UNIVERSITI TEKNOLOGI MARA

JABATAN BANGUNAN

FAKULITI SENIBINA, PERANCANGAN DAN UKUR

UINIVERSITY TECHNOLOGY MARA

PERAK

NOVEMBER 2010

Adalah disyorkan bahawa Laporan Latihan Amali ini yang disediakan

Oleh

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2008213502

Bertajuk

SOIL INVESTIGATION

Diterima sebagai memenuhi sebahagian dari syarat untuk memperolehi Diploma Bangunan

Penyelia Laporan	Mohd Najib Abd Rashid
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PERAKUAN PEALAJAR

Adalah dengan ini, hasil kerja penulisan Laporan Latihan Praktical ini telah dihasilkan sepenuhnya oleh saya kecuali seperti ruang dinyatakan melalui latihan praktikal yang telah saya lalui selama 6 bulan mulai 17-05-2010 hingga 16-11-2010 di Perunding Abadi Sdn Bhd. Ianya juga sebagai satu syarat lulus kursus BLD 299 dan diterima sebagai memenuhi sebahagian dari syarat untuk memperolehi Diploma Bangunan.

Nama ZULHELMY BIN ZA'ABA
No KP UiTM : 2008213502
Tarikh : 16 NOVEMBER 2010

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

SOIL INVESTIGATION

READY BY:
ZULHELMY BIN ZA'ABA
2008213502

PREFACE

Alhamdulillah, I am very grateful to Allah S.W.T for his divine grace and with His permission that I can complete this practical report. I will also like to make a higher appreciate and thank to everyone that is involved in making my practical report. Many thank to Encik Johari the one that is supervise me and spent some of his time helping me, Encik Zahrull and also Encik Mohd Radzi and also to all of the Perunding Abadi staff. Apart from that I would to thank to Encik Mohd Najib Abd Rashid as student's supervisor and also to Encik Haiqal Bin Mohd Ramli as practical training coordinator and visitor lecture, but not least, I would like also thank the entire Building Department lecturer. Also not to forget I also would like to thank to my parent, the consultant, main contractor, sub contractor and my entire classmate for their support and always been there for me. Only Allah can repay for the time and energy that they has been sacrifice to teach and helping to complete this report.

ABSTRACT

Soil investigation is the first work that needs to be performed by the contractor. This is because the result will be effect on the building design. The intent of this study is to have a better understanding of the functions and methods of soil investigation, to know the problem that there encounter during the test and it solution as well as to know the approval needed in the test construction. There are various test and methods used in conducting soil investigation depend on what desire information that we want to know. The common methods that are used are the Wash Boring method. It is used to collect samples from the soil. This test used a machine capable of digging up to 60 meter and the sample are taken by using the split spoon that are more known as SPT (Standard Penetration Test). This test is also used to assess the situation of the underground whether the land has an empty space (cavity) or not. By the sample that we got it will be sent to the laboratory for test and to known the characteristic of the soil. There is another simple way that is by using Mackintosh Probe. This test was conducted to test the strength of the soil and used to collect used to guide the construction of a small project. At last by doing the soil investigation we can identify the type of the soil and we can make an appropriate design mostly on the C & S design as well as the type of the material that can be used based on the result of soil investigation.

TITLE: SOIL INVESTIGATION

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LIST OF INITIALS

SSM	Suruhanjaya Syarikat Malaysia
CIDB	Construction Industry Development Building
M&E	Mechanical and Electrical
C&S	Civil and Structure
S.O.	Superintendent Officer
SPT	Standard Penetration Test
CRR	Core Recovery Ratio
RQD	Rock Quality Designation

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION REVIEW

Soil investigation is one of the steps that are needed to be done before starting in any construction work. Soil investigation always be done at the early stage of the work and it is most important work before start the construction.

It is to obtain information on the physical properties of soil and rock around a site to design earthworks and foundations for proposed structures and for repair of distress to earthworks and structures caused by subsurface conditions. A soil investigation will include surface exploration and subsurface exploration of a site.

The other purpose of the soil investigation is to get information about the project site that can be used by consultant in making the most appropriate design for the construction that are about to start. Soil is not only limited to one kind of construction only, it can be use in all type of construction like high rise building, bridge construction, housing construction, even when to construct a port also need to do a soil investigation.

In general by doing the soil investigation it give the advantage to the to the consultant to know what the problem there might be involve and it can be prevent at the early stages. Also for the contractor the information obtained can be used for preparing the tender document. The information obtained can also be used for make the right decisions in all stages of design, construction and maintenance by the customer.

The different about this test is the method that is going to use. The different the type of the soil the different the type of method of soil investigation is going to be use.

1.2 Selection of Research Topic

The preparation of this report is based on information obtained through observation and researcher questioning with supervisors and workers at the site. This is important because we can get the important information from the employees who are performing the duties of soil investigation. In, addition, reference material from the internet is also important to reveal the problems that are related to soil investigation.

With the information that is obtained from various sources, it will complete the entire item that is going to be discussing in the report. Report prepared by the researcher tells about soil investigation. So the reseacher would like to investigate how the right process of soil investigation is going to happen, and it can be one of the references to those who would like to know how the process of soil investigation really works.

Overall, this study examines how the process of soil investigation works and what it purposes. In all of the construction they must have a problem no matter small or big, so the researcher also will try to see what the problem and try to solve it in any ways that will everyone understand.

1.3 OBJECTIVE

The objective of this study is:

1.2.1 To have a better understanding of the functions and methods of soil investigation.

1.2.2 To know the problem that there encounter during the test and it solution.

1.2.3 To know the approval needed in the test construction.

1.4 SCOPE OF THE STUDY

For this report the author has made a choice to make the case study about the Soil Investigation at No 8, Jalan 3, Ampang, Selangor Darul Ehsan.

It is near the Kelab Darul Ehsan near Selangor. The place that the author sees the soil investigation is in an existing house that is going to be tearing down and build a new house that is 3 storey building including with a basement and underground floor. The total estimate cost for building the house is around 4 million Ringgit Malaysia.

The soil investigation has been appointed to the contractor that is specialist on doing soil investigation that is BUMIMETRO ENGINEERING SDN. BHD

Scope and Purpose

1.2.1 To know more detail on the method that has been used.

1.2.2 The material that are use for making the soil investigation.

1.2.3 The step on making the soil investigation.

1.5 WAY OF THE REASEARCH

At first, I find resources related to the process of soil investigation. From books, magazine, newspapers, journals, websites, thesis, websites, articles and the entire thing that related to the topic for references to the writer to completed the report on soil investigation. All the information obtained is combined, manipulated and analyse and update in order.

