



اُنِيُوَرِ تِكْنُوْلُوْجِي مَارَا
UNIVERSITI
TEKNOLOGI
MARA

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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entitled

Concrete Test

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

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

SEPTEMBER 2015

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 Multiglow Corporation 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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ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah, the Most Merciful, the Most Graceful.

I would like to extend my heartfelt gratitude for the guidance, advice and help rendered throughout the period of training by the following group of amazing individuals. First and foremost, I would like to thank Dato' Seri Ronnie for the opportunity given to conduct my training in his esteem company. His team of professionals comprising of Dato' Seri Ir. Izhar Idris, Mr. Adam Johari Ku Abdullah, Ms. Nur Aishah Sabri, Mr. Fairul Nizam And Mr. Lung Fook Tong have enabled me to learn and develop my understanding, knowledge and feel of real time projects and the theory involved in analysis of structures, building and civil works. They are also responsible towards streamlining and assessing my training. My gratitude also goes to the site personnel who have extended their cooperation and help to further enhance my ability in understanding the procedures in construction and site administration, tests procedure, site safety and best practices in the industry. It is an honour for me to be given the opportunity to work with all of them.

Besides, I would also like to thank all the UiTM lecturers that have taught and nurtured me in becoming a better student and person. I would like to extend my deepest appreciation to the lecturers who are directly or indirectly involved during my training stint. I value the time, effort, encouragement and ideas that they have contributed towards the successful completion of my training, this report and the valuable knowledge that have been shared over the last few semesters to the supervising and visiting lecturer, Mr. Mohd Reeza Yusof, practical training coordinator, Mrs. Noor Rizallinda binti Ishak and faculty coordinator, Dr. Mohd Rofdzi bin Abdullah.

Last but not least, my special thanks to my beloved parents for their sacrifices over the years.

ABSTRACT

Concrete is known as composite material composed of coarse granular material embedded in a hard matrix of material that fills the space between the aggregate particles and glues them together. Therefore, this report discuss more about concrete test to determine properties of concrete. Properties of concrete means that the characteristics of concrete and its basic qualities. This report was conducted based on the bungalow house project that located at Bukit Gasing. The objective of this report is to determine the types of test that can be carried out. The result of every test show the properties of concrete used. All information in this report is based on the experience, interview and research from internet and book. The properties of concrete are very important in a construction. It is because the poor concrete can affect the building.

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CHAPTER 1.0

PREFACE

1.1 Introduction

UiTM has been stated that one of condition to graduate must go to practical training. However, there is some course that exempted from going to practical training. Practical training is good because it give students the opportunities to gain an experience and knowledge from the worker that have a lot of experience in this industry. This is also can exposed the students in real situation. Besides, during this time the students can apply what have been studied before this.

In department Building, every student must go to practical training. This department has decided that the practical training for building's student is during their semester 5. The students must pass the core subject which is Building Construction for every semester and repeated subject must less than 12 credit hour before can go to practical training. The students must find the place itself before the semester 5 has started. Additional, in construction industry the student must have green card.

The company that have given the opportunities to author to do the practical training is Multiglow Corporation Sdn. Bhd. This company is located at Seri Kembangan. This company has been established since 1999 until now, 2015. This company has started from a small company and become bigger year by year. They have a lot of project around Malaysia to be conduct and one of the projects is located at Kuala Lumpur.

1.2 Objective

The objective of this report:-

- i) To study about properties of concrete.
- ii) To determine the method of concrete test that conduct on site.
- iii) To identify the defects in concrete.

1.3 Scope of Study

The author has been done this practical training at Multiglow Corporation Sdn. Bhd. that located at Bandar Putra Permai, Seri Kembangan. One of the on-going projects is located at Kuala Lumpur. This project title is to build 1 unit of 2 storey bungalow houses with 2 storey of lower ground and 1 unit of swimming pool Mukim Kuala Lumpur at Lot 37249, Jalan Gasing Piring, Mukim Kuala Lumpur for Gasing Meridian Sdn Bhd.

This project does not use any special method to build the building. It is same with the other housing project. However, there still has a lot of knowledge can be obtained from this project. One of the knowledge that can learn from this project is about concrete. The selected concrete must suitable with the uses of the building. These projects use the concrete for their structure of the building such as beam, slab and column.

There are tests that must be carrying out before the structure can be casting. This test is very important to fulfil the properties of concrete. The test can be conducted on site such as slump test and cube test. After casting, the concrete may have the defect. This defect of concrete is because of some factor. Some of the defect such as colour variation, crazing and dusting.

1.4 Method of Study

1.4.1 Research

i) Internet

Internet is one of source to get new information because it can search anything that needed in an internet. On this ways, people can know all the things that they do not know easily. People must know to take the information in internet because sometimes the information in internet is not related or not suitable to the topic. So, people must refer to many materials after get the information from internet because it can prevent from get the wrong information.

1.4.2 Interview

The interview was occurred during practical training at Multiglow Corporation Sdn. Bhd. It is a conversation between authors with the worker at this company such as Mr. Adam, Ms. Aishah, Mr. Nizam and Mr. Lung. A lot of information they give about construction of the building. The detail given by them was very useful in this report.

1.4.3 Site Visit

Site visit is one way to get information because the people can know the actual location of the building. Through the site visit, people can see with their own eyes the construction of the building. Sometime the imagination of people cannot be described, so that, this site visits is very helpful. The experience during site visit is very important.

1.4.4 Observation

When people conduct the site visit, it can give the benefit because people can observe whatever around the location to build the building. Through observation, people can know how the building been constructing. It is because each project has a different method to construct. This way of study also gives the people to know how to manage the problem in site.

1.4.5 Discussion

Discussion with friends also can give the new information because sometimes friends know about the information and all the things. From this ways, it can help people to improve the information because people can share or give opinion whatever they know about the topic. So, people can refer to the lecturers, book and others to make sure the information that gets from discussion weather it is suitable or not.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company



Multiglow Corporation Sdn. Bhd. was established in early year of 1999. It is a private limited company. The mind sets of the people are at the right ambient when cohesively want to transform such a vibrant and aggressive company into a Winning Organisation. Besides the inner drive to succeed, it has also the stamina to persevere through hard times and troughs.

