UNIVERSITI TEKNOLOGI MARA

DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITY TECHOLOGY MARA

(PERAK)

SEPTEMBER 2014

It is recommended that this practical training report provided

BY

NUUR SYIFA SAHIB

2012898676

ENTITLED

PRECAST CONCRETE STAIRCASE

Accepted in partial fulfilled the requirements for obtaining a Diploma in Building.

Report Supervisor	Pn. Hasni Suryani Bt Mat Hasan
Practical Training Coordinator	Pn Wan Nordiana Binti Wan Ali
Faculty Coordinator	Dr Mohd Rofdzi Bin Abdullah

DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

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(PERAK)

SEPTEMBER 2014

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 Pembinaan Bertegas Makbul Sdn Bhd for duration of 5 months starting from 12 May and ended 29 September 2014. It is submitted as one of the prerequisite requirements of DBN307 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

Name : Nuur Syifa Sahib

UiTM ID No : 2012898676

Date : 29 September 2014

ACKNOWLEDGEMENT

Alhamdulillah, all praises to Allah for the strengths and His blessing in completing this thesis. Special appreciation goes to my project coordinator, Mr. Azmin bin Abdul Aziz, for his supervision and constant support. His invaluable help of constructive comments and suggestions throughout the experimental and thesis works have contributed to the success of this research. Not forgotten, my appreciation to my site engineer, IR Kasa Bin Ismail for his support and knowledge regarding this topic. I would like to express my appreciation to the Project Manager at the site, Mr Wong for their support and help towards my postgraduate affairs. My acknowledgement also goes to all the technicians and office staffs at Pembinaan Bertegas Makbul that has help me in doing my practical report and give their support and share their knowledge with me. Sincere thanks to my lecture supervisor Puan Hasni Suryani Binti Mat Hasan for their guidance, advice and moral support during doing this report in successfully. Thanks for their concern in ensure to being success at training time. Not to forget, great appreciation to the rest Practical Training Coordinator Sr. Anas Zafirol Bin Abdullah Halim and Faculty's Coordinator Dr.Mohd Rofdzi Bin Abdullah. Last but not least, my deepest gratitude goes to my beloved parents, and and also to my siblings for their endless love, prayers and encouragement. To those who indirectly contributed in this report, your kindness means a lot to me. Thank you very much.

Thank you very much

ABSTRACT

As being mentioned staircase were very important in high rise building. The objective of this report is to identify the installation method of precast concrete staircase and to identify the components and equipment used in installation of precast concrete staircase. Method of study in this report involve observation and interview. Observation and interview have been done in order to gain information and knowledge. The findings in this report are the installation method are preparation of mould, forming of reinforcement bar, piping, concreting, dismantle mould, lifting, installation, grouting, handling and finished and the component involve are U-bar, reinforcement bar T12, UPVC pipe, stringer mould, flight mould, base plate mould, close cover, grease, bolts and nuts and kerosene.

CONTENTS PAGE

LIST OF TABLE

LIST OF FIGURES

LIST OF PHOTOS

LIST OF APPENDICES

LIST OF ABBREVIATIONS

UBBL Uniform Building By-Law

UiTM Universiti Teknologi MARA

CIDB Construction Industry Development Board

CHAPTER 1

PREFACE

1.1 Introduction

The IBS manufacture has 5 groups which are precast concrete system, metal framing system, formwork system, timber framing system and block work system.

In precast concrete system, one of it is staircase which is known as the building element. Stair may be constructed of timber, bricks, stone and steel or reinforced cement concrete. However, fire protection of staircase is extremely important. Staircases provide access and communication between floors in buildings, and are a path by which fire can spread from one floor to another. Therefore, is must be enclosed by fire resisting walls, floors, ceilings and doors. (Punmia, 2005).

According to Warszawski (1999), said that important aspect in the design of stairs is the strength aspect. It must be designed to carry certain loads, which are similar to those used for the design of the floor. The components in the staircase are step which permits ascent or descent, tread which it is the upper horizontal portion of a step upon which the foot is placed while ascending or descending, then the riser is the vertical portion of a step providing support to the tread, while flight is defined as an unbroken series of steps between landings, landing is the level platform at the top or bottom of a flight between the floors.

Staircase not only to transport people to another floor, but it required a good stair. The stair should be design so as to provide easy, quick and safe mode of communication between the floors. The general requirements which a stair should fulfil are the location, width of stair, length of flight, pitch of stair and materials of construction. While the width of the stair it should be wide enough to carry the user without much crowd or inconvenience. For the length of the flight, comfort point view, the numbers of steps are not more than 12 and not less than 3. The materials of construction should provide a sufficient strength, and fire resistance. (Punmia, 2005).

