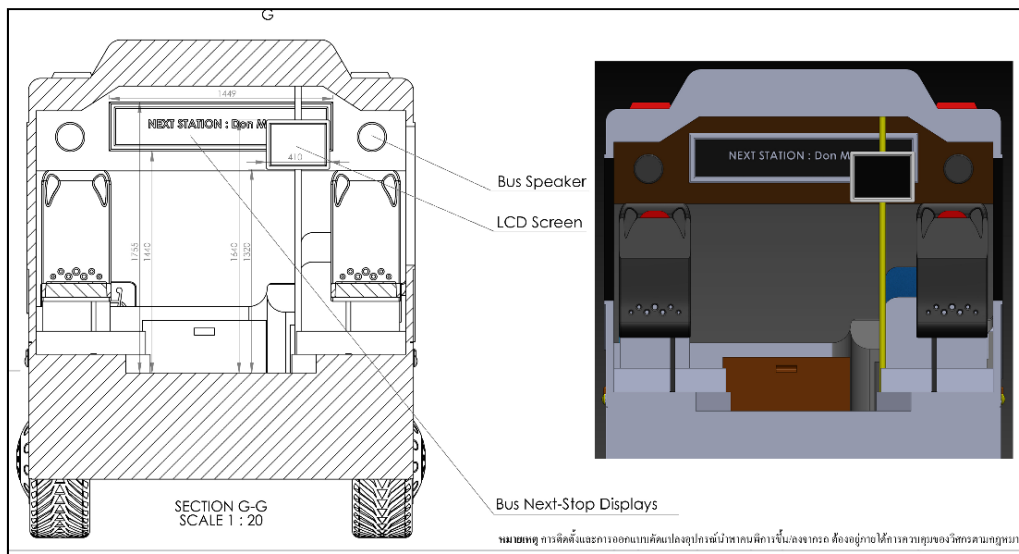


Figure 5.2.1 – 5 Text moving signs or signs notifying a name of the next station for persons with disabilities and older persons installed in vehicles must be large to be easily noticed. Loudspeakers should be installed to notify the name of the next station which must be clearly heard from all locations.

5.2.2 3D Model

The working diagram and facility installation in vehicle prototypes were designed in 3D models and printed using a 3D printer. Facilities were scaled down to look like a real one. The 3D model shows the facility area using LED lights and running LED lights notifying a name of the next station. LED lights are related to the computer and software systems displaying the result in the form of a home touch button. Video models of facilities are displayed to capture better images and have a better understanding. Example of 3D models and simulation software are shown from Figure 5.2.2 – 1 to Figure 5.2.2 – 2.

Figure 5.2.2 – 1 Complete 3D Model

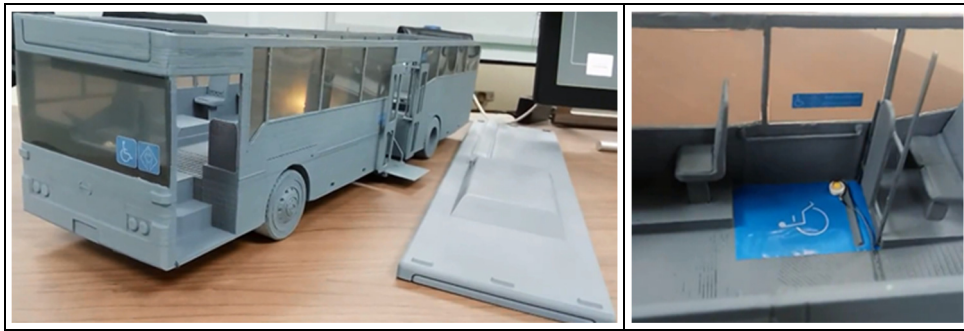


Figure 5.2.2 – 2 Three-dimensional Model and Computer Interaction



5.2.3 Production and Development Possibility

Concerning the production and development possibility, local general materials that can be provided in Thailand are considered, as a result, the design cost is not expensive. In case of mass production, the prototype cost can be reduced by more than 20% assessed from similar manufacturing equipment. As for the use of this prototype, it can be applied to all types of public vehicles by adjusting the size as required. To enable the production and development to be possible, the project has developed a prototype for serving persons with disabilities in ascending and descending from vehicles, which can be installed in the BMTA's studied vehicles. The prototypes were tested and displayed during the project second public hearing on August 31, 2017 at Richmond Stylish Convention Hotel as shown in Figure 5.2.3 – 1. The participants expressed great interest in the seminar.

Figure 5.2.3 – 1 Prototype of Equipment Guiding Persons with Disabilities Displayed during the Second Public Hearing



5.3 Cost Estimate of Vehicle Prototypes

The OPT has cooperated with the BMTA in pushing for the prototypes of fixed route buses and delivered the design of EUROII air-conditioned bus (Hino) equipped with facilities and equipment such as wheelchair elevators, ramps, wheelchair parking spaces, signs displaying equipment or facilities, signs notifying a name of the next station, etc. The BMTA approved the design that can be used to facilitate persons with disabilities for further study in the future. The modification cost amounts to 700,000 baht with the details of modification cost estimate as shown in Figure 5.3 – 1.

Table 5.3 – 1 Cost Estimate for Vehicle Prototype Modification

Item	Budget cost (baht)		
	Amount	Cost per set	Total
1) Speaker & Amplifier			
• Amplifier	1	10,000	10,000
• Loudspeaker mounted on public vehicles	6	3,000	18,000
2) LED driver and texting LED			
• LED monitor (30x100 cm)	1	20,000	20,000
• LED drivers and controllers	1	15,000	15,000
• Installation cost	1	5,000	5,000
3) Monitor (17 inches), the former one may be used	1	20,000	20,000
4) Tail lifting device: vertical			
5) Door	1	150,000	150,000
6) Stickers placed on the front, seats and doors	4	1,000	4,000
7) Installation costs of electrical systems, buttons and cables	1	15,000	15,000
8) Structural modification to install wheelchair parking systems	1	30,000	30,000
Total (baht)	690,900		

5.4 Suggestions for Vehicle Prototype

Vehicle prototypes developed by the project, including the design and cost estimate for the operation plans of facility and service provision in the transport sector for state agencies and relevant private companies can serve as the standard of vehicle purchase in the future or modification of the existing passenger vehicles, for example,

- 1) Short-term plans: The design and cost estimate as well as wheelchair lifting equipment will be delivered to modify the BMTA's passenger vehicles.
- 2) Long-term plans: Prototypes can be modified to be used in intercity buses, most of which are different depending on the number of seats, the number of floors, etc. The detailed design should be modified to suit each model.