During the initial set-up, Multiglow Corporation's business activity is mainly concentrating on hard and soft landscape projects. The company had received a full support from the Sunway Paving Solutions Sdn. Bhd., Maxistone and

Sunden Pavings to maintain in this industry. In this competitive era, they are not limiting themselves to concrete pavement works only but they also offer a wide range of products which can name it such as granolithic, pebble wash, stone, stencilcrete, texture concrete, clay paver, clay brick, compressed concrete tile and homogenous tiles to meet with the Client's requirement.

In order to keep ahead, the company look for strategic partners that equipped with the right resources and capabilities to venture into infrastructure and civil engineering works in year 2001 and has set-up another construction arm with qualified engineers penetrating into Electrical and Building Automation projects.

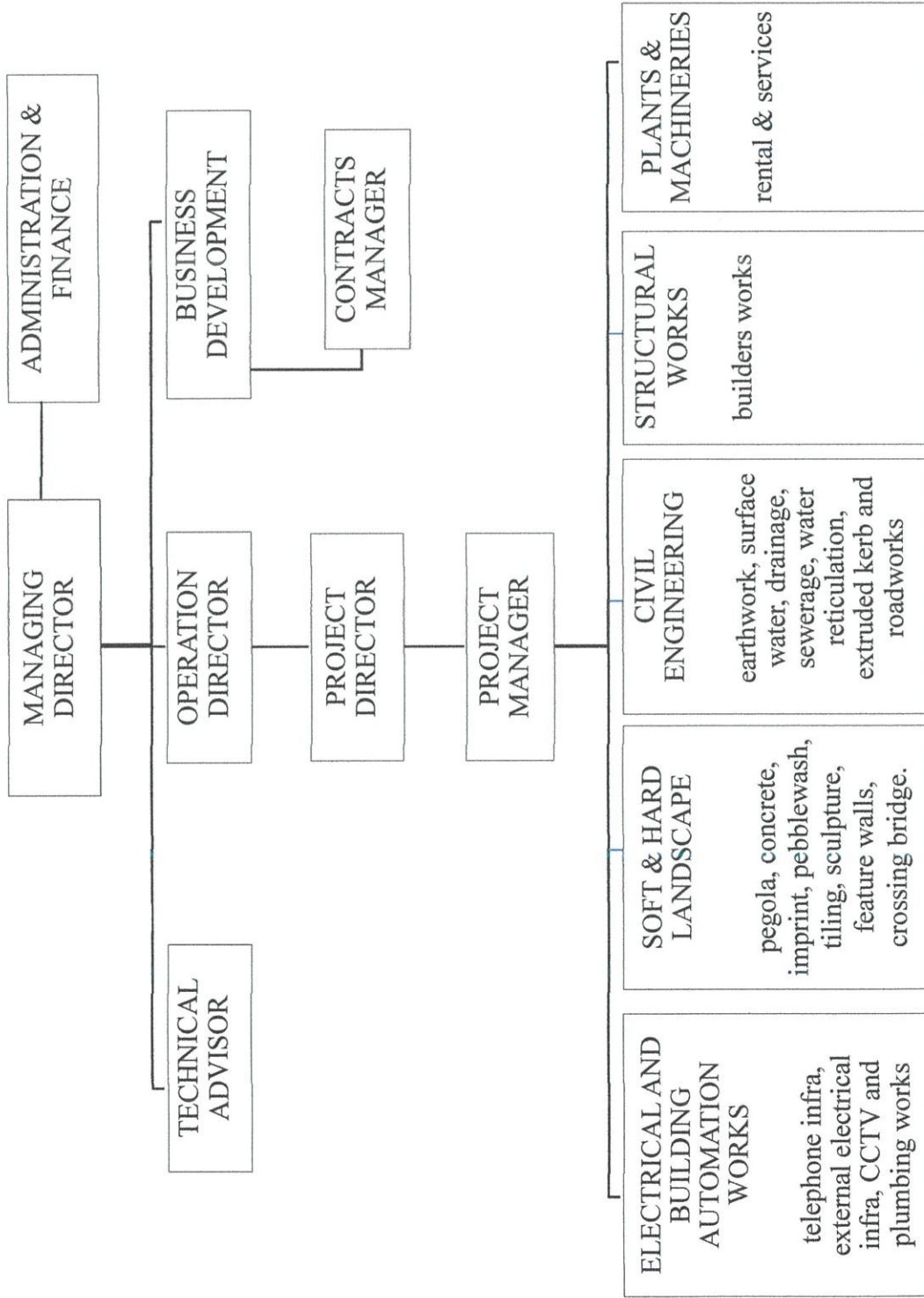
Now, Multiglow has its own team of skilled and experienced project team together with the investment on heavy machineries such as Motor Grader, excavators, backhoes, backpushers, roller compactor, Arrow Kerbmaker and 10 wheeled lorries. The excellent teamwork and the application of specialized knowledge has enabled them to meet the diverse requirement of clients.

Nowadays, Multiglow have been handling project with UEM Construction Sdn. Bhd., Ahmad Zaki Sdn. Bhd., Gamuda Engineering Berhad, Pembinaan Mitrajaya Sdn. Bhd., Mudajaya Corporation Berhad, Syarikat Ismail Ibrahim Sdn. Bhd., Rekavista Sdn. Bhd., Road Builder (M) Sdn. Bhd., Crest Builder Bhd., Hartasuma Sdn. Bhd., WCT Land Bhd., Acre Works Sdn. Bhd., MEB Construction Sdn. Bhd., Bahtera Nirwana Sdn. Bhd., Putra Perdana Construction Sdn. Bhd., Ranhill Civil Sdn. Bhd., Brunfield Construction Sdn. Bhd., Norwest Holdings Sdn. Bhd., IJM Construction Sdn. Bhd., WCT Engineering Sdn. Bhd., Dekon Sdn. Bhd., Bina Mahasil Sdn. Bhd., Dewan Perniagaan Malaysia Negeri Selangor, PKNS Infra, Setia Putrajaya Development Sdn. Bhd., Pembinaan Punca Cergas (PPC) and KUB Builders Sdn. Bhd.