In conclusion, IBS is not a new system that been used in Malaysia, but already in Malaysia. To introduce to other contractor or company to use this system, it should make a special course and training for every worker. Moreover, this system is much better than current construction method. It also saved time and money as well to improve Malaysia economics.

1.2 Objective

i. To identify on the installation method of precast staircase.

ii. To identify the equipment and components used in installation precast concrete staircase.

1.3 Scope of study

This study will be focusing on the installation of precast stair on site. There will be the casting yard and mould at site. The precast concrete staircase is proposed in Chowrasta Market that is located at Penang Road. Employer of this project was Majlis Perbandaran Pulau Pinang.

1.4 Method of study

There are primary method of study which can be divided into observation and interview.

i. Observation

Observation had been made using eye contact and observes at site situated at Penang Road. Here it can be observe that precast concrete staircase had already been made at the factory and brought to the site for installation.

ii. Interview

An interview have been made with the project manager that is Mr Wong. Mr Wong has worked for 30 years and have many experiences and gave information that are needed about this topic. As so as the engineer that is Ir. Kasa bin Ismail. Furthermore, interview with the bar bender, skilled worker and others was also been carried out.

Secondary study method is by using literature study.

i. Literature study had been used in several ways which are books, internet and documents. Books had a lot of information and borrow from the library to be made as references. This method is more productive to understand detail about the in-situ and precast staircase.

CHAPTER 2

COMPANY BACKGROUND

2.1 Introduction

Pembinaan Bertegas Makbul Sdn Bhd is a firm of building construction activity. This company was established in the 08th. June 1999. No. Registration is 485 395-D. Registered with a Class A Contractor and Construction Industry Development Board Malaysia (CIDB) G-7.

Since its inception, the company has shown excellent performance in the completion of several projects both government and private projects to adhere to the principle of maintaining the quality of the service provided. Having the right number of staff with experience in the construction and management to further strengthen the company's position to face the challenges ahead.

In addition to interest, profits and enthusiasm and passion to the company will continue to achieve success and plans to become a Bumiputera company Dynamic thus support the government's ambition to become an industrialized country by 2020.

2.2 Company Profile

Register trade name: Pembinaan Bertegas Makbul Sdn Bhd

Date established: 08hb. Jun 1999

No. Company: 485395-D

Registered Business Address: 56-1-3rd Floor, Perak Plaza, Perak Road, 10150 Pulau Pinang

Address: NO.1, 5-03, Jalan P. Ramlee, 10460 Penang.

Telephone No.:

Fax No: 04-2831 862

Email: pbmsb@hotmail.com

Phone No:

Authorised Capital: RM 1,000,000.00

Capital Paid: RM 1,000,000.00

Members of the Board & Shareholders : Ir. Kasa Bin Ismail , Azmin Bin Abdul Aziz

EPF Reference No: 14009191

Code of benefits No: C5119660P

CIDB & GCMS Registration No.: 1000202-PP055090

Validity: 13/01/2012 - 07/19/2014

No. PKK Bumiputera Status: 1000202-PP055090 (G7)

Validity: 15/10/2012 - 07/19/2014

MOH & Bumiputera Status Registration No: 357-02054264

Validity: 28/10/2011 - 10/27/2014

No. Registration Span: Span / SME / (PT) / 800-2C/2/12/547

Validity: 15/06/2012 - 14/06/2013

Reference Bank:

CIMB Bank Berhad: # 43, Beach Street, 10300 Penang.

A / C No. : 0722-0003148-05-0

CIMB Bank Berhad: No.28, Jln Radin Tengah, New Bdr Seri Petaling, 57000 K.Lumpur.

A / C No. : 1429-0004790-05-0

Alliance Bank (M) Berhad: Gr Flr, BGN Barkath, 21 Beach Street, 10300 Penang.

A / C No. : 070390010099404

Alliance Islamic Bank Berhad: Gr Flr, BGN Barkath, 21 Beach Street, 10300 Penang.

A / C No. : 570340010010682

Maybank: # 9 Union Street, 10200 Penang.

A / C No. : 507013009825

Bank Muamalat (M) Berhad: Lot 24-28 Middle Rd, Tmn Sri Tunas, 11950 B / Baru, Penang.

A / C No. : 0702-0001530-71-9

Auditors & Accountants: Folks DFK & Co.

48A, 1st Floor,

Jalan Green Hill, 30450 Ipoh, Perak.

