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PROPOSAL FOR BUS STATION ADJACENT TO CENTER POINT, KOTA KINABALU

ANDY SURIN A/L KHOO AH CHAI

FINAL YEAR PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT
FOR THE DEGREE OF BACHELOR IN CIVIL ENGINEERING

SCHOOL OF ENGINEERING AND INFORMATION TECHNOLOGY
UNIVERSITY MALAYSIA SABAH
KOTA KINABALU
2004

CERTIFICATION

I admit that the project report was prepared by my own except for the equation and quatation that have been explained their resources.

FEBRUARY 2004

ANDY SURIN A/L KHOO AH CHAI
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ABSTRAK

Pengangkutan kini semakin memainkan peranan yang penting dalam kehidupan manusia dan menjadi sebahagian daripada keperluan asas yang penting. Penaiktarafan Dewan Bandaraya Kota Kinabalu (DBKK) pada 2 Februari 2000 telah membawa kesedaran kepada pihak berkuasa untuk meningkatkan kecekapan sistem pengangkutan yang sedia ada dengan menyediakan satu terminal yang dapat menampung kehendak berkenaan. Dalam laporan projek akhir ini, perhatian telah ditumpukan kepada pembentukan sebuah terminal bus yang bersebelahan dengan pusat membeli-belah Center Point. Terminal berkenaan terletak pada satu lapangan seluas 17300 m^2 yang merupakan lokasi strategik iaitu dalam lingkungan Pusat Komersial dan Perdagangan Kota Kinabalu. Projek akhir ini menumpukan perhatian pada rekabentuk struktur utama binaan terminal dan binaan sokongan terminal. Susunatur terminal yang dicadangkan adalah berdasarkan kepada kajian isipadu dan kadar maksima yang digunapakai dalam pengiraan ialah sebanyak 252 kenderaan bas. Dengan itu, sebuah susunatur terminal bas yang dapat menampung sebanyak 200 buah bas dalam satu-satu masa telah dipraktikkan dengan mewujudkan satu peraturan mengehadkan jangkamasa menunggu dan memunggah penumpang kepada sesebuah bas yang menggunakan terminal ini. Kesemua rekabentuk adalah berpandukan kepada British Standard (BS) 8110 untuk kerja-kerja konkrit bertetulang, BS 5990 untuk kerja keluli dan pembebanan berpandukan BS 6399. Hasil daripada kajian trafik, nilai isipadu puncak sebanyak 252 buah bas dalam setengah jam telah digunakan sebagai platform rekabentuk. Selain itu, aliran trafik dianggap kurang daripada nilai ini dan satu peraturan yang hanya membenarkan sesebuah bas untuk memberhenti, menurun dan membawa penumpang dalam masa yang ditetapkan sahaja bagi membenarkan bas-bas lain untuk memasuki ruang terminal bas. Akhir sekali, rekabentuk terminal bas ini memerlukan bidang kejuruteraan yang luas seperti kejuruteraan trafik, struktur dan bidang seni bina.

ABSTRACT

Transportation now a day, has become more and more important for human life and it can be considered as part of human basic needs. The transformation of Kota Kinabalu City Hall (DBKK) on 2nd February 2000, being drawn the city authority toward of improving the efficiency of public services system as well as the facilities to cater the system itself. In this project, the study is concentrate on establishing a bus terminal adjacent to the Center Point Shopping Complex. The proposed terminal is located on a 17300 m^2 of open space area, which is one of the strategic locations within the Kota Kinabalu Commercial and Trade Center. The proposed project is mainly focused on a complete structural design and other minor facilities associated with the terminal services. The layout of the terminal is based on the current demand obtained from the volume count and the maximum demand is about 252 buses in half-an-hour. Therefore, a layout that can accommodate around 200 buses in certain period with a restriction time for clearance where each bus can be only load or unload and parked in the terminal for a specific period is proposed. The design in the project is based on the British Standard 8110 for concrete design and BS 5950 for steel structure as well as for the loadings to BS 6399. As conclusion of the traffic analysis, the highest peak volume of 252 buses in half an hour is being taken to be the platform of the project. Besides that, it is assumed that the normal condition of the volume trends are lesser than 252 buses. In the other hand, the propose terminal will conducting a clearance regulation where each buses can be only load or unload and parked in the terminal within a specific period. The objective is to give opportunity to other buses to park in the terminal. As conclusion, the proposal for bus station actually required broad fields of study such as the traffic engineering, structure and the architecture study