2.2 Company Profile

Company Name	:	Multiglow Corporation Sdn. Bhd.
Date of Incorporation	:	8 January 1999
Place of Incorporation	:	Kuala Lumpur, Malaysia
Company Registration No	:	475211-A
Correspondence Address	:	No 18, Jalan BPP 5/3, Pusat Bandar Putra Permai, 43300 Seri Kembangan, Selangor Darul Ehsan.
Contact Number (Tel)	:	
(Fax)	:	
Banker	:	CIMB Bank Berhad, RHB Bank Berhad
Store/Plant	:	Lot No. 4676, Jalan Telok Datok, Dengkil
Authorities Registration	:	CIDB (G7) Expiry: year 2015
Paid-Up Capital	:	RM 1,500,000.00
Landscape Planner	:	Jeffrie Bin Othman
Company Secretary	:	KML Management Services, No 8-3A, Room A, Jalan Pandan 3/2, Pandan Jaya, 55100 Kuala Lumpur.
Company Accountant	:	Lesmond & Lee

2.3 Organization Chart



2.4 List of Project

2.4.1 Completed Projects

i) AHMAD ZAKI SDN. BHD.

The Construction And Completion Of Earthworks And Infra Works For Phase 1 & 2 At Kerteh Polymer Park In Lot Q, Kerteh, Terengganu For East Coast Economic Region Development Council (ECERDC).



Figure 2.1: Kerteh Polymer Park.

Source: Stephen Moore (2010).

ii) KUB BUILDERS SDN. BHD.

Cadangan Projek Pembinaan Secara 'IBS' Bagi 32 Buah Blok Tambahan & 4 Buah Blok Sekolah Baru Di Negeri Selangor, Wilayah Persekutuan, Kuala Lumpur & Negeri Sembilan.

- Subcontract untuk kerja bangunan & kerja luar untuk SMK Maxwell, SMK Taman Maluri, SMK Victoria & SMK Cheras Perdana.



Figure 2.2: Industrial Building System Projects.

Source: <http://www.kubbuilders.com/projects-school.htm>

iii) PEMBINAAN MITRAJAYA SDN. BHD.

Subcontract For Hard & Soft Landscape Works For The Proposed Construction And Completion Of Watersport Facilities, Precint 6; Hardscape Works For P3, P4, P11 And Remaining Works For P2 & P3.

iv) UEM CONSTRUCTION SDN. BHD.

Subcontract For Civil & Structural Works For The Execution & Completion Of Earthworks, Road & Drainage, External Water Reticulation, Sewerage System For Proposed Medical Park.

v) MEB CONSTRUCTION SDN. BHD.

Privatisation Of South Klang Valley Expressway – Section 2 And Section 3.

- Construction and completion of pavement, interlocking paver, fencing, gate and drainage works for weighbridge station arah barat dan timur.



Figure 2.3: SKVE Highway.

Source: <httpwww.jemerlang.comproject.phpid=19>

vi) SIERRA TEGUH SDN. BHD.

Cadangan membina dan menyiapkan sebuah sekolah kebangsaan putrajaya p.17 menggunakan industrial building system (IBS) yang mengandungi 18 bilik darjah dan kemudahan berkaitan di wilayah persekutuan putrajaya.

- Drainage works, sewerage, reticulation works, road works, interlocking and turfing.

vii) DEWAN PERNIAGAAN MELAYU MALAYSIA NEGERI SELANGOR

To supply labour, material, machinery, supervisor and all necessary tools for completion related building works including road pavement, soft & hardscape, drainage sewerage works for build secondary school with 36 classroom at section 27, Shah Alam.



Figure 2.4: Secondary school at section 27.

Source: <https://smksek27shahalam.wordpress.com>

viii) BAHTERA NIRWANA SDN. BHD.

Membina dan menyiapkan Sekolah Kebangsaan Temerloh Jaya (Projek Baru RMK8) di Temerloh, Pahang.

ix) MUDAJAYA CORPORATION SDN. BHD.

Subcontract For Earthworks Between CH 18500 To CH 21700 Proposed Design And Build Contract For The Privatisation Of Kg. Jawa To Kundang (CH 0 To CH 17600).



Figure 2.5: Kuala Lumpur – Kuala Selangor Expressway (KLSE).

Source: Bina Puri Sdn Bhd (2013).

x) DEKON SDN. BHD.

Infrastructure Works For Electrified Double Tract Project (Ipoh To Padang Besar).



Figure 2.6: Electrified Double Tract Project (Ipoh To Padang Besar).

Source: MMC Gamuda (2014).

2.4.2 Project in Progress

i) AHMAD ZAKI SDN. BHD.

Pakej V6: Construction And Completion Of Viaduct Guideway And Other Associated Works From Plaza Phoenix To Bandar Tun Hussein Onn Station.

- Subcontract: CH40 – Drainage works.

