DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

ROAD AND DRAINAGE INSTALLATION

Prepared by:

NUR QAJWA QASHIRA BINTI SHAMSHUL KAMAL

2019429698

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

FEBRUARY 2022

It is recommended that the report of this practical training provided

by

Nur Qajwa Qashira Binti Shamshul Kamal

2019429698

entitled

Road and Drainage Installation

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

		_____
Report Supervisor	:	Prof. Madya Ts Dr Siti Akhtar Mahayuddin
		_____
Practical Training Coordinator	:	Dr. Nor Asma Hafizah Binti Hadzaman
		_____
Programme Coordinator	:	Ts Dr. Dzulkarnaen Bin Ismail.

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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 Lim Chuan Hock & Sons Sdn Bhd for a duration of 20 weeks starting from 23 August 2021 and ended on 7 January 2022. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

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Name : Nur Qajwa Qashira binti Shamshul Kamal

UiTM ID No : 2019429698

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ACKNOWLEDGEMENT

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

I'd want to offer my sincere gratitude for all of your help, advice, and guidance throughout the course. It's an honour to be a part of Lim Chuan Hock & Sons Sdn Bhd, a terrific company, for a delightful 20 weeks of internship. This event would not have been possible without significant human contributions. As a result, I feel quite fortunate to have been invited to participate. First and foremost, I'd want to express my sincere gratitude to Puan Hartini binti Saffea for allowing me to complete my training at his distinguished firm. Participating in important decisions and providing essential counsel and valuable guidance, both conceptually and practically, were extremely beneficial to my research. It's an honour for me to be able to 'work' with everyone of you. She also took time out of his busy schedule to listen, guide, and keep me on track, allowing me to finish my task at their famous organisation and continue my training. It is with great pleasure that I offer my heartfelt gratitude to the team pros, Puan Hartini Saffea and her teams, for engaging in useful decisions and providing crucial counsel and valuable guidance, both conceptually and practically, which were tremendously beneficial to my study.

Second, I'd like to thank all of the instructors at UiTM who have taught and mentored me during my studies. It's always a pleasure to express my gratitude to the amazing people at the UiTM for their candid suggestions on how to improve my practical abilities. Prof. Madya Ts Dr. Siti Akhtar Binti Mahayuddin, Supervising Lecturer, Ts Sr Dr Ida Nianti binti Mohd Zin, Evalution Lecturer, Dr. Nor Asma Hafizah Binti Hadzaman, Practical Training Coordinator, and Dr Dzulkarnaean Bin Ismail, Programme Coordinator have all contributed time, effort, encouragement, and ideas to the successful completion of my training, this report, and the valuable knowledge that has been shared.

I would also want to thank the other members who were willing to share their information. They gave me a lot of new ideas about the task. Also thank you to my family who tried their best to support me either by giving me infinite enthusiasm to continue this assignment or by financial support to be used to pay for all the costs required throughout this practical training.

ABSTRACT

From cities, towns, and even rural areas, road systems are the most important facility to allow the community to pass and move either using transport or on foot. Therefore, the larger the area, the more and length of roads required. The drainage system is an essential facility to enable wastewater and rainwater to move to a treatment plant. Hence, more building means more drains need to be built. Therefore, this report will confer about the construction of road and drainage. This report is based on a site in Setia Experience Center (Setia Fontaines), Jalan Seksyen 3 Putera Bertam, 13200 Kepala Batas, Penang. The main objective of this report is to ascertain the method statement of road and drain construction, defects from roads and drainage and the problems and solutions throughout this project. It will focus on how the whole process was done and the importance of road and drainage systems to developing countries. This report will also look at the construction management and observations during construction work.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

The term "road system" refers to the elements of a public or private road network that are now in place or are being planned (Law Insider, 2012). Within the transportation service area, a road system refers to any existing or projected public roadways, whether state, county, or city including freeway interchanges with county roads or city streets and the ramps for those interchanges but excluding freeway mainline.

All areas, there will definitely be roads. it can be said that roads are very important. The use of roads to the community moves from one place to another using their own vehicles. If there is a defect on the road, the vehicle will be damaged and there may be a road accident.

Drainage is the process of draining water from the surface or sub-surface of a specific area. All the pipe on a private or public property that transports sewage, rainwater, and other liquid waste to a place of disposal is referred to as a drainage system. To maintain healthy conditions, the drainage system gathers and eliminates waste stuff in a systematic manner. Drainage systems are intended to dispose of wastewater as fast as feasible and to keep sewage and septic tank gases out of residential areas (School od Pe, 2017).

Our community's capacity is not growing, resulting in a shift in water usage and development scale in one area. As a result, a smooth flow of water to avoid many complications, a working drainage system is essential. A plugged drain, for example, would prevent water from flowing freely, resulting in flooding and pollution. In other words, the drainage system's quality must be protected from the start of its construction.

There are four types of drainage systems: surface drainage, and sub-surface drainage, downspout and gutter system, and slope drainage system. All are equally important as they share the same functionality. Location, material, and shape are the differences between

them. Drainage is found on the ground surface, sub-surface drains are found beneath the ground, downspout and gutter systems are found on the building's roof, and slope drainage systems are mostly found on hillsides.

However, this report will focus on road and drainage. Therefore, this research’s aim is to evaluate the causes of defects in Malaysian road and drainage and this chapter contains the objectives which are to identify the causes, types and solutions for defects.

1.2 Objectives

This internship report aims to achieve some objectives. The objectives are as stated below:

1. To investigate the process of constructing the roads and drainage.
2. To identify the causes of roads and drainage defects.
3. To discover the problems and solutions in the construction of road and drainage.

1.3 Scope of Study

This case study was conducted at Setia Experience Centre as figure 1.1 shows the location of Bandar Setia Fontaines, Kepala Batas. The main objective or scope for this case study is to identify defects occur and explain how rectification process for this completed project.

