DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

THE CONSTRUCTION OF REINFORCED CONCRETE SLAB AT RIANA SOUTH CONDOMINIUM

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(PERAK)

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STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references are stated herein, prepared during a practical training session that I underwent at TCS Construction SDN BHD for a duration of 14 weeks starting from 3 September 2018 and ended on 7 December 2018. It is submitted as one of the prerequisite requirements of DBG307 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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To end, I would like to reach out to my parents and my friends for their willingness of helping me throughout this report. I am thankful and grateful to them. All of them.

Thank you.

ABSTRACT

Building construction is the process of constructing a building or an infrastructure. Slab is a structural element that is made of concrete and is used to create flat horizontal surfaces such as floors, roof decks and ceilings. Hence, this report will discuss about the method of constructing reinforced concrete slab. This report was conducted for the building construction and construction of reinforced concrete slab at Riana South, Cheras, Kuala Lumpur. The prime objective of building construction is to make sure that the performance of the building can be continues to the utmost throughout its design life. The method of study used for this report were interviews, case study and literature reviews. The objectives of the report are to identify the method of constructing reinforced concrete slab on a high rise building, to determine the problems occurred and solutions taken to solve problems throughout the slab. To conclude, as slabs are the foundation for most construction, it is extremely important to understand all aspects of development to completion.

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CHAPTER 1.0

INTRODUCTION

1.1 Background and Scope of Study

1.1.1 Background

Construction is a series of actions undertaken by construction companies which produce or alter buildings and infrastructure. Individual construction companies become competent at one or more of the actions over many years. They apply their specialised skills and knowledge on construction projects. Each construction project has a start and end date and usually requires a number of construction companies that work together to produce a new or altered building, a group of buildings, or an addition or alteration to the infrastructure. (Radosavljevic, 2012)

Building is to a certain extent determined by availability of material and skilled operatives, therefore local, regional and national factors will also be responsible for some variation. Supplementary study material and detail can be obtained from professional journals, legislative paper, manufactures product literature, the many cross-references in the text and attending exhibits and seminars. The most valuable learning resource is observing and monitoring construction in progress. (Chudley, 1982)

Building construction is the process of adding structure to real property. The vast majority of building construction projects are small renovations, such as addition of a room, or renovation of a bathroom. Often, the owner of the property acts as labourer, paymaster, and design team for the entire project. However, all building construction projects include some elements in common - design, financial, and legal considerations. Many projects of varying sizes reach undesirable end results, such as structural collapse, cost overruns, and/or litigation reason, those with experience in the field make detailed plans and maintain close supervision during the project to ensure a positive outcome.

Slabs however is a common structural element of modern buildings. Horizontal slabs like example reinforced concrete slabs are most often used to construct floors and ceilings. While some are used for exterior paving. In many domestic and industrial building a thick concrete slab, supported on foundations or directly on the subsoil, is used to construct the ground floor of a building. These can be either called "ground-bearing" or "suspended" slabs.

In high rise buildings and skyscrapers, thinner, pre-cast concrete slabs are slung between the steel frames to form the floors and ceilings on each level. Cast in-situ slabs are used in high rise buildings and huge shopping complexes as well as houses. These in-situ slabs are cast on site using shutters and reinforced steel. On the technical drawings, reinforced concrete slabs are often visualised as "r.c.c.slab" or simply "r.c". Technical drawings are often created by structural engineers who use software such as AutoCad or Revit structure.

In-situ concrete slabs are built on the building site using formwork – a type of boxing into which the wet concrete is poured. If the slab is to be reinforced, the rebars, or steel bars, are positioned within the formwork before the concrete is poured in. Plastic-tipped metal or bar chairs are used to hold the rebar away from the bottom and side of the formwork, so that when the concrete sets its completely envelops the reinforcement.

1.1.2 Scope of Study

Throughout the three months of industrial training at the construction of Riana South, Cheras, a lot of experience and technical knowledge had been gained. The construction was in the middle stage of progress. The work that was carried out from the beginning of the month was constructing the reinforced concrete slab and had been chosen as the case study for this practical report.

This report provides information regarding implementation of the first stage to the final stage on the building construction of reinforced concrete slab at Riana South, Cheras. These stages of constructions involve planning and development activities associated with building construction and consist of three closely related processes:

i. Preparation and conduction of the construction works.
ii. Establishing the problems occurred and performing the correct methods to solve the problems.

1.2 Objective

1.2.1 Aim

To study the building construction of reinforced concrete slab at Riana South Condominium, Cheras, Kuala Lumpur.

1.2.2 Objectives

i. To identify problems occurred and the solutions taken to solve them.
ii. To investigate the methods of constructing reinforced concrete slab on a high rise building.

1.3 Methods of Study

1.3.1 Primary Data

i. Interview

Interview sessions were conducted with several people who are in charge with responsibility for the site. The people concerned are the supervisors, sub-contractors, skilled workers, un-skilled workers and others.

ii. Observation

Studies were also made by observation method during the practical training through site visits. The information collected were based on what happened at the construction site with guidance by supervisor on site. Cameras and cell phones were used to record any important data and information such as the progress of construction, and also the equipment and machineries that were used for the construction.

1.3.2 Secondary Data

I. Books

Literature review has been done to study and find out about regarding the building construction of reinforced concrete slab, the methods on how to construct it through relevant books, articles and thesis that has been searched at PPAS Raja Tun Uda Library and UiTM Shah Alam Library. Some of the literature studies are also from the project drawings on site given by the architects. And also other materials such as AutoCad files and others.

II. Internet

Internet was also used as a secondary source to obtain information about failure in construction such as defects. There are several websites that have been used to get more information about failure in construction.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

TCS Construction Sdn Bhd, (formerly known as Projek Bumi Bina Sdn Bhd) was incorporated in 1998 to pursue firmly into the construction of building and civil engineering works. To establish itself as one of the most trustful and competent contractor in the country is the main objective. Its goal is to be a contractor of choice. Dato' Ir. Tee Chai Seng is the founder of TCSCSB and he was also the co-founder of Pembinaan Tuju Setia Sdn Bhd, (PTSSB) which specializes in the construction of high-rise building, institutional buildings and hypermarkets. After leaving PTSSB in the year 2015, he continues his focus towards TCS Construction Sdn Bhd.

Guided by a dedicated management team, TCS Construction comprises of qualified engineers from various backgrounds, including civil and structural engineers, mechanical engineers, quantity surveyors, electrical engineers, safety and health officers and independent QA/QC teams with extensive experience in building and civil engineering works.

The company had completed several projects ranging from landed residential buildings, shop offices, medium to high-rise buildings and also infrastructure works such as water pipelines, service reservoirs, sewerage treatment plants and institutional buildings. They are always committed to achieve the highest standards and quality of works.

TCSCSB is certified with ISO 9001 by SIRIM Malaysia for the building and civil engineering works and currently preparing for ISO 14000 (Environmental) and ISO 45000 for Safety and Health. Their Quality Statement and Quality Policy has always been consistent in Quality workmanship, Timely completion of projects, Effective services and Continual improvement in Quality Management System and business relationships

2.2 Company Profile

2.2.1 Owner

Dato' Ir. Tee Chai Seng (Director)

Dato' Ir Tee holds a Bachelor of Science in Civil Engineering (High Honors) from The University of Texas at Arlington, United States. He is a registered Professional Engineer, Malaysia (P Eng), a Chartered Professional Engineer, Australia (CP Eng, Aust), a corporate member of The Institution of Engineers, Malaysia (MIEM) and a member The Institution of Engineers, Australia (MIE Aust). He is also a member of Association of Consulting Engineers, Malaysia (MACEM). He passes the Engineer-In-Training (EIT) Exam for Professional Engineers conducted by The Texas State Board of Professional Engineers. He is a member of The Institution of Civil Engineers, UK (ICE).

He has more than 34 years of working experience in the construction of building and infrastructure works. He is also a practicing civil and structural consulting engineer, a project manager and involved in property development. He has successfully completed the design and supervision of many projects ranging from mixed developments and major townships to infrastructure work, high-rise and super high-rise buildings, commercial and retails complexes, institutional and industrial buildings, highway and bridges, water treatment and wastewater treatment plants, jetties, marina and coastal engineering, geotechnical and foundation engineering.