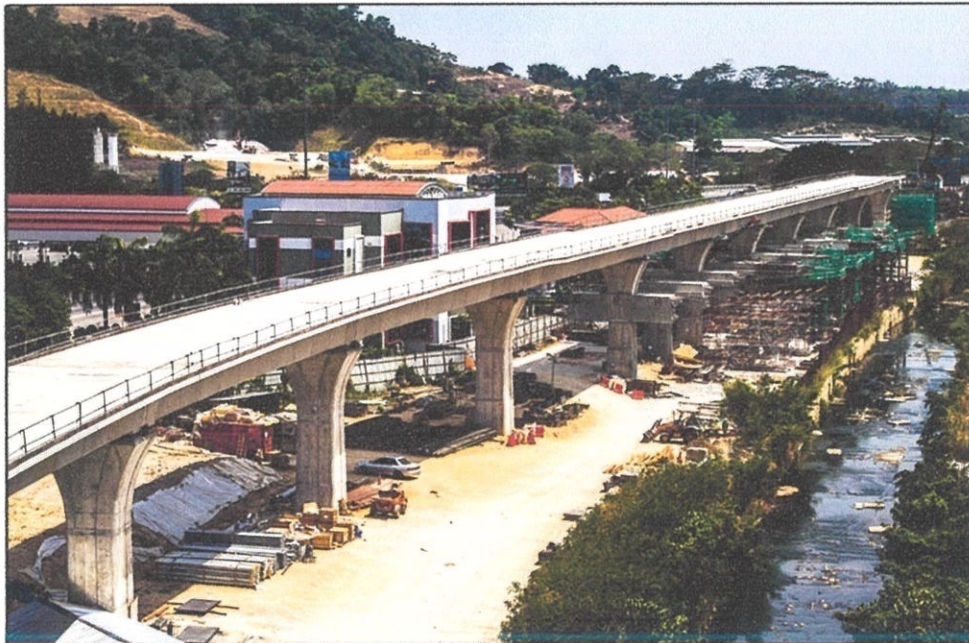


Figure 2.7: The construction of Bandar Tun Hussein Onn station in progress.

Source: MRT Corp (2014).

ii) DELIMA PURI DEVELOPMENT SDN. BHD.

Cadangan Membina, Menyiapkan, Mereka Bentuk, Menguji Terima (Commissioning) Dan Menyerah Bangunan Enam (6) Tingkat Di Atas Lot 1/17 Didalam Kawasan Teknologi Park Malaysia (TPM), Off Lebuhraya Jalan Sg. Besi Puchong, Bukit Jalil, Kuala Lumpur Untuk Tetuan Delima Puri Development Sdn Bhd.

iii) SEIE ENGINEERING SDN. BHD.

Cadangan Membina Dan Menyiapkan Sebuah Hospital Rembau (76 Katil) Fasa 2 Dan Kerja-Kerja Berkaitan Diatas Sebahagian Lot 738, Pekan Chembong, Rembau, Negeri Sembilan Untuk Kementerian Kesihatan Malaysia Dan Jkr Malaysia.

iv) GASING MERIDIAN SDN. BHD.

Cadangan Membina 1 Unit Rumah Banglo 2 Tingkat Beserta 2 Tingkat Aras Bawah Tanah Dan 1 Unit Kolam Renang Di Atas Lot 37249, Jalan Gasing Piring, Mukim Kuala Lumpur, Wilayah Persekutuan, Kuala Lumpur Untuk Tetuan Gasing Meridian Sdn Bhd.



Photo 2.1: The concreting is in progress on ground floor level.

v) SECM SDN. BHD.

Cadangan Pembangunan 4 Blok Perdagangan (20 Hingga 21 Tingkat) Sebuah Blok Annexe 2 Tingkat Dan 7 Tingkat Tempat Letak Kereta Bawah Tanah Di Mukim Sungai Buloh, Daerah Petaling, Selangor Untuk Tetuan Tujuan Gemilang Sdn Bhd (Pj Trade Centre).

- Subcontract for internal and external electrical work.

vi) SECM SDN. BHD.

Proposed Commercial, Retail And Hotel Re-Development On Lot 252 & 253 Located At Seksyen 43, Jalan Tun Razak, Kuala Lumpur (Empire Tower).

- Subcontract for electrical works.

vii) CAPITAL NETWORK SDN. BHD.

Cadangan Membina 3 Blok Pangsapuri Kos Sederhana Di Atas Tapak C Yang Mengandungi Sebahagian Lot 1119 Dan Sebahagian Tanah Kerajaan Selayang Pandang Mukim Batu, Daerah Gombak, Majlis Perbandaran Selayang, Selangor Untuk Tetuan Muafakat Kekal Sdn Bhd (Magnaville).

- Subcontract for external electrical and telephone works.

viii) SECM SDN. BHD.

Cadangan Merekabentuk Dan Menyiapkan Kolej Sains Kesihatan Bersekutu Ulu Kinta, Perak.

- Subcontract for electrical & telephone services.

CHAPTER 3.0

CASE STUDY

3.1 Introduction of Project



Photo 3.1: Bukit Gasing.

The projects that author do as case study is located at Kuala Lumpur. This area is own by Gasing Meridian Sdn. Bhd. and also client for this project. This area has 68 unit of house. The area per house and position per house is different from each other. Each unit of house have their own design. It is depends on the client requirements. Besides, every unit of house have different contractor, architect consultant, civil and structure engineer consultant and mechanical and electrical consultant. It is because the client of every unit of house is different.

Currently, there only have 1 unit of house in progress to build. That is on Lot 37249, Jalan Gasing Piring, Mukim Kuala Lumpur. That is located near the main entrance of this area. The main road to enter this area has been done by the owner of this place which is Gasing Meridian Sdn. Bhd. Entrance. This is 4 storey bungalow house projects that have a total area 1459 per meter square. This house has 2 storeys above ground and 2 storey underground. This project also includes 1 unit of swimming pool that have area 7.5m x 5.73m.

This project has started since 2014. The duration given for build this house is only 24 month. The actual date of this project is on 12 October 2014 and the target date to be finished was on 2 October 2016. The main contractor for Lot 37249 is reward to Multiglow Corporation Sdn. Bhd. This means all responsibilities under them. They have responsibility to build and design this house. The entire consultant is under main contractor. The consultants include architect, civil and structure engineer and mechanical and electrical engineer.

This is a project over the hill. That's why there have a lot of works to do during earthwork. They need to excavate the soil to build 2 storey underground. Soil investigation also need do properly to avoid landslide and settle. Usually, they only use a foundation to build house but in this project because of some reason they use piling. Piling has their owned advantage which is can strengthen the soil. The type of piling has been chose by geometic from civil and structure consultant.

Right now, this project already construct until Ground Floor Level. It is about 45% of construction. There are 55% more to finish the construction work. The remaining work of this project is including construction of structure on 1st Floor Level, Roof Level and also finishing work. The scope of finishing work is installation of door, window and tile in the house.

3.2 Concrete

Concrete is known as a composite material composed of coarse granular material embedded in a hard matrix of material that fills the space between the aggregate particles and glues them together. Concrete also can consider as a composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregates (Construction material, n.d). Coarse granular material is the aggregate or filler while the hard matrix of material is the cement or binder.