At stage-two, I interviewed all supervisors who work in the Perunding Abadi Sdn. Bhd., Where all evidence is recorded. All supervisors always give a good respond and comment.

After all the necessary and sufficient information, analysis has been done to get the right and appropriate answers on the method of the process of Soil Investigation.

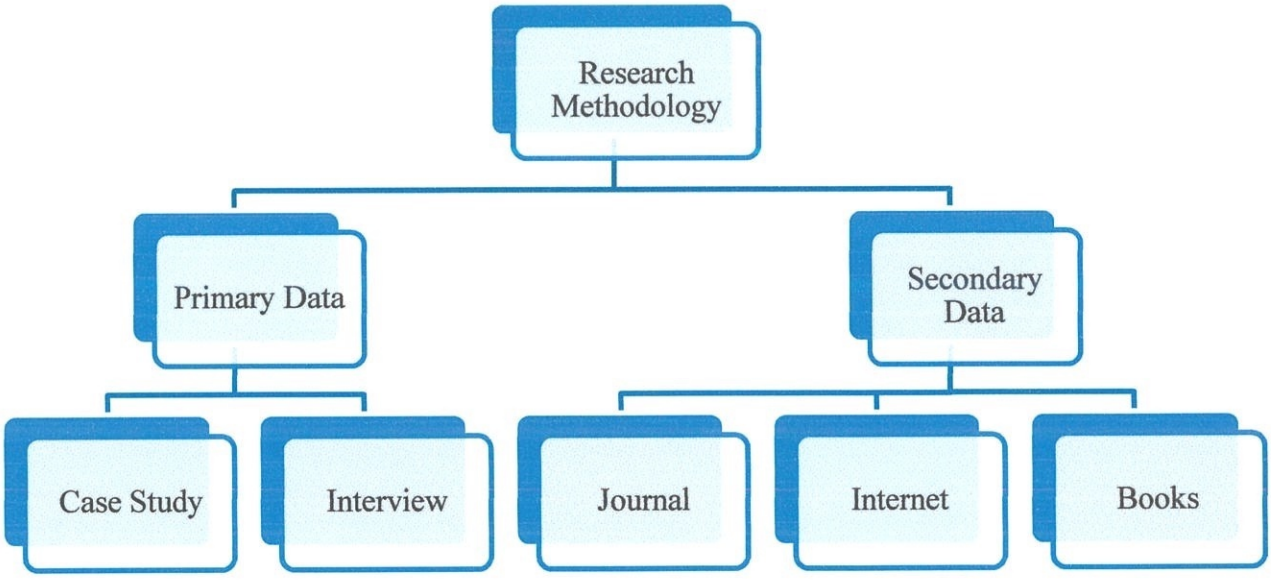


Figure 1.1: Way of research

CHAPTER 2

COMPANY PROFILE

2.1 INTRODUCTION

Beginning on May 15, 2010, researcher started having Practical Training for six month and ended on 16 November 2010. This is as a complement to the Diploma in Building syllabus that I have take. All the student in Diploma in Building that take the BLD 299 subject must do the practical training to pass the subject.

The company that I chose to take my practical training is located in Wangsa Maju that Perunding Abadi Sdn.Bhd. regsted with Suruhanjaya Syarikat Malaysia (SSM), Construction Industry Development Building (CIDB), and Board of Engineers.

It is lead by led by Ir. Afifudin Bin Abas, Ir. Hj. Mansor Bin Ahmad and Ir. Zulkiflee Bin Mat Omar as a Board Director as well as some of the worker and engineers that make the company running smoothly.

CORPORATE INFORMATION

COMPANY NAME	:	PERUNDING ABADI SDN. BHD.
DATE OF IN CORPORATION	:	Februari 13, 1985
COMPANY REGISTRATION	:	135287 – x
BUSINESS ADDRESS	:	No. 61-3, Jalan Wangsa Delima 5, Pusat Bandar Wangsa Maju, 53300 Setapak, Kuala Lumpur
TEL	:	
FAX	:	03-4142 7468
E-MAIL	:	pabadi@perundingabadi.com.my
WEBSITE	:	www.perundingabadi.com.my
BRANCH ADDRESS	:	No. 26B, Jalan Enau 15, Taman Teratai, 81300 Skudai, Johor Bahru
TEL/ FAX	:	
E-MAIL	:	pasb2@streamyx.com
PRINCIPAL ACTIVITY	:	Civil & Infrastructure Consultancy Mechanical & Electrical Consultancy Project Management Consultant
AUTHORISED CAPITAL	:	RM 100,000.00
PAID-UP CAPITAL	:	RM 100,000.00
PRINCIPAL BANKERS	:	AFFIN BANK BERHAD Cawangan Ampang Jaya No. 11 & 11A, Jalan Mamanda 7/1, 68000 Ampang, Selangor

CONTACT PERSON	:	Ir. Afifuddin Bin Abas (M&E)
		Ir. Hj. Mansor Ahmad (M&E)

2.2 HISTORY OF THE COMPANY

This company is a consulting company, involving all type of engineering like civil and structure also electrical and mechanical. It was established in 1985 with a paid up capital of RM 100 000.

It started with four directors that are Ir. Afifudin Bin Abas that is in charge for the electrical, Ir. Hj. Mansor Bin Ahmad incharge in electrical and Ir. Zulkiflee Bin Mat Omar that are in charge in mechanical.

With skill and experience at hand, and a few contacts, the companies have received and execute a contract for the job. Like being the consultant for the client also for the contractor on working like building a high rise building, excavate drainage and other projects.

Having long been involved of being consulting, The company have gain a lot of experience in consulting a project, such as C&S it major work is in design beam, design column, and many more but is it more toward to the structure and infrastructure work like drainage. Like for the M&E always has been expert in the work of cabling, communication system and also the use of latest technology.

It is the hope of the company to continue and grow this business in future.

