



DEPARTMENT OF BUILDING
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING
UNIVERSITI TEKNOLOGI MARA
(PERAK)

SEPTEMBER 2015

It is recommended that the report of this practical training provided

By

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2013847456

Entitled

Construction of Staircase

accepted in partial fulfillment of requirement has for obtaining Diploma In Building

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DEPARTMENT OF BUILDING
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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 stated herein, prepared during a practical training session that I underwent at Pingat Harmoni Sdn Bhd for duration of 5 months starting from 25 May and ended 9 October 2015. It is submitted as one of the prerequisite requirements of DBN307 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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Date : 13 OCT 2015

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Thank you very much

ABSTRACT

For building that has more than two floors, staircase is important as a connection between upper floor and lower floor for occupant to move to another floor. There is various type of staircase and all of it comes out with their own architectural design according to the type of that building. This report briefly discuss about process construction of staircase that involve in in-situ of the staircase installation reinforced concrete staircase. There are several ways that the writer gaining information construction site such as making observation site visit and interview. As a result, the staircase installation of reinforced concrete not easy as we see because it needs to follow the law of UBBL and fire safety regulation and must do it carefully.

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CHAPTER 1

PREFACE

1.1 Introduction

Staircase was install in building is one means whereby one may travel from one floor to another floor. It is easy to passenger going up and down. Staircase also not as a connection travel only, but also act fire safety which is during the fire.

Every building in Malaysia has different of stairs that used. There is much type of stairs using in Malaysia. Either house or building. The principal of staircase in building is flight, step, tread, riser, step, stairwell, landing, balustrade and handrail. (Fillion, Hall, Bertorelli And Philips, 1998)

Stairs as a main component for all type of building. There are various type of staircase like the staircase can be straight stairs, half landing stairs, L Shaped stairs (quarter turn stairs), spiral stairs, and winder stairs and others.

1.2 Objective

The objectives of the study are as follows:

- 1) To identify the process involve in staircase installation
- 2) To identify labor, machineries and equipment that used in process of installation staircase.
- 3) To identify the type of staircase that usually used in construction

1.3 Scope Of Study

The scope of study a project at Pingat Harmoni Sdn Bhd which construct the residential and warehouse at Tanah Merah, Kelantan. The scope of study for construct staircase involves various design and type. The study focused on the process involve and how to construct to the building and which type of staircase that have used.

In-situ reinforced concrete stairs have many advantages that are why many site using this type to build staircase in construction. Therefore, it also reviews the methodology of construction staircase, to ensure that project successful. In-Situ staircase is a one ideally suited for construct that have often used in construction.

The study will focused mainly on the construction staircase where is the part of building elements to ensure that building is a connection between floor and another floor. In addition, construction the staircase is a main part during construction work. Lastly, they must to follow the safety instruction during in construction site

1.4 Method Of Study

There are several ways that been used in gaining information to prepare this practical report. These are the common ways used to gain the information needed to finish the practical report successfully and effectively based on industrial practical training. Some of the ways that been used are:

1 Interview

To get the information for this report, the writer has been interviewing some person to identified information. The writer meets with Encik Mazli Bin Mat Said as site supervisor and Encik Muzaffar Bin Majid as site engineer. From the interview, it can getting information which is something new in construction staircase and with modern tools that used while install can give other knowledge. Based on their knowledge, it can easy to add information about staircase in this report. Lastly, the discussion with our supervisor, Encik Anas Zafirool Abdullah Halim gives me more ideas and knowledge to expand the contents of the report.

2 Observation

Observation also the important and most effective method when studying about construction of staircase for the building, where the true step when workers install the staircase at site can give better understand how to install that stairs. Observation also increases the experience of writer.

3 Literature

Another method that has been used to get the information is using hand out and book to make some research. The book that has learned in previous semester in subject building construction II can help to give information about staircase.

CHAPTER 2

COMPANY BACKGROUND

2.1 Introduction of Company

Pingat Harmoni development Sdn Bhd with registered no: 1085282-D are situated at PT 3317, Tingkat Atas, Taman Pasir Pekan, 16250 Wakaf Bharu, Kelantan . It actually a small group company under of Pingat Harmoni Sdn bhd. It establish on 18 Mac 2014, around a years ago. This company is 100 % under bumiputera management.

Pingat Harmoni Development Sdn. Bhd is one of the famous housing developers at Kelantan. It do lot of things such as field of property and engineering words for private and government office. It also does a constructions job like sub-kon (contract) to construct many type of building at Kelantan and Terengganu. A majority project that it constructs is the house residence such as terrace, bungalow and semi-D house.

To increase a company performance and skilled, our director already taken a profesional staff to handle about the management of Pingat Harmoni Development Sdn. Bhd. In addition, an excellent level of words and service that given by our sub-contractor also gives an good effect in image of company to our customers. They handle that entire project given with successfully.

For compete with the others housing developers that are increase every day, this company provide a complete machinery and now we already have our own machine to use in building such as ready mix mixture. We don't need to rent that machinery anymore.it will decrease a little bit of building cost. It will attract a customer to do an business agreement with developer or contract.

Objective

1. To give a good and excellent service to all client.
2. To generate and ensure that all level of Malaysia citizens especially a lower income group to buy and build their own residence depends on their ability.
3. To generate an opportunity especially for lower income groups to enjoy a complete facilitate and afford to have an comfortable residence for their life.

Vision

- To support a lower income and a citizen that don't have their own residence to have a comfortable and complete house without put a burden to them. So they can live in peaceful.

Mission

- To arrange and develop certain places with an aim to increase a level of citizen life rank either in direct or indirect ways.

2.2 Company Profile

Company : Pingat Harmoni Development Sdn. Bhd.