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LIST OF SYMBOL

The symbols those have been used in the report are those standard symbols adopted in standard handbook, standards like BS 8110 and BS 5950. The symbols and the meaning are shown below:

A_c	Total area of concrete
A_{sc}	Area of vertical reinforcement
A_s	Area of tension reinforcement
A_{sv}	Total cross section of links at the neutral axis, at a section
b	Width or effective width of a section or flange in the compression zone
b_v	Breadth of a section
d	Effective depth
E	Modulus Young
F	Ultimate load
f_{cu}	Characteristic strength of concrete
f_s	Estimated design service stress in tension reinforcement
f_y	Characteristic strength of steel
h_f	Thickness of flange
k	a factor that indicate the strain distribution in the concrete in compression and strains in the reinforcement, whether in tention or compression
L_e	Effective length of column or beam
M	Design ultimate moment
M_x	Design ultimate moment about x axis

M'_x	Effective uniaxial design ultimate moment about x-axis
M_y	Design ultimate moment about y axis
N	Design ultimate axial load on column
n	Total design ultimate load per unit are
S_v	Spacing of link along the member
V_c	Design concrete shear stress
Z	Lever Arm
δ_a	Actual deflection
δ_d	Permissible deflection
β_{sx}	Short Span coefficient
β_{sy}	Long Span coefficient

CHAPTER 1

INTRODUCTION

1.1 GENERAL

Transportation now a day has become more and more important for human life and it can be considered as part of human basic needs. From the historic age until today's high technology and digital world, the transportation scope has been changing from the economic purpose which involved personal travel in search of food or work, travel for trade or commerce until travel for exploration, conquest, or personal fulfilment, or for the improvement of one's status in life. The development of a nation relies on its transportation efficiency and it is an essential factor for attracting the local and foreign investments to a certain area, town or city and finally it will boost the local growth activity.

The transformation of Kota Kinabalu Town Hall to City Hall on 2nd February 2000 has drawn the city authority towards improving the efficiency of public services system as possible. The transportation demand is based on the number of users with difference background and status using the transportation service around Kota Kinabalu City. The

City main transportation system is bus service system; which plays an important role in the city life. Hence a specific terminal that can provide a systematic, sufficient and efficient service to the user must be provided. Therefore, the terminal must have an adequate characteristic such as strategic location, accessible for user, and can serve for other needs such as car parks, food and beverage centre etc.

1.1 PROJECT BACKGROUND

The land premise beside the Centre Point Shopping Complex currently is owned by the City Hall but it is being rented to the Bumiputra Bus Entrepreneur Association (*Persatuan Pengusaha Bas-bas Bumiputra*) as city's temporary bus terminal before the city permanent terminal is expected to complete outside the city centre activity. At same time, this area is also being used as the partial car park area due to the inadequate parking space especially during weekend.

This location is an open area with crusher-run pavement that has an average length and width of 197.01m and 84.08m respectively. The coverage area of the temporary bus terminal is about 1.73 ha or 17300 m^2. Basically the purposed location is a reclamation area for the past city's enlargement scheme during 1957 where addition of 7330 acres has been made. Hence the reclamation area has generated this area as Kota Kinabalu Commercial and Trade Centre. Several options will be used to promote the purposed building as a total transportation terminal, either with car parking facilities or terminal with or without commercial facilities or with both combination facilities (car parking and commercial facilities). This is due to the current option/ facility provided at the surrounding the purpose terminal has already provide the required service to the public such as the supermarket, bank, food court and other commercial premises.

Besides that, the taxi centre also located adjacent to the Centre Point Shopping Complex; which providing a taxi service to the user. Hence, they also share the same space as the bus service at the terminal. Usually during weekend, the street that separates the terminal and the Shopping Complex is congested due to several users that illegally park their vehicles at the roadside, which directly reduce the traffic space. At the same time, the street also serves the heavy vehicles to unload their goods to the shopping complex.