2.3 COMPANY OBJECTIVE

The objective of the company is:

2.3.1 To gain profit on high of efficiency and productivity in the construction company.

2.3.2 Making Bumiputra contractor and consultant can deal with various challenges to the work assigned.

2.3.3 To be a successful entrepreneur in the construction industry.

2.4 ORGANIZATION CHART

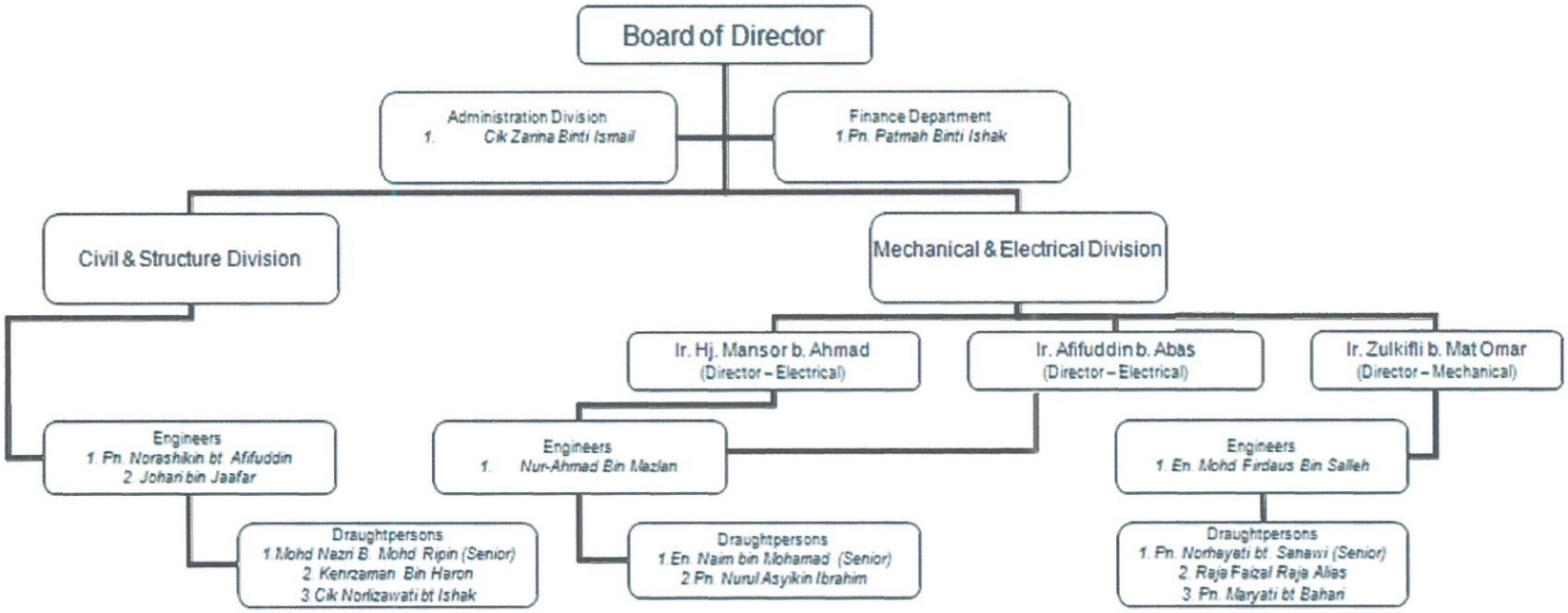


Figure 2.1: Perunding Abadi Organisation Chart

Source: Perunding Abadi Sdn. Bhd company profile

2.5 LIST PROJECT

NO.	PROJECT	CLIENT	STATUS
A	**GOVERNMENT, EDUCATION & PUBLIC FACILITIES**		
1.	MENAIKTARAF DAN MEMBAIKPULIH PUSAT PERLINDUNGAN WANITA DI BAITUL EHSAN, SABAK BERNAM SELANGOR. i. M&E Services ii. C&S Services	MAJLIS AGAMA ISLAM SELANGOR	PLANNING STAGE JULY 2009
2.	CADANGAN MEMBINA & MENYIAPKAN ASRAMA SEKOLAH RUMINAN DI INSTITUT VETERINAR MALAYSIA (IVM) KLUANG JOHOR i. M&E SERVICES	KEMENTERIAN PERTANIAN & INDUSTRI ASAS TANI MALAYSIA	DESIGN JULY 2009
3.	CADANGAN PEMBINAAN BANGUNAN BENGKEL ROTAN 4 TINGKAT DI INSTITUT KRAF NEGARA, LOT 4830 & 4988 DAERAH GOMBAK , SELANGOR i. M&E SERVICES	REZA RIDZUAN ARCHITECT	CONSTRUCTION APRIL 2009
4.	CADANGAN PENGGANTIAN KABEL ELEKTRIK DI SELURUH KAMPUS UNIVERSITI MALAYA i. M&E Services	UNIVERSITI MALAYA	COMPLETED JUN 2009
5.	CADANGAN PEMBAGUNAN PROJEK SEK. KEB. DESA PERDANA WILAYAH PERSEKUTUAN KUALA LUMPUR Services:- i. M&E Services	KEMENTERIAN PELAJARAN MALAYSIA	CONSTRUCTION JAN 2009
6.	MENAIKTARAF PAGAR KESELAMATAN DAN PEMASANGAN CCTV DI KOMPLEK SMS, SHAH ALAM SELANGOR DARUL EHSAN Services:- i M&E Services	KEMENTERIAN KESELAMATAN DALAM NEGERI (KKDN)	COMPLETED DEC 2008
7.	CADANGAN PROJEK PEMBANGUNAN KOSMETIK, FARMASEUTIKAL DAN TOILETRIES DI NILAI, MUKIM LABU, DAERAH SEREMBAN, NEGERI SEMBILAN . Services:- I M&E Services ii Civil & Structure Services	LEMBAGA KOKO MALAYSIA	CONSTRUCTION APRIL 2008
8.	CADANGAN PEMBANGUNAN PEJABAT, KUARTERS DAN KEMUDAHAN BAGI PASUKAN GERAK AM (PGA) BATALION KE-8 POLIS DIRAJA MALAYSIA (PDRM), DIATAS LOT 1972, SELUAS 41.558 EKAR, MUKIM KEMUMIN, DAERAH KEMUMIN, KOTA BAHRU, KELANTAN DARUL NAIM (FASA 1 & 2) Services: i. Electrical Services ii. Mechanical Services a) Fire Fighting System b) Lift – Centralized monitoring system. c) Overhead Crane d) Centralized Air Conditioning and Ventilation with BAS monitoring and control System e) Kitchen Equipments for Dining Halls, coffee house and Specialist Classroom f) Cold Water services g) Sanitary Plumbing Services	PEMBINAAN BLT SDN. BHD	CONSTRUCTION (2008 & 2009)