Date of establish : 18 Mac 2014

Company no : 1085282-D

Diretor : 1) Md. Rasid Bin Mohamad
2) Rohazmi Bin Md Rasid
3) Wan Hazimah Binti Wan Mat
4) Rohaiza Bin Md Rasid
5) Rohaida Binti Md Rasid

Registered Adress : No, 4959-A, Tingkat 1, Km1/2, Jalan Pengkalan
Chepa, 15400 Kota Bharu, Kelantan

Adress Of Busines : Pt 3317 Tingkat Atas, Taman Sri Kota Pasir
Pekan, 16250 Wakaf Bharu, Kelantan

No. Fon / No.Fax : 

Bank : Cimb Islamic Bank Berhad
(Wisma Square Point, Kota Baharu, Kelantan)

Company Secretary : Kb Tax Consultants & Management Services
No. 4959-A, Tingkat 1 Km ½, Jln Pengkalan Chepa,
15400 Kota Bharu Kelantan.

Auditor : Jalil & Co. Chartered Accountant
No. 83, Tingkat 1, Jalan Sultan Ismail,
20200 Kuala Terengganu, Terengganu

Table 2.1: Schedule Of Main Share Holder

NO	NAME	POSITION	RACE
1	Md Rasid Bin Mohamad	Director	Malay
2	Rohazmi Bin Md Rasid	Director	Malay
3	Wan Hazimah Bt Wan Mat	Director	Malay
4	Rohaiza Bin Md Rasid	Director	Malay
5	Rohaida Bt Md Rasid	Director	Malay

Source: Profile Pingat Harmoni Sdn Bhd (2014)

TOTAL CAPITAL SYER (NORMAL SYER RM 1.00)

= RM 400,000.00

Table 2.2: Schedule of Pingat Harmoni Development Sdn Bhd Staff

NO.	STAFF NAME	YEARS	POSITION	QUALIFY
1	Aini Suhada Bt Mohamad Fauzi	27	Accountancy	Bachelor Degree (Hons) Accountancy (Uitm Dungun)
2	Tuan Hasmadi Bin Tuan Hassan	36	Personel Assistance CEO	SPM
3	Norzafriana Bt Ab Roni	26	Sales Marketing	STPM
4	Siti Rosnani Bt Zakaria	26	Assistance Sales Marketing	SPM

Source: Profile Pingat Harmoni Sdn Bhd (2014)

1.3 Organization Chart

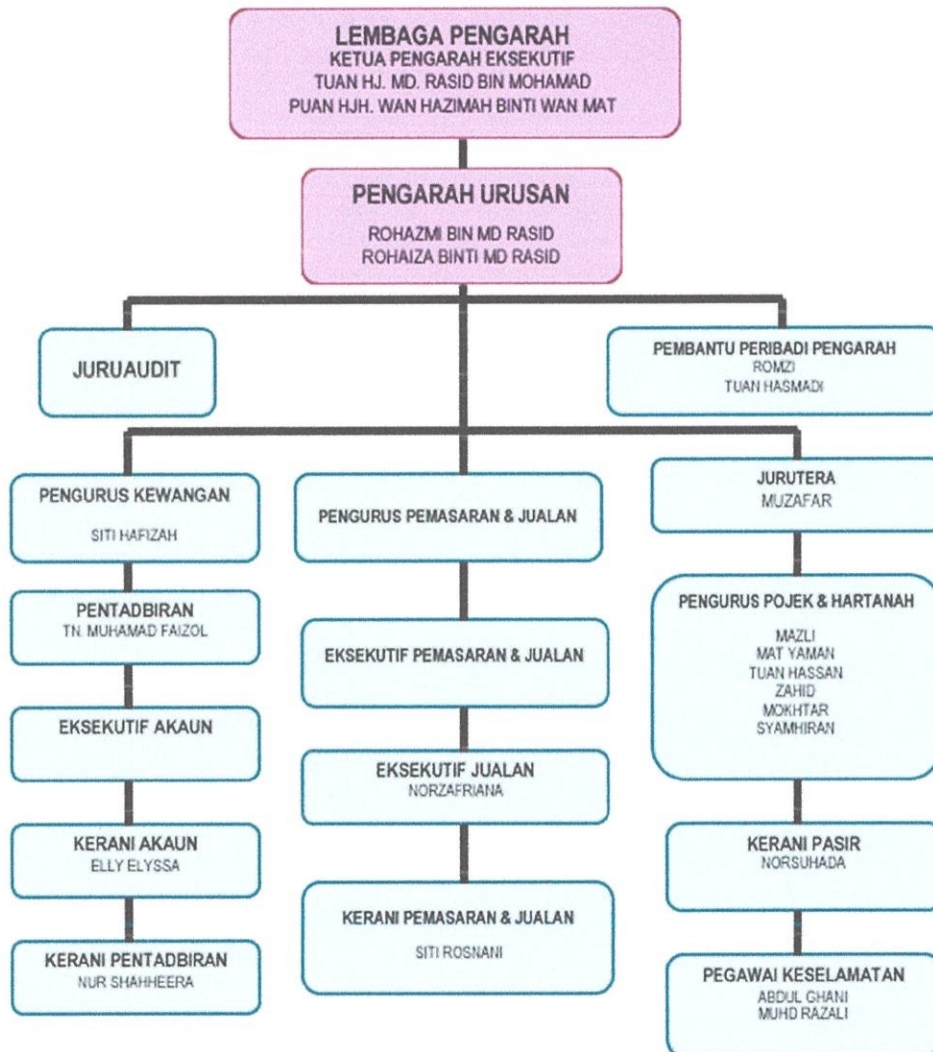


Figure 1.1: Organization Chart
Source: Profile Pingat Harmoni Sdn Bhd

2.4 List Of Project

2.4.1 COMPLETED PROJECTS

TANAH MERAH, KELANTAN.

Name of Project : Taman Kota Harmoni

Location : Boundary Tanah Merah Town.