Dato Ir Tee started TCS Construction Sdn Bhd in year 1998 to undertake construction of building and infrastructure works and design and build contract.

He has previously lectured part time for the working individuals pursuing BEM Part I and Part II Exams conducted by Engineering Council, UK. He continues to give specific lectures and career talks to the graduating engineers at the Universiti Teknologi Malaysia (UTM), Universiti Sains Malaysia, UKM, UPM and UTAR. He is currently preparing a design manual for Civil and Structural Engineering Practices - "A practical approach to infrastructure and structural design; Design Errors, Mistakes and Blunders and a manual for construction on, "Site Planning and Management with case studies". He is leading the site teams on quality assurance and control for all the site works and familiar with the quality assessment, Qlassic by CIDB Malaysia.

2.2.2 Profile

Name of Company	:	TCS CONSTRUCTION SDN BHD (Formerly known as PROJEK BUMI BINA SDN BHD) (466772-H)
Registered Address	:	No.76A, Jalan SPU 1, Saujana Business Park, Bandar Saujana Putra, 42610 Jenjarom, Kuala Langat Selangor Darul Ehsan, MY
Telephone	:	
Facsimile	:	
Business Address	:	No.78A, Jalan SPU 1, Saujana Business Park, Bandar Saujana Putra, 42610 Jenjarom, Kuala Langat Selangor Darul Ehsan, MY.
Telephone	:	
Facsimile	:	
Date of Incorporation	:	August 04, 1998
Nature of Business	:	Building & Civil Engineering Contractor
Paid Up Capital	:	RM 2,000,000.00
Board of Directors	:	1. Dato' Ir Tee Chai Seng 2. Datin Koh Ah Nee
Company's Secretary	:	YKF Management Services No. 50-2, Jalan Bendahara 38/7 Bandar Mahkota Cheras, 43200 Cheras, Selangor
Telephone	:	
Facsimile	:	

2.2.3 Year Established

TCS Construction Sdn Bhd was incorporated in August 04, 1998.

2.2.4 Company Vision

To be a preferred builder and contractor of choice in the country. To build people, branding, reputation and trust.

2.2.5 Company Mission

Delivery on time / Ahead with best workmanship

2.2.6 Location of Company

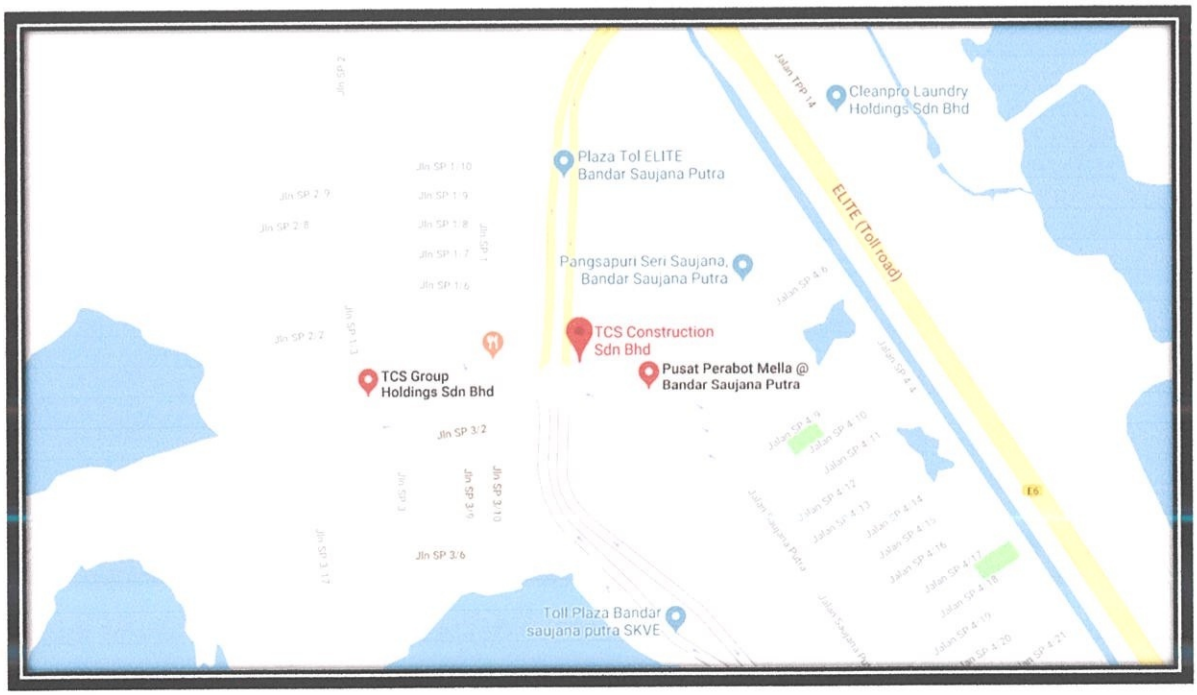

Figure 2.2.6.1: Location of TCS Construction Sdn Bhd

Source: www.google.com/tcsconstructionmap

No.76A, Jalan SPU 1, Saujana Business Park, Bandar Saujana Putra, 42610 Jenjarom, Kuala Langat Selangor Darul Ehsan, Malaysia.