Concrete is form by mixing cement, aggregates, water and admixture. Cement is a powder and when mixed with water it forms a paste. That paste acts like a glue or bond to stick the aggregate together. There are several types of cement such as portland cement, high early strength cement, low heat cement and sulphate resisting cement. Each types of cement have their own advantages and different properties of concrete. The common type of cement that usually use in construction is portland cement.

Aggregate is one of material to form concrete. There are 2 type of aggregates which is coarse aggregate and fine aggregate. Coarse aggregates is refer to crushed rock, gravel or screenings while fine aggregates is refer to fine sands, course sands and crusher fines. Graded of coarse aggregate should range in size, so they can fit together well. Besides, the selected sand must from concreting sand not bricks sand or plasterer sand. This is because bricks sand or plasterers sand are not suitable for concreting.

Water is also one more important material to form a concrete. The water used must be clean, fresh and free from unwanted chemical. This is because the water can give the affect to concrete. Sea water is one example of water that cannot be used in concrete. It is because the sea water contains salt and cause the steel reinforcement in concrete to rust quickly.

The admixtures are also often used in concrete if required. The admixtures are added to concrete during mixing concrete. The admixtures are mix with concrete to change or alter properties of concrete. There are various types of admixture and each of them has a different function to concrete. The examples of admixture are air-entraining agents, water reducer and superplasticizers. Air entraining agents is functioning to improve the workability and cohesion of concrete. Water reducer is functioning to increases the dispersion of cement particles while superplasticizers is functioning to reduce the water cement ratio of concrete.

Concrete has 3 different states which is plastic state, setting state and hardening state. First state is plastic state. It is called plastic when the concrete is like bread dough. The meaning of that is the concrete is soft and can be worked or moulded into different shapes. Usually the concrete is plastic during placing and compaction. Second state is setting state. It is called setting when the concrete no longer soft. The setting state takes place when the concrete begins to stiffen. Last state is hardening state. Hardening state take place after the concrete begins to gain strength and harden.

There are grade in concrete. The grade of concrete that be used must suitable with their application on building. Each grade has a different ratio and strength. The ratio is consists of 3 material which is cement, sand and aggregates. There are some of the grades that can mix on site and some of them cannot mix on site. The grades can be mixed on site such as grade 5, 10, 15, 25 and 30. More than grade 30 cannot be mix on site. Usually concrete grade 15 or less than that is use as lean concrete. Then, concrete grade 30 and less is use to reinforcement structure, while concrete grade 35 and above is use as a precast structure. This is the table of grade and its ratio of concrete.

Table 1: Grade and ratio of concrete

Grade	Ratio (Cement: Sand: Aggregates)
5	1:5:10
10	1:3:6
15	1:2:4
25	1:1:2
30	1:1:1

Source: Supplified (2015).

3.2.1 Properties of Concrete

Properties of concrete are refer to concrete characteristics and basic qualities of concrete. This can determine either the concrete can be used or cannot be used. There are three main properties of concrete such as workability, cohesiveness and stability and strength and durability.

i) Workability

Workability is a general term to describe properties of concrete. Its means the ease with which the concrete can be transported, placed and consolidated without excessive bleeding and segregation.

There are a few factors that have affect workability of concrete such as water content, type of aggregates and temperature. Water content in the concrete has balance with other material. The water cannot too much and cannot too little in concrete. The excessive water makes the concrete easier to placing. This mean the workability of concrete is increase but it has decrease the strength of concrete. The concrete with

too little water is hard to placing. This mean the workability of concrete is decrease but the strength is increase.

Aggregate also can affect the workability of concrete. Aggregate have many size and shape. The most suitable size of aggregate to achieve good workability is a maximum size of aggregate. There are several shape of aggregate such as rounded aggregate, irregular aggregate, angular aggregate and flaky and elongated aggregate. Among the shape the workability of concrete can be increased by using the rounded aggregate. Besides, the workability of concrete also can be affected by temperature. The hot weather or higher temperature makes the concrete hardened quickly. This condition has decreased the workability of concrete.

There is a way to find out either the concrete has a good or poor workability. The good workability of concrete is the concrete can be formed, compacted and finished to its final shape and texture with a minimal effort and also does not have segregation of ingredient. Otherwise, the poor workability of concrete is the concrete does not flow smoothly into forms and does not envelope the steel reinforcement bar properly. The poor workability of concrete also has a difficulty to compact and finish.

There are a few tests can be carried out to find out the workability of concrete. The test such as slump test, compaction factor test and vebe test.

Slump Test

Slump test is a common test and usually use to find out the workability of concrete. The slump test is the simplest test compared to other test because it is indicates the behaviour of a compacted concrete cone

under the action of gravitational forces. This test can be carried out anywhere either at batching plant or on site. There are 4 different kind of possible slump exist. It is true slump, zero slump, shear slump and collapsed slump.

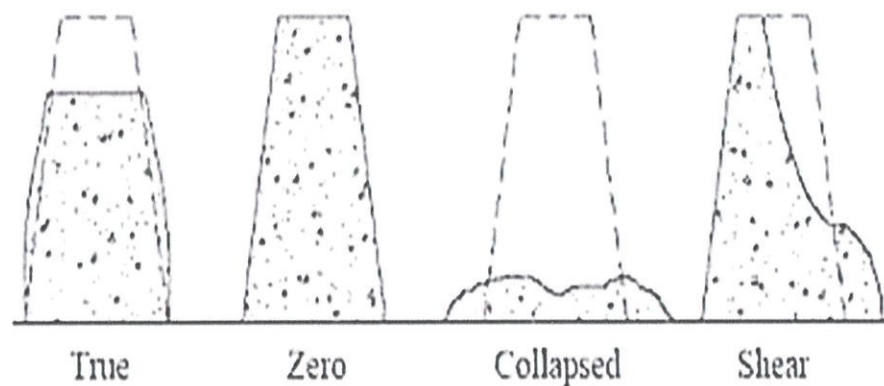


Figure 3.1: Result of slump.