1.2 OBJECTIVES OF PROJECT

The project is mainly focused on the complete structural design and other minor facilities associated with the terminal services. Hence, the objective of the design can be interpreted as follows:

a) To design a centralised local city bus;

b) To provide better terminal for user's satisfaction;

c) To provide other utilities such as car park, food court centre and other commercial space (if required)

The purpose terminal is a multi-storied building completed with commercial centre, and car parking space while the ground floor is a terminal bus. But the requirement of commercial centre is still under consideration because the terminal is surrounding by commercial premises that provide the required services such as bank, shopping centre, food court, and other services.

1.3 SCOPE OF STUDY

The design for a multi-purpose transportation terminal will involve a lot of field or scope including the Civil and Structure (C&S), Mechanical and Electrical (M&E) and others. Hence there are some limitations while completing this project work.

Therefore, the designs are being limited until the scope of civil & structure; that is the main structural design. At the same time, the other services of the building or terminal such as the escalator, lift, electrical supply, air-conditional system, air ventilation and lighting system are being assumed according to general practice. The structural design guidelines that being used is based on the British Standard 8110, BS 5950 for steel design and the loading is based on BS 6399 Part 1

1.4 ORGANIZATION OF PROJECT REPORT

This project report is composed of ten chapters and the general outlines of each chapter are indicated as follows:

Chapter 1: General

Introduce the project background, objective, scope of project and some basic outlines of the project

Chapter 2: Literature Review

Provide some introduction of the theoretical method and criteria used in design and the common factor used by engineer or designer during designing work. Hence, this will provide a initial guide-line and analysis for the design project thesis

Chapter 3: Methodology of Data Collection and Design Criteria

This topic provides information on how the data collection had been done, the analysis and the guideline used in designing work.

Chapter 4: Data Analysis and Loading Calculation

This topic will showing how the analysis is being done and the calculation on loading from the data collected and the initial assumption given.

Chapter 5: Design of Slab

This chapter is mainly show the steps of designing several slab panels of the building manually, while the others will be analysed by software

Chapter 6: Design of Beam

This topic shows all method of designing the beams, which include the T and L beams. All loads acting on beams will be analysed by Esteem, and the result such as the moment and shear envelope will be used in design. In this chapter, only 2 critical beams will be designed manually.

Chapter 7: Design of Column

This chapter presents the initial works of designing column in the building. As the previous, chapter, only 2 critical columns will be designed manually and the others by using the Esteem.

Chapter 8 : Design of Foundation

The chapters will interpret the steps of designing the foundation. The final loadings are based on the Esteem data of analysis as the reference. As usual, only the critical footing will be designed manually.

Chapter 9: Design of Shelter

The chapter will initially discuss the structure of shelter and the function and the drawing. The design will be based on BS 5950 Steel design structure

Chapter 10: Discussion, Conclusion and recommendation

This final chapter provide the summaries from the result, the final assumption, explanation of the drawing and the resulted data; and suggestion or recommendation to enhance this project in the future in full version.

CHAPTER 2

LITERATURE REVIEW

2.1 GENERAL

Literature review is a systematic, reproducible method of for identifying, evaluating and interpreting the existing or the previous study or works produced by the researchers, scholars and practitioners. The literature review is very important in term of providing a background or guideline for the researchers or practitioners in their research topic or project proposal topic. Therefore in this chapter, the literature of review will includes the traffic engineering study especially the volume study, parking studies, and bus terminal characteristic.

2.2 TRAFFIC ENGINEERING STUDY

The development of transportation system via its facilities has contributes to the higher standard of living and the nation growth as a whole. However, the problems related to the transportation system exist simultaneously with the traffic growth. Hence, the

transportation efficiency became more and more important besides the sophistication perspective because it will govern the public transportation image among the users as the main target and to solve the transportation problems arising in the area. For example, Kuala Lumpur City has varieties of public transportation system such as light rapid transit (LRT) and monorail system in order to promote a more effective transportation system to solve its chronic congestion although a systematic public system such as bus system has already been implemented.

Solution of transportation problems requires an effective and total study of the transportation behaviour. Therefore, adequate information needs to be collected by organizing such surveys and studies. The traffic engineering study can be divided into three categories; which are (i) dynamic study, (ii) inventory and (iii) administration study. The dynamic traffic is a collection of data under operation conditions, which include the studies of traffic volume, speed, delay, accidents or crashes and parking. While the inventory study is a collection of existing information data that in term of list or graphic display of information; such as width of street, traffic route system, space of parking and other traffic regulation. In contrast, the administration studies use the existing engineering records in the government agencies or department or others non-government agency that related to the traffic study.