2.2.7 Company Logo

Figure 2.2.7.1: TCS Construction Logo Company

Source: www.google.com/tcsconstructionlogo

2.3 ORGANIZATION CHART

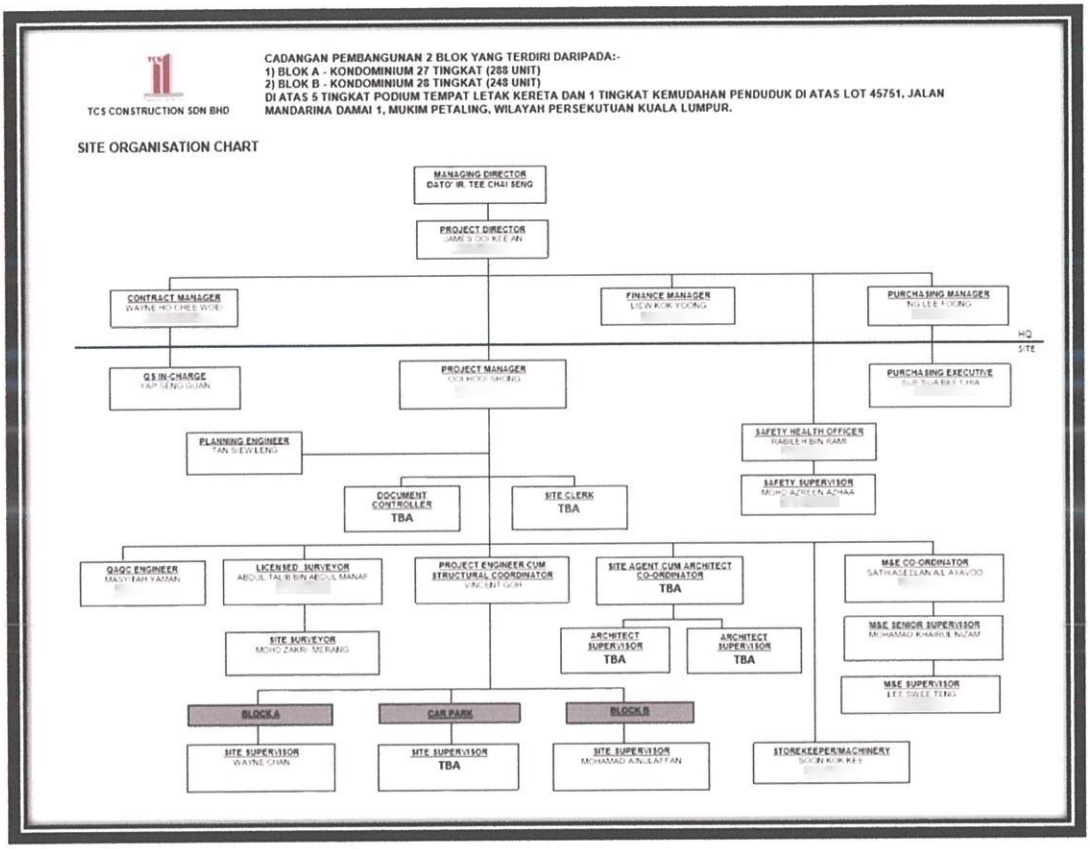

Figure 2.3.1: Organization chart TCS Construction

2.4 LIST OF PROJECTS

2.4.1 ONGOING PROJECTS

Table 2.4.1.1: TCS Construction ongoing projects

No	Project title	Contract sum (RM)	Commence/completion
1	Proposed phase 8A1 Development 356 double storey terrace houses (20' x 65') at part of Lot 11605 at Mahkota Hills, Mukim Lenggeng, Seremban, Negeri Sembilan Darul Khusus	71,994,847.90	08/10/2018- 04/02/2021
2	Cadangan pembangunan komersil bercampur di atas Lot PT 4191, Kawasan KTCC, Muara Selatan, Bandar Kuala Terengganu, Daerah Kuala Terengganu, yang terdiri daripada: i) 1 blok podium pusat membeli-belah di tingkat 1, 2 & 3 beserta tempat letak kereta di tingkat basemen dan tingkat 4, 5, 6, & 7	101,015,000.00	01/10/2018-30/07/2019
3	Proposed Construction and Completion of 4 Blocks 18 Storeys Height with 1 Block 7 Storey Detached Elevated Carpark Podium Complete with Common facilities such as of Multi – Propose Hall, Management Office, Swimming Pool, Gym Room, Guard House, Refuse Chamber and Provision of SSU Podium at Lot PT 41254, PT 41255, PT 41256 & PT 41258 and rizab jalan mukim Tanjong Dua Belas, Daerah Kuala Langat, Selangor Darul Ehsan	151,000,000.00	22/01/2018-21/09/2020

4	Cadangan Pembangunan 2 Blok yang terdiri daripada:- (1) Blok A – Kondominium 27 Tingkat (288 unit) , (2) Blok B – Kondominium 28 Tingkat (248 unit) di atas 5 tingkat Podium tempat Letak kereta dan 1 tingkat kemudahan penduduk di atas lot 45751, Jalan Mandarina Damai 1, Mukim Petaling, Wilayah Persekutuan, Kuala Lumpur.	119,721,700.00	01/11/2017-30/04/2020
5	Cadangan pembangunan 896 unit rumah mampu milik Wilayah Persekutuan 35 tingkat berserta 7 tingkat tempat letak kereta yang mengandungi : (i) Kemudahan dewan serbaguna, pejabat pengurusan, tadika, 2 bilik musalla, 2 bilik pengurusan jenazah, 8 ruang perniagaan, ruang peti surat, ruang tempat letak motosikal, pencawang eletrik, dan bilik – bilik M& E di tingkat bawah (ii) 2 unit rumah kebuk sampah 1 tingkat (iii) 1 unit pondok pengawal 1 tingkat, diatas Sebahagian lot PT9238, Jalan Pantai Dalam, Wilayah Persekutuan Kuala Lumpur	141,732,545.70	16/10/2017-15/10/2020

6	Cadangan membina 3 Blok Pangsapuri Perkhidmatan 35 tingkat (780 unit) yang mengandungi : (i) Blok A : 260 unit yang mengandungi 48 unit jenis A, 104 unit jenis B, 54 unit jenis C, 54 unit jenis D dari tingkat 8 hingga 34, (ii) Blok B: 260 unit yang mengandungi 48 unit jenis A, 104 unit jenis B, 54 unit jenis C, 54 unit D dari tingkat 6 hingga 34, (iii) Blok C : 260 unit yang mengandungi 48 unit jenis A, 104 unit jenis B, 54 unit jenis C, 54 unit jenis D dari tingkat 8 hingga 34. (iv) tempat letak kereta di tingkat Sub- Basement & tingkat 2 hingga 6. (v) Ruang-ruang perniagan di tingkat bawah (vi) 1 unit kedai pejabat dua tingkat, pejabat pengurusan dan tadika di tingkat bawah (vii) 1 unit kebuk sampah di tingkat bawah (viii) Kemudahan berkaitan yang mengandungi surau lelaki dan wanita, function lounges, dewan serbaguna, bilik bacaan, studio, gymnasium, kolam renang dan gelanggang permainan di tingkat 7 (x) 1 unit perhentian teksi dan bas , diatas no. 6 (PT 36938), jalan setia dagang AH U13/AH, Setia Alam, Seksyen U13, 40170 Shah Alam, Selangor untuk Tentuan: Bandar Setia Alam Sdn. Bhd	41,692,283.00	16/09/2017-15/06/2019

2.4.2 COMPLETED PROJECTS

Table 2.4.2.1: TCS Construction completed projects

NO	PROJECT TITLE	CONTRACT SUM (RM)	PROJECT TYPE
1.	The Design, Construction and Completion Of Reinforced Concrete Retaining Wall (RC Wall) for 87 units 3-1/2 Level Shop / Office In Bandar Puchong Jaya for M/S Pilihan Megah Sdn. Bhd.	151,000,000.00	250 length of R.C. Retaining Wall Of Various Height From 6m To 8m
2.	Proposed 2 Level Car Park Building For 87 Unit 3-1/2 Level Shop Office on Sub-divided Lot 556, 557 & 558, Bandar Puchong Jaya, Mukim Petaling, Daerah Petaling,SEL.D.E. for M/S Pilihan Megah Sdn. Bhd	720,000.00	2 Level Car Park Building
3.	Proposed Construction, Completion and Commissioning STP (PARCEL 4A) for Bandar Putra, Mukim Senai- Kulai,Johor D.T. for M/S Nice Frontier Sdn. Bhd.	2,618,574.00	Cyclic Sequencing Activated Sludge (CSAS) Domestic Waste
4.	Sub-Contract for Proposed Infrastructure Work for Cosmos and Capitol on Lot 556,557 & 558, Bandar Puchong Jaya, Mukim Petaling, Daerah Petaling for M/S Restabina Sdn. Bhd.	1,600,000.00	Civil Work; Roads, Drainage, Water Supply & Sewerage
5.	Tanks, Elevated Water Tanks And Pump House at Phase3I For Bukit Sentosa, on Lot 1696, 1707, 199 & 192, Mukim Serendah, Daerah Hulu Selangor, SEL.D.E. For M/S Talam Industries Sdn Bhd.	3,698,500.00	R.C. Elevated Tank, Suction Tank And Pump House
6.	Construction and Completion of 154 units of 1-1/2 Level Terrace Houses (20' x 65') Type "Suria", Bandar Puchong Jaya for M/S Paksi Teguh Sdn Bhd.	8,500,000.00	Construction of 154 units of 1-1/2 Storey Terrace Houses.
7.	Proposed Construction of 0.65 Million Gallons Reservoir At P.T. 19402, Bandar Puchong Jaya, Mukim Petaling Daerah Petaling, Selangor Darul Ehsan For M/S Pilihan Megah Sdn Bhd.	600,000.00	Construction of 0.65MG Water Tank