About Project

- Wide of area 22 hektar (54.362 acre).
- Strategic location
- Specific with future customers business
- Basic facilitates that fulfill customers choice
- Different design from another project

Table 2.3: Type of Building

NO	TYPE OF BUILDING	UNIT
1	Terrace 1 storey	201
2	Terrace double storey	16
3	Semi-d 1 storey	36
4	Semi d double storey	4
5	Bungalow 1 storey	16
6	Bungalow double storey	14
7	Shop building double storey	36
8	Shop building 3 storey	41
9	Hop Building 4 storey	6
	TOTAL	370

Source: Profile Pingat Harmoni Sdn Bhd (2014)



Figure 2.1: Brochure Taman Kota Harmoni

Source: Profile Pingat Harmoni Sdn Bhd (2014)



Figure 2.2 : Brochure Taman Kota Harmoni

Source: Profile Pingat Harmoni Sdn Bhd (2014)

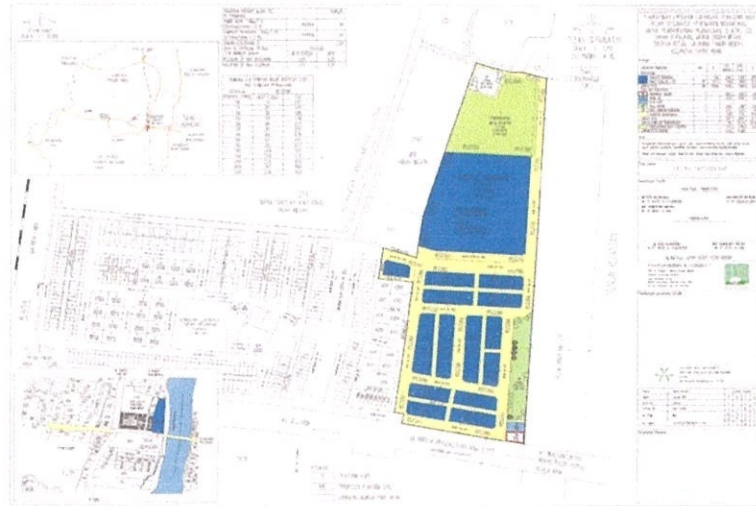


Foto 2.1: Site Plan For New City Tanah Merah

Source: Asma (2015)

SUNGAI PINANG, TUMPAT, KELANTAN

Name Of Project : Taman Sri Pinang

Location : Kg Sungai Pinang, Tumpat, Kelantan

About Project

1. large of area
2. strategic location
 - Special specifications depends other project
3. specific with future customers business
4. basic facilitates that fulfill customers choice
 - Nearer with primer and secondary school, mosque, clinic and others

Table 2.4 :Type And Total Of Building

NO	TYPE OF BUILDING	UNIT
1	Terrace 1 storrey	14
2	Semi-d 1 storrey	4
3	Bungalow 1 storrey	6
	TOTAL	24

Source : Profile Pingat Harmoni Sdn Bhd (2014)

Table 2.5: Project In Progress

NO	LOCATION	WIDE	TYPE	AVAILABLE
1	Taman D'semerak Harmoni		-12 lot bungalow	100%
2	Taman Hidayah Harmoni Lot 344-360 Lot 370-396 Area : Bandar Tanah Merah District : Kusial		-44 lot terrace double storrey	100 %
3	Mata Air Kemubu Lot 319-349 Area: Gong Pachat District: Semerak, Pasir Putih	2.116 Hektar 5.228 Ekar	- 28 Lot Bugalow	
4	Taman Harmoni Sungai Petai Lot 1471-1500 Area : Gong Pachat District: Semerak, Pasir Puteh	1.6910 hektar 4.178 ekar	- 12 lot bungalow - 16 lot semi-d	
5	Jerteh Lot 5132-5144 Area : Bukit Kenak, Darang Buaya District: Besut	1.136 hektar 4.178 ekar	- 13 lot bungalow	
6	Kg Raja 1 Area : Kg Raja District : Besut	4147 hektar 1024 ekar	-3 lot shop building/ office - 5 lot bungalow	100 %
7	Kg raja	3.2374 hektar	- 14 lot bungalow	

	Lot 769 Area: kg raja District : kuala besut	7.9998 ekar	- 32 lot semi-d - 18 lot terrace	
8	Gua Musang Lot 12631 City : Gua Musang Territory : Gua Musang	1.0851 hektar 2.4735 ekar	- 29 lot shop building/ office	100%

Source: Profile Pingat Harmoni Sdn Bhd (2014)

Table 2.6: Project In Future

BIL	LOKASI	KELUASAN	KOMPONEN	STATUS
1	Harmoni Square Lot 2838 Mukim : Tanah Merah Daerah : Kusial	21.588 ekar	146 office lot 2 store 1 block buildinghypermarket	
2	Jerteh Lot 1145 Mukim : Bukit Peteri Daerah : Besut, Jerteh	2.4965 hektar 6.169 ekar		
3	Jerteh Lot 2371 Mukim : Bukit Peteri Daerah : Besut, Jerteh	14415 MP 3565 ekar	4 lot store 4 lot bungalow 12 lot semi-d	
4	Jerteh Lot 2208 Mukim : Bukit Peteri Daerah : Besut, Jerteh	17478 hektar 4319 ekar	11 lot bungalow 17 lot terrace	
5	Pasir Hor Lot 7205 Mukim : Guntong Daerah : Limbat, Pasir Hor Jajahan : Kota Baharu	1.001 hektar 2.4735 ekar	12 lot bungalow 4 lot semi-d	