Company Secretary: Liew Kok Wah56l, 3rd Floor, South Plaza, Victoria Road, 10150 Penang

2.3 Organization Chart

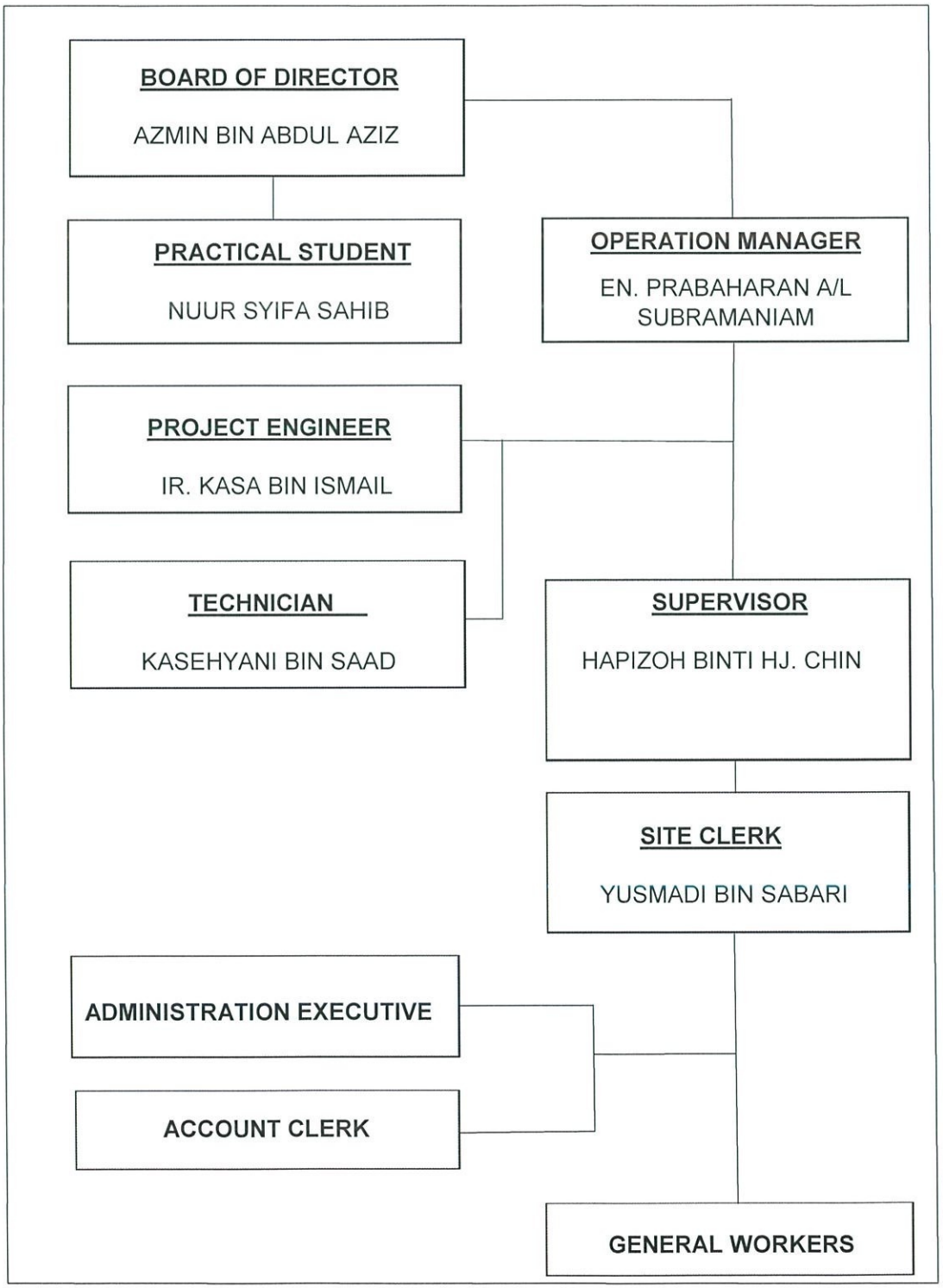

Figure 2.1 Organization Chart

2.4 List of Project

2.4.1 Completed projects

Table 2.1 Completed Projects

No.	Project Title	Employer	Contract total price (RM)	Year
1.	Pembinaan 1 Blok Tambahan Bangunan Sekolah 4 Tingkat Di Sekolah Kebangsaan Mak Mandin, Seberang Perai Utara, P.Pinang.	Jabatan Kerja Raya	3,328,100.00	Completed 14/03/2002 - 31/12/2002
2.	Tender Untuk Menurap Semula Jalan-Jalan Dan Kerja-Kerja Berkaitan Di Kawasan Bidang Kuasa MPPP (Kawasan A)	Majlis Perbandaran Pulau Pinang	1,093,950.00	Completed 23/04/2002 - 22/10/2002
3.	Cadangan Kerja-Kerja untuk Penyelenggaraan Kerja Awam Di Sekitar Wilayah Persekutuan Kuala Lumpur Untuk DBKL (2003/A112)	Dewan Bandaraya Kuala Lumpur	4,500,000.00	Completed 04/11/2003 - 31/12/2006