NO.	PROJECT	CLIENT	STATUS
9.	CADANGAN MEMBINA STOR PUSAT BAGI RIZAB JABATAN PENTADBIRAN DI ATAS SEBAHAGIAN LOT 27333, TAMAN MOUNT AUSTIN, JOHOR BAHRU, JOHOR DARUL TAKZIM **Services:** i. Electrical Services ii. Telephone iii. Fire Fighting System – Hose Reel iv. Air Conditioning and Ventilation System v. Cold Water vi. Sanitary Plumbing Services vii. Civil & Structure	MAJLIS BANDARAYA JOHOR BAHRU	COMPLETED 2007
10.	CADANGAN PEMBINAAN MAKMAL KEJURUTERAAN AWAM & ELEKTRIK KOLEJ POLY-TECH MARA KUANTAN. PAHANG. Servises:- i. Civil & Structure	MAJLIS AMANAH RAKYAT (MARA)	CONSTRUCTION 2006
11.	CADANGAN MEMBINA SEBUAH MASJID DI ATAS LOT PTB 8272, BANDAR MAS, KOTA TINGGI, JOHOR DARUL TAKZIM **Services:** i. Electrical Services ii. Telephone iii. Fire Fighting System iv. Air Conditioning and Ventilation System v. Cold Water vi. Sanitary Plumbing Services	LEMBAGA KEMAJUAN JOHOR TENGGARA (KEJORA)	COMPLETED DEC 2006
12.	CADANGAN PEMBANGUNAN PUSAT BIODIVERSITY DI MUKIM BATU TALAM, DAERAH RAUB, PAHANG DARUL MAKMUR. **Services:** i. Civil & Structure	TECHNOLOGY PARK MALAYSIA	COMPLETED (October 2006)
13.	PROPOSED 3 STOREY OFFICE BLOCKS AND HANGAR FOR MALAYSIAN HELICOPTER SERVICES SDN BHD AT TERMINAL 3, SUBANG AIRPORT, SELANGOR DARUL EHSAN. i. Electrical Services ii. Telephone, PABX, IT iii. PA System iv. Fire Fighting System – Hose Reel, Foam System v. Air Conditioning and Ventilation System vi. Cold Water vii. Sanitary Plumbing Services viii. Civil & Structure	MALAYSIAN HELICOPTER SERVICES SDN BHD	DESIGN / TENDER (KIV)
14.	CADANGAN MENGENDALIKAN PROJEK PEMBINAAN PRASARANA INSTITUT KRAF NEGARA, TAMAN REKREASI TEMPLER, RAWANG, SELANGOR DARUL EHSAN. **Services:** i. Civil & Structure	PERBADANAN KEMAJUAN KRAFTANGAN MALAYSIA	COMPLETED 2006

NO.	PROJECT	CLIENT	STATUS
15	CADANGAN MEMBINA DAN MENYIAPKAN PUSAT PERKHIDMATAN PELANCONGAN TANJUNG BALAU DI ATAS LOT PTD 4022 SELUAS 16.9 HEKTAR (41.9 EKAR) DAERAH KOTA TINGGI, JOHOR DARUL TAKZIM. **Services:** i. Electrical Services ii. Telephone iii. Fire Fighting System iv. Air Conditioning and Ventilation System v. Cold Water vi. Sanitary Plumbing Services	LEMBAGA KEMAJUAN JOHOR TENGGARA (KEJORA	COMPLETED 2005
16	CADANGAN MEMBINA DAN MENYIAPKAN KAMPUS TETAP UiTM CAWANGAN PULAU PINANG (FASA 1), DI LOT 3430, MUKIM 6, DAERAH SEBERANG PERAI TENGAH, PULAU PINANG UNTUK TETUAN UNIVERSITI TEKNOLOGI MARA. Pakej 1 : Kerja - Kerja Tanah Pakej 2 : Kerja - Kerja Cerucuk Pakej 3 : Bangunan Pentadbiran Pakej 4 : Bangunan Asrama, Makmal Kejuruteraan Pakej 5 : Bangunan Asrama, Hotel Pakej 6 : Kerja - Kerja Infrastruktur, P.Islam Pakej 6a : Kerja - Kerja 'Sewerage Treatment Plant' **Services:** ELECTRICAL SERVICES i. Electrical Services a) HT System – 33kV supply and 11 kV infrastructure with remote monitoring and control system b) LV System with Generator Support ii. Telephone iii. PABX iv. HIS (Hotel Information System) v. IT System a) Fiber Optics Infrastructure b) Fiber Optics Backbone System vi. PA system – Fiber Optics Infrastructure, inter-building paging system. vii. Audio-Visual System for Lecture Halls MECHANICAL SERVICES viii. Fire Fighting System a) Centralized Addressable Fire Alarm Monitoring System b) Smoke-spill fan System c) Hose Reel d) Sprinkler e) CO2 System ix. Lift – Centralized monitoring system. x. Overhead Crane xi. Centralized Air Conditioning and Ventilation with BAS monitoring and control System xii. Kitchen Equipments for Dining Halls, coffee house and Specialist Classroom xiii. Cold Water services xiv. Sanitary Plumbing Services	UNIVERSITI TEKNOLOGI MARA (UiTM)	COMPLETED DECEMBER 2005

