

DEVELOPMENT OF CONCEPT DESIGN FOR AN IDEAL CITY BUS

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This report is submitted in
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DECLARATION

“I hereby, declare this thesis is the result of my own research
except at cited in the reference”

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PENAKUAN

“Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan dan petikan yang tiap-tiap satunya saya telah jelaskan sumbernya”

Tandatangan :

Nama Penulis : WONG JIAR MEAN

Tarikh :

*Specially dedicated
to my family and beloved companion*

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ABSTRACT

There are many types of bus available in all countries where the society is demanding more accessible city buses, which provide a safe and comfortable environment for passengers. This paper concentrates on the development of concept design for an ideal city bus packaging which considered the ergonomics and safety factor. All the necessary information is gathered by constructing the literature study. Background of related studies and legal requirement of city bus is reviewed, as well as the market surveys are done to attain customer input regarding ideal bus design. Consequently, the technical aspects regarding ergonomics and packaging to establish a three-dimensional data bus concept design complete with the bus packaging parameters is referring to the standard requirements of Standard Bus Procurement Guidelines, American Public Transit Association, Automotive Industry Standard, and Federal Transit Administration. Through all the input collected and analyzed, the expected results of an ideal three-dimensional concept design with detail dimensions and important parameters of each design aspects is developed. Then, the results obtained are adapted into the CATIA bus drawing to generate the best results of bus design. The drawing obtained is then evaluated and validated with the aid of manikin to achieve the most suitable city bus design parameters that fulfil the level of comfort that fits 95 percent of Asian anthropometry data. At the end of this paper, an ideal three-dimensional concept design 12 meter long single deck city bus incorporates with low floor design that captures the combination of the overall external dimension, floor height, doors, windows, walkway, stairs, handrail, passenger compartment, and operator compartment is developed. The concept design developed is able to be modified into different shape of bus by referring to the important parameter results achieved in this paper.

ABSTRAK

Terdapat pelbagai jenis bas di seluruh dunia. Kebelakangan ini, masyarakat semakin cenderung kepada bas bandar yang dapat memudahkan penumpang bas dari segi peruntukan persekitaran bas yang selamat dan selesa. Kertas ini tertumpu pada pembangunan konsep rekabentuk pakej bas bandar yang ideal serta dianggap ergonomik dan selamat. Semua maklumat yang diperlukan dikumpulkan dengan mendirikan kajian. Latar belakang kajian, standard dan undang-undang bas bandar dilihat, serta kajian pasaran dilakukan untuk mendapatkan pendapat penumpang bas terhadap rekabentuk bus yang sesuai. Justeru, aspek-aspek teknikal mengenai konsep rekabentuk yang lengkap dengan parameter bas berdimensi tiga ini adalah merujuk pada keperluan “Standard Bus Procurement Guidelines”, “American Public Transit Association”, “Automotive Industry Standard”, dan “Federal Transit Administration”. Dengan adanya semua data yang telah dikumpul dan dianalisis, keputusan yang diharapkan daripada konsep rekabentuk tiga dimensi yang ideal ini dibangunkan dengan dimensi detail dan parameter yang penting dari setiap aspek rekabentuk. Kemudian, keputusan yang diperolehi diadaptasi menjadi lukisan bas dalam perisian CATIA untuk menghasilkan lakaran konsep rekabentuk bas bandar yang terbaik. Lukisan CATIA yang diperolehi kemudian dievaluasi dan diaktifkan dengan bantuan “manikin” untuk mencapai parameter rekabentuk bus yang memenuhi tahap yang menyesuaikan 95 peratus data antropometri Asia. Akhirnya, sebuah konsep bas bandar berdimensi tiga dengan 12 meter panjang yang dilengkapi dengan kombinasi dimensi luaran, ketinggian lantai bus, pintu, tingkap, tangga, gerabak penumpang dan gerabak pemandu bas dihasilkan. Dengan ini, rekabentuk konsep ini diyakini mampu diadaptasi ke dalam bentuk bas bandar yang berbeza dengan merujuk pada semua hasil-hasil parameter penting dalam kertas ini.

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LIST OF ABBREVIATIONS

ISO	=	International Standard Organization
IEC	=	International Engineering Consortium
UNECE	=	United Nation Economic Commission for Europe
SBPG	=	Standard Bus Procurement Guidelines
APTA	=	American Public Transit Association
AIS	=	Automotive Industry Standard
FTA	=	Federal Transit Administration
SAE	=	Society of Automotive Engineer
BIC	=	Bus Industry Confederation
NDX	=	Non-Deluxe
SDX	=	Semi Deluxe
DLX	=	Deluxe
ACX	=	Air-Conditioning Deluxe
CAD	=	Computer-Aided Design
EDA	=	Ergonomics Design and Analysis

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CHAPTER 1

INTRODUCTION

In this chapter, development of transportation including the transportation history, mode of transportation, function of transportation, and a brief introduction of the public bus transportation will be explained.

1.1 Overview

From the Review of Developments in Transport in Asia and the Pacific (2005), transportation can be defined as the movement of people and goods from one location to another. In the review, it is realized that the first transportation used as the first human transportation technology is walking. Early Paleolithic and Neolithic man walked through their world on their own legs. In the late Neolithic, animals began to be used. Thus, as shows in Figure 1.1, domestication of animals introduces a new way for human to allow heavier loads to be hauled, or to ride on the animals for higher speed and duration. However, they could only carry what could be loaded onto or tied to their animal's backs.