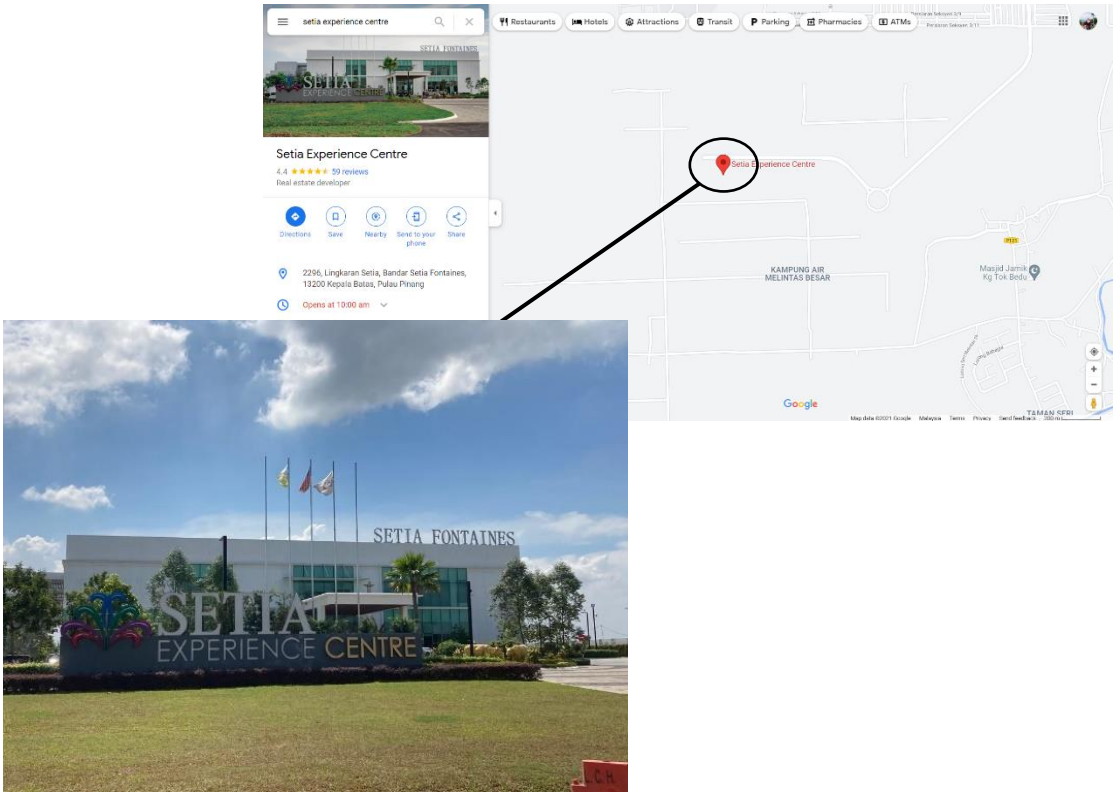


Figure 1.1: Site Location

1.4 Method of Study

There are several data collection methods used to achieve the objectives of this report:

i. **Interviews**

Interview sessions with several people who in charge on the site. Those people are the project manager, supervisor, main contractor, sub-contractor, skilled worker, unskilled worker and others.

ii. **Internets**

Research on the internet was made to increase knowledge or information about this report topic. For example, explore google website and YouTube that is related to rectifying works such as how to rectify hollow tiles, tiles polish and more.

iii. **Observations**

The observation was made during the practical training period. it has been observed how skilled and unskilled workers do the rectification works and how project manager deals with defects issue and how to settle it.

iv. **Document Reviews**

This method collects systematic data from existing records available from the company, such as construction drawings, company profiles, work programs, and photos from workers. Most of the confidential information about both the company and project is used to be of benefit to this report.

CHAPTER 2

COMPANY BACKGROUND

2.1 Introduction of Company

Lim Chuan Hock & Sons Sdn Bhd is a construction company incorporated on 15 Feb 1990 (Figure 2.1). This company also registered with CIDB Malaysia and recognised with Grade 7 CE21 in Construction Manager. The scope of work in this company encircles road and drainage works, earthworks, explosive and blasting, structural works, retaining wall, slope treatment or stabilisation and supply of building material.

Furthermore, all processes and activities are carried out in accordance with documentation. All of the staff and sub-contractors are trained in the relevant aspects of the quality management system. This company prioritized the diligency and quality of work produce by the proficient staffs. Furthermore, the team consists of a group of talented and experience people to ensure the consistency of our output.

The Executive Director of Lim Chuan Hock & Sons Sdn. Bhd. is Mr.Lim Kok Huat, followed by Director which is Mr. Albert Lim Kok Heng and fellow project manager which are Mr. Lim Jia Jian, Mr. Goay Chee Wei and Mrs. Pung Bee Chen.

Figure 2.1: Lim Chuan Hock & Sons Sdn Bhd Office

2.2 Company Profile

The profile of this company has been summarised as in table 2.1 below.

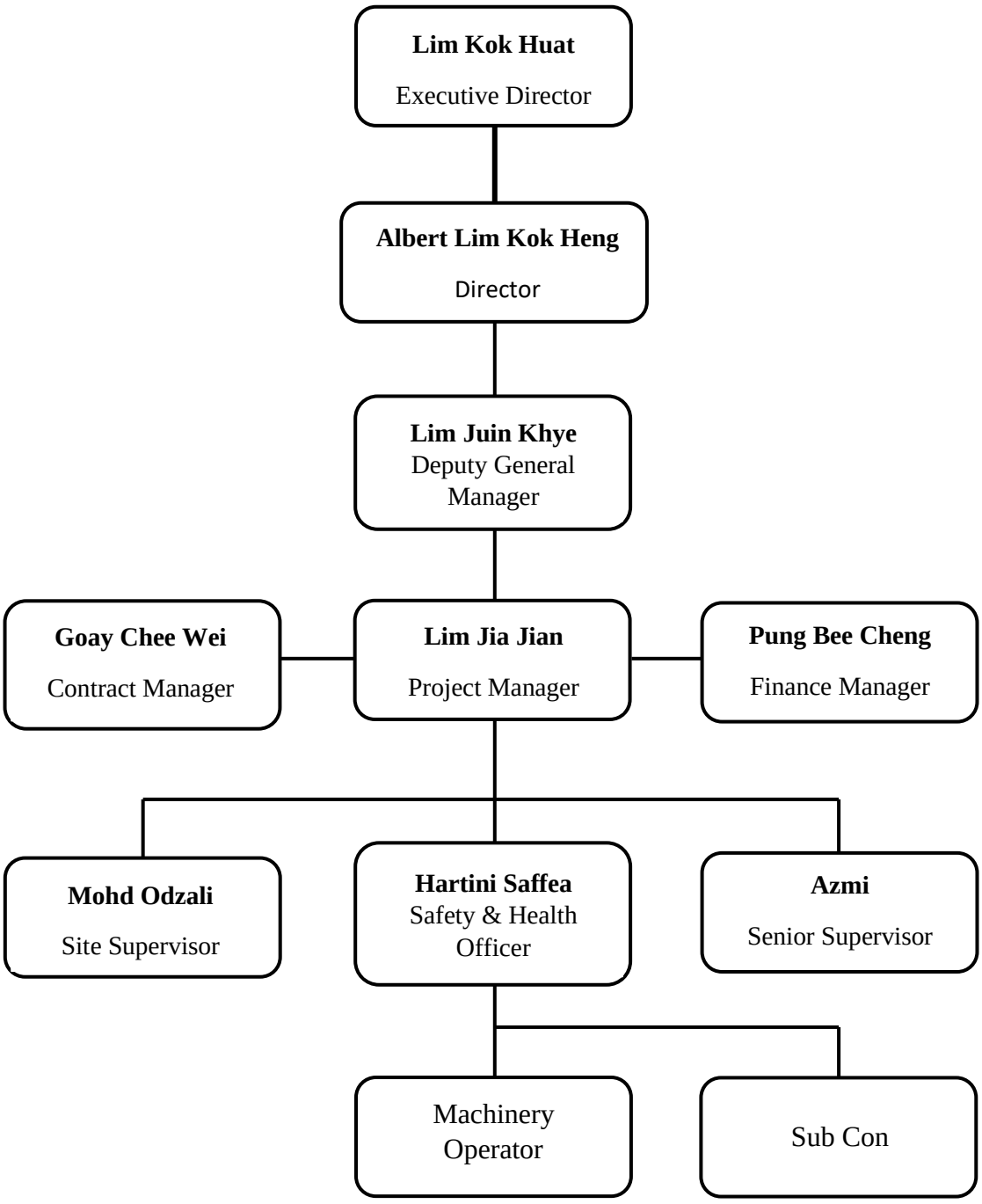
Table 2.1: Company Profile

Company Name	Lim Chuan Hock & Sons Sdn Bhd
Business Address	No.10, Lebuh Rambai 11, Paya Terubong, 11060 George Town, Pulau Pinang
Telephone Number	04-828 8996
Email	lch-group@lch.com.my
Company Registration No	193524-P
Date of Registration	15th FEBRUARY 1990
Banker	Public Islamic Bank
Bank account number	3801315810
Authorized capital	RM 5,000,000.00
Paid-up capital	RM 2,500,000.00
Company Logo	

2.3 Company Organisation Chart

This company headed by Mr. Lim Kok Huat as Executive Director and the whole organization chart of this company as in figure 2.2 below.