4.	Cadangan Pengubahsuaian Bilik Persidangan Majlis Dan Ruang-Ruang Persekitaran, Dewan Bandaraya, DiAtas Lot 69, Jln Padang Kota Lama, Seksyen 19, Georgetown, Daerah Timur Laut, Pulau Pinang.	Majlis Perbandaran P.Pinang	3,580,913.50	Completed 12/04/2004 - 20/05/2005
5.	Pembinaan Bangunan 2 Tingkat Klinik Pergigian Jalan Perak, Pulau Pinang	Jabatan Kerja Raya	1,518,000.00	Completed 07/03/2005 - 19/06/2006
6.	Cadangan Membina & Menyiapkan 28 Unit Rumah Teres 2 Tingkat Serta Kerja-Kerja Infrastruktur Yang Berkaitan Di Atas Lot 5544-5571, Mk 7, Seberang Perai Utara, Pulau Pinang. Taman Air Tawar Indah Fasa 5 (Zon 3).	Uda Land (North) Sdn. Bhd.	3,232,700.00	Completed 07/01/2008 - 06/01/2009

7.	Cadangan Projek Pembinaan Bangunan 'Approach Room' Di Pangkalan TUDM Butterworth, Pulau Pinang.	Kementerian Pertahanan Malaysia	4,223,000.00	Completed 22/05/2008 - 27/04/2011
8.	Pembinaan 1 Blok 4 Tingkat Bangunan Tambahan Di Sekolah Kebangsaan Bayan Lepas, Daerah Barat Daya, Pulau Pinang.	Jabatan Kerja Raya	2,334,144.00	Completed 23/06/2008 - 21/12/2009
9.	Cadangan Membina Dan Menyiapkan 74 Unit Rumah Bandar Kos Rendah (Fasa 1B) Di Atas Lot 5209 (Lot Lama 684 & 685), Mukim 9, Permatang Tok Mahat, Seberang Perai Selatan, Pulau Pinang.	JKP Sdn. Bhd.	4,251,640.87	Completed 12/03/2012 - 11/06/2013

2.4.2 Project in Progress

Table 2.2 Project in progress

No.	Project title	Employer	Contract total price (RM)	Year
1.	Cadangan Menaiktaraf Dan Pengubahsuaian Pasar Chowrasta Di Jalan Penang, Pulau Pinang.	Majlis Perbandaran Pulau Pinang	12,190,206.40	On Progress 01/04/2013 - 31/03/2015

CHAPTER 3

PRECAST CONCRETE STAIRCASE

3.1 Introduction

Staircase is one of the element for high rise building because to connect from one floor to another. Staircase has various types of method construction from conventional method to precast method. This project applies precast method for staircase and conventional method. But for this report focus on precast concrete staircase on site. The contracts choose this method because it saves money and also the sizes are same.

3.2 Project background

Photo 3.1 Chowrasta Market

Photo 3.1 show Chowrasta Market that is located at the Penang Road. The project was started in 1/04/2013 and will be completed in 31/03/2015. This project is for upgrading and renovation of Chowrasta Market in Penang Road.

Company that are handling this project is Pembinaan Bertegas Makbul Sdn. Bhd. This is an A class company. This project takes a total cost of RM12, 190,206.40. The board of director in this company is En. Azmin Bin Abdul Aziz and being helped by an engineer that is En. Kasa Bin Ismail.

Employer of this project is Majlis Pembandaran Pulau Pinang. This project is obtained through an open tender.