NO.	PROJECT	CLIENT	STATUS
17.	CADANGAN PEMBAIKAN DAN PENGUBAHSUAIAN AUDITORIUM , IBU PEJABAT MARDI SERDANG, SELANGOR UNTUK PENDIDIKAN DAN KEMAJUAN PERTANIAN MALAYSIA i. Electrical Services iii. Mechanical Services a) Fire Fighting System b) Centralized Air Conditioning and Ventilation with BAS monitoring and control System	INSTITUT PENYELIDIKKAN KEMAJUAN PERTANIAN MALAYSIA (MARDI)	CONSTRUCTION (NOVEMBER 06)
18.	CADANGAN MEMBINA DAN MENYIAPKAN 1 BLOK BANGUNAN PUSAT TRAUMA DAN KECEMASAN 7 TINGKAT YANG MENGANDUNGI PERKHIDMATAN KECEMASAN DI TINGKAT BAWAH, UNIT PENGAJIAN / PENGAJARAN DI TINGKAT 1 DAN TEMPAT LETAK KERETA DI TINGKAT 2 HINGGA 6 DI ATAS SEBAHAGIAN LOT 38, SEKSYEN 15 UNIVERSITI MALAYA, K. LUMPUR. Services:- i. Electrical Services with Generator and UPS support ii. Telephone iii. PABX iv. IT - Fiber Optics Backbone System v. Surgical Lights and Medical Service Pendant vi. Medical Gas System vii. Compressed and Suction Gas System for dental chair viii. Pneumatic Tube System ix. Sterilizers, Fume Cupboard and associated Equipment x. ELV System a) Public Address and Audio Visual system b) Nurse Call System c) Intercom d) CCTV e) MATV xi. Fire Fighting System a) Centralized Addressable Fire Alarm Monitoring System b) Smoke-spill fan System c) Staircase Pressurization system d) Hose Reel e) Automatic CO2 System xii. Lift. **xiii. Air Conditioning and Ventilation with monitoring and control System** a) OT laminar flow system b) Negative pressure Decontamination & Isolation room xiv. Cold and Hot Water System xv. Sanitary Plumbing Services a) Neutralizing Tank xvi. Elevated Helipad Aviation Lighting with Control System	PUSAT PERUBATAN UNIVERSITI MALAYA	COMPLETED FEBRUARY 2005
19.	CADANGAN BANGUNAN KOMPLEKS PERUMAHAN SISWAZAH, UNIVERSITI PUTRA MALAYSIA. **Services:** i. Electrical Services ii. Telephone, IT iii. Fire Fighting System iv. Cold Water v. Sanitary Plumbing Services	UNIVERSITI PUTRA MALAYSIA	COMPLETED 2006

NO.	PROJECT	CLIENT	STATUS
20	CADANGAN MEMBINA DAN MENYIAPKAN BANGUNAN FAKULTI SAINS MAKLUMAT & TELEKOMUNIKASI UPM/CADANGAN BANGUNAN KOMPLEKS KEJURUTERAAN UPM. **Services:** i. Electrical Services WITH Generator backup ii. Telephone iii. IT iv. PABX v. Fire Fighting System vi. Air Conditioning and Ventilation System vii. Cold Water viii. Sanitary Plumbing Services	UNIVERSITI PUTRA MALAYSIA	COMPLETED 2002
21	CADANGAN MEMBINA DAN MENYIAPKAN PUSAT KESIHATAN JALAN BIJAK 1/22, SEKSYEN 1, UiTM SHAH ALAM, SELANGOR. **Services:** i. Electrical Services WITH Generator backup ii. Telephone iii. IT iv. Fire Fighting System v. Air Conditioning and Ventilation System vi. Medical Gas vii. Compressed and Suction Gas for Dental chair System viii. Vacuum System ix. Cold Water x. Sanitary Plumbing Services	UNIVERSITI TEKNOLOGI MARA (UiTM)	COMPLETED 2001
22	CADANGAN MEMBINA SEUNIT BANGUNAN ARKIB NEGARA CAWANGAN KEDAH/PERLIS. **Services:** i. Electrical Services WITH Generator backup ii. Telephone iii. IT iv. PABX v. Fire Fighting System a) Addressable Fire Alarm System b) Sprinkler system c) Hose reel System vi. Air Conditioning and Ventilation System vii. Precision Air Conditioning system with special condition of a) Strong Room b) Media Room c) Archive viii. Lift & Dumbwaiter services ix. Cold Water x. Sanitary Plumbing Services Mobile Racking & Archiving System	ARKIB NEGARA MALAYSIA	COMPLETED 2004
23	CADANGAN MEMBINA DAN MENYIAPKAN 1 DEWAN SERBAGUNA DI LOT PTD 60377, TAMAN DESA CEMERLANG, JOHOR BAHRU, JOHOR DARUL TAKZIM. **Services:** Civil & Structure	MAJLIS BANDARAYA JOHOR BAHRU	COMPLETED 2006
24	CADANGAN MEMBINA DAN MENYIAPKAN 1 DEWAN SERBAGUNA DI GUGUSAN FELDA MEMPAGA 2, MUKIM BENTONG, DAERAH BENTONG, PAHANG DARUL MAKMUR i. Mechanical &Electrical Services ii. Civil & Structure	MAJLIS DAERAH BENTONG	COMPLETED 2005

NO	PREVIOUS PROJECTS	CLIENT	STATUS
1	CADANGAN PEMBINAAN BALAI PAMERAN DAN PEJABAT KOMPLEKS ARKEOLOGI LENGGONG, KOTA TAMPAN, PERAK.	JABATAN MUZIUM DAN ANTIKUITI MALAYSIA	COMPLETED
2	CADANGAN MEMBINA DAN MENYIAPKAN MAKTAB RENDAH SAINS MARA (MRSM) DI PONTIAN, JOHOR.	MARA	COMPLETED
3	CADANGAN MEMBINA DAN MENYIAPKAN BANGUNAN TAMBAHAN FASA 4A TERDIRI DARIPADA BANGUNAN PUSAT PERKHIDMATAN PELAJAR, PSPP, PUSAT KOMPUTER, MAKMAL BAHASA DAN SETOR PUSAT DI KAMPUS UITM CAWANGAN PERLIS, ARAU, PERLIS.	UNIVERSITI TEKNOLOGI MARA (UiTM)	COMPLETED
4	MEREKABENTUK, MEMBINA, MENYIAPKAN, MENGUJITERIMA DAN MENYENGGARA BANGUNAN TAMBAHAN SERTA MENGUBAHSUAI BLOK-BLOK BANGUNAN SEDIADA & PENINGKATAN TARAF KEMUDAHAN INSTITUT LATIHAN PERINDUSTRIAN DI KUALA LUMPUR.	JABATAN TENAGA RAKYAT	COMPLETED
5	CADANGAN PEMBINAAN KUARTERS TAMBAHAN JABATAN TENAGA RAKYAT , ILP PEDAS, NEGERI SEMBILAN DARUL KHUSUS.	JABATAN KERJA RAYA	COMPLETED
6	CADANGAN MEMBINA DAN MENYIAPKAN PEMBANGUNAN ZOO AIR KEROH DI ATAS LOT 2349, MUKIM BUKIT KATIL, MELAKA TENGAH, MELAKA UNTUK JAB. PERHILITAN MALAYSIA.	JABATAN KERJA RAYA	COMPLETED
7	CADANGAN MEMBINA & MENYIAPKAN PUSAT KEGIATAN MASYARAKAT (KEMAS) JENIS A & B.	JABATAN KERJA RAYA	COMPLETED
8	THE DESIGN, CONSTRUCTION, EQUIPPING AND OF COMMISSIONING OF AMBULATORY CARE CENTRE, HOSPITAL PULAU PINANG.	KEMENTERIAN KESIHATAN MALAYSIA	DESIGN ONLY