Figure 2.2: Lim Chuan Hock & Sons Sdn Bhd Organisation Chart



2.4 List of Projects

2.4.1 Completed Projects

For the past 5 years, the completed project of this company within the last 5 years (2016-2021) listed in the Table 2.2, Table 2.3, Table 2.4, Table 2.5, Table 2.6 and Table 2.7

Table 2.2: Completed Projects in 2016

No.	Project Title	Project Value	Nature of Work	Client
1.	(SPICE – RECTIFICATION WORKS FOR PART OF JALAN TUN DR. AWANG & SETIA WELCOME CENTRE ENTRANCE) PROPOSED RECTIFICATION WORKS TO JALAN TUN DR. AWAMG AND SETIA WELCOME CENTRE ENTRANCE FOR CONSTRUCTION AND COMPLETION OF SPICE AT LOT 569, 11543 & 7481, MUKIM 12, JALAN TUN DR. AWANG, DAERAH BARAT DAYA, PENANG.	RM711,473.00	DRAINAGE RECTIFICATION WORKS	ECO MERDIAN SDN BHD
2.	EARTHWORK, ROCK BLASTING AND ANCILLARY WORKS ("THE WORKS") FOR PROPOSED EXTENSION TO EXISTING MANUFACTURING FACILITY AT CAMPUS 1 COMPRISING OF 6 NEW 6 STOREYS PRODUCTION & CARPARK B9 BUILDING, NEW 4 STOREY OFFICE AND SPINE BUILDING, NEW 2 STOREY CAFETERIA B5 BUILDING AND NEW 8 STOREY WITH SUB-BASEMENT B8 OFFICE BUILDING ON LOT 2357, 5779, 6054, 8753, 8754, 9887 & H.S. (D): 22930, LEBUH SUNGAI TIRAM 1, MUKIM 12, S.W.D. PHASE 2, F.I.Z., BAYAN LEPAS PULAU PINANG.	RM10,000,000.00	EARTHWORK, ROCK BIASTING, ANCILLARY WORKS	B. BRAUN MEDICAL INDUSTRIES SDN BHD

3.	ROAD & DRAINAGE WORKS CADANGAN MEMBINA (1) BLOK RUMAH PANGSA KOS RENDAH 28 TINGKAT MENGANDUNGI 24 TINGKAT RUMAH PANGSA KOS RENDAH (690 UNIT), 4 TINGKAT PODIUM YANG TERDIRI DARIPADA 3 TINGKAT TEMPAT LETAK KENDERAAN DI PARAS 1 HINGGA 3, 1 UNIT KEDAI DAN TAPAK PENJAJA D PARAS 1, KAWASAN LAPANG ATAS BUMBUNG PODIUM DI PARAS 4 DI ATAS LOT 616, 617, 929, 20030 & 20031, JALAN KAMPUNG BUKIT, MK. 11, BAYAN LEPAS, DBD., PULAU PINANG UNTUK TETUAN DIAMAWARD (M) SDN. BHD.	RM960,000.00	ROAD & DRAINAGE WORKS	DIAMAWARD (M) SDN BHD
4.	PROPOSED ROADS & DRAINAGE WORKS FOR PROPOSED PLOT 7 DEVELOPMENT ON LOT 690, 5784, 1348 DAN 1046, MK12, D.B.D., JALAN PERMATANG DAMAR LAUT, BATU MAUNG, PULAU PINANG.	RM6,603,773.60	ROAD & DRAINAGE WORKS, ANCILLARY WORKS, ELECTRIC & MECHANIC WORKS	VIENNA VIEW SDN BHD
5.	PROPOSED EARTHWORKS TO MIX DEVELOPMENT ON PT 2509 & PT 2511 (LOT ASAL 9324 & 9325), MUKIM 13, DAERAH TIMUR LAUT, PULAU PINANG FOR MESSRS. ECO TERRACES DEVELOPMENT SDN. BHD.	RM17,187,013.70	EARTHWORKS	ECO TERRACES DEVELOPMENT SDN BHD

Table 2.3: Completed Projects in 2017

No.	Project Title	Project Value	Nature of Work	Client
1.	CADANGAN JALAN DAN PARIT BAGI: - CADANGAN 2 BLOK KONDOMINIUM 33 TINGKAT (202 UNIT) DAN 1 TINGKAT KEMUDAHAN MASYARAKAT SERTA 5 TINGKAT PODIUM MENGANDUNGI KEDAI/PEJABAT (23 UNIT) DAN TEMPAT LETAK KENDERAAN DI ATASLOT-LOT 1599, 1602, 1603 & 435 SEKSYEN 2, BANDAR TANJUNG TOKONG, PUPAU PINANG.	RM 1,017,664.30	ROAD & DRAINAGE WORKS	IVORY ASSOCIATES SDN. BHD.
2.	ROCK STRUCTURE WORKS PHASE 2A3 " RECLAMATION FOR SERI TANJUNG PINANG(PHASE II) DEVELOPMENT (STP2) PENANG.	RM 3,500,000.00	ROCK STRUCTURE WORKS	TROPICAL ENERGY SDN. BHD
3.	PROPOSED TREE CUTTING WORKS FOR PERMOHONAN KEBENARAN MERANCANGUNTUK CADANGAN MENDIRIKAN: PELOT A A) 2 BLOK SOHO 31 TINGKAT (MENARA 1 - 489 UNIT MENARA B - 489 UNIT) DI ATASPELOT B A) 1 BLOK PUSAT MEMBELI BELAH DAN TEMPAT LETAK KERETA 5 TINGKAT DAN 4PELOT C A) 1 BLOK HOTEL 14 TINGKAT (336 BILIK) DI ATAS PODIUM 5 TINGKAT YANG MENGANDUNGI KEMUDAHAN RUANG KOMERSIAL DAN TEMPAT LETAK KERETABASEMEN 2 TINGKAT DI ATAS LOT 4470, LOT 7007 DAN 6363, MUKIM 1, JALAN BARU, SEBERANG PERAITENGAH, PULAU PINANG.	RM 559,734.00	TREE CUTTING & TEMPORARY WORK	SPECTACULAR ACRES S/B
4.	PROPOSED EARTHWORKS AND ANCILLARY WORKS TO: - SITE A - PROPOSED 48 UNITS SEMI-DETACHED HOUSES AND 3 UNITS BUNGALOWHOUSES, ON LOT 11212, 11227 & 12282, MUKIM 12, S.W.D., PENANG.	RM 8,087,586.18	EARTHWORKS & ANCILLARY WORKS	PALMEX INDUSTRIES SDN BHD