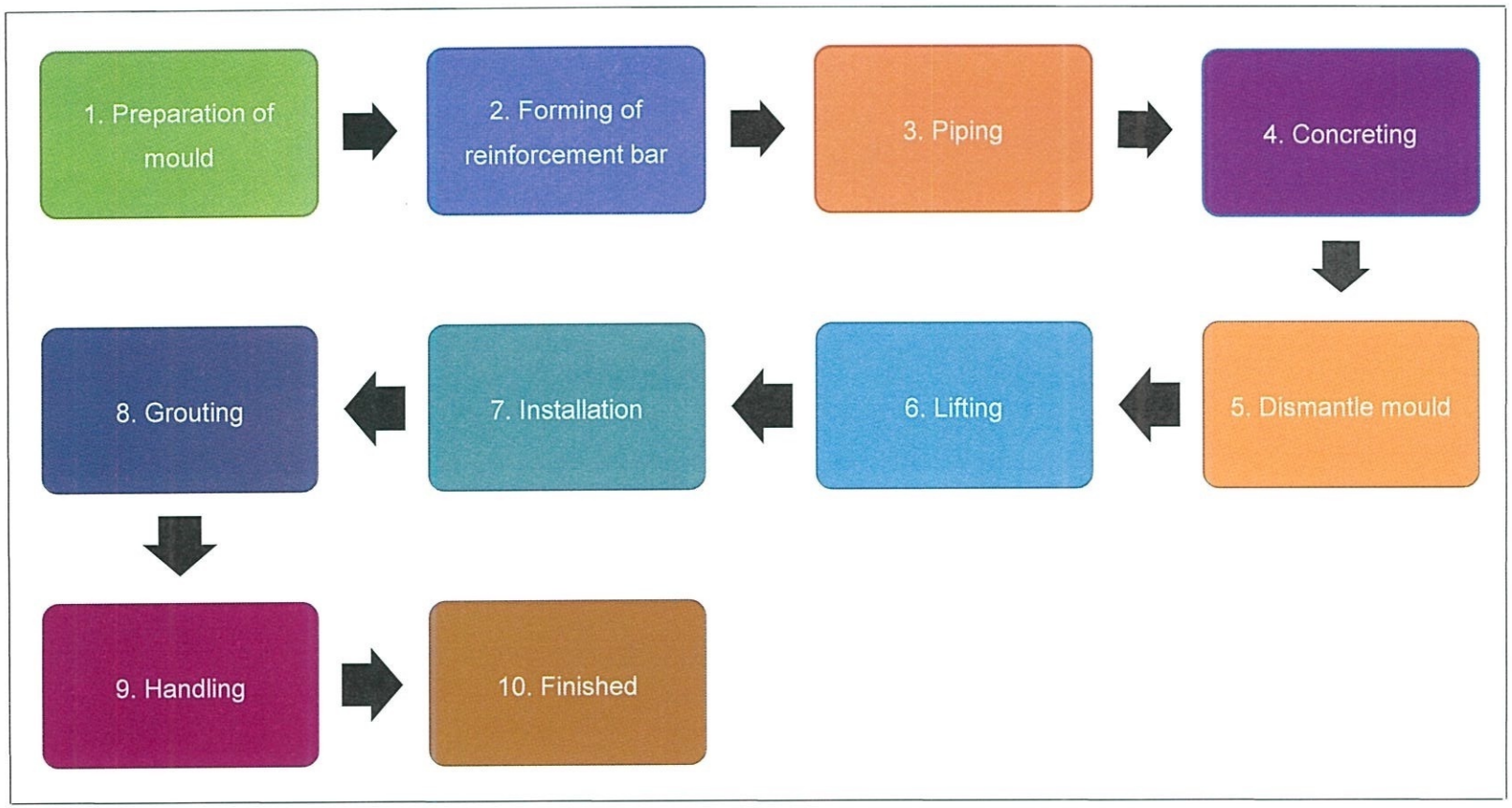

Figure 3.1 Installation Method of Precast Concrete Staircase

3.3 Case Study

i. Preparation of mould

Photo 3.2 Preparation of mould

First, the stringer plate is put at the casting yard. Then, the crane lift the base plate to cast it in. Using tower crane, it lifts up the base plate to put on the stringer plate. Brace it with using 13 bolts and nuts. Only 10 minutes completed brace the mould in. After that, brace the close cover at the end of the staircase mould. Using 4 bolts and nuts, the close cover is being braces. Within 3 minutes the close cover is brace to the mould.

ii. Forming of reinforcement bar

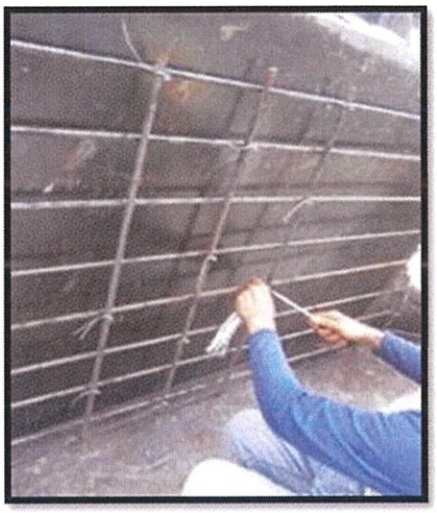

Photo 3.3 Forming of reinforcement bar

Form the reinforcement bar accord structural drawing. Reinforcement bar is important because without it, the concrete will fall apart and crack. T12 reinforcement bar is put on the stringer plate. T means tensile or known as high yield bar because to support live load and dead load.

The reinforcement bar T12 is arranged. Fix reinforcement bar with binding wire. The gap of the T12 is 150 mm. Then, continued to fixing binding wire to the reinforcement bar. Using the binding wire, the reinforcement bar can stand properly.