Figure 1.1: Reeve's bullock team 1903
(Source: *City of Tea Tree Gully Local History Collection*)

Nowadays, transport can be performed by varies of modes, such as human-powered, animal powered, road, water, aviation, rail, cable, pipeline and space that are used as important modes of transportation. For all the cases in the developed world, public bus services are usually subject to some form of legal control in terms of vehicle safety standards and method of operation, and possibly the level of fares charged and routes operated. Its main public duty is to provide a public transport service for passengers to turn up and use, rather than fulfilling private contracts between the bus operator and user. With reference to the Review of Developments in Transport in Asia and the Pacific (2005), the level and reliability of bus services in countries around the world is often dependant on the quality of the local road network, levels of traffic congestion, and the prevalent population density.

Bus is a major mode of public transport in most countries of the world, especially in urban areas which lack of airline and train services. Bus transportation has long time been an economical and convenient mode of transportation. The buses found in countries around the world are different due to the differentiation of local market requirement where it depends on the quality of the local road network and the population density of a country. Normally, to fulfil the different requirement of customers demand, the types and features of buses have to be developed according to local tradition or market. For example, buses were fitted with air conditioning in Asia.

1.2 Problem Statement

Bus transport play an important role in Malaysia as there are many bus services available in Malaysia. The passengers of bus usually consists of those who do not have cars, including children, teenagers, adults, students, and elders. Therefore, they use public buses to go places around their house by city busses, and they also use intercity busses to go places far away from their house. Public transport is good because it is easy to use so anybody can go on it. However, there are still many problems occurred due to the design of Malaysia busses in the aspect of appearance, accessibility features, ergonomic, comfortability, functionality, and safety.

Although viewed as essential, bus services and buses are generally looked down upon for a variety of reasons. Passenger amenities in buses, such as seats and standing space, are inadequate and uncomfortable; they are noisy and vibrate. The climate of large regions in Malaysia, as also elsewhere in the world, is characterized by high ambient temperatures as well as high humidity for many months in a year. This aspect coupled with high passenger occupancy, also termed packing density, results in poor comfort levels inside the bus as quantified by air temperature, humidity and velocity.

Thus, this project is targeted to provide ergonomic, safe to use, and have high functionality, efficient, effective, eco-and consumer-friendly city bus transportation. In conclusion, broadly designed buses should be sleek and ergonomically designed, should facilitate level boarding and alighting, have comfortable seating and suspension, advanced passenger information system, vehicle information and tracking systems, should be passenger and disabled friendly and have electronic fare collection, among other requirements.

1.3 Scope of the project

1. To do the literatures study on the background of buses.
2. To gain the customer input (voice of customer) regarding the design of the city bus.
3. To do literatures regarding the related regulations with city bus.
4. To come out with a list of specifications to be considered during the design work of city bus.
5. To understand and digest the specifications regarding city bus in order to express them in the design work.
6. To think and come out with the innovative features that can be attached to the conceptual designs.
7. To evaluate and validate the concept design generated

1.4 Objectives

The main objectives of this project are: -

1. To consider all specifications and regulations related to the city bus design.
2. To develop the conceptual design breakdown configuration.
3. To develop conceptual design of an ideal city bus in the form of 3D data.
4. To study the interior and exterior design of current city bus.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of Bus

Buses used to be called as omnibuses, but people now simply call them "buses". The name of „bus“ is a shortened version of omnibus, which gives the meaning of carrying of a number of people in one vehicle. According to the article published by Park May Berhad (2001), bus is a large wheeled vehicle meant to carry many different persons along with the driver. It is larger than a car. Thus, it can be defined as a larger motor vehicle designed to carry passengers usually along a fixed route according to a timetable or schedule.

From the article of Park May Berhad (2001), bus transportation probably had its beginning in the days of the Romans. However, a horse-drawn urban omnibus was introduced in Paris in 1662 by Blaise Pascal and his associates, but it remained in operation for only a few years. The omnibus as shown in Figure 2.1 reappeared c.1812 in Bordeaux, France, and afterward in Paris (c.1827), London (1829), and New York City (1830). It often carried passengers both inside and on the roof.



Figure 2.1: Parisian Omnibus in the late nineteenth century

(Source: <http://bus38.free.fr/hist1854eng.html>)

According to the article published by Park May Berhad (2001), buses were motorized early in the 20th century. In most country, motorbus transportation increased rapidly now. The construction of small buses is similar to heavy automobiles, while the construction of large buses is similar to that of heavy trucks. Some large cities now use articulated buses, which can seat more than 60 passengers; such buses are constructed in two parts and joined, or articulated, with an accordion-style sleeve.

2.2 Bus History

Table below shows the sample of chronology with the reference to Ariffin, A. (2001), Global Oneness Foundation (2004), and Bus History Association (BHA). The summary of history of bus transportation from year 1662 until 1831 is tabulated in Table 2.1 below.

Table 2.1: Bus History

Year	Description
1662	- A horse-drawn urban omnibus was introduced in Paris in 1662 by Blaise Pascal and his associates, but it remained in operation for only a few year.
1826	<ul style="list-style-type: none"> - The omnibus reappeared in Bordeaux, France. - First public transport system for general use originated in Nantes, France. - Stanislas Baudry, a retired army officer who had built public baths using the surplus heat from his flour mill on the city's edge, set up a short route between the center of town and his baths. - When Baudry discovered that passengers were just as interested in getting off at intermediate points as in patronizing his baths, he changed the route's focus. - His omnibus featured wooden benches that ran down the sides of the vehicle; passengers entered from the rear.