8.	Proposed Construction of 85 Units 1 Level Low Cost Shop House & 2 Units TNB Sub-station for the Proposed Development of Phase 3A/2 on Lot 60 & 16635 (Part of Ladang Sungai Kapar) Sungai Kapar Indah, Mukim Kapar, Daerah Klang, SEL.D.E. For M/S Pembangunan Hartanah Guthrie Sdn Bhd	6,580,000.00	Construction of Single Level Shop using fairface Precast hollow blocks
9.	Proposed Development on Lot 3 & 60(Part of Ladang Sungai Kapar) Sungai Kapar Indah, Mukim Kapar Daerah Klang, SEL.D.E. For M/S Pembangunan Hartanah Guthrie Sdn Bhd	175,820.00	Construction of 2 Units Show House
10.	Proposed Construction of 68 Units 2 Level Shop Office & 2 Units TNB Sub-station for the Proposed Development of Phase 4H on Lot 3 & 60 (Part of Ladang Sungai Kapar) Sungai Kapar Indah, Mukim Kapar, Daerah Klang, SEL.D.E. For M/S Pembangunan Hartanah Guthrie Sdn Bhd	13,418,043.50	Construction of 68 Units 2 Level Shop Office
11.	Proposed Construction of 55 Units 2 Level Shop Office and 1 Unit TNB Sub-station for the Proposed Development of Ladang Sungai Kapar Phase 5B on Lot 3 & 60 (Part of Ladang Sungai. Kapar), Mukim Kapar, Daerah Klang, Selangor For M/S Pembangunan Hartanah Guthrie Sdn. Bhd.	8,832,694.35	Construction of 55 Units 2 Level Shop Office
12.	Proposed 1 No. Of 0.9mg Elevated Reinforced Concrete Water Tank No. 2 for the Proposed Development of Ladang Sungai Kapar on Lot 3 & 60 (Part of Ladang Sungai. Kapar), Mukim Kapar, Daerah Klang, Selangor For M/S Pembangunan Hartanah Guthrie Sdn. Bhd.	2,333,000.00	Construction of 0.9mg Elevated RC Water Tank
13.	Construction and Completion Of Suction Tanks, Elevated WaterTanks, Pump House And Staff Quarters at Bukit Sentosa II, Mukim Serendah, Daerah Hulu Selangor, SEL.D.E For Messrs Noble Right Sdn Bhd.	10,366,720.00	Construction of 1.5km of Mild Steel Pipelines, 1.5mg Elevated R.C Elevated Tanks, 1.5mg R.C Tank and Pumping Facilities

CHAPTER 3.0

CASE STUDY

3.1 Introduction of Project

Figure 3.1.1: Riana South Condominium, Cheras.

Riana South @ Bukit Mandarina, Cheras is a construction of 536 units luxurious condominium developed by IJM Lands Berhad located at along Persiaran Alam Damai, Cheras, Kuala Lumpur. Nestled at the heart of Bukit Mandarina, this construction project was started on November 2017 and is estimated to be completed by April 2020. Riana South constructed with a value of RM119,721,700.00 consists of two blocks and 536 units situated on 5.79 acres of leasehold land. There are three types of layouts which are A1, B1 and B2 of 3 bedrooms 2 bathrooms to 3+1 bedrooms 2 bathrooms with sizes ranging from 947 sq.ft. to 1,238 sq.ft. Each unit will be provided 1-2 parking bays.

3.1.1 List of Consultants

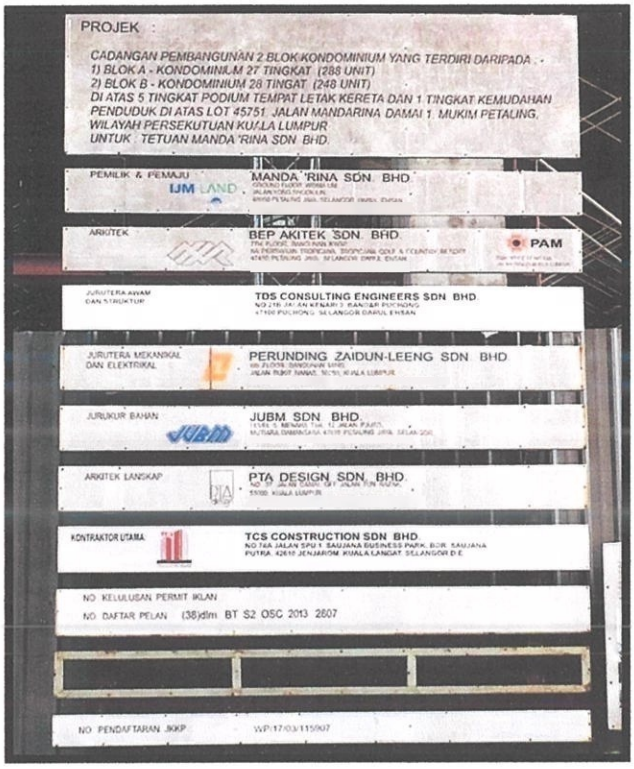

Figure 3.1.1.1: Project signboard

PROJECT: PROPOSE CONSTRUCTION AND COMPLETION OF TWO CONDOMINIUM BLOCK CONSISTING OF 1)BLOCK A- 27 STOREY CONDOMINIUMS (288 UNITS) 2)BLOCK B- 28 STOREY CONDOMINIUMS (248 UNITS) ABOVE 5 LEVELS OF CARPARK PODIUM AND 1 LEVEL OF RESIDENTS' CONVENIENCE ABOVE LOT 45751, JALAN MANDARINA DAMAI 1, MUKIM PETALING, WILAYAH PERSEKUTUAN KUALA LUMPUR.	
DEVELOPER	Manda'rina Sdn. Bhd(IJM Land)
ARCHITECT	BEP Akitek Sdn. Bhd.
STRUCTURAL ENGINEER	TDS Consulting Engineers Sdn. Bhd.
MECHANICAL & ELECTRICAL ENGINEER	Perunding Zaidun-Leeng Sdn. Bhd.
QUANTITY SURVEYOR	JUBM Sdn Bhd
LANDSCAPE ARCHITECTURE	PTA Design Sdb Bhd
MAIN CONTRACTOR	TCS Construction Sdn Bhd.

Table 3.1.1.1: List of consultants.

3.1.2 Location of Project

The location for this project is at Lot 45751, Jalan Mandarina Damai 1, Mukim Petaling, Wilayah Persekutuan Kuala Lumpur. Riana South is surrounded by a wide variety of amenities and modern conveniences. Popular shopping hotspots in the area include Ikon Connaught, Cheras Leisure Mall, Cheras Sentral and IKEA Cheras. Nearby schools in the vicinity include SJK(C) Connaught (2), SJK(C) Taman Connaught, SMK Taman Connaught, SK Seri Anggerik and SMK Seri Mutiara. UCSI University is just a short drive away. The area is also the center of business activities such as banks, retail shops, clinics and restaurants. Riana South is accessible via Persiaran Alam Damai which has easy connectivity to East West Link (Connaught Highway), CherasKajang Highway and Middle Ring Road (MRR2). Public transportation in the area includes buses and taxis.

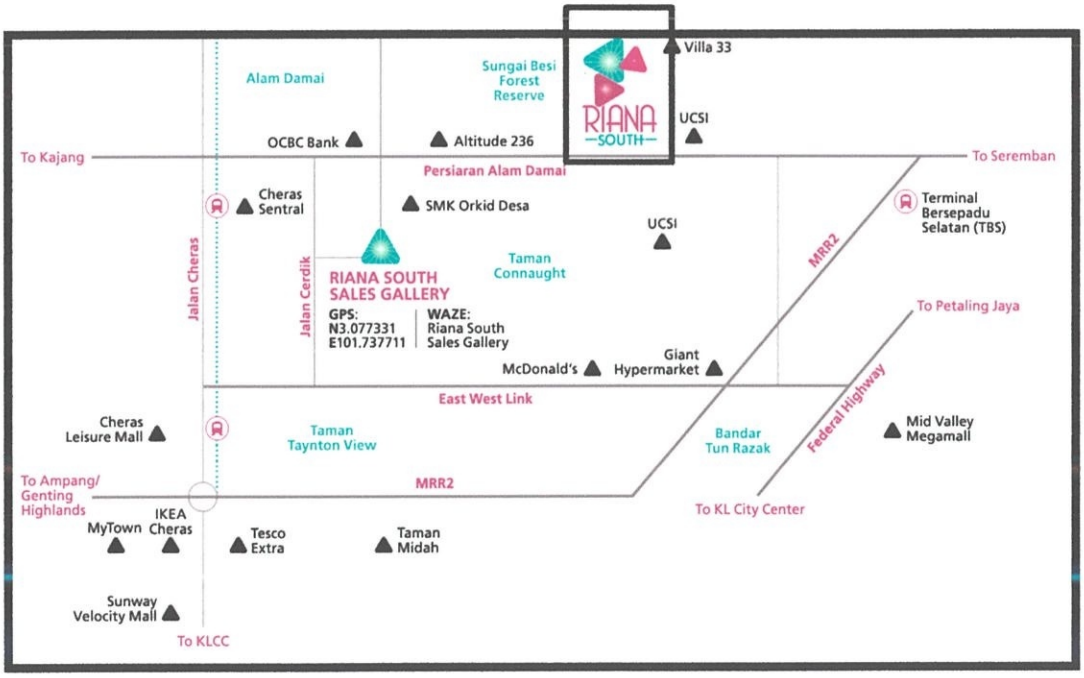

Figure 3.1.2.1: location of project Riana South, Cheras.