	SITE B - PROPOSED 107 UNITS STRATA TITLE TERRACE HOUSES AND TOWN HOUSES ON LOT 11214, 14338 & 14339, JALAN KENARI, MUKIM 12, S.W.D., PENANG.			
5.	PROPOSED ROAD UPGRADING WORKS TO PLOT 18 & 19, TECHNOPLEN, MEDAN BAYAN LEPAS, TAMAN PERINDUSTRIAN BAYAN LEPAS, PHASE IV, BAYAN LEPAS PENANG.	RM 460,000.00	ROAD & DRAINAGE WORKS	PENTAMASTER TECHNOLOGY (M) SDN.BHD.
6.	PROJEK CADANGAN PEMBINAAN LOJI RAWATAN AIR POKOK SENA BERKAPASITI30MLD, MUKIM JABI, POKOK SENA, KEDAH DARUL AMAN.	RM 468,726.50	ROCK EXCAVATION AND BLASTINGINCLUDING CRUSHING WORKS	HP BINA JAYA SDN BHD
7.	PROPOSED 2 BLOCKS OF 33 & 34 LEVELS CONDOMINIUM (270 UNITS) & 1 BLOCKS OF 6 LEVEL CARPARK PODIUM AT LOT 48, 3563, 3627 & 4166, MKM 18, PERSIARANLEMBAH PERMAI, DAERAH TIMUR LAUT, PULAU PINANG.	RM 244,131.50	ROAD WIDENING & RESURFACINGWORKS	NILAI ARIF SDN BHD
8.	PROPOSED DEVELOPMENT ON LOT 3618, MUKIM 18, D.T.L., JALAN MOUNT ERSKINE,PENANG.	RM 30,210.00	SLOPE TREATMENT & STABILIZATION	VST BUILDER SDN BHD
9.	PROJECT: EARTHWORKS & ANCILLARY WORKS FOR PROPOSED 1 BLOCKS OF 33 LEVEL CONDOMINIUM (132 UNIT), 1 BLOCK OF 34 LEVEL CONDOMINIUM (138 UNIT) & 1 BLOCK OF 6 LEVEL CARPARK PODIUM ON LOT 48, 3563, 3627 & 4166, MUKIM 18,D.T.L., PERSIARAN LEMBAH PERMAI, DAERAH TIMUR LAUT, PULAU PINANG FOR TENTUAN NILAI ARIF SDN. BHD. (C/O: HUNZA PROPERTIES (NORTH) SDN. BHD.	RM 10,850,000.00	ANCILLARY WORKS	HUNZA PROPERTIES (NORTH) SDN.BHD.

10.	(SETIA SKY VILLE - EARTHWORKS, TEMPORARY WORKS AND RETAINING WALL) EARTHWORKS, TEMPORARY WORKS AND RETAINING WALL WORKS TO PROPOSED RESIDENTIAL DEVELOPMENT ON LOT 2706, 2708 & 2158, SEKSYEN 2, BANDAR JELUTONG, DAERAH TIMUR LAUT, PULAU PINANG.	RM1,434,373.90	EARTHWORKS & RETAINING WALL	KAY PRIDE SDN BHD
11.	MIXED DEVELOPMENT ON LOT 634 & LOT 635, CHANGKAT SUNGAI ARA, D.B.D.,PULAU PINANG.	RM 169,416.80	ROADWORKS	SETIA GREEN & SETIA PINNACLE
12.	ROAD RESURFACING WORKS IN KULIM INDUSTRIAL ESTATE, JALAN PERMATANGPAUH, BUTTERWORTH, PENANG.	RM 80,242.00	ROADWORKS	ETECCO SYSTEMS & SERVICES SDNBHD
13.	CADANGAN UNTUK (1) MEMBAIKPULIH 3 UNIT RUMAH KEDAI SEDIA ADA 2 TINGKAT NO.191,193,197 & 199 (FASA 1) (2) MENDIRIKAN 1 BLOK BANGUNAN PEJABAT 23 TINGKAT (FASA 2) YANG TERDIRI DARIPADA (A) LOBI & RUANG M&E DI PARAS 1,2 & 14 (B) RUANG PEJABAT DI PARAS 3-13, 15-23 (C) TEMPAT LETAK KERETA & MOTOSIKAL MEKANIKAL 'TOWER' DI ATAS LOT 5, JALAN MAGAZINE, SEK.11W, BANDAR GEORGE TOWN, D.T.L., PULAU PINANG UNTUK TETUAN M. SUMMIT GLOBALSDN BHD.	RM 218,371.33	UPGRADING WORKS, ROAD& DRAINAGE WORKS	M SUMMIT GLOBAL SDN BHD

Table 2.4: Completed Projects in 2018

No.	Project Title	Project Value	Nature of Work	Client
1.	ROAD WIDENING, TRAFFIC AND STREET LIGHTING WORKS AT JALAN TELUK KUMBAR, PULAU PINANG (ROAD WORK, INFRASTRUCTURE AND ANCILIARY WORKS.	RM 2,411,247.90	ROAD & DRAINAGE WORKS	LIK TIN CENTURY SDN BHD
2.	CADANGAN MENDIRIKAN SATU BLOK KONDOMINIUM 18 TINGKAT (JENIS HAK MILIK STRATA), 13 TINGKAT KONDOMINIUM (148 UNIT), 1 TINGKAT ROOF GARDEN DI TINGKAT 18, 4 TINGKAT PODIUM TEMPAT LETAK KERETA (TERMASUK PENCAWANG TNB & PEJABAT PENGURUSAN), 1 UNIT DEWAN ORANG RAMAI & TADIKA 1 TINGKAT (DENGAN KOLAM RENANG), 1 UNIT PONDOK PENGAWAL, 1 UNIT DEPO SAMPAH DI ATAS LOT 55 & LOT 56, BANDAR PRAI, PERSIARAN SEMBILANG SEBERANG PRAI TENGAH, PULAU PINANG.	RM 578,238.26	ROAD & DRAINAGE WORKS	HP BINA JAYA SDN BHD
3.	CADANGAN PEMBANGUNAN YANG TERDIRI DARIPADA: A) BLOK A: RUMAH PANGSA MAMAPU MILIK KOS SEDERHANA 39-TINGKAT YANG TERDIRI DARIPADA: i)LOT LOT KEDAI (5 UNIT) DI PARAS 1 ii)RUMAH PANGSA MAMPU MILIK KOS SEDERHANA (258 UNIT) DI PARAS 2-38 iii)KEMUDAHAN MASYARAKAT DI PARAS 39 B) BLOK B: RUMAH PANGSA MAMPU MILIK KOS SEDERHANA 36-TINGKAT YANG TERDIRI DARIPADA: i)LOT LOT KEDAI (10 UNIT) DAN M&E DI PARAS 1 ii)TEMPAT LETAK KENDERAAN DI PARAS 1-11 iii)RUMAH PANGSA MAMPU MILIK KOS SEDERHANA (501 UNIT) DI PARAS 2-35 DENGAN KEMUDAHAN REKREASI DI PARAS 12&36.	RM 1,128,000.00	ROAD & DRAINAGE WORKS	M SUMMIT COPRORATIONSDN BHD