NO.	PROJECT	CLIENT	STATUS
B	**RESIDENTIAL**		
1.	CADANGAN MEMBINA SEBUAH LAB DAN INKUBATOR BAGI HORTIKULTUR DI FRIM, KEPONG, K.LUMPUR Services: M&E & C&S	INST. PENYELIDIKAN PERHUTANAN M'SIA (FRIM)	CONSTRUCTION (MAY 2009)
2	CADANGAN PEMASANGAN STRUKTUR PEMANCAR TELEKOMUNIKASI SEMENTARA SETINGGI ___M DIATAS BUMBUNG BANGUNAN DI NO. 5-2, JLN 2/125G, DESA SRI PUTRI 57100 KUALA LUMPUR. Services: CIVIL & M&E	CELCOM (M) BERHAD	COMPLETED (OKT 2008)
3.	PEMBINAAN KOMPLEKS JABATAN LAUT, PULAU INDAH, PELABUHAN KELANG SELANGOR Services i- Electrical Services ii- Mechanical Services	JABATAN LAUT SEMENANJUNG MALAYSIA	PMC (JUN 2006)
4.	PROPOSED RESIDENTIAL DEVELOPMENT FOR PHASE 2, PRECINCT 11, PUSAT PENTADBIRAN KERAJAAN PUTRAJAYA, PUTRAJAYA, SELANGOR.	PUTRAJAYA HOLDINGS SDN. BHD	
	1. CADANGAN PEMBANGUNAN RUMAH TERES 2 TINGKAT DAN RUMAH BERKEMBAR 2 TINGKAT DI FASA 2, ZON 9A, SEBAHAGIAN PRECINT 11 PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN PUTRAJAYA, MUKIM DENGKIL, DAERAH PUTRAJAYA, SELANGOR DARUL EHSAN.		CONSTRUCTION (2009)
	2. CADANGAN PEMBANGUNAN RUMAH BERKEMBAR 2 TINGKAT DI FASA 2, ZON 10B, SEBAHAGIAN PRECINT 11 PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN PUTRAJAYA, MUKIM DENGKIL, DAERAH PUTRAJAYA, SELANGOR DARUL EHSAN. **Services :** i. Electrical ii. Telephone iii. MATV System iv. Cold Water v. Sanitary Services		CONSTRUCTION (2009)
	3. CADANGAN PEMBANGUNAN 4 BLOK PANGSAPURI KERAJAAN JENIS B YANG MENGANDUNGI 572 UNIT DI FASA 2, ZON 12A DI ATAS LOT PT 6877, SEBAHAGIAN PRESINT 11 PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN PUTRAJAYA, MUKIM DENGKIL, DAERAH PUTRAJAYA, WILAYAH PERSEKUTUAN **Services :** i. Electrical ii. Telephone iii. IT iv. MATV System v. Cold Water vi. Sanitary vii. Submersible pump viii. basement ventilation system ix. Lift		TENDER / DESIGN (KIV)

NO.	PROJECT	CLIENT	STATUS
5	CADANGAN MEMBINA DAN MENYIAPKAN SEBUAH PEMBANGUNAN (FASA 1– PAKEJ 1) YANG MENGANDUNGI 100 UNIT RUMAH TERES 2 TINGKAT (20' X 80') DI ATAS SEBAHAGIAN LOT 8667 DAN 8869, MUKIM KAJANG, DAERAH ULU LANGAT, SELANGOR DARUL EHSAN **Services :** CIVIL & STRUCTURE	TPPT SDN BHD	CONSTRUCTION (2008)
6	CADANGAN MEMBINA DAN MENYIAPKAN SEBUAH PEMBANGUNAN (FASA 1– PAKEJ 1) YANG MENGANDUNGI 37 UNIT RUMAH TERES 2 TINGKAT (22' X 57') DAN 1 UNIT PENCAWANG ELEKTRIK DI ATA LOT 8669 MUKIM KAJANG , DAERAH ULU LANGAT, SELANGOR DARUL EHSAN **Services :** CIVIL & STRUCTURE	TPPT SDN BHD	CONSTRUCTION (2007)
7	CADANGAN PEMBANGUNAN (FASA 2) MEMBINA :- A. 12 UNIT RUMAH BERKEMBAR 2 TINGKAT (JENIS RBA) – 10.97M X 34.784M (MIN) B. 10 UNIT RUMAH BERKEMBAR 2 TINGKAT (JENIS RBB) – 12.19M X 27.432M C. 16 UNIT RUMAH BERKEMBAR 2 TINGKAT (JENIS RBC) – 12.19M X 27.23M DI ATAS LOT 2064 DAN 3754 MUKIM BENTONG, DAERAH BENTONG, TAMAN SHAH BANDAR HUSSEIN, PAHANG DARUL MAKMUR **Services :** i. Civil & Structure ii. Electrical iii. Telephone iv. Cold Water v. Sanitary Services	SRI BISTARI SDN BHD	COMPLETED MAC 2009
8.	PROGRAM PERUMAHAN RAKYAT (PPR) KAMPUNG SERI MALAYSIA, SUNGAI BESI, KUALA LUMPUR. **Services :** i. Electrical ii. Telephone iii. MATV System iv. Cold Water v. Sanitary Services vi. Fire Fighting System – Hose Reel, CO2 vii. Lift	JABATAN PERUMAHAN NEGARA	COMPLETED (2008)
9	CADANGAN MEMBINA 36 BLOK KONDOMINIUM 10 TINGKAT (208 UNIT) DI ATAS SEBAHAGIAN LOT 526-529, MUKIM SRI RUSA, DAERAH PORT DICKSON, N. SEMBILAN. **Services :** i. Electrical ii. Telephone iii. MATV System iv. Lift v. Cold Water vi. Sanitary Services	UDAPEC SDN BHD	COMPLETED 2006