Source: www.google.com/rianasouthloacation

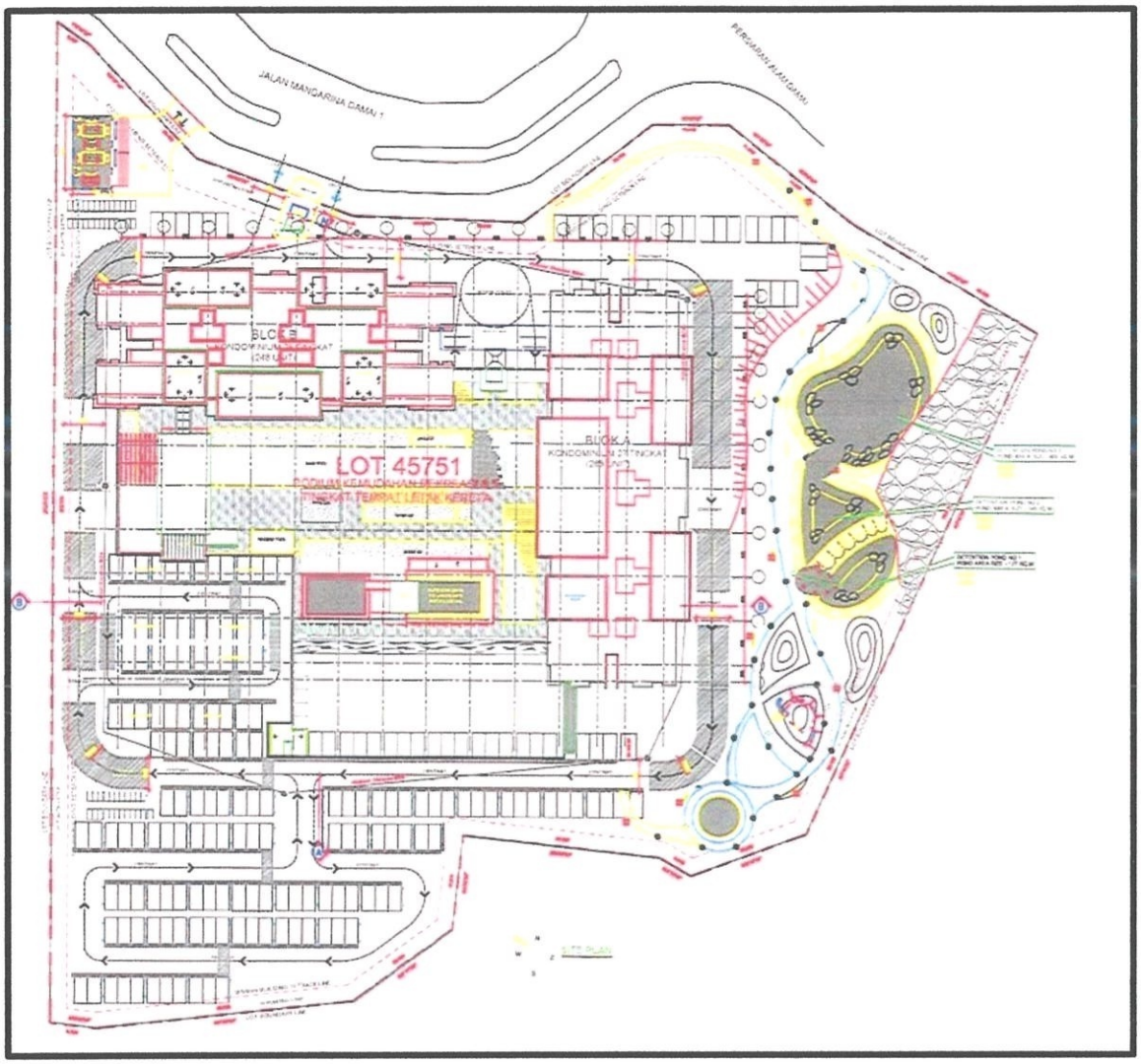

Figure 3.1.2.2: Site Plan.

3.2. REINFORCED CONCRETE SLAB

Reinforced concrete floor slab have taken many forms since their first introduction to the world. Some of the slabs were obviously direct imitations of earlier floors made entirely of wood or of wood supported on steel or iron beams. Others were just as clearly invented, with no recognizable ancestors, to suit the properties of the materials – steel bars and plastic concrete. (Gamble, 2000)

Economics and development of methods of construction, the suitability of particular slabs for particular sets of requirement, and advances in the methods of analysis of slabs have all joined to shape the current practice, and these factors will just as surely continue to change the types of slabs that are built. The concrete slab work starts when the column and the ground beam has been constructed well and has been inspected by the site supervisor and the consultant.

The concrete slab may be supported by:

i. Masonry or reinforced concrete Walls
ii. Monolithically casted reinforcement concrete beams
iii. Structural steel members
iv. Columns
v. The ground

Concrete floor slabs may be in situ or prefabricated. For Riana South, in-situ method was used for the concrete floor slab using formwork which is commonly made of wooden planks & boards, plastic or steel but for this site the project manager decided to used aluminium formwork as it is easy to install and uninstall for workers and can reduce time waste for construction.

METHOD STATEMENT FORM

Table 3.2.1: Method statement for concrete slab

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
1.	<u>Installing Aluminum Formworks</u> As the shear wall area has completed, aluminum formworks were placed throughout its section. Bolts and nuts were used to make sure the formwork stays firmly at their area situated. Struts were placed under the formwork of the slab zone to make certain that the formwork would not plummet.	 	- 7 aluminum laborers - 1 supervisor	- bolts and nuts - hammers - ladders	Each slab is constructed base on zones. For this particular part, it took around 3 hours to completed this one zone.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
2.	<u>Placing of Starter Bars</u> As the slab area is finish, other works such as beam and shear wall reinforcement steel parts is being done. Starter bars were also placed.		- 2 to 4 steel workers. - 1 supervisor	- rebar tying tool	Takes about 4 hours to complete.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
3.	<u>Oil Placement</u> Furthermore, oil is being placed on to the aluminum formwork's surfaces. This is done to prevent the concrete from sticking to the formwork after its dry.		- 1 laborer	- oil - roller - bucket	Takes up to 2 hours for zone 1. Other zones may affect the duration as it is different.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
4.	<u>Placing Spacer Blocks</u> After oil has been placed, spacer blocks were arranged on to the surface of the aluminum formwork. These spacer blocks will prevent the bottom reinforcement bar from emerging into the ceiling after casting is done.		- 1 laborer	- spacer blocks	Around 1 hour to finished arranged all the blocks.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
5.	<u>Bottom RC Bars Placing</u> Bottom reinforcement bars are set on to the surface of the aluminum formwork by using the tower crane.	 	- 3 steel workers - 1 laborer - 1 supervisor - 1 signalman - 1 tower crane operator	- tower crane	Takes about 4 hours to complete all the work.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
6.	<u>Installation of M&E Services</u> After all bottom reinforcement bars has been placed, M&E services such as plumbing pipes, electrical pipes for wires, air conditioner pipes and fire safety panels were installed before laying of the top reinforcement bar.	 	- 2 plumbers - 2 electrician - 2 laborers - 1 M&E supervisor	- bar cutters - pipe cutters - glue - measuring tape	All of the process takes about 3 hours to finish.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
7.	<u>Top RC Bars Placing</u> Top reinforcement bar are placed after all the services has been done. Tower crane was used to carry the top bars into placed above the bottom bar and the services.		- 3 steel workers - 1 laborer - 1 supervisor - 1 signalman - 1 tower crane operator	- tower crane	Takes about 3 to 4 hours to completion.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
8.	<u>Levelling</u> Levelling was done to obtain the absolute height for the concrete slab. The points were marked onto the starter bars as a guidance for concrete slab height with masking tapes.	 	- 1 surveyor - 2 chainman	- automatic level instrument - staff - measuring tape - masking tape	Takes about 2 to 3 hours to finish each zone depends on the weather.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
9.	<u>Site Inspection</u> After all that has been done, joint inspection was executed with SO's Representative on all steel reinforcement placed to comply with the construction drawings and criteria listed in the drawings. All final alteration will be made during this process.	 	- 1 supervisor - 1 site engineer - 1 laborer - 1 consultant	-	Around 2 hours to make sure all correction has been made.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
10.	<u>Concrete Casting</u> Casting of concrete was done after joint inspection has finished. Concrete is placed onto the slab to cover all bars and services using static pump or concrete bucket. Ready mixed concrete was transferred by mixer trucks from the plant. The concrete was compacted by mechanical vibrators to make sure all the concrete worked into all structural members.	 	- 5 concreter - 1 site engineer - 1 site supervisor - 1 signalman - 1 tower crane operator	- static pump - concrete bucket - shovel - mechanical vibrator - tower crane	Takes about 10 to 13 hours depends on the zone. The process may take longer if transport was jeopardizing.