Regarding to the propose of bus terminal adjacent to the Centre Point, Kota Kinabalu, a dynamic study has been used to determine the trend or traffic behaviour in the area. Among the scopes in the dynamic studies, the volume study has been chosen and been implemented. The volume studies basically are the average daily traffic and vehicles classification.

2.2.1 Volume Study

The volume study, which is part of dynamic studies, is an important scope of traffic studies in order to determine the traffic flow within the targeted area. The traffic flow or volume can be defined as the number of vehicles that passing a certain points in the roads or other specific location within a certain period of time. It is the most basic of all traffic parameter and it is usually used in the planning, design, control, operation and management analysis.

Therefore, the traffic volume studies are conducted to collect the number of vehicles or pedestrians that passing a point on highway facility during a specified time period (*Garber N.J & Hoel L.A*). The period of time can be just 15 minutes until as much as number of years in depends on the criteria and also type of project required. Hence, there are several types of traffic movement change need to be given a necessary attention or observation during conducting the volume study; the traffic flow can be differ either from day and nigh, day by day or year by year etc. The volume study is being conducted according to the requirement of volume characteristics needed in the survey such as:

i. Average Annual Daily Traffic (AADT)

   AADT is an average 24 hours counts collected every day in the years (*Garber N.J & Hoel L.A, 2002*). Usually AADT is being used in transportation analysis such as to make estimation on the highway or transportation facilities revenue as well as to evaluate the economic feasibility study on the transportation project. If it is used in the highway system, AADT is important in order to establish the traffic volume trends and also to make or develop an improvement and maintenance programs for the highway system.

ii. Average Daily Traffic (ADT)

ADT is an average count that being collected for 24hours and conducted greater than a day but less than a year period (*Garber N.J & Hoel L.A, 2002*). In the other words, ADT also can be represented by the total traffic for the year divided by 365 accordingly to the *REAM (Road Engineering Association of Malaysia) Guide of Geometric Design of Road*. Usually the ADT is being practiced in order to determine the current demand for a traffic facilities or highway. At the same time, the engineer can make an evaluation of existing traffic flow in the area so that a certain planning activities can be made. Besides that, an evaluation of proposes expenditure can be also determined.

iii. Peak Hour Volume (PHV)

PHV is a maximum number of vehicles that pass a certain points on a specific location within a time period of 60 consecutive minutes (*Garber N.J & Hoel L.A, 2002*). This data usually is being used to in development of program related to the traffic operation as well as to use in the capacity analysis. In the highway engineering aspect, the PHV is used in the geometric design characteristic of a highway such as the chanelizations, number of lane and so on.

iv. Vehicle Classification (VC)

VC is a set data that recorded the various classes of vehicles either in the Peak Hourly Volume or Design Hourly Volume. The vehicles characteristic must be determine in order to differentiate the weight, axles, and sizes. This data is important in the design road or facilities where it will be used in determination of propose structure characteristic. Besides that, the commercial vehicles are generally heavier, slower and occupy more space; then the number of it can be used to design a special facilities or highway characteristic.

2.2.2 Type Of Volume Count

There are different types of traffic volume count can be done, and depending on the associated data required. According to *Garber N.J & Hoel L.A*, the volume counts can be grouped into:

i. Cordon Counts

Is a useful method when information on vehicles accumulation within area in particular specific time is required. An imaginary closed loop is done on the target area where as each intersection street intercept with the cordon imaginary line is being taken as the count station. This method is useful for planning facilities, updating and evaluating traffic operational techniques.

ii. Screen Line Counts

Basically it is alike the cordon counts where an imaginary running line is done on the large section area and usually man made or nature barrier is being taken. This count is drawn such that the screen lines are not crosses more than once on the same street. The data (traffic volume) will be varies within the same screen line due to different land-use pattern

iii. Intersection Counts

This method is practice at the intersections where as the number and type of vehicles as well as their movement is collected. This counts are used to determine the phase length and the circles time for signalisation or channelization

iv. Pedestrian Volume Counts

This type of count is undertaken when certain propose pedestrian facilities or an existing is to be evaluated. Usually the count is conducted at the pedestrian location such as crosswalk.

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