NO.	PROJECT	CLIENT	STATUS
10	CADANGAN PENEMPATAN SETINGGAN DIATAS LOT 15757, JLN KEBUN, MUKIM KLANG, D. KLANG, SELANGOR.	PERMODALAN NEGERI SELANGOR	COMPLETED 1998
11	CADANGAN MEMBINA SEBLOK PANGSAPURI 3 ½ TINGKAT DENGAN SETINGKAT SUB BAWAH TANAH MENGANDUNGI 28 UNIT KEDIAMAN DIATAS LOT NO.248, JLN LANDASAN, BUKIT KUDA, BANDAR KLANG, SELANGOR.	BUKIT GOMBAK. SDN BHD.	COMPLETED 1999
12	CADANGAN SKIM PERUMAHAN DIATAS TANAH KERAJAAN BT. 7, JLN KAPAR, DAERAH KLANG, SELANGOR	PERMODALAN NEGERI SELANGOR	COMPLETED 1997
13	CADANGAN MEMBINA 41 UNIT RUMAH TERES 1 TGKT KOS SEDERHANA RENDAH & 25 UNIT TERES 1 TGKT KOS SEDERHANA DIATAS LOT 1352,JLN GOH HOCK, MUKIM KAPAR, DAERAH KLANG, SELANGOR.	MASTER PERKASA (M) SDN. BHD.	COMPLETED
14	CADANGAN MEMBINA 37 UNIT RUMAH TERES 2 TGKT DI ATAS PTD 1796-802, PTD 1812-1821 & PTD 1832-1851, PEKAN PORT DICKSON.	PEMBINAAN A & A SDN. BHD.	COMPLETED
15	CADANGAN MEMBINA & MENYIAPKAN 24 UNIT RUMAH BERKEMBAR 2 TGKT DI LOT 4167 (LOT ASAL 1150) JLN OFF GONG PASIR MUKIM SURA, DAERAH DUNGUN, TERENGGANU.	KREATIF TEGUH SDN BHD	COMPLETED
16	D'AMBANG KOTA MIXED DEVELOPMENT TOWNSHIP AT KUALA LUKUT, P. DICKSON.	TRUE CREATION SDN. BHD.	COMPLETED
17	CADANGAN MEMBINA 25 UNIT BANGLO 1 TINGKAT DI TAMAN SERI REMBAU, REMBAU, N. SEMBILAN.	KOPERASI SRI REMBAU BERHAD.	COMPLETED
18	CADANGAN MEMBINA & MENYIAPKAN SEBUAH SURAU SETINGKAT DI ATAS TANAH WAKAF MAJLIS UGAMA ISLAM WILAYAH PERSEKUTUAN KUALA LUMPUR.	MAJLIS UGAMA ISLAM WILAYAH PERSEKUTUAN	COMPLETED
19	CADANGAN PEMBANGUNAN PERUMAHAN DI ATAS LOT 004347, MUKIM RUSILA, DAERAH MARANG, TERENGGANU DARUL IMAN.	Q TECH	DESIGN / KIV

NO.	PROJECT	CLIENT	STATUS
C.	**INDUSTRIAL**		
1	CADANGAN PEMBINAAN KAWASAN PERINDUSTRIAN RINGAN DI ATAS LOT 9390, KAWASAN PERINDUSTRIAN LALANG, KUANTAN, PAHANG.	COLD STORAGE (M) SDN. BHD.	COMPLETED
2	CADANGAN BLOK KILANG SATU TINGKAT SERTA SATU TINGKAT PEJABAT DI ATAS LOT 17300 BUKIT RAJAH, SELANGOR.	PARKERIZING INDUST. (M) SDN. BHD	COMPLETED
3	CADANGAN MEMBINA SEUNIT KILANG DIATAS LOT PT 34287 & 34288, MUKIM KLANG, DAERAH PETALING, SELANGOR.	AMERAYA PROPERTIES SDN. BHD.	COMPLETED

Table 2.1: List of Project

Source: Perunding Abadi Sdn. Bhd company profile

CHAPTER 3

THEORITICAL REVIEW

3.1 INTRODUCTION

In any construction, whether to build a house, high rise building or a bridge, the strength of the soil is important because the land will be the one that support the entire load that will be given by the house on anything that is built on them. Therefore, soil investigation is very important, by doing this we may know what the soil limit is and what we can do to build a building on it without any getting any casualties. To obtain sample samples are not influenced by external elements is very difficult, due to environmental factors that are always changing and it make it complicated to get accurate reading on the lab because of it. To get the most accurate reading on it there are few procedure that we must follow and also a few step that we cannot ignore and by following this it will enable us obtained the most accurate result in a short time.

The primary functions of any ground investigation process will be one of the following:

1. Locating specific 'targets', such as dissolution features or abandoned mine workings
2. Determining the lateral variability of the ground;
3. Profiling, including the determination of groundwater conditions;
4. Index testing;
5. Classification;
6. Parameter determination.

3.2 METHOD OF SOIL INVESTIGATION

According to Clayton et al (1982) there is several method of soil investigation that is available for advancing boreholes to obtain samples of soil strata. The particular methods are used based on their suitability for local ground conditions. The principal methods are:

3.2.1 Boreholes/ Washboring

3.2.2 Power augring

3.2.3 Light percussion drilling

3.2.1 Boreholes

Clayton et al (1982) stated that boreholes are sometime called washboring or deep boring. Rotary open hole drilling by circulating fluid (water, bentonite or air foam) is the most common method. The other commonly used method is wash boring which utilises the percussive action of a chisel bit to break up materials and flush to the surface by water pumping down the hollow drill rods. Borehole usually includes boring through soil, coring through rock, sampling, in-situ testing and water-table observations. The depths usually do not exceed 100m.

i. Boreholes with Standard Penetration Tests (SPT), collection of disturbed and undisturbed soil samples.