	C)BLOK C: RUMAH PANGSA KOS SEDERHANA RENDAH DAN RUMAH PANGSA KOS RENDAH 17-TINGKAT YANG TERDIRI DARIPADA: i)LOT LOT KEDAI (10 UNIT), DAN M&E DI PARAS 2 ii)TEMPAT LETAK KENDERAAN DI PARAS 1-5 iii)RUMAH PANGSA KOS SEDERHANA RENDAH (135 UNIT) DAN KOS RENDAH (135 UNIT) DI PARAS 2-17 DENGAN KEMUDAHAN REKREASI DI PARAS 2,6 & 17 D)LOJI KUMBAHAN NAJIS E) KOMPLEKS PENJAJA F) KIRAAN KAWASAN LAPANG DI ATAS TANAH KERAJAAN LOT 987, MUKIM 9, TELUK KUMBAR, D.B.D., PULAU PINANG. DI ATAS LOT-LOT 953, 968, 975 DAN 977, MUKIM 9, BUKIT GEMURUH, TELUK KUMBAR, DAERAH BARAT DAYA, PULAU PINANG. UNTUK TETUAN M SUMMIT CORPORATION SDN BHD.			
4.	SUPPLY AND DELIVERY OF ROCK FOR LAND RECLAMATION AT BAYAN BAY, D.B.D., PENANG.	RM 1,252,000.00	SUPPLY ARMOUR ROCKS	SEE SONG & SONS SDN BHD
5.	CADANGAN SKIM PERUMAHAN KOMUNITI BERPAGAR DAN BERPENGAWAL TERDIRI DARIPADA: i.1 UNIT RUMAH SESEBUAH 2 TINGKAT ii.80 UNIT RUMAH TERES KLASTER 3 TINGKAT iii.1 UNIT DEWAN KOMUNITI 1 TINGKAT DI ATAS LOT 302, MUKIM 3, D.B.D., JALAN SUNGAI RUSA, PULAU PINANG. UNTUK TETUAN BSK CONCEPT HOME SDN BHD.	RM 1,384,279.50	ROAD & DRAINAGE WORKS	BSK CONCEPT HOME SDN BHD

6.	PROPOSED UPGRADING WORKSTO STREETSCAPE OF MAJLIS BANDARAYA PULAU PINANG (MBPP) ON GAT LEBUH CHINA, GEORGE TOWN WORLD HERRITAGE SITE, PULAU PINANG FOR GEORGE TOWN CONSERVATION AND DEVELOPMENT CORPORATION SDN. BHD.	RM 2,965,330.00	UPGRADING WORKS	GEORGETOWN CONSERVATION ANDDEVELOPMENT CORPORATION SDN BHD
7.	PROPOSED SWIMMING POOL DECK, ROCK REVETMENT, SCUBA SHED AND SLOPE STABILIZING WORKS BEHIND DART ROOM AT PENANG SWIMMING CLUB, TANJUNG BUNGAH, PENANG.	RM 1,089,955.67	SWIMMING POOL DECK, ROCK REVETMENT, SCUBA SHED & SLOPESTABILIZING WORKS	PENANG SWIMMING CLUB
8.	PROPOSED DEVELOPMENT (SUNWAY MEDICAL CENTRE PHASE 1) ON LOT 5781,5782,5783 AND 5784, MUKIM 1, S.P.T, PULAU PINANG FOR ALLIANCE PARADE SDN BHD. SUNWAY MEDICAL CENTRE SEBERANG JAYA SMCSJ-PHASE 1 -SMCJ PHS1.	RM 727,399.00	ROAD UPGRADING WORKS	SUNWAY CONSTRUCTION SDN BHD

Table 2.5: Completed Projects in 2019

No.	Project Title	Project Value	Nature of Work	Client
1.	CADANGAN PEMBANGUNAN DI ATAS LOT-LOT 1385, 2102, 3223, 3224 & 7629, JALAN PAYA TERUBONG, MUKIM 13, DAERAH TIMUR LAUT, PULAU PINANG. (ROAD & DRAINAGE UPGRADING WORKS ALONG JALAN PAYA TERUBONG – PART 1: FROM SG DONDANG UNTIL TEMPLE (IN FRONT OF GOLDHILL COMPLEX).	RM 1,330,000.00	ROAD & DRAINAGE UPGRADING WORKS	SUNWAY CITY (PENANG) SDN BHD
2.	CADANGAN MEMBINA 1 BLOK BANGUNAN GALERI JUALAN & PEJABAT SEMENTARA SATU TINGKAT 3 TAHUN DI ATAS SEBAHAGIAN LOT 6029, JALAN TUN DR. AWANG, MUKIM 12, DAERAH BARAT DAYA, PULAU PINANG.	RM 1,260,000.00	ROAD & DRAINAGE UPGRADING WORKS	HUNZA (PENANG INTERNATIONAL COMMERCIAL CITY) SDN BHD
3.	UPGRADING MONSOON DRAIN BEHIND ISLAND PLAZA, TAJUNG TOKONG, PENANG.	RM 109,000	UPGRADING WORKS	IVORY VIEW SDN BHD
4.	EARTHWORKS & ANCILLARY WORKS FOR PROPOSED MIXED DEVELOPMENT ON LOTS 1022 & 1885, JALAN JURU, MUKIM 12, DAERAH SEBERANG PERAI TENGAH, PULAU PINANH+G FOR HUNZA-LAND CORPORATION SDB BHD, HUNZA REAL ESTATE (JURU) SDN BHD. (FORMALLTY KNOWN AS EUROANCHOR SDN BHD). HUNZA REALITY (JURU) SDN BHD. (FORMALLY KNOWN AS SKYMEADOW SDN BHD). HUNZA HOSPITALITY SDN BHD. (FORMALLY KNOWN AS ECOTHEME SDN BHD).	RM 11,300,000.00	EARTHWORKS & ANCILLARY WORKS	HUNZA-LAND CORPORATION SDN BHD

Table 2.6: Completed Projects in 2020

No.	Project Title	Project Value	Nature of Work	Client
1.	KERJA KONTRAK MILL & PAVE DI JALAN BUKIT TAMBUN.	RM 51,627.89	MILL & PAVE	JATI TINGGI SDN BHD
2.	KERJA KONTRAK MILL & PAVE DI PENANG SCIENCE PARK.	RM 122,835.86	MILL & PAVE	JATI TINGGI SDN BHD
3.	PROPOSED ROAD AND DRAINAGE SYSTEM FOR PROPOSED HOUSING DEVELOPMENT CONSISTS OF: PACKAGE 1-424 INITS OF 2-STORY TERRACES AND PACKAGE 2-280 UNITS 2-STORY TERRACES ON LOT 21145, MUKIM 13, BANDAR CASSIA, BATU KAWAN DAERAH SEBERANG PERAI SELATAN, PULAU PINANG.	RM 6,298,879.30	ROAD & DRAINAGE	ECO HORIZON SDN BHD
4.	PROPOSED EXTERNAL ROAD AND HARDSTANDING WORKS (PACKAGE 1) ON LOT 21145, MUKIM 13, BANDAR CASSIA, BATU KAWAN DAERAH SEBERANG PERAI SELATAN, PULAU PINANG.	RM 4,419,582.00	ROAD AND HARDSTANDING WORKS	ECO HORIZON SDN BHD
5.	EARTHWORKS, FOUNDATION WORKS & SOIL NAILING FOR CADANGAN MENDIRIKAN 1 UNIT RUMAH SEBUAH 3 TINGKAT DENGAN KOLAN RENANG DI ATAS LOT 4465 (PECAHAN LOT) BANDAR TANJONG TOKONG, DAERAH TIMUR LAUT, PULAU PINANG.	RM 642,287.20	SLOPE STABILISATION & SOIL STRENGTHENING WORKS	DR. LESLIE BUCKLEY