6	Rantau Panjang Lot 2119 Mukim : Gual Nering Daerah : Rantau Panjang	2 ekar 35 depa	11 lot bungalow	
7	Lot 1211 Mukim : Kg. Sireh Daerah : Kota Jajahan : Kota Baharu	0.4212 hektar 1040 ekar	13 lot storey	
8	Lot 1211 Mukim : Padang Enggang, Wakaf Che Yeh Daerah : Kota Jajahan : Kota Baharu	2615 mp 0.535 ekar	5 lot storeys	
9	Lot 774 Mukim : Parit Daerah : Limbat Jajahan : Kota Baharu	0.3060 hektar 0.756 ekar	5 lot storeys	
10	Lot 5557 Mukim : Telong Daerah : Telong Jajahan : Bachok	0.4249 hektar 1049 ekar	4 lot storeys 4 lot semi-d	
11	Lot 1001 Mukim : Gong Pachat Daerah : Limbat Jajahan : Kota Baharu	1.595 hektar 3941 ekar		

12	Lot 1987 Mukim : Semerak Daerah : Semerak Jajahan : Pasir Putih	0.4116 hektar 1017 ekar	4 lot semi-d 2 lot bungalow	
13	Lot 2854 (0.3759 Ha) Lot 198 (0.3286 Ha) Mukim : Semerak Daerah : Semerak Jajahan : Pasir Putih	0.3759 hektar 0.3286 hektar 0.928 ekar 0.811 ekar		
14	Lot 574 Mukim : Kuala Besut Daerah : Besut	0.7713 hektar 1905 ekar	11 lot bungalow	
15	Lot 5743 Mukim : Kok Keli Daerah : Tumpat	0.2311 hektar 0.571 ekar		
16	Lot 502 Mukim : Kok Keli Daerah : Tumpat	0.1518 hektar 0.375 ekar	2 lot bungalow	
17	Lot 5745 Lot 4901 Mukim : Kg Kemuning Daerah : Machang	0.1401 hektar 0.0827 hektar 0.3462 ekar 0.2043 ekar		
18	Lot 1141 Mukim : Tujoh Daerah : Tumpat	0.1805 hektar 0.446 ekar	3 lot bungalow	
19	Lot 1491 Mukim : Wakaf Bharu Daerah : Tumpat	0.1959 hektar 0.484 ekar	3 lot bungalow	

20	Lot 818 Mukim : Wakaf Stan Daerah : Kota Bharu	0.1141 hektar 0.282 ekar		
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Source: Profile Pingat Harmoni Sdn Bhd (2014)

CHAPTER 3

CASE STUDY

3.1 Introduction

The function of a staircase is to provide pedestrian access to the different level within a building and generally comprise a series of cranked slabs. At first sight, an inclined member of the type used in a staircase appears to be different in concept from that of a horizontal member, but in facts the basic principles are the same. (Clements,1981)

Although there are many variants of the basic theme, like straight flight stair, quarter-turn stair or L shape, half-turn stairs or U shaped stairs, spiral stairs, winder and other stairs. It also provided with a series equal riser, or steps, formed for the purpose of giving a sufficient footing to facilitate travel.

It is not easy to build a staircase because the standard provided by Uniform Building By Law (UBBL) must be followed. It used the thickness and materials to make the stairway stronger, so that it is not have cracked when the climate and weather change and no damaged with overloaded users.

3.2 Case study

3.2.1 Factor of Selection Stairs

Based on the Anas Zafirool (2012), the selection of suitable staircase depends on the factor:

- 1) Type Of Building (Residential or public building)
- 2) The opening of stairs builds
- 3) The steepness and riser needed
- 4) Economic design

Table 3.1: The measurement of part of stairs

	RESIDENTIAL	PUBLIC BUILDING
Width	600 mm- 800 mm	800 mm- 1200 mm
Riser	175 mm	165 mm
Thread	250mm	275 mm
Slope	35 °	27° - °33

Source: Note Building Construction II (2012)

3.3 Principal to build stairs

According to Anas Zafirof (2012), there are several principal to build stair:

3.3.1 Flight

A continuous series of stairs between lower floor to the upper floor, between the floor to the stair platform and between stairs platform to another platform. A flight stairs shall have not less minimum than 3 risers and shall not exceed the maximum 16 riser. The common width is between 600 mm-1200 mm

3.3.2 Steps

Steps shall be constructed in the intervals between each other, stairs can be built open or closed by installing a riser between traces

3.3.3 Tread

The horizontal surface of any step. The function that allows users to put a foot on the stairs upward remedy. The trail must have figured organizes to avoid slippage. The actual size is 230 mm and depends on the type of building

3.3.4 Riser

Distance upward in a flight of stairs. This measurement determines the steepness of the stairs. Common size is 190 mm and depends on building.

Based on Mannes (1982):

3.3.5 Widths

The width is determined by the number of people likely to use the stair at any one time.

3.3.6 Run

A run is a sequence of more than three steps before a landing occurs; a landing must be built after eighteen risers.

3.3.7 Landings

The length of a landing should not be less than the unobstructed width of the stairs, where smaller steps are taken, landing can be correspondingly narrower. Landing should be wide enough to allow stretcher or furniture to be carried

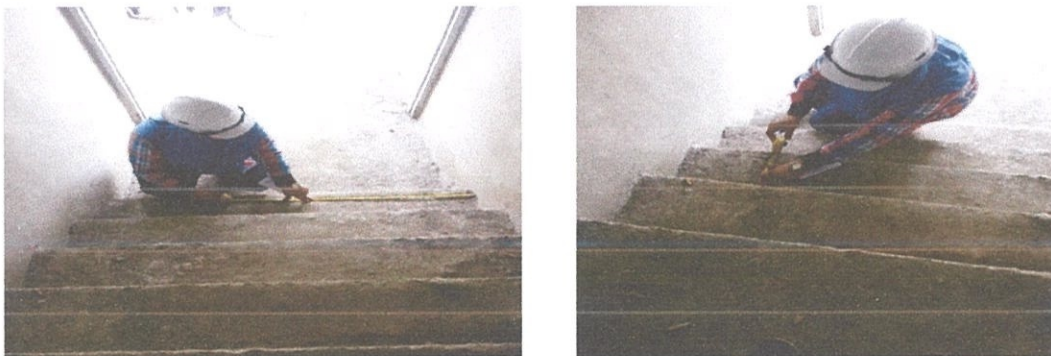


Photo 3.1: Measure the tread and width of stairs

Source: Asma (2015)