Source: Online Civil Engineering (n.d.).

Collapsed slump means the concrete is collapse completely. It is because the concrete contain excessive water. The excessive water has come from wet coarse and fine aggregates. Meanwhile, shear slump means that the concrete slips sideways. It is because of there are errors while doing the slump test. Therefore, the slump test has to be repeated for the second times if the shear slump keep occurs. The concrete has to be rejected if the collapsed slump is keep occurred and shear slump still occur for the second times.

Zero slump means that the concrete is stiff. That result is occurring if the water in concrete is not enough. It is also occur when the concrete loss the water due to hot weather. The only acceptable slump is true slump. True slump means that the concrete is not too dry and not too wet. The proportion of the material use is correct. There are slump measurements in true slump. Every measurements of slump have their own strength and their uses.

Table 2: Workability of slump.

Degree of workability	Slump		Use for which concrete is suitable
	mm	inch	
Very low	0 – 25	0 – 1	Very dry mixes: used in road making. Roads vibrated by power operated machines.
Low	25 – 50	1 – 2	Low workability mixes: used for foundations with light reinforcement. Roads vibrated by hand operated machines.
Medium	50 – 100	2 – 4	Medium workability mixes: manually compacted flat slabs using crushed aggregates. Normal reinforced concrete manually compacted and heavily reinforced sections with vibrations.
High	100 – 175	4 – 7	High workability concrete: for sections with congested reinforcement. Not normally suitable for vibration.

Source: Civil Engineer Dictionary (n.d).

Compaction Factor Test

Compaction factor test is appropriate for the concrete that use a maximum aggregates size of 40mm. This test usually has been done at the laboratory. The disadvantage of compaction test is this test not suitable for field application. It is also because this test is not consistent and the mixes can stick to the side of the hoppers.

This test is carried out by using main apparatus which is compacting factor apparatus. The other apparatus also is needed such as trowels to fill the concrete in upper hopper, graduated cylinder, balance, tamping rod and iron buckets. All the apparatus is important to achieve the result that needed.



Figure 3.2: Compact factor apparatus.

Source: Aimil Ltd Instrumentation & Technologies (n.d).

In this test, the weight of empty cylinder is measure first. After that, fill in the top hopper with a sample of concrete. The gate is opened after the top hopper was filled with the sample of concrete to allow the concrete fall into the bottom hopper. Then, the gate of bottom hopper is opened to fill the cylinder. Next, the weight of cylinder that fills with the concrete (partially compacted) is measured and the cylinder is empty. After that, fill again the cylinder with the same concrete and compact it by using tamping rod. Then, measure the weight of cylinder that fills with compacted concrete (fully compacted).

Calculation for the compactor test:-

$$\text{Compaction factor (\%)} = \frac{\text{weight of partially compact concrete } (w_1 - w_0)}{\text{weight of fully compact concrete } (w_2 - w_0)}$$

Weight of empty cylinder = w_0

Weight of partially compacted concrete = w_1

Weight of fully compacted concrete = w_2

The results of compaction factor test determine the workability and consistency of concrete. The result of compaction test show that the higher compaction factor test, the higher workability of concrete (Kumar,2013). There are 4 types consistency of concrete can be determined in the test. The consistency consists of stiff, plastic, flowing and self-compacting. All of different concrete consistency has a different strength. The concrete also have different usage.

Table 3: Compaction factor test result.

Concrete Consistency	Compacting Factor (Ac)%	Uses & Recommended Of Compaction
Stiff	75 – 80	Dams – retaining walls (vibration)
Plastic	80 – 90	All mass structures (hand compaction)
Flowing	90 – 95	Slabs – reinforcement structures (vibration)
Self compacting	> 95	Thick steel renif structures (no compaction)

Source: Concrete Basic (n.d).

Vebe Test

Vebe time is defined as the time taken to complete covering of the underside of the disc with concrete container. Vebe test is same as slump test that measures the consistency only. However, it is more meaningful for mixtures of concrete with a low consistency. This test is most suitable test to determining the differences in consistency of very dry mixes. This test can be carrying out if the size of aggregates that use in concrete is less than 40mm.

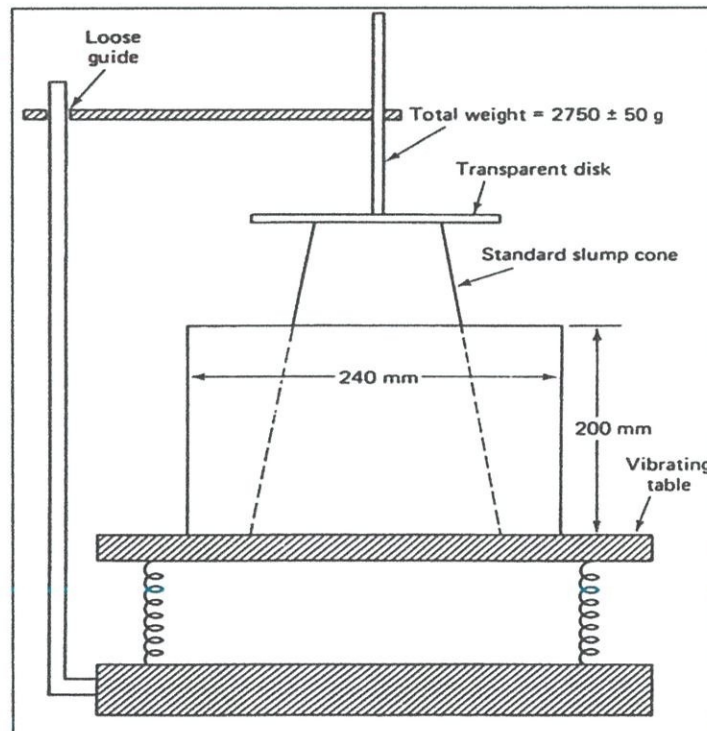


Figure 3.3: Vebe Consistometer.

The result of vebe test determined the workability of concrete. The workability of concrete is depends on the time taken to remould the concrete from the conical to the cylindrical shape until the disk is completely covered with concrete. The result of vebe test shows that the higher time taken to vibrate the concrete, the lower workability of concrete.