Insert or slot in the T12 reinforcement bar of U-bar to the close cover. The U-bar acts as hook to lift and to connect with the mid-landing and suspended landing slab. There are 3 space at the close cover to fill the U-bar and continued to fixing with binding wires. The formation of fixing reinforcement bar had been completed within 45 minutes or less than it.

iii. Piping

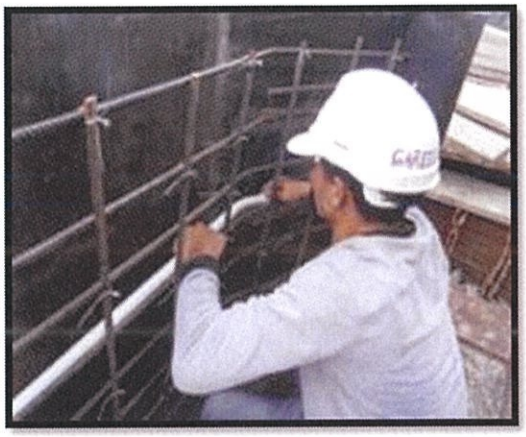

Photo 3.4 Piping

First, cut the polystyrene into square shape and make a hollow square in the polystyrene that enough to slot in the UPVC pipe. Then, strip with masking tape. The UPVC pipe is protected with polystyrene and masking tape to avoid the concrete enters to the UPVC pipe. The UPVC pipe is for the wiring to flow in the pipe.

Then, the UPVC pipe was inserted into the reinforcement bar. Long UPVC pipe being installed using glue to connect from left and right pipe.

iv. Concreting

Photo 3.5 Concreting

Before concrete, the precast staircase mould must be clean and put grease on the tread and riser to avoid the concrete stick to the mould. Spray with the kerosene to the flight mould to increase the bond to prevent the concrete stick to it. Next, screw the precast staircase mould with bolts and nuts for final before concrete in.

Then after the truck arrived at the site concrete bucket was prepared and carried by the tower crane. The tower crane carried the concrete bucket to the precast staircase casting yard. Pour the concrete to the precast staircase mould. During concrete discharge, the wet concrete shall be vibrated with poker vibrator and the vibrator shall move backwards to strike off the access concrete.

v. Dismantle mould

Photo 3.6 Stack of staircase after dismantle

After leaving 24 hours or more than 2 days, the staircase mould shall be dismantled. Use spanner to unscrew the bolts and nuts. Unscrewed the close cover, base plate and flight mould. The tower crane then will carried the staircase and stacks at the storage area.

vi. Lifting

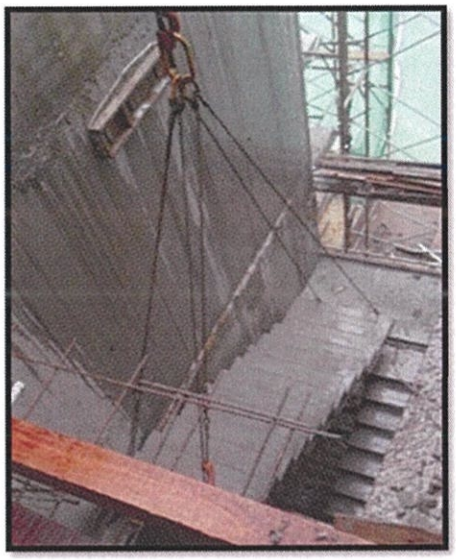

Photo 3.7 Lifting the staircase

The hook at the tower crane is being hook to the U-bar. The staircase should be support at two locations during hoisting which at the both U bar-(at the end of the staircase). The crane lifts up the staircase.

vii. Installation

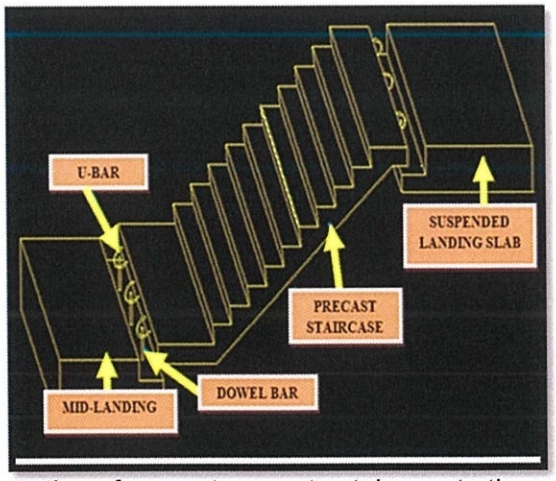

Photo 3.8 illustration of precast concrete staircase to the mid-landing and suspended landing slab

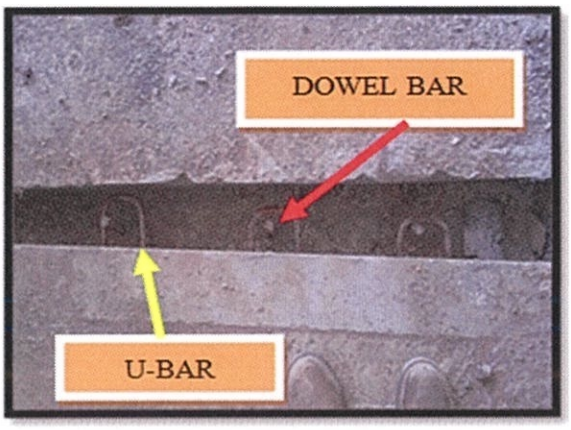

Photo 3.9 the connection of precast staircase to the landing

The above photo show how the U-bar and the dowel bar are connected. The staircase is connected by using the U-bar and the dowel bar. These both reinforcement bar are important in connecting the stair.