Table 2.7: Completed Projects in 2021

No.	Project Title	Project Value	Nature of Work	Client
1.	INFRASTRUCTURE WORKS FOR PARCEL 1 FOR THE PROPOSED DEVELOPMENT DI ATAS LOT 28,SEBAHAGIAN LOT 403 DAN SEBAHAGIAN LOT 728, JALAN BATU GANTUNG, SEKSYEN 2 GEORGETOWN, DAERAH TIMUR LAUT, PULAU PINANG.	RM 26,992,355.90	REMAINING WORKS	BERJAYA LAND DEVELOPMENTSDN BHD
2.	PROPOSED DRAIN DIVERSION WORK ON LOT 1385, 2102, 3223, 3224 & 7629, JALAN PAYATERUBONG, MUKIM 13, DAERAH TIMUR LAUT, PULAU PINANG.	RM 1,095,680.00	DRAIN DIVERSION	SUNWAY CITY (PENANG) SDNBHD
3.	CADANGAN MENJALANKAN KERJA PENSTABILAN DAN PEMULIHAN CERUN UNTUK JANGKA MASAPANJANG BAGI LOT 1730 & 1731, SEKSYEN 1, BANDAR TANJUNG TOKONG, DAERAH TIMUR LAUT, PULAU PINANG.	RM 229,687.00	SLOPE STABILIZATION WORKS	SIEWSUI SDN BHD

To summarise, Lim Chuan Hock & Sons Sdn Bhd completed 38 projects from the past 5 year (2016-2021).

2.4.2 Project in Progress

Currently, this company has five more projects which the latest project is expected to be completed in the year 2022. The details of the project in progress are summarised as in Table 2.8 below.

Table 2.8: Project in Progress

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	ROAD AND DRAINAGE WORKS FOR PROPOSED 58 STOREY APARTMENTS WITH 1 LOWER GROUND LEVEL (PHASE 1A) COMPRISING OF: (i) 1 LOWER GROUND LEVEL CARPARK (ii) 10 LEVEL OF CARPARK (iii) 1 LEVEL OF COMMUNITY FACILITIES (iv) BLOCK A: 41 STOREY APARTMENTS (394 UNITS) (L12-L52) WITH COMMUNITY FACILITIES (v) BLOCK B: 47 STOREY APARTMENTS (452 UNITS) (L12-L58) WITH COMMUNITY FACILITES ON LOT 6026, 6027, 8070, PT6716 AND PART OF LOT 6031, JALAN TUN DR. AWANG, MUKIM 12, DAERAH BARAT DAYA, PULAU PINANG FOR HUNZA (PENANG INTERNATIONAL COMMERCIAL CITY) SDN BHD	RM3,330,000.00	2 NOVEMBER 2020	30 APRIL 2022	2020-2022	HUNZA (PENANG INTERNATIONAL COMMERCIAL CITY) SDN BHD
2.	PLOT A: PROPOSED 11 STOREY RETAIL MALL & CONVENTION CENTRE WITH 2 STOREY BASEMENT AT PT208 & PT213, SEKSYEN 8, BANDAR GEORGETOWN, DAERAH TIMUR LAUT, PULAU PINANG.	RM18,984,680.50	15 JANUARY 2021	30 APRIL 2022	2021-2022	SEE SONG & SONS SDB BHD
3.	PROPOSED CONTRUCTION & COMPLETION OF ROAD AND DRAINAGE WORKS AT MAIN					

	ACCESS (ZONE 2 & 4) ON PARTS OF LOTS 1557,1826,1829,2547 & 2466, MUKIM 6, DAERAH SEBERANG PRAI UTARA, PULAU PINANG.	RM20,897,533.40	25 JANUARY 2021	25 JANUARY 2022	2021-2022	SETIA FONTAINES SDN BHD
4.	CADANGAN MENDIRIKAN 1 BLOK SEKILAH 3 TINGKAT DI ATAS LOT 343 & LOT 105, MUKIM G, DAERAH BARAT DAYA, JALAN SUNGAI NIPAH, PULAU PINANG.	RM 209,271.30	FOLLOW MAIN CONTRACTOR SCHEDULE	-	-	PALMVIEW CONSTRUCTION SDN BHD
5.	EARTHWORKS FOR PROPOSED 17 UNITS SINGLE STOREY SHOPLOT ON PART OF LOT 4835, LEBUH SUNGAI KELIAN, BANDAR TANJUNG BUNGAH, D.T.L., PULAU PINANG.	RM 1,200,000.00	20 OCTOBER 2021	19 JANUARY 2022	2021-2022	PENANG REALTY SDN BHD

CHAPTER 3.0

ROAD AND DRAINAGE INSTALLATION

3.1 Introduction to Road and Drainage

Figure 3.1: Setia Fontaines

Figure 3.2: Site Plan

All construction projects that are newly completed will have their defects. Construction defects are generally defined as defects in design, workmanship, and in materials or systems used in a project that result in failure of parts of a structure and cause damage to humans or property. When this happens technically it requires us to identify the defect itself in the case of the type or cause of the defect as well as the corrective work, we need to choose to fix the defect. For the case study, the most common defects on the road were cracks, breaks and potholes. while for the drainage of drains, floods occur due to blockages and water can not flow properly.

Setia Fontaines, a 1,675-acres freehold township development by SP Setia at Bertam. Strategically located adjacent to Bandar Putra Bertam and has an estimated gross development value of RM13 billion, to be developed over the next 20 years. This project consists of 2 zones which is Zone 2.1 and Zone 4.1. Zone 2.1 as in Figure 3.2 known as Amansara South is the first residential component in Setia Fontaines master planned township development by SP Setia. It comprises 16 residential precincts, 270 acres of commercial and retail components and 100-acre of greeneries which include a 63-acre manmade lake with musical fountain and a 37-acre town park. In zone 4.1 as shown in figure 3.6, they called as NusaCinta. NusaCinta is the second residential component to be launched Setia Fontaines master-planned township development by SP Setia. NusaCinta comprises a total of 294 landed residential units, offering a few types of landed houses with built-up sizes ranging from 1,332 sq. ft. up to 2,943 sq. ft.

In the case study, the explanation about the installations of road and drainage and the rectifying process begins and is completed. This process was carried out at Zone 2.1 as in figure 3.4 and 3.5 has been assigned to manage the defects.

Figure 3.4: Site Area Zone 2.1

Figure 3.5: Site Area Zone 2.1

Figure 3.6: Site Area Zone 4.1

The project was participated by some experienced companies as stated in Table 3.1 below.