Table 4: Vebe time.

Workability Description	Vebe Time (seconds)
Extremely dry	32 – 18
Very stiff	18 – 10
Stiff	10 – 5
Stiff plastic	5 – 3
Plastic	3 – 0
Flowing	–

ii) Cohesiveness and stability

Cohesiveness is how well concrete can hold together when plastic while stability is a condition in which the aggregate particles are held in homogeneous dispersion. The cohesiveness and stability of concrete depends on the grading of aggregate and the water content. Graded aggregates mean a range of aggregate sizes from large rocks to small sands. Well-graded aggregates can give a more cohesive mix in concrete, while too much coarse aggregate causes a bony mix in concrete.

The cohesiveness and stability of concrete is affected by segregation and bleeding characteristics. Segregation is defined as the mixture's instability caused by a weak matrix that cannot hold individual aggregate particles in homogeneous dispersion (Gambhir, 2013). There are 3 types of segregation in concrete. One of them is coarse aggregate separating out or settling down from the rest of the matrix. It is also called segregation when the paste is separating from coarse aggregate. Other than that, water separating out from the rest of the material is also called as segregation.

Bleeding is defined as a layer of water accumulates on surface of concrete. After that, the evaporation of water appeared around the concrete and the water reabsorbed into the concrete. Bleeding also can refer as water gain. The excessive bleeding always appears on thin members of structure such as roof, slab, road slab and also when the concrete is placed in a sunny day.

The appearance of segregation and bleeding in concrete causes concrete weaker. Besides, it is also decrease the durability of concrete and the segregation leave a poor surface of concrete. The cause of this problem in concrete is because of inappropriate placing and compacting method. Furthermore, it is also because of poorly graded aggregate. The aggregate that used is not suitable with the mix of concrete.

The segregation and bleeding in concrete cannot be measured by any test. It is adequate to examine it by visual observation and inspection of cores of hardened concrete. However, this problem can be reduced and control by paying attention to mix proportioning and also to the method of handling and placement. Besides that, the problem also can be reduced by increasing the sand content and add the air entrain in concrete that act as substitute for fine materials.

iii) Strength and Durability

Strength and durability are one of the main properties of concrete. The strength and durability of concrete are affected by the density of the concrete. Denser concrete is more watertight. The concrete durability is increases together with the concrete strength. Concrete must be well-made because it is very important to protect the steel in reinforced concrete. Well-made concrete is a naturally strong and durable material. The characteristic of well-made concrete is the concrete can dense.

Besides, the concrete is reasonably watertight. The concrete also able to changes in temperature as well as wear and tear from weathering.

There are many factors that have been affected the strength and durability of concrete. The factor such as curing, weather and the water cement ratio. Curing is keeping the concrete damp for a period. It is to allow the concrete to reach maximum strength. The longer curing give more durability of concrete. Then, the concrete can receive higher early strength if there is a warmer weather. The water cement ratio also affects the strength and durability of concrete. The too much water and not enough cement make the concrete weaker and less durable.

However, the strength and durability of concrete can be determined by performing a cube test. Cube test is specified as a control measure in the majority of specifications and considerable research has been carried out to establish the value of the test and the relationship between the specimen and the concrete in the structure (Richardson, 2003).

The cube has been testing to determine the strength of concrete. Then, it followed by performing a compression test. The compression test is carried out when the cube achieve age 7, 14 and 28 days. Usually, the cube is testing on age 7 and 28 days only. The cube is cured during the days. The concrete cube normally cured under water at a mini mum of 20 ± 2 °C (Cobb, 2008).

The result of cube test is depends on the load during the compression test. The concrete have a very good strength if the load is increase according the days. The different grades of concrete have a different specification.

Table 5: Cube strength specification.

Grade	Load – N/mm ²			
	3 days (50%)	7 days (70%)	14 days (85%)	28 days (100%)
30	335 – 15.0	470 – 21.0	570 – 25.5	670 – 30.0
35	390 – 17.5	550 – 24.5	670 – 30.0	785 – 35.0
40	450 – 20.0	625 – 28.0	760 – 34.0	895 – 40.0
45	505 – 22.5	705 – 31.5	865 – 38.5	1010 – 45.0
50	560 – 25.0	785 – 35.0	955 – 42.5	1120 – 50.0
55	615 – 27.5	865 – 38.5	1055 – 47.0	1235 – 55.0
60	670 – 30.0	940 – 42.0	1145 – 51.0	1345 – 60.0
65	730 – 32.5	1020 – 45.5	1245 – 55.5	1460 – 65.0
70	785 – 35.0	1100 – 49.0	1335 – 59.5	1570 – 70.0
75	840 – 37.5	1180 – 52.5	1435 – 64.0	1685 – 75.0
80	895 – 40.0	1255 – 56.0	1525 – 68.0	1795 – 80.0

Source: Hanson Heidelberg Cement (n.d).

3.3 Method Statement

The projects that author choose as case study is located at Bukit Gasing. They have been carried out a slump test to find out the workability of concrete and cube test to find out the strength and durability of concrete. The slump test and cube test has been done on site during concreting the structures for lower ground 1. The slump test and cube test have been done by the technician from the concrete's company which is Hanson. The authors able to see in real how the slump test and cube test have been carried out. The concrete that use as a sample to do the slump test and cube test have been taking from the concrete to cast the structure at lower ground 1.

This concrete has been mix at the batching plant and then being transported to the site. This concrete can be called a ready-mix concrete. This lower ground 1 level has use $75m^3$ of concrete for their suspended slab. The $30m^3$ of the concrete is a waterproofing concrete while the other concrete is a normal mix. The waterproofing concrete is use at a swimming pool area to avoid leaking problem. The grade of concrete that has been use is grade 30 which has a ratio of the cement, sand and aggregates is 1:1:1.

The slump test and cube test must be carried out every time concreting work is proceeding. It is very important because it may affect the building.

Method Statement of Slump Test

1. Setting and clean the apparatus of slump test.
2. Put the base plate on the smooth surface.



Photo 3.2: The base plate is put on the smooth surface.