3.4 Type of stairs

The staircase can be straight stairs, half landing stairs, L Shaped stairs(quarter turn stairs), spiral stairs, and winder stairs

3.4.1 Straight Stairs

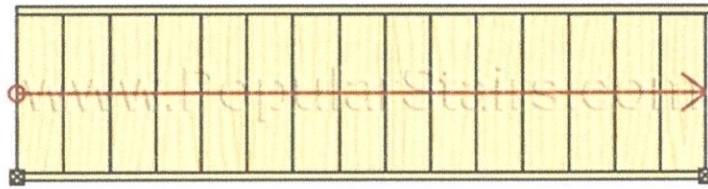


Figure 3.3: Straight Stairs

Source: Popular Stairs (2011)

Based on Popular Stairs, 2011, it is convenient and functional. It is easy to go up and down, it is also easy to carry things on the next floor. But the presence of one long flight makes this type of staircase limited height. The amount of treads in one straight flight shall not exceed 16. The usage of a staircase with a straight flight is feasible only in those cases where two levels need to be joined by an imaginary straight line.

3.4.2 Half Landing Stairs

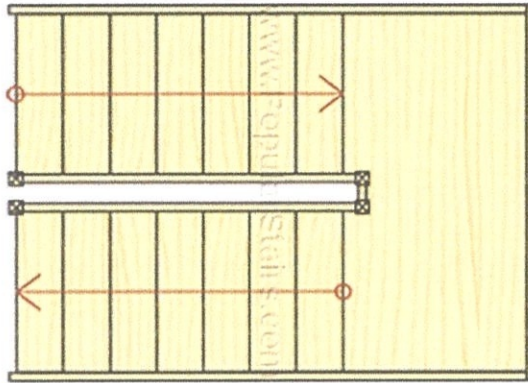


Figure 3.4: Half Landing Stairs

Source: Popular Stairs (2011)

According to Popular Stairs, 2011, Are also a variety of staircase with straight flight. Just like Quarter Landing Stairs they also have landing. But this type stairs change a direction of the flight 180 degrees and also serves as a place for rest when moving

3.4.3 L Shaped stairs(quarter turn stairs)

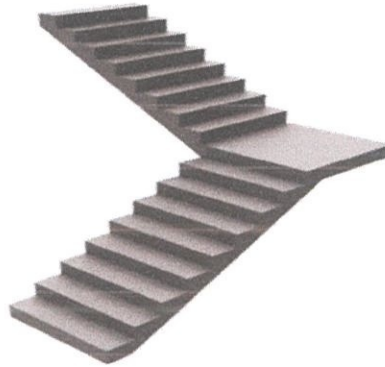


Figure 3.5: Quarter-turn stair or L stairs

Source: Type of Stairs (2011)

The L shaped is a variation of the straight stair with a bend in some portion of the stairs. This bend is usually achieved by adding a landing at the bend transition point. The bend is often 90 degrees; however it does not have to be. If the landing closer to the top of the stairs is sometimes referred to as an L stairs. (Type of Stairs, 2015)

3.4.4 Spiral stairs



Figure 3.6: Spiral Stairs

Source: Type of Stairs (2015)

Spiral stairs are often confused with curved stairs. Although, both types of stairs follows a helical arc (like the shape of a spring), spiral stairs usually are made from very compact and the treads radiate around a center pole. (Type of Stairs, 2015)

3.4.5 Winder stairs



Figure 3.7: Winder Stairs

Source: Types of Stairs (2015)

Winder stairs have pie shaped or triangular step at the corner position. They are common in older homes, often used as a secondary staircase where the grand may have been entry and the winder used access to the kitchen. They require less space than many other types of stairs. They have more visual interest. Winder stairs seem to create a more seamless transition, visually, as they meander around corner. (Types of Stairs, 2015)

3.5 Material used for stairs construction

In stairways construction, the material commonly used are stone, iron and wood. The selection of material used should be based on the location and the used to be made of the stairway.

The first one is used stone. Stone is better to used and placed at outside building because of this material have natural capability of resisting atmospheric influences. (A Treatise on Architecture And Building Construction 3, 2008)

Second one is used iron. Iron is generally selected because this material as it possesses great resistance to heat and suitable if placed inside a building designed as fireproof. (A Treatise On Architecture And Building Construction 3, 2008)

Lastly, the most commonly used material in in construction is wood especially in private building, where no heavy travel is to be expected. Furthermore wood have extra strength. (A Treatise on Architecture and Building Construction 3, 2008)

3.6 Project Background



Foto 3.2: Project Plan

Source: Asma (2015)

Project Title: Cadangan Membina Dan Menyiapkan 370 Unit Rumah Kediaman Dan Kedai Mengandungi:

- a) 117 Unit Teres 1 Tingkat Di Atas Lot Pt.4602-Pt.4718
- b) 100 Unit Teres 1 Tingkat Di Atas Lot Pt.4719-Pt.4842
- c) 24 Unit Semi-D 2 Tingkat Di Atas Lot Pt4819-Pt.4842
- d) 16 Unit Semi-D 1 Tingkat Di Atas Lot Pt4843-Pt.4858
- e) 24 Unit Banglo 1 Tingkat Di Atas Lot Pt.4859-Pt.4882
- f) 19 Unit Banglo 1 Tingkat Di Atas Lot Pt.4883-Pt.484901
- g) 62 Unit Kedai 2 Tingkat Di Atas Lot Pt.4902-Pt.4933, Pt.4942-Pt.4971
- h) 8 Unit Kedai 4 Tingkat Di Atas Lot Pt.4934-Pt.4941