Table 3.1: Construction Project

CLIENT	**SETIA FONTAINES SDN BHD** Setia Experience Centre, Lot 2457, Mukim 6, Daerah Seberang Perai Utara, 13200 Kepala Batas, Pulau Pinang.
ARCHITECT	**BYG ARCHITECTURE SDN BHD** 12-A Arratoon Road, 10050 Penang, Malaysia. Tel: 04-228 8852 Fax: 04-228 9092 http: www.byggroup.com
INFRASTRUCTURAL ENGINEER	**JURUTERA MTC SDN BHD** 4-E Lorong Delima 1, 11600 Greenlane, Pulau Pinang. Tel: 04-657 2818 Fax: 04-659 7818
MECHANICAL ELECTRICAL & PROCESS ENGINEER	**GH CONSULTANTS SDN BHD** Level 10, Unit 10(B), Wisma Boon Siew, No.1, Penang Road, 10000 Penang, Malaysia. Tel: 04-262 1800 Fax: 04-262 1801
LANSCAPE ARCHITECT	**LANDSCAPE STUDIO SDN BHD** 2F, Lorong Delima 1, Greenlane, 11600 Pulau Pinang. Tel: 04-656 8588 Fax: 04-660 2332
MAIN CONTRACTOR	**LIM CHUAN HOCK & SONS SDN BHD** No.10, Lebuh Rambai 11, Paya Terubong, 11060 George Town, Pulau Pinang. Fax: 04-828 8996
CONTRACTOR (PACKAGE 2)	**JING KIEW CONSTRUCTION SDN BHD** No.9, Lorong Perniagaan 1, Pusat Perniagaan Sungai Dua, 13800 Butterworth, Pulau Pinang. Tel: 04-356 3772 Fax: 04-356 2771

CONTRACTOR (PACKAGE 3 & 4)	**FADZILL CONSTRUCTION SDN BHD** 69d-2, Persiaran Bayan Indah, Sungai Nibong, 11900, Pulau Pinang. Tel: 04-642 7210 Fax: 04-642 7062
CONTRACTOR (CLUBHOUSE)	**MAXRAJIN SDN BHD** 14-E Arratoon Road, 10050, Pulau Pinang. Tel: 04-226 2448 Fax: 04-226 2388

In this project, the drainage is divided into two types, the roadside drain, and the main drain. The roadside drains are constructed with 4 different widths: 750mm, 900mm, 1200mm, and 1500mm. Whilst the main drains are constructed with 6 different widths: 2400mm, 2700mm, 3000mm, 3600mm, 4200mm, and 6000mm.

Road construction in SP Setia project involves approximately 6 kilometers. Part of the area uses 1 lane, 2 lanes and 3 lanes. Moreover, the whole construction was done using equipment which are sand, asphaltic concrete, crusher run, bituminous tack coat and bituminous prime coat with 5 layers of road pavement from below, sub-grade (150mm-300mm), sub-base (100mm) -300mm), Base course (100mm-300mm), binder course (50mm-100mm) and the top layer is surface course (25mm-50mm).

3.2 Method of Statement for Installation

3.2.1 Method Statement of Road

Below is the typical sequence for the construction of roads on the site:

1. Preparation and laying 100 mm granular material sub-base.
2. Laying the 200 mm crusher run on the road base.
3. Preparation and laying of 60 mm Asphaltic Concrete Binder Course.
4. The 40 mm Asphaltic Concrete Wearing Course.

i) Preparation of the Road Formation

1. Obtain relevant approved construction drawing from Consultant/Engineer
2. Set out the road chainage for certain equal interval. Offset the centerline chainage left and right side.
3. Mark the offset point with timber / steel pegging and mark the proposed level of the road on the peg.
4. If any excavate the soft material and replace with suitable materiel and compact with roller.
5. Cut the formation level and grade to the proposed level. Check the levels by referring to the offset peg.
6. Roll and compact properly and carry out field density test and CBR test on the sub-grade level as per specification.
7. Carry out joint inspection with Subcontractor on the formation level.

ii) Preparation of Road Sub-Base

1. Lay quarry dust or sands on the sub-grade level to the required thickness as specification and compact roller.
2. Carry out field test and CBR test on the sub-base as per specification.
3. Carry out joint inspection with Subcontractor on the sub-base level.

iii) Preparation of Road Base

1. Lay crusher run on the top of sub-base and compact by the roller. The thickness for any layer is according to specification as shown in figure 3.7.

Figure 3.6: Crusher run at Zone 2.1

2. Carry out field density test and CBR test on the road base as per specification if required.
3. Carry out joint inspection with Subcontractor on the road base. Use relevant form to check on the thickness before proceeding to next stage.

iv) Preparation of Premix Works

Figure 3.7: Premix works at Zone 2.1

- Binder Course
  1. Once the road base level is achieved and well completed, sweep the surface with power broom or equivalent to remove dust on the surface.
  2. Spray a layer of bitumen prime coat on the approved surface. Let the prime coat set for 12 hours as per specification requirement.
  3. Lay binder course premix on the top of the prime coat layer using paver / machine.
  4. For each layer of premix, compaction by tandem roller shall be done and follow up by tyre roller.

- Wearing Course

  Refer to work instruction of binder course above.

Road Construction Laying Procedure

1. Work shall begin on-site upon approval and acceptance of the road base.
2. The surface to be covered by the asphalt-concrete bonding process shall be free of all damage, loose materials, and standing water by sweeping.
3. Prime coat of approved bitumen emulsion shall be applied as specified on the prepared surface prior to the layout of the asphalt binder course.
4. The asphaltic concrete binder shall be plant mixed with approved bitumen content.
5. The approved asphalt concrete binder track shall be delivered to the site by tipper trucks. To prevent heat loss, the mixture is covered by a tarpaulin.
6. The asphaltic concrete binder course must be laid by a paver in a single layer.
7. Compaction shall be performed by means of the specified equivalent type of compactors. Rolling shall always begin from the bottom to the top of the carriageway. The minimum rolling temperature is 80 degrees Celsius.
8. The surface of the asphalt-concrete binder shall be finished in line and grade as required by the drawings.

3.2.2 Method Statement of Drainage

i) Method Statement of Unloading

1. Trailer from drainage supplier will arrive at site to where the drain is needed.
2. Using excavator to lifting will be standby at the unloading location to unload the box culvert or U-Drain.
3. Two workers will be on the trailer to hook the box culvert using steel wire rope while another two workers will be at the unloading area (land) standby to release the hook for box culvert.
4. When the above trailer (two worker) is ready hook the box culvert, they will give instruction to the excavator. Excavator will slowly lift the box culvert and move it to another two workers which is at the unloading area (land). Then, these two workers (land) are release the hook and excavator will go back to step 3.
5. Repeat the above steps until all the box culvert finish unloading.

ii) Installing of Drainage according to alignment

1. U-drain will be arranged in a line right beside drain alignment during unloading.
2. An excavator will dig a trench and laying crusher run for base of drainage.
3. Each side of the trench will be excavated with slope profile.
4. Crusher run will be compacted before installing of drain.
5. Two workers will be on top where the drains are to hook the U-drain using steel wire rope to another excavator meant only for hoisting and installing U-drain.
6. When everything is secure, there two workers will signal the operator to lift up the drain.
7. Excavator will proceed to lift the U-drain to where it should be installed (according to alignment).
8. Only when the excavator lowers the U-drain not more than knee height, another two workers will go near to install accordingly.
9. Upon completion of adjusting alignments and levels, there two workers will the unhook the U-drain.
10. All these steps will be repeated until completion.