METHOD STATEMENT FORM

NO	METHOD	SEQUENTIAL DIAGRAM	MANPOWER	MACHINERIES/ TOOLS	DURATION
11.	<u>Curing</u> After the concrete has been set, it is left to cure. The aluminum formwork can be remove once the concrete is hard enough.		- 1 site supervisor	- curing compound	Takes about half a day or around 13 hours to fully mature.

3.3 PROBLEMS OCCURRED AND TIIE SOLUTIONS TAKEN TO SOLVE THEM.

Although slabs may be filled with bottom and top reinforcement bars and has a strong endurance toward breaking apart, slabs may still have some problems that can occur due to some simple mistakes.

While slab concrete may offer many benefits, it is not always perfect. Improper processes and maintenance, as well as certain weather conditions, can cause a few common problems that can affect the aesthetics or durability. Thankfully, though, most of these common problems also have solutions.

Although there is much more problems and defects that can occur to the slab, this part will only focus on two major defects on the reinforced concrete slab. The two major defects are cracking and blisters.

3.3.1 CRACKING

Cracking is one of the most common issues regarding concrete slab. If the concrete is cracking outside the control joints – joints intentionally placed in concrete to control cracking – it is still strong. As concrete is curing, it naturally shrinks, and this shrinkage may cause cracking outside of those intentionally placed joints. The concrete is still structurally sound and is still considered a quality material.

There are three types of cracks in concrete slabs. Shrinkage cracks aren't severe, because they rarely indicate any structural defect. However, they can occasionally be a source of radon or water entry into the structure. Settlement cracks indicate that there was inadequate site preparation when the slab was poured. These cracks need further analysis to determine whether or not they indicate a larger problem. Finally, frost heaves are the most serious. They can indicate a substantial risk and should be dealt with as soon as possible.

Concrete can be one of the most durable and long lasting products used around when installed properly. But it is important that concrete contractors follow well-established guidelines with respect to concrete placement.

Reasons why concrete hacks:

- Excess water in the mix

Concrete only requires a little of water to achieve maximum strength. But lately, wide majority of concrete used in residential work has too much water added on site. The water is added to make the concrete easier to install. But the excess water also reduces the strength of the concrete.

- Rapid drying of concrete

Rapid drying of the slab will significantly increase the possibility of cracking. The chemical reaction, which causes concrete to go from the liquid or plastic state to a solid state, requires water. This chemical reaction, or hydration, continues to occur for days and weeks after pouring of the concrete.

Figure 3.3.1.1: Example of cracking

Fixing the crack.

20mm deep x 20mm wide were saw cut include 10mm on both sides of the RC slab crack lines by using diamond concrete cutter. Next, Slab is hacked by using electrical breakers along the pre-cut cracks to form 20mm x 20mm U' grooves to receive epoxy resin grout. All Losses materials, dust and laitance in pre-hacked grooves are cleaned

and removed by using electrical blower or vacuum cleaner. Make sure the substrate is sound, dry, clean and free from oil and grease.

Other ways to prevent the cracking from happening is knowing the allowable water for the mix the contractor is pouring- or be very sure of the chosen contractor who will make sure the proper mix is poured. It is more expensive to do it right- it simply takes more manpower to pour stiffer mixes. Other than that, make sure that the necessary water is available for the reaction by adequately curing the slab.

3.3.2 BLISTERS

Blisters are formed when bubbles of entrapped air get stuck underneath an already sealed surface and produce bumps of varying sizes. These defects are typically identified when the concrete slab is being laid and simply requires some alteration to the actual concrete mix in order to prevent more blisters from appearing.

Blisters are more of an annoyance than they are a structural problem and shouldn't cause any long-term issues for homeowners. One or a combination of these factors may be responsible: winds blowing over concrete surface and reducing surface moisture; a subgrade that is cooler than the concrete; a sticky mixture with excessive fines that seal the surface quickly; lean mixtures that have to be worked excessively to produce desired finishes; concrete that's finished too early, by hand or machine; and improper use of tools.

Figure 3.3.2.1: Blisters on slab

Ways for prevention:

If blisters are forming, try to either flatten the trowel blades or tear the surface with a wood float and delay finishing as long as possible. Under conditions causing rapid evaporation, slow evaporation by using wind breaks, water misting of the surface, evaporation retarders or a cover of polythene film.

Do not seal the surface before air from below have chance to escape. Also, avoid dry shakes on air-entrained concrete. Other than that, use heated or accelerated concrete to promote even setting throughout the depth of the slab in cooler weather. Furthermore, always protect the surface from premature drying and evaporation. With this way, blisters may be prevented from happening.

CHAPTER 4.0

CONCLUSION

4.1 Conclusion

After the overall work of construction that has been done at Riana South, Cheras, reinforcement concrete slab is one of the important parts that is used in the construction industry. A proper care for the material is a must so that it would not cause any problem in the future. A few precaution has been established when someone is using the reinforcement bar to install the reinforcement concrete slab.

One of the main precaution that had been applied is the type and material of reinforcement is kept in a good condition and has been arranged accordingly to the correct place based on the drawing plan. This small mistake need to be avoid because it might cause a long term problem. Improper arrangement may cause time and money. Thus will not help out the company in a good way.

In completing this report, the method of installation of reinforced concrete slab has been explained in detail and clearly discussed throughout each table and sentences. The problems occurred and also the solutions taken to prevent the problem has also been covered throughout this report.

The methods for the construction was simple yet difficult to comprehend. Ways of construction still is the same following all the rules and regulation but the work system and the application that is applied towards building was extremely incredible. This process helped a lot in the progress of the building construction.

The other precaution that also has risen is suitability of concrete grade. Reinforced concrete parts at this project bear the weight of everything that is placed on top it so the grade of the concrete must be suitable to compliment the weather on the site. Thus, the correct concrete grade will help in maintaining the quality of concrete slab. However, there are some tests that do it at site to check the quality of concrete. Such as cube test and slump test

Lastly, due to outstanding cooperation from supervisors and the workers, all problems occurred were handled smoothly and without any issues. Finally, there are many new things that can be learned and can be implemented in daily lives.

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Radosavljevic, M. (2012). *Construction Management Strategies.* West Sussex, UK: John Wiley & Sons.