According to Gue (2000) Standard Penetration Test (SPT) is the most commonly used in-situ test in Malaysia. As per BS1377, the hammer weight is 65kg, with drop height of 760mm. Sampler is driven a total of 450mm into soils and the number of blows for the last 300mm of penetration is the SPT 'N' value. The disturbed soil samples can be collected from the split spoon sampler

SPT is generally carried out at 1.5m depth interval depending on the undisturbed soil sampling schedule. The SPT test is simple and rugged however certain cares are required:

- Dented driving shoe should not be used.
- Depth of test is important and no test shall be carried out in the casing
- Base of borehole must be properly cleaned.
- Used counter to prevent counting error
- Mark the penetration depth clearly.
- Always keep borehole water level as close to the natural ground water as possible or else keep the borehole full of water.
- Prevent water level in the borehole dropping too fast below natural ground water level during changing of assembly for SPT in silty and sandy soils to prevent boiling in the soils.
- Require close supervision.

Soil samples collected from the borehole are as follows:

- Wash Samples: from soil washed out from the borehole for soil strata description.
- Disturbed Soil Samples : From split spoon samples after SPT
- Undisturbed Soil: Using piston sampler thin wall sampler, continuous sampler, mazier sample.

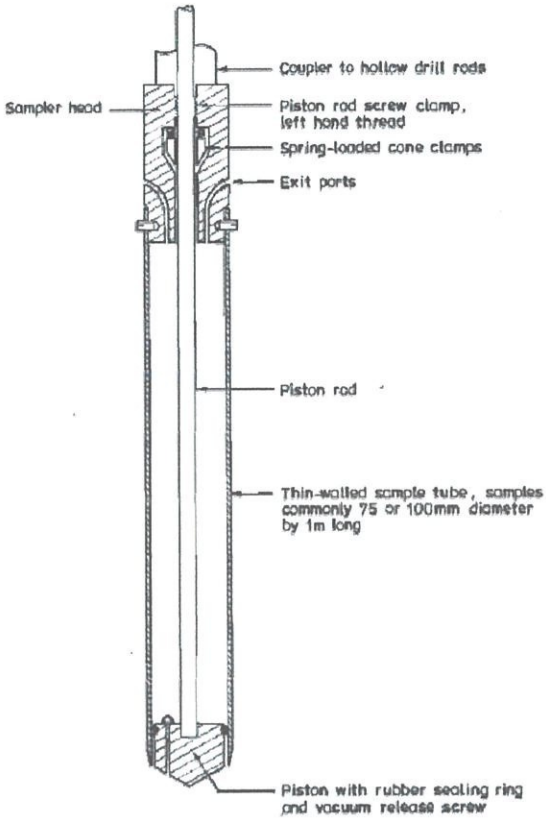


Figure 3.2 Piston Sampler

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

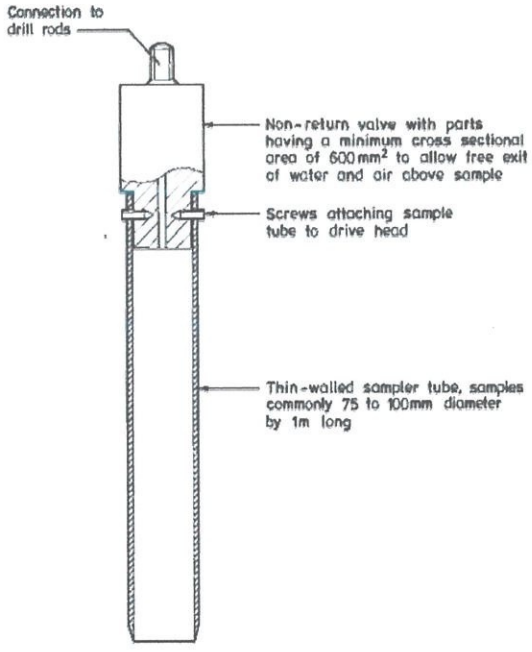


Figure 3.3 Thin Wall Sampler

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

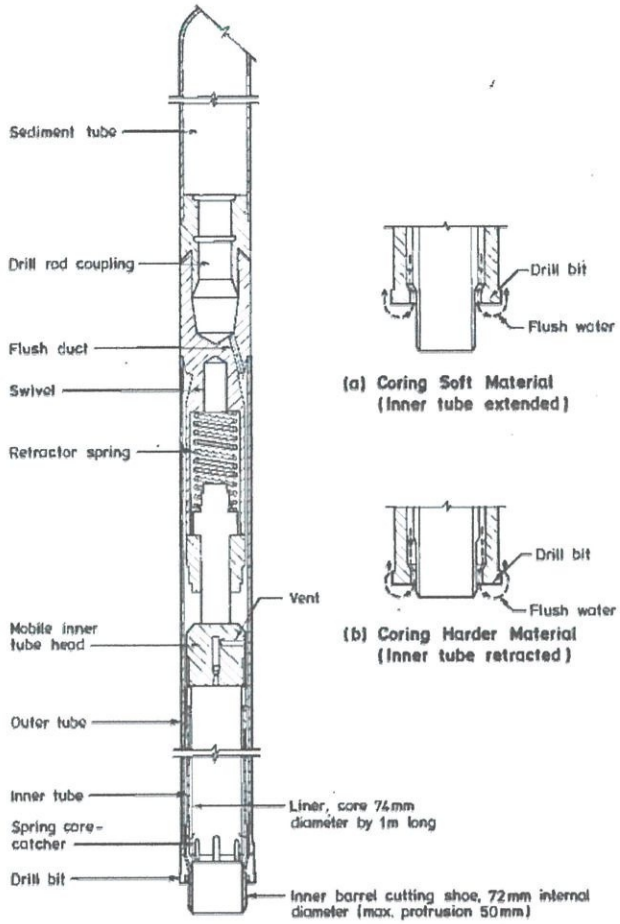


Figure 3.4: Mazier Sampler

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

When sampling soil from the boreholes, the following checklist shall be followed:

- Distorted or blunt cutting edge or dirty tubes should not be used.
- Check sizes of components and condition.
- Sampler must be properly cleaned and greased.
- The soil samples collected should be properly sealed and labelled to prevent loss of water when preserving moisture content is required.
- Undisturbed soil samples should be sealed with layer of grease, follow by non-shrink wax and tape to prevent loss of moisture (excess grease

by the side of tube for wax placement must be removed to ensure good contact between wax and the inner side of sampler)

- Properly stored and packed for transport to prevent disturbance during transportation.

ii. Coring

Clayton et al (1982) stated that the most common use of rotary coring in ground investigations is to obtain intact samples of the rock being drilled, at the same time as advancing the borehole. To do this a core barrel, fitted with a 'core bit' at its lower end