Overall Method Statement

1. Setting out of drain alignment with the reference of Pre-com Plan is carried out.
2. Drainage work is commenced at the Zone 2.1 and continues with Zone 2.2 with the construction of RC Drain of 1200 mm size followed by 5000 mm size.
3. After all the RC Drain at Zone 2.1 completed, construction of concrete sump is carried out.
4. Box culvert 1200 mm x 900 mm crossing inside Zone 2.1 and Zone 2.2 can be carried out during the sump construction work.
5. The works indicated of above said from item 2 to item 4 require 2 nos of excavator, 1 no of backhoe and 2 team of drain workers.
6. The above said item 1 to item 5 will be conducted continuity.
7. The road kerb will be commenced after the drainage works completed.
8. After the road kerb completed, preparation for the side table base and road base for the road will be proceed by using excavator, backhoe, back pusher and compaction roller.
9. After that will proceed with the Zone 4.1, Zone 4.2 and Zone 4.3.
10. The sequence of item 2 until item 9 is repeated for the Zone 4.
11. In the midst of the drain construction at Zone 4, all of the box culverts be installed immediately when the precast culvert reach on site.
12. Road sign will be installed before pavement work proceeds.
13. The works of asphaltic concrete binder course will be laid.
14. However, the road finishing pavement and road hump only proceed until the binder course.
15. The wearing course will be laid after all the drainage work and road work to binder course completed.
16. The above said works from item 11 to item 15 are carried out continuity.
17. The installation of Bus Stop can commence after finish road marking.
18. As built can be proceed after wearing course laid.
19. After 7 days of the wearing course completed the road marking will be carried out.

3.3 Causes of Defect

3.3.1 Causes of road defects

Usually, road will be defective when it has been built for a long time or the road is frequently used. Defects that often occur in the road are potholes as in figure 3.8, cracks as in figure 3.9 and breaks as in figure 3.10. Moreover, although it's still under construction and the road is not open to the public, the road will often be damaged due to heavy machinery passing through by it. When making observations, the causes will be able to be known.

Asphalt cracking by far makes up for most pavement failure issues because of its tendency to spread and the wide variety of elements that can cause cracking. It is normal for an asphalt surface to crack over time due to the settling of soil and the exposure to the outdoor elements, however, there are some less usual and common cracking issues that can form from improper mix design for pavement construction.

Potholes are formed through prolonged water intrusion from existing cracks in the surface. If alligator cracks and other asphalt stress cracks are not treated, water will begin to erode the surface all the way down to the sub-base. This will cause large holes to form in the asphalt which will spread and cause damage to vehicles. Once a pothole is formed a patch can be applied to the surface, but because the sub-base has been destroyed the area will continue to become compacted.

Commonly, road are possible causes of potholes because of poor quality mixtures. Sometimes, the workers want to get the job done quickly till the mixtures do not mix properly. Next, lack of compaction allowing ingress of water. Not only water ingress, even empty spaces that are not properly deposited can cause potholes. Furthermore, mechanical damage to the road due to poor reinstatement of roads after services installations and asphalt content to low can occur potholes road.

Figure 3.8: Potholes on the road surface

Figure 3.9: Road crack

Figure 3.10: Breaks Road

3.3.2 Causes of drainage defects

In a construction area, a drain is categorised as the earliest completed object. so, Construction and civil engineering activities on site often pose a considerable risk of causing drainage network damage. Piling through pipes by contractors is a regular occurrence caused by a failure to determine the depth of a drain or examine whether there are drains flowing beneath the footprint of a planned structure or addition.

Water authority approval is required when construction within 3 meters of a public sewer or 1 meter of a public lateral drain, according to building regulations. Even if the drain is neither a public sewer nor a shared drain, failing to identify its position can result in serious problems if the drain's line intersects with the line of the structure above. Many occurrences of pipe damage are the result of site activity that disregards these factors.

Furthermore, when substantial volumes of groundwater are removed from types of rocks, such as fine-grained sediments, land subsidence occurs. The rock compacts because the water is partly responsible for holding the ground up. The rocks collapse in on themselves when the water is removed. Encrustations can form because of land movement, subsidence, and water infiltration washing away subsoils, obstructing pipe drainage.

Human activities such as the removal of subsurface water, aquifer-system compaction, drainage of organic soils, mining, hydro-compaction, natural compaction, sinkholes and thawing permafrost are all common causes of land subsidence. All of these can pose a hazard to drainage systems. However, subsidence is often the result of a damaged pipe rather than the cause. In other words, if notice signs of land subsidence, it could be the result of a leaking drain softening the ground. Worse, it could be the result of a drain that has collapsed.

3.4 Problems and Solutions

3.4.1 Road

Discovering the problems and solutions in road construction, Table 3.2 below explains in more detail for each type of defect that occurs.

Table 3.2: Problems and Solutions for Road

PROBLEM	SOLUTION
• Longitudinal (Linear) Cracking Longitudinal cracking is cracking that is parallel to the pavement's centerline or laydown direction. These can be a result of both pavement fatigue, reflective cracking, and/or poor joint construction. Joints are generally the least dense areas of pavement. 	Less severe cracks measuring 1/2 inch or less can be sealed to prevent moisture from entering into the sub grade. More severe cracks should be fixed by removing the cracked pavement layer and replacing it with an overlay.
• Traverse Crack Transverse cracks can be caused by reflective cracks from an underlying layer, daily temperature cycles, and poor construction due to improper operation of the paver. 	To prevent moisture from entering the subgrade, less serious fissures of 1/2 inch or less can be plugged. The fractured pavement layer should be removed and replaced with an overlay for more serious cracks.

• Potholes Road Potholes roads are caused by the expansion and contraction of ground water after the water has entered into the ground under the pavement. 	Full depth replacement patch.

3.4.2 Drainage

Discovering the problems and solutions in road construction, Table 3.3 below explains in more detail for each type of defect that occurs.

Table 3.3: Problems and Solutions for Drainage

PROBLEM	SOLUTION
• Pipe flaws don't always have to be caused by a specific outside (or inside) source; in many cases, normal wear and tear weakens joints and seals over time. Infiltration can produce a build-up of encrustations when a seal is no longer water-tight, which affects the efficiency of drainage flow and can eventually cause more serious difficulties.	This issue can usually be addressed quickly and easily with a lining or patch repair over the joint or defect to seal the pipework and prevent further leakage. Encrustation can be removed with either a milling or robotic cutter.
• Underground water level in the site is high	Installing sheet piles and geotextiles to provide earth retention and excavation support is the best solution for this problem. Before beginning with the drain construction, the workmen installed timber sheet piles and geotextiles.
• Natural phenomena such as earthquakes, soil compaction, glacial isostatic adjustment, erosion, sinkhole development, and adding water to fine soils deposited by wind can all induce subsidence (a natural process known as loess deposits).	The encrustation will need to be removed using a milling or robotic cutter. After they've been removed, lining or patching the joint or flaw is the best way to seal the piping and prevent further leaks.

CHAPTER 4

CONCLUSION

In short, the method that is used in a proper and correct, complicating the occurrence of roads and drains to be damaged. It is important for the people involved to monitor the entire construction process to avoid future tragedies.

Defects can occur anytime, anywhere and not only for an old installation but for the new installations too. Defects need to be rectified perfectly to avoid them from reoccurring the next time. In this report, all the methods of rectifying defects which are major problems that always be issued by the owner explained in detail.

Every problem that occurs must have a solution. If the problem is left untreated, it is likely to cause severe damage. The use of roads and drains is for the use of all, so any problems that occur need to be fixed as soon as possible.

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