Client Name: Pingat Harmoni Sdn Bhd

Defect Liability Period: 5(five) years

Developers: Pingat Harmoi Develoment

Table 3.2: List of Consultant Involves

Architect	Arkitek Shukri Tingkat 1 Kompleks Yakin, Jalan Gajah Mati, 15000 Kota Baharu Kelantan
Developer	Pingat Harmoni Development Sdn Bhd Tingkat Atas, Taman Sri Kota Pasir Prkan,16250 Wakaf Baharu, Kelantan
Engineer	Not Stated
Quantity Surveyor	Not Stated

Source: Pingat Harmoni Sdn Bhd (2015)

3.8 Flow Chart of Staircase Installation

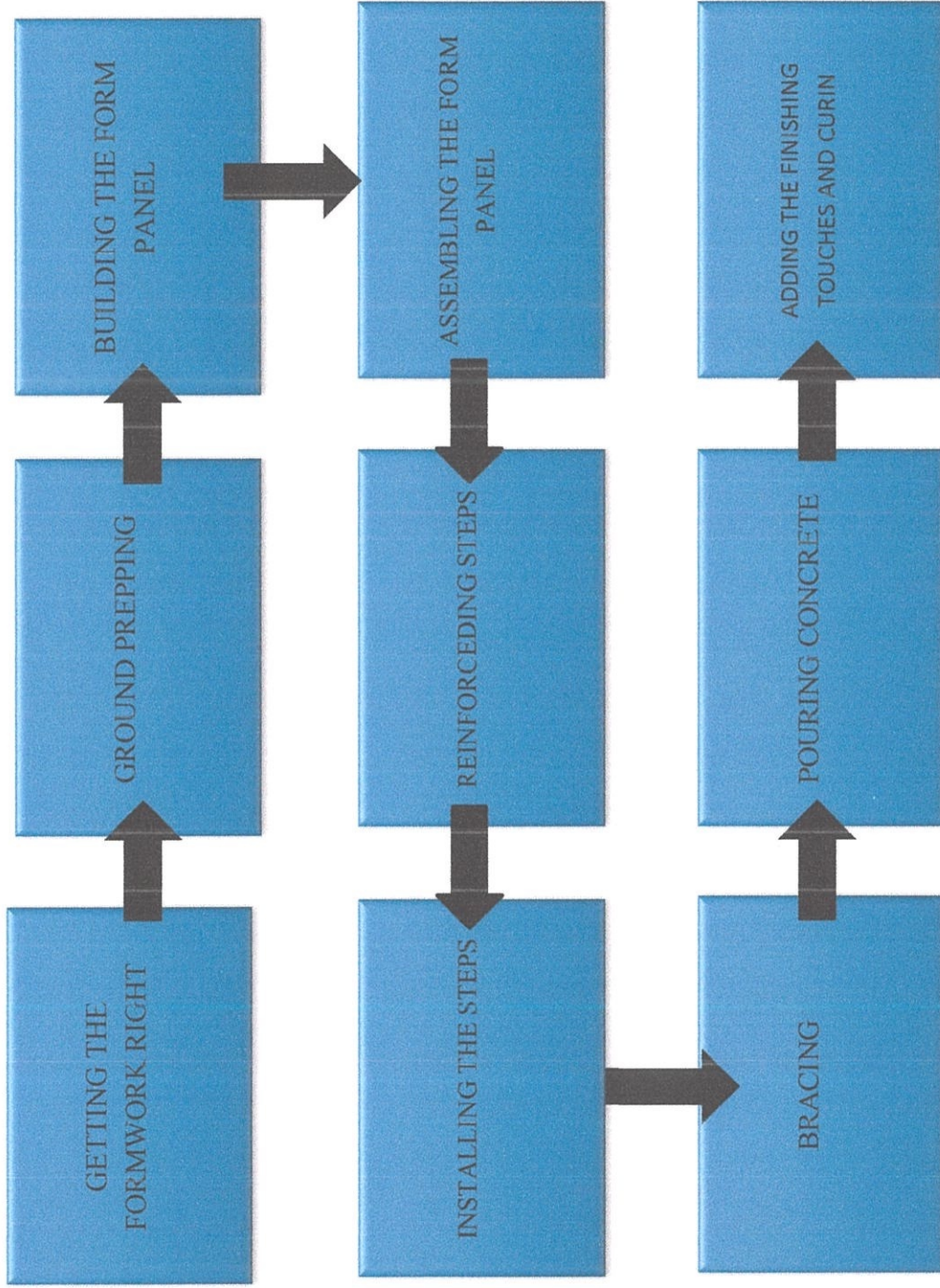

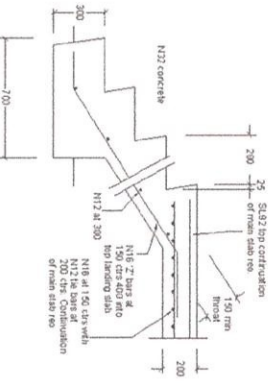


Figure 3.8: Flow Chart Of Staircase Installation

Table 1.8: Step of installation in-situ staircase

NO	OPERATION	DIGRAM	PLANT/MATERIAL/ EQUIPMENT	LABOUR	OUTPUT
1	<p><u>STAIRCASE FORMWORK</u></p> <p>Calculate the dimension for each step on the different in floor height</p> <p>After measure between booth floors, you need to then divide the value of high found by number of riser would like to have</p> <p>One piece of plywood are install sloping between the lower floor to the upper floor</p>	 <p>Photo 3.3 : Install plywood as platform Source : Asma (2015)</p>	<ul style="list-style-type: none"> -measuring tape -hammer -nails -plumb 	<ul style="list-style-type: none"> -Skilled workers -carpenter 	1 day

<p>2</p> <p>After the installation of formwork have finish, they install the reinforcement bar inside the formwork area</p> <p>The detail connection between slab and floor need to refer detail drawing before install</p>	 <p>Photo 3.4 : installation reinforcement Bar</p> <p>Source : Asma (2015)</p>	<p>-playar - reinforcement bar type y12 -reinforcement bar type R8(link)</p>	<p>-Skilled workers -bar bender</p>	<p>1 day</p>
 <p>Figure 3.1 : detail connection reinforced concrete</p> <p>Source : Asma (2015)</p>				