3. Place the frustum cone on the plate where the large opening at the bottom while the small opening at top.



Photo 3.3: Frustum is place on the base plate.

4. Fill in the frustum cone is with concrete in 3 layers.



Photo 3.4: The frustum is fill with concrete.

5. Each layer of concrete is temped 25 times with the steel rod.



Photo 3.5: The concrete is temped for 25 times.

6. After the cone is completely filled with concrete, struck off the top surface of cone by using scrapper.



Photo 3.6: The top surface of frustum is struck off with the scrapper.

7. Then, lifted the cone in vertically slowly and carefully to get the result.



Photo 3.7: The frustum is pull out slowly.

8. The decrease in the height of the concrete is called slump.

9. Placing the reverse cone beside the slump and the scrapper over the cone.



Photo 3.8: The frustum and scrapper is placed beside the concrete.

10. Then, measure the height of slump by using measuring tape.



Photo 3.9: The slump of concretes is measured.

11. Record the result.

Method Statement of Cube Test

1. Setting up the apparatus by using bolt and nut to attached the mould and base plate.
2. Clean the mould and base plate.
3. Applied the mould and base plate with oil to prevent concrete from sticking to the side of the cube.



Photo 3.10: The oil is put on the mould and base plate.

4. The cube is fill with a three layer of concrete.



Photo 3.11: The mould is fill with concrete.

5. Compact every layer of concrete for 25 times by using the steel rod.



Photo 3.12: The concrete is compact for 25 times.

6. The upper surface of cube is struck off to produce a smoothen surface.



Photo 3.13: Struck off and smoothen the upper surface of mould.

7. Label the cube and cover the upper surface of cube with a plastic.



Photo 3.14: Labelling the cube.

8. Dismantle the cube after 24 hours from the cube is done.



Photo 3.15: The cube is dismantled from mould.

9. Submerge the concrete cube in water for curing.



Photo 3.16: The cube is cured in water.

10. After that, carried out the compression test at age 7 and 28 days by using compression machine.

3.4 Defects in Concrete

i) Colour Variation



Photo 3.17: Colour Variation.

Colour variation is a surface of concrete that has a difference in colour. The colour may appear as patches of light and dark. This defect of concrete is happen because of uneven and variable of curing condition. The curing time at least must be done in 3 days or 7 days. It is also happen because of different brand or type of cement is applied on the surface of concrete as a drier.

This defect can be prevented by using an even concrete mix when placing and compacting. Besides, the defect also can be prevented by keep the concrete evenly moist without using drier. However, this occurrence may keep appear on site because the people cannot control everything in one time. So that, people can applying the coat on the surface of concrete to hide the variation if this defect appears.

ii) Dusting



Photo 3.18: Dusting.

Dusting is also one of the defects that can occur in concrete. Dusting is a fine powder on the concrete surface which comes off on the fingers. The causes of this type of defects is because of the finishing is done before the bleed water has dried and also the finishing is done during the rain. It is also happen because of the concrete is not curing properly.

However, this defect can be prevented by protecting the concrete from drying out too quickly either in hot or windy weather. In that case, the wet plastic is used to prevent the concrete drying out too quickly. Besides, the dusting also can be prevented by let any bleed water dry up before trowelling. Another way to prevent it from happen is by remove the water in cold conditions. The water can be removed if the curing process is done correctly.

iii) Efflorescence



Photo 3.19: Efflorescence.

Efflorescence is a one more defect that happen in concrete. Efflorescence is a white crystalline deposited that sometimes has found on the surface of concrete soon after it is finished. This defects is appear on the surface of concrete because of the mineral salts are dissolved in water. The deposits of water evaporates salt has left on the surface if the water with dissolved mineral salts collects on the concrete surface. Besides, efflorescence also appear because of excessive bleeding on concrete.

This defect can be prevented. The way is make sure the water used in concrete clean from impurities and salt-free water. However, this efflorescence defects may keep appear unexpectedly even if the prevention has been taken. So that, dry brushing is used to repai it. Then, wash it with the clean water. The wire brush is not allowed to clean the efflorescence. After that, wash the area with the dilute solution of hydrochloric acid.

iv) Honeycombing



Photo 3.20: Honeycombing.

Honeycombing is another defect that has happen in concrete. Honeycombing means that there are too much of coarse aggregate appear on the surface of concrete. The cause of this honeycomb is because of the poor compaction during concreting. It is usually happen in a structure of column. Column has more than 2 meter high, so that the robin engine cannot reach the bottom and it's allow the honeycomb appeared in the surface.

Other than that, honeycomb also appear because of the paste leakage from forms. The poor characteristic of cement and water has been used to form the paste. This defect can be repaired by rendering if it appears on the surface only. Otherwise, if honeycomb appears throughout the concrete it must be removed, replaced and the surface require rendering. Rendering means cover the surface with a layer of mortar.

CHAPTER 4.0

CONCLUSION

Concrete can consider as a composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregates. The concrete is form by mixing the cement, sand and aggregates. The ratio of the cement, sand and aggregates represent the grade of concrete. Each grade has their owned strength to the different type of building. This project has been use concrete grade 30. The ratio of this grade is $1m^3$ cement, $1m^3$ sand and $2m^3$ aggregates.

Every concrete has been test by the technician plant of concrete. The tests that have been carrying out determine the properties of concrete such as workability, cohesiveness, strength and durability. This project has been carrying out the slump test to know the workability of concrete. The cube test also has been carried out to know the strength of concrete. The slump test and cube test has been done on site. The result of this slump test is 70mm. This means that the concrete is passed and can be used to concrete.

Concrete is place in a correct way to avoid the defects that occur after the concrete hardened. The examples of the defect that can be found such as colour variation, dusting, efflorescence and honeycombing. All this defect can be avoid occurring by their own method. For example, the honeycomb can be avoided by compact all the area by using robin engine. Sometimes, this thing occurs too even if the method to avoid it has been taken. Therefore, the concrete have to be repair. The area that have honeycomb defect have to be cleaning first before can plastering it.

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