Photo 3.10 Complete installation of precast staircase

The U-bar from the staircase is put in the dowel bar. The dowel bar is for the staircase to hold or to connect with the mid-landing and suspended landing slab. Then the staircase is done being installed.

viii. Grouting

Photo 3.11 grouting the staircase

Grouting the staircase to cover the joint of the staircase. Mix the Sika grout with water. Apply the grout through the joint section. Then, allow the grout to flow to the opposite end. Keep the staircase undisturbed for at least 24 hours. Check all the joints are properly sealed.

ix. Handling

Photo 3.12 Handling

A railing had been constructed with 915 mm high mid steel. Top rail is constructed by 65mm and filled with 20mm diameter thick mild steel circular hollow section. The base was welded with steel base plate.

x. Finished

Photo 3.13 Finished of staircase

Finished of the staircase is the final stage. Mix the mortar cement and sand (1:3). Lay 25mm thick mortar bed to the tread and riser, and used level spirit to make even surface to the tread. Make a space for the porcelain tile to install at the edge of the tread.

Apply porcelain non-slip nosing tiles, size 80mm x 200 mm to the edges of the tread. Leave it for 2 days for mortar to harden and after that, the staircase is ready to use

3.2.3 Components and equipment.

Photo 3.14 U-bar

The reinforcement bar is used to connect to the flight and landing beam.

It is known as U-bar because it is shape like U.

Photo 3.15 Reinforcement bar T12

T12 with 150mm diameter. This high yield bar is to support the load from concrete and people when using the staircase.

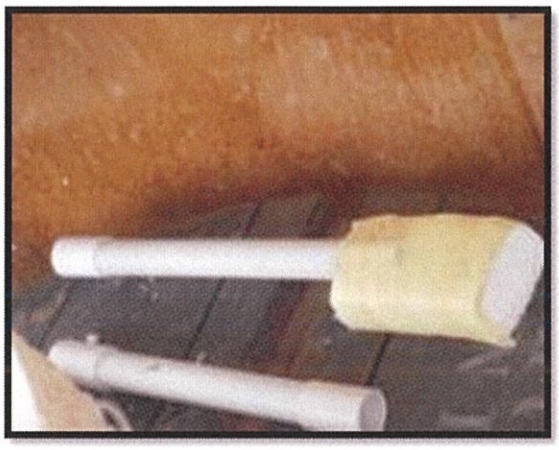

Photo 3.16 UPVC Pipe

The UPVC pipe is wrapped with masking tape and stereo foam to prevent the inside of the UPVC pipe from being cover with concrete. This pipe is used as the sanitary fitting for example lamp. The size of the UPVC pipe is 20mm.

Photo 3.17 Stringer mould

Stringer mould is made from steel so that it is reusable.

Photo 3.18 Flight mould

The tread and riser mould is in standard size. The tread is 255mm. while the riser is 168.42 with nosing 25mm.

Photo 3.19 Base plate mould

Base plate of precast staircase mould. The cover of the staircase or the back of the staircase.

Photo 3.20 Close cover

These pieces have 2 close cover. It is used to cover at the end of the staircase.

Photo 3.21 Grease

The red colour is the grease. The grease is to prevent the concrete from stick to the mould and easy to dismantle mould.

Photo 3.22 Bolts and nut

Using bolts and nuts and screw the mould so that the pieces of the mould will not fall apart.

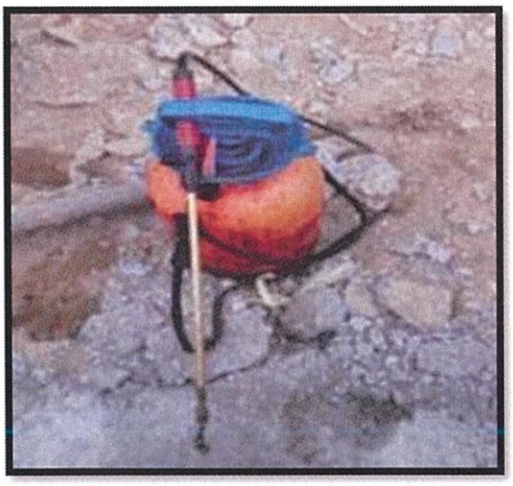

Photo 3.23 Kerosene

To avoid the concrete stick to the mould and easy dismantle staircase from the mould.

Photo 3.24 sika powder

This grout is easy to use just add water. It is also non-toxic and non-corrosive material.