NO	OPERATION	DIGRAM	PLANT/MATERIAL/ EQUIPMENT	LABOUR	OUTPUT
3	Some timber are being install behind the sloping formwork in vertically position in order to support the staircase formwork and increase the stability the strength and avoid from moving	 <p>Photo 3.6 : supported timber</p>	<ul style="list-style-type: none"> -hammer -gloves -wood -nails 	General workers	1/2 day
4	The riser for each of the staircase step by following the standard riser are not 280mm or 10" or 1'	 <p>Photo 3.7 : measure the tep of riser Source : Asma (2015)</p>	<ul style="list-style-type: none"> -measuring tape -gloves 	-General workers	3 hour







NO	OPERATION	DIGRAM	PLANT/MATERIAL/ EQUIPMENT	LABOUR	OUTPUT
5	<p>After all of the staircase formwork have been install along with the reinforcement bar, the concreting staircase work can be carried out</p> <p>The grade of the concrete for the staircase work are grade 25 (G25)</p> <p>The concrete produce from the factory are being moving by concrete ready mix to concrete bowl , then into the staircase formwork</p>		<ul style="list-style-type: none"> -cement -water -aggregate -Concrete mixture -bowl -crane -shovel 	<ul style="list-style-type: none"> -concreter -skilled workers -semiskilled worker -general workers 	2hour

Photo 3.8 : concrete delivery

NO	OPERATION	DIGRAM	PLANT/MATERIAL/ EQUIPMENT	LABOUR	OUTPUT
6	<p>Move the concrete bowl to the staircase formwork carefully</p> <p>Then pour the fresh concrete to the formwork staircase</p>	 <p>Photo 3.9 : moving concrete to staircase formwork</p>  <p>Photo 3.10 Pour concrete to the formwork staircase</p>	<ul style="list-style-type: none"> -concrete bowl -shovel -vibrator poker -crane 	<ul style="list-style-type: none"> -skilled worker -general workers -concreter 	

NO	OPERATION	DIGRAM	PLANT/MATERIAL/ EQUIPMENT	LABOUR	OUTPUT
7	By using the shovel, the workers spread the concrete equally to the each area inside the formwork and smooth the surface of the concrete	 <p>Photo 3.11 : use shovel to equal surface concrete</p>	<ul style="list-style-type: none"> -shovel -safety shoes -gloves 	<ul style="list-style-type: none"> -general workers 	1/4 hour
8	By using the vibrator poker , the concrete are being compacted to avoid from honey comb inside the concrete	 <p>Photo 3.12: vibrating concrete to avoid honey comb Source : Asima (2015)</p>	<ul style="list-style-type: none"> -safety shoes -gloves -vibrator poker -generator 	<ul style="list-style-type: none"> -skilled workers -general workers -semiskilled wokers 	½ hour

NO	OPERATION	DIGRAM	PLANT/MATERIAL/ EQUIPMENT	LABOUR	OUTPUT
9	<p>After the concrete have been compacted, the staircase are being harden for a few days and removes formwork</p> <p>Curing work for 7days, 14days and 28days</p> <p>Next, the concrete are perfectly harden. Finally the in-situ concrete staircase is done</p>	 <p>Photo 3.13 : staircase after removal formwork Source : Asma (2015)</p>	<ul style="list-style-type: none"> -water -hammer -gloves 	<ul style="list-style-type: none"> -Semiskilled workers -general workers 	3 weeks

CHAPTER 4

CONCLUSION

The conclusion that can be concluded is that the installation of the stairs is important for each building. This is because the stairs acts as important role for the occupiers to go one floor to another floor. Besides that, in-situ have many advantages because of it embraces various building shape, it is not necessary to pay for crane on site and it is easily used for two way structural system. But in-situ stairs also have several disadvantages which is need high labor numbers and plant on site erection of formwork is time consuming.