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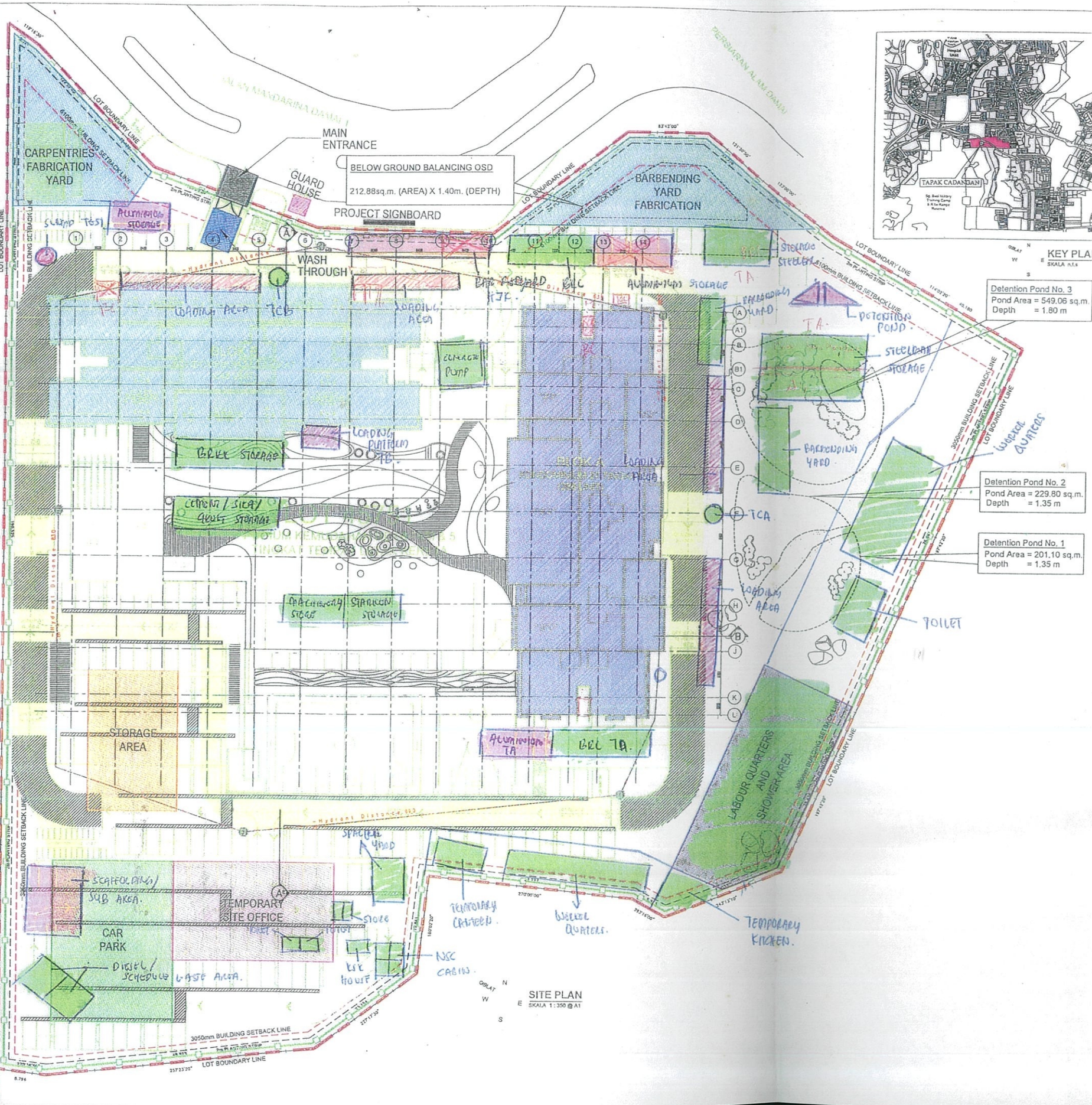
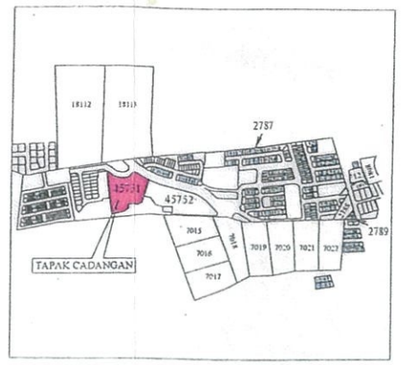
APPENDIXES





LEGEND:

- PROPOSED HOARDING
- TEMPORARY ACCESS ROAD

NOTE:

TAJUK CADANGAN:

CADANGAN PEMBANGUNAN 2 BLOK KONDOMINIUM YANG TERDIRI DARIPADA :-

1) BLOK A - KONDOMINIUM 27 TINGKAT (288 UNIT)
2) BLOK B - KONDOMINIUM 28 TINGKAT (248 UNIT)

DI ATAS 5 TINGKAT PODIUM TEMPAT LETAK KERETA DAN 1 TINGKAT KEMUDAHAN PENDUDUK DI ATAS LOT 45751, JALAN MANDARINA DAMAI 1, MUKIM PETALING, WILAYAH PERSEKUTUAN KUALA LUMPUR.

UNTUK :
TETUAN MANDA'RINA SDN. BHD.

TANDATANGAN PEMILIK / WAKIL KUASA:

IJM LAND

TANDATANGAN ARKITEK :

ARKITEK PROFESIONAL

NAMA & ALAMAT ARKITEK :

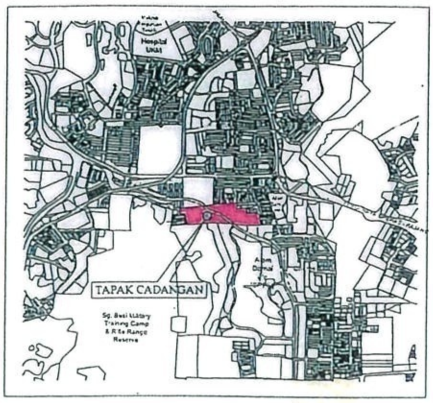
TENDER DRAWING

TAJUK LUKISAN :

KEY PLAN
LOCATION PLAN
SITE PLAN

Skala: 1 : 350	Tarikh: APRIL 2017
Di Lukis: FZL	Di Semak: ER
NO. LUKISAN:	PINDAAN:

TENDER DRAWING
DATE : APRIL 2017



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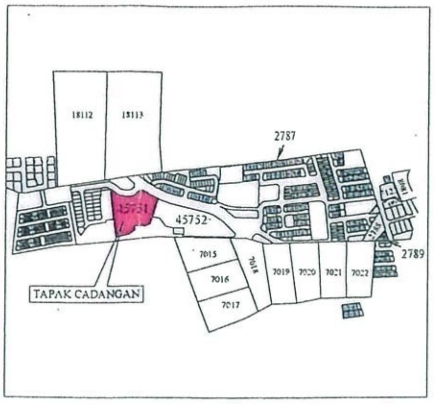
KEY PLAN
SKALA n.t.s



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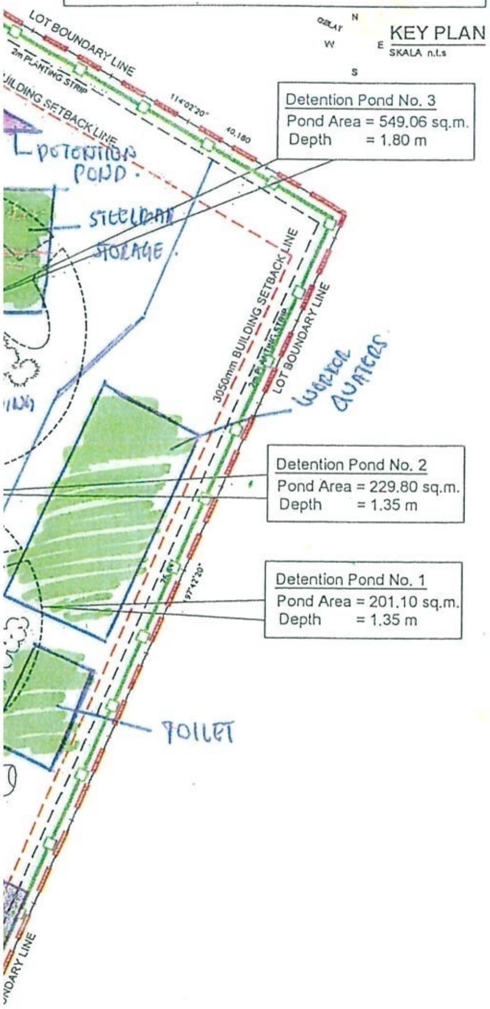
LOCATION PLAN
SKALA n.t.s