CHAPTER 4

CONCLUSION AND RECOMMENDATION

Staircase was very important especially in high rise building. Staircase can be used to transport people from one floor to another floor and can be used when emergency happened. Besides, it also enhance building appearance with its unique design and colour.

In order to construct precast concrete staircase it is important to identify the equipment and components used for precast concrete staircase and study on the method of installation of precast staircase.

As a conclusion, in order to construct precast concrete staircase the installation method are preparation of mould, forming of reinforcement bar, piping, concreting, dismantle mould, lifting, installation, grouting, handling and finished and the component involve are U-bar, reinforcement bar T12, UPVC pipe, stringer mould, flight mould, base plate mould, close cover, grease, bolts and nuts and kerosene.

As for recommendation observation on modular staircase can be done in order to gain extra knowledge as modular construction was new in construction industry.

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B.C Punmia, Ashok Kumar Jain and Arun Kumar Jain,(2005). Building Construction. Stair, 437 – 462.

Warszawski, A. (1999). Industrialized and Automated Building Systems, Technion-Israel Institute of Technology, E and F N Spoon.

APPENDIX

PERUNDING YAA SDN BHD
(Company No. 335410-T)
Jurutera Perunding – Consulting Engineers

45 Jalan Free School
11600 Pulau Pinang
Tel:
Fax: 04-2816995
Email: design@perundingyaa.com.my

ENGINEER'S INSTRUCTION

Engineer's Instruction Serial No. : 13 Date: 30 July 2014
Architect's Instruction Serial No. :

PROJECT: PROJEK MENAIKTARAF DAN PENGUBAHSUAIAN PASAR CHOWRASTA DI JALAN PENANG, PULAU PINANG

UNTUK: TETUAN MAJLIS PERBANDARAN PULAU PINANG (MPPP)

To Contractor : M/s Pembinaan Bertergas Makbul Sdn. Bhd.
No. 1-5-03, Jalan P. Ramlee
10460 Pulau Pinang Tel: Fax: 04-2831862

New Market - Staircase

Under the conditions of our Standard Form of Contract, I/we hereby issue the following instructions:

With reference to Staircase 1 and 2 of the new carpark block.

You are requested to check the beams around the staircase core, in particular the beams at the landing level. Please refer to our construction drawings. There should also be a clearance of 1220mm. On site this is only 850mm.

At the staircase landing, there should be no continuous beams as per our construction drawings. However on site this has been constructed.

Please propose your rectification works.

Issued By :

Ir. Winston Ong Cheng Hock
Director

Endorsement by Architect as Instruction issued:
..... Date :

Copies to : M/s Arkitek LLA Tel: Fax: (04) 2288246 (Ms. Eleen Foo, Mr Ooi)
M/s Unitech QS Tel: Fax: (04) 229 0029 (Mr. Goh)
M/s Perunding PLA Tel: Fax: (04) 3317337 (Mr. Tsang)

Via Fax & Mail

(Fax No: 04-283 1862)

ARKITEK LLA
SDN. BHD. (485095-P)
ARCHITECTURE
PLANNING
CONSERVATION

FAXED
RG - 147/14

Our ref: LLASB/FEL/OTG/11333/PBMSB/CO 34

10 July 2014

Pembinaan Bertegas Makbul Sdn Bhd
No. 1-5-03
Jalan P. Ramlee
10460 Pulau Pinang

Attn: En. Azmin Bin Abdul Aziz

Dear Sir,

CADANGAN MENAIKTARAF DAN PENGUBAHSUAIAN PASAR CHOWRASTA DI JALAN PENANG, PULAU PINANG
RE: EXTENSION OF TIME

Your submission of documents dated 21st May 2014 (Ref No PBMSB/MPPP/PC-250213/LLA090), our letter dated 2nd July 2014 and your revised Work Progress Report submitted on 10th July 2014 is referred.

In view of (a)site conditions (b) weather conditions (c)unforeseen conditions, we hereby grant you Extension of Time as follows: -

(a) SITE CONDITIONS : interruption of works during general elections and festive seasons **(14 days)**

(b) WEATHER CONDITIONS : continuous rainfall and inclement weather In the months of September to November 2013 **(18 days)**

(c) UNFORESEEN CONDITIONS : interruption of works due to relocation of obstructing underground TNB cables **(70 days)**

Note: Contract Period : 1st April 2013 to 31st March 2015
Recommended E.O.T : from 31st March 2015 to 10th July 2015

2. Total Extension of Time granted : **102 days**

DIRECTORS:
LAURENCE LOH, AADIP, RIBA, APAM, LAM, MIID, ICOMOS
ONG JIN CHENG, B.ARCH (ADEL.), FPAM, LAM, MIID
ERIC KANG, B.ARCH (HONS. UCD), APAM, LAM

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