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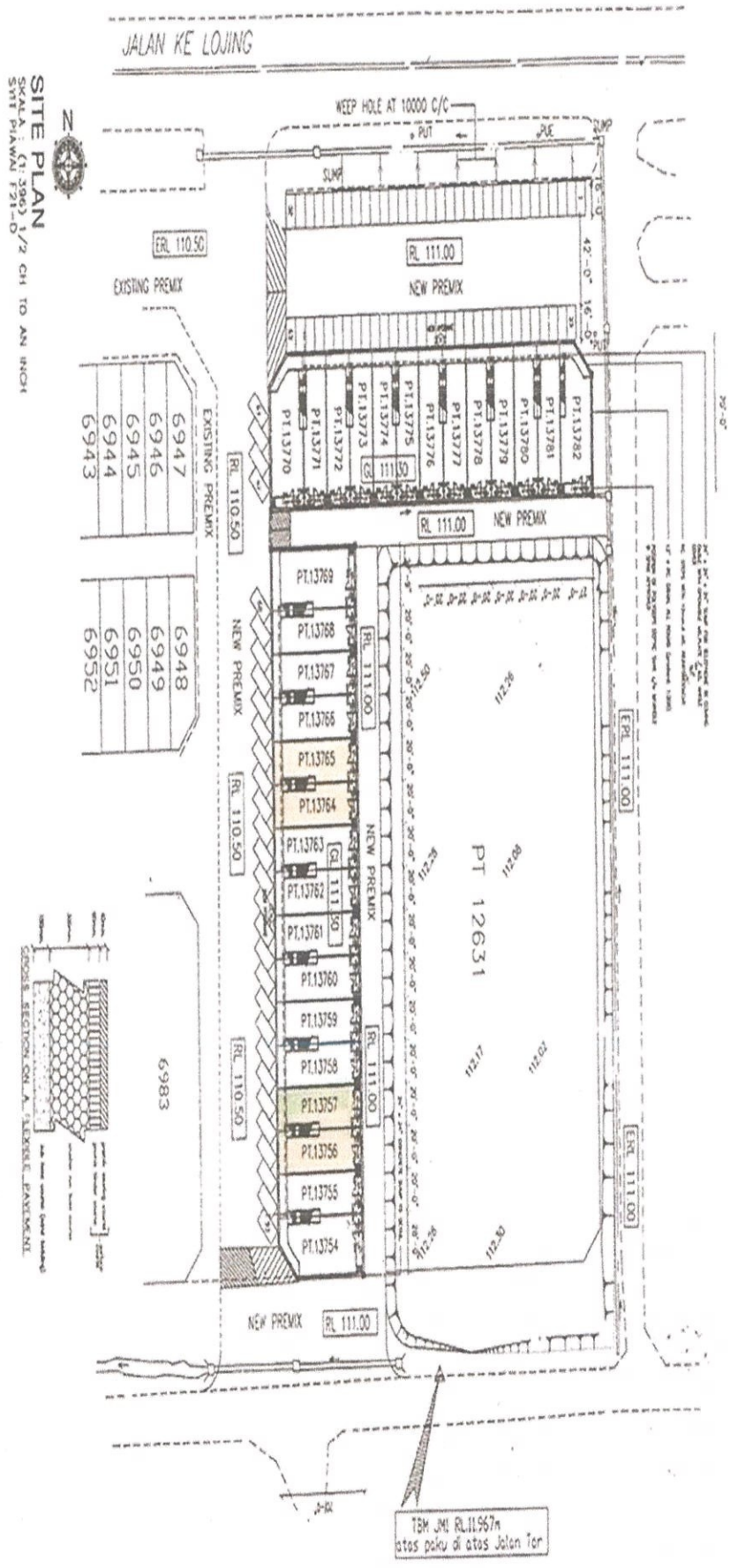
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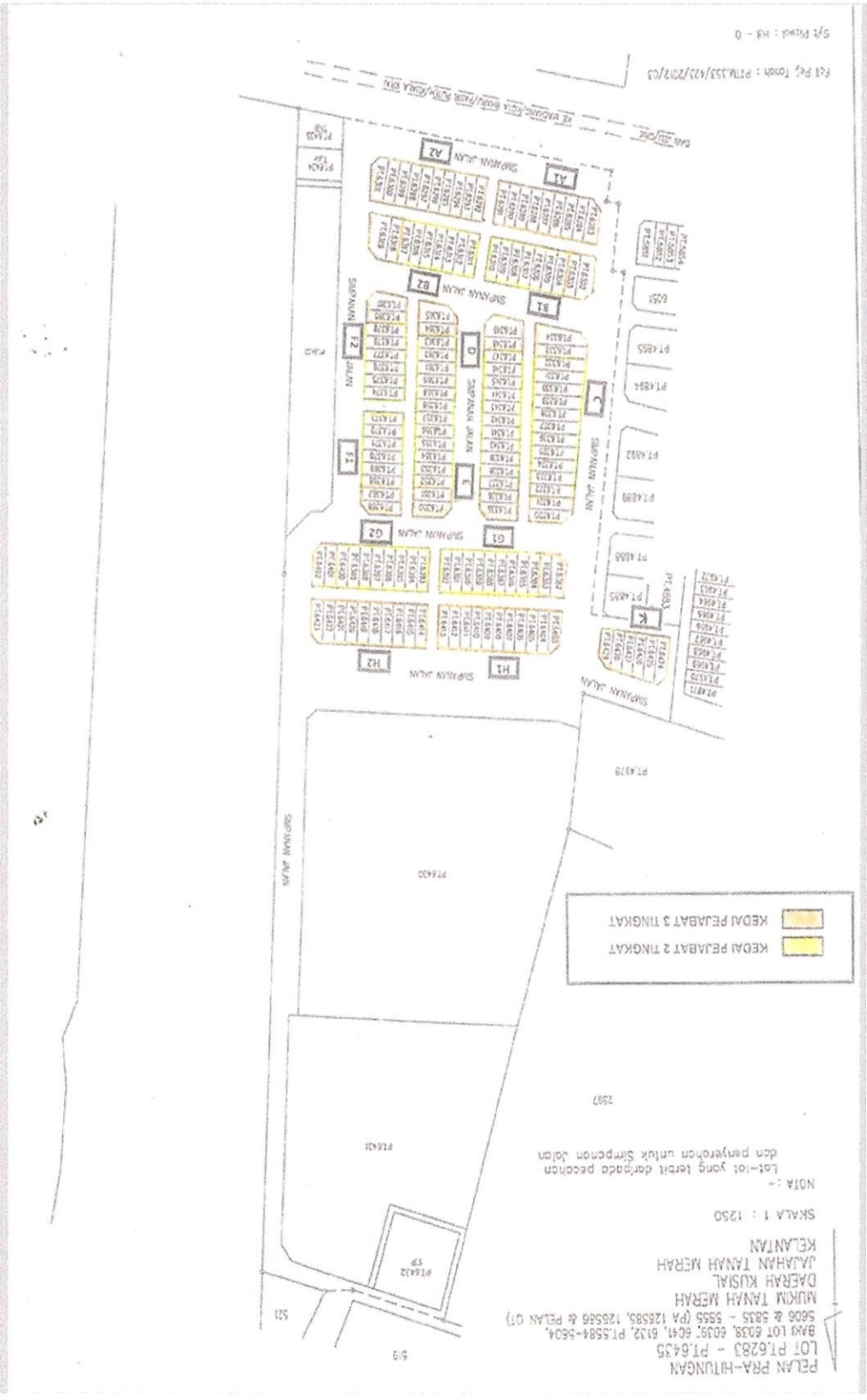
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Appendix B: Site Pelan Tanah Merah



Appendix A: Site Pelan New Project Tanah Merah