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SEMI TOP DOWN AND BOTTOM UP CONSTRUCTION WORK IN DEEP  
BASEMENT OF TALL BUILDING IN KUALA LUMPUR.

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A project report submitted in partial fulfilment of the  
requirements for the award of the degree of  
Master of Engineering (Civil-Structure)

Faculty of Civil Engineering  
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NOVEMBER 2009

I declare that this project report entitled “*Semi Top Down and Bottom Up Construction Work in Deep Basement of Tall Building in Kuala Lumpur*” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and this is not concurrently submitted in candidature of any degree.

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*Special dedication to my beloved wife (Noorleha Lee Jung-hee) who has fully given encouragement and moral support towards accomplishment my study and to my dearest daughter (Wan Noorlily).*

*..... for everlasting love and cares.....*

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## ABSTRACT

This project report is to present underground basements construction work in tall building constructed with bottom up method and semi top down method. Bottom up method is normally carried out in area with fewer plant facilities to operate. Semi top down method is carried out in urban area with compact surround area to reduce construction period and cost. Three floors underground basement founded on same type underground limestone from two projects of 30-storey building are investigated. The excavation for both basement substructures is varied from 14m to 18m below existing ground level. The work methodology in the basement construction work is presented. Excavation works, slope stabilization, retaining systems, site instrumentations and under ground water table are those parameters influenced in substructure works. All the parameters from both methods are compiled during substructure work then assessed and evaluated in view of technical aspect. Contrary to bottom up method, in semi top down method, the retaining wall system and pre installed temporary stanchion are required, however shot-crete in slope stabilization, steel strutting system and earth backfilling are eliminated. It appears that in basements works using semi top down method has offered more advantages compare with bottom up method in view of shorter construction period and cost effective. The suggestions proposed for preliminary study in three floors basement work are rate completion time are  $16.3\text{m}^2/\text{day}$  and  $13.2\text{m}^2/\text{day}$  and for construction cost at sub-contractor price are  $\text{RM}1,556.92/\text{m}^2$  and  $\text{RM}1,758.76/\text{m}^2$  for semi top down method and bottom up method respectively.



## ABSTRAK

Laporan projek ini mengupaskan kerja-kerja besmen bawah tanah dalam pembinaan bangunan tinggi menggunakan cara kerja bawah ke atas dan cara kerja separa atas ke bawah. Cara kerja bawah ke atas dijalankan di kawasan yang tidak memerlukan penggunaan banyak jentera. Cara kerja separa atas ke bawah pula dijalankan di kawasan yang padat sekelilingnya dengan mengambilkira penjimatan kos dan masa pembinaan. Pembinaan dua bangunan setinggi 30 tingkat dengan tiga besmen bawah-tanah di atas tanah batu-kapur dikajisiasat. Kerja-kerja mengorek tanah untuk sub-struktur di kedua-dua besmen bangunan tersebut adalah di sekitar 14m sehingga 18m kedalamannya dari aras sediaada. Tata kerja dalam pembinaan besmen tersebut dibentangkan. Kerja-kerja pengorekan tanah, kesetabilan cerun, sistem penghadangan, alat-alat pengukuran tapak bina dan aras air bawah tanah adalah pembolehubah yang mempengaruhi kerja-kerja substruktur. Semua pembolehubah dari kedua-dua cara kerja disusun semasa kerja-kerja substruktur, selepas itu ditentukan dan dinilai dari sudut teknikal. Berbeza dari cara kerja bawah ke atas, didapati cara kerja separa atas ke bawah memerlukan sistem dinding penghadang dan tiang pasang siap, walaubagaimana pun perlindungan *shot crete* dalam kesetabilan cerun, sistem besi jermang sadak (*steel strutting system*) dan timbus balik tanah tidak diperlukan. Kerja-kerja besmen menggunakan cara kerja separa atas ke bawah didapati memberi kelebihan berbandingkan cara kerja bawah ke atas dari sudut masa pembinaan yang singkat dan penjimatan kos kerja. Cadangan yang diutarakan untuk kajian permulaan dalam pembinaan tiga besmen bawahtanah adalah kadar masa pembinaan ialah  $16.3\text{m}^2/\text{hari}$  dan kadar harga subkontraktor ialah  $\text{RM } 1,556.92/\text{m}^2$  bagi cara kerja separa atas ke bawah. Manakala bagi pembinaan mengikut cara kerja bawah ke atas, kadar masa pembinaan ialah  $13.2\text{m}^2/\text{hari}$  dan kadar harga subkontraktor is  $\text{RM } 1,758.76/\text{m}^2$

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

In Malaysia, tall buildings with deep basements have been extensively constructed mainly in the expensive and congested urban area. Basements effectively serve as underground space for car park and other usage in extensive scheme. The excavation of the deep basement requires much attention of structural and geotechnical engineers as well as contractor itself. The considerations involved in design and planning contributed to safety and economical aspect which should be emphasized at early stage. The execution of the deep basement construction work can be either carried out with method of bottom up or top down, however it is subject to site local geology condition and location of the building itself. The hybrid of both methods which is called semi top down method may look more viable to give influences in saving of both time and economical construction aspect.

In Kuala Lumpur area, as metropolitan city, development of tall building with underground basement rapidly being in progress recently, refer **Figure 1.1**. Demand on

luxurious standard living in town area with ease infrastructure has caused land usage is fully utilized. The development gives challenging to engineers and contractors to think intensively in designing and method of construction while maintaining client objectives to suit with functional of building itself. Based on local experience, construction of basement required more attention in economical aspect in finding accurate method to construct deep basement in safely manner.



**Figure 1.1** : Tall buildings in Kuala Lumpur

## **1.2 Problem Statement**

In construction of deep basements, the major concerned is safety and economical aspect. This matter is not only implies to project itself but also influence to surround existing building as well. Safety is mainly influenced by proper sequence activity in construction system which being implementing at the present of time. Economical is cost effective contributes to move the construction activity influenced by operation and monitoring activity. Settlement in soil contributed to ground movement is due to excavation, presence of ground water, vibration in piling works, stability system in bracing and strutting as well as others activity in basement construction works. The proper knowledge of sequence activity in excavation work executed plays important role to eliminate such consequence defects to existing adjacent structures or building. In cost estimating of underground structures, methodology of basement construction work, cost operation and time completion contributed in many type of construction method. In each method, there are certain limits influenced bound with the pros and cons of the system activity. Reviewing past project is able to give guideline decision to support estimation cost and time analysis for basement construction works.

## **1.3 Aim and Objective**

The aim of the project study is to get comparison sequence activity, time and cost completion in basement work in tall building executed using two types deep basement construction method i.e (a) Bottom Up Construction Method and, (b) Semi Top Down Construction Method.

Through these two basement construction methods, the objectives of this project study are encompassed in:-

- i. Investigation of sequence activity in construction basement work of tall building.
- ii. Comparison in cost and time construction basement work of tall building.

#### **1.4 Scope of Project Study**

In capturing the above aim and objectives, field investigation is to be carried out from two selected tall building projects in Kuala Lumpur area which are:-

(i) **Project 1:**One (1) block 30-storey building with 3 floors basement at Jalan Ampang, Kuala Lumpur which basement work is carried out with Bottom Up Method, and

(ii) **Project 2:**One (1) block 30-storey building with 3 floors basement at Jalan Tuanku Abdul Rahman, Kuala Lumpur which basement work is carried out with Semi Top Down Method

**Project 2** is commenced after one year late from **Project 1**. Both projects are founded on similar underground Kenny Hill Formation underlain by Kuala Lumpur Limestone.