Detention Pond No. 3	
Pond Area	= 549.06 sq.m.
Depth	= 1.80 m

Detention Pond No. 2	
Pond Area	= 229.80 sq.m.
Depth	= 1.35 m

Detention Pond No. 1	
Pond Area	= 201.10 sq.m.
Depth	= 1.35 m

LEGEND:

- PROPOSED HOARDING
- TEMPORARY ACCESS ROAD

NOTA:

WALL FINISHES	FLOOR FINISHES	CEILING FINISHES
PP PLASTERED & PAINTED BRICKWALL	CR CEMENT RENDER	AT ACOUSTIC TILE
FF FAIRFACE BRICKWALL	CT CERAMIC TILE	AB ASBESTOS FREE BOARD
T TIMBER PANELLING	W CR WATERPROOFED CEMT. REND.	PP PLASTERED & PAINTED
CT CERAMIC TILE	HT HOMOGENEOUS TILES	FP FIBROUS PLASTER BOARD
OP OFF-FORM EMULSION PAINT	PT PORCELAIN TILES	SC SKIM COAT
PG POLISHED GRANITE	FH FLOOR HARDENER	T TIMBER PANELLING
M MARBLE	TS TIMBER STRIP	OP OFF-FORM EMULSION PAINT
GT GLAZED TILE	WP WASHED PEBBLES	GB GYPSUM BOARD
SC SKIM COAT	TD TIMBER DECK	WA WASH AGGREGATE

TAJUK CADANGAN:

CADANGAN PEMBANGUNAN 2 BLOK KONDOMINIUM YANG TERDIRI DARIPADA : -
1) BLOK A - KONDOMINIUM 27 TINGKAT (288 UNIT)
2) BLOK B - KONDOMINIUM 28 TINGKAT (248 UNIT)
DI ATAS 5 TINGKAT PODIUM TEMPAT LETAK KERETA DAN 1 TINGKAT KEMUDAHAN PENDUDUK DI ATAS LOT 45751, JALAN MANDARINA DAMAI 1, MUKIM PETALING, WILAYAH PERSEKUTUAN KUALA LUMPUR.

UNTUK :
TETUAN MANDA'RINA SDN. BHD.

TANDATANGAN PEMILIK / WAKIL KUASA:

HOO KIN SEE
MANDA'RINA SDN. BHD.
Ground Floor, Wisma IJM,
Jalan Yong Shook Lin,
Petaling Jaya,
Selangor Darul Ehsan.

IJM LAND

TANDATANGAN ARKITEK :

Keperluan SPAH
Keperluan Pengurusan Sistem Pepejal dan Pembersihan Awam
Keperluan Tempat Letak Kenderaan
Keperluan penyediaan kemudahan Orang Kurang Upaya

LEMBAGA ARKITEK MALAYSIA
Ar. Kam Pak Cheong
ARKITEK PROFESIONAL
No. Pendaftaran LAM: A/K 20

NAMA & ALAMAT ARKITEK :

STATUS LUKISAN :
TENDER DRAWING

TAJUK LUKISAN :
KEY PLAN
LOCATION PLAN
SITE PLAN

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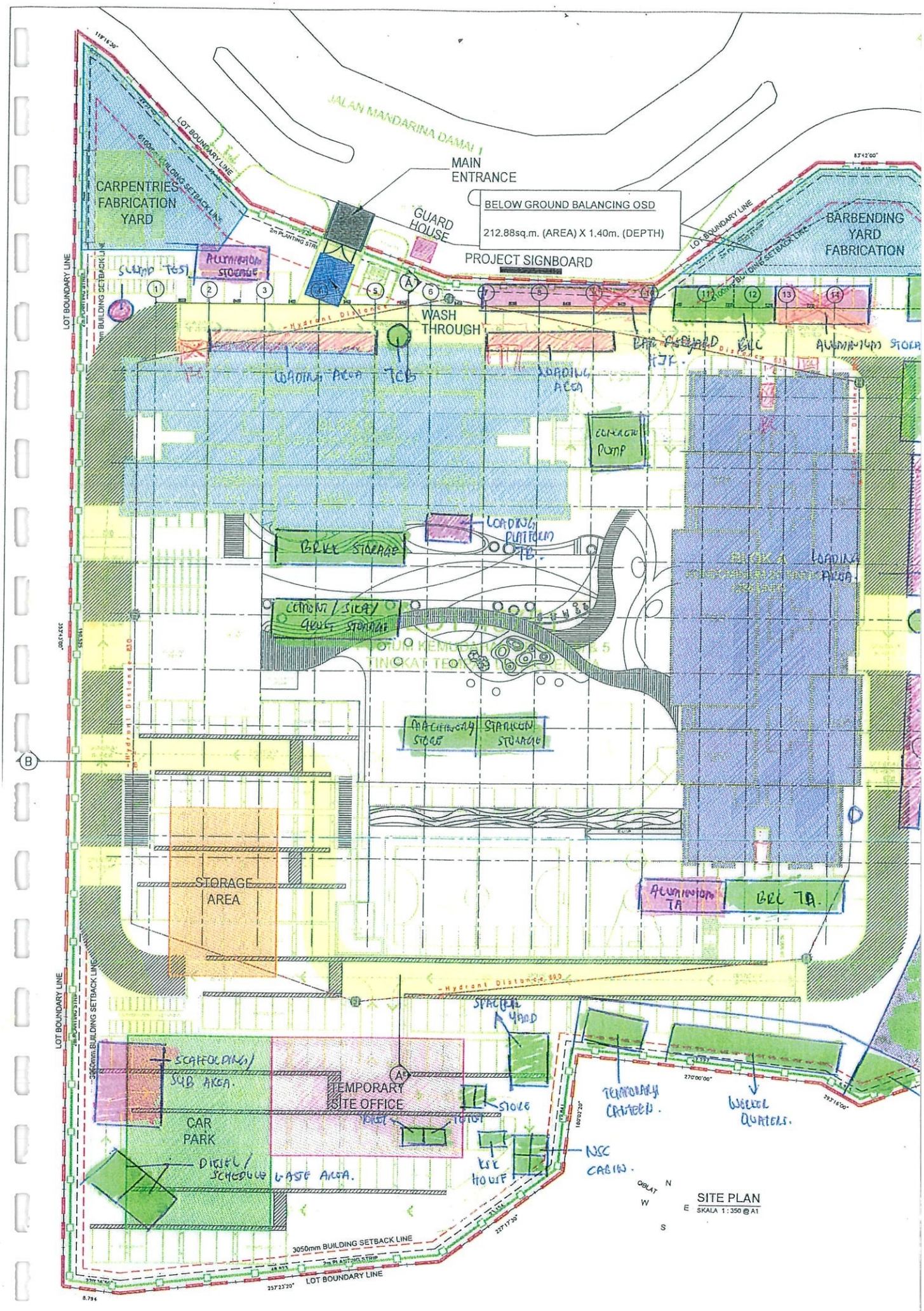
Di Lukis: FZL	Di Semak: ER	
NO. LUKISAN: 1936/PH6/TD/100		PINDAAN: 00

TENDER DRAWING
DATE : APRIL 2017


JALAN MANDARINA DAMAI 1
MAIN ENTRANCE
BELOW GROUND BALANCING OSD
212.88sq.m. (AREA) X 1.40m. (DEPTH)
GUARD HOUSE
PROJECT SIGNBOARD
CARPENTRIES FABRICATION YARD
BARBENDING YARD FABRICATION
LOT BOUNDARY LINE
3050mm BUILDING SETBACK LINE
2m PLANTING STRIP
WASH THROUGH
LOADING AREA
CONCRETE PUMP
BRICK STORAGE
LOADING PLATFORM
STORAGE AREA
SCAFFOLDING/ S&B AREA.
TEMPORARY SITE OFFICE
CAR PARK
DIESEL / SCHEDULE WASTE AREA.
STORE
TEMPORARY CRANE.
WORKER QUARTERS.
NSC CABIN.
SITE PLAN
SKALA 1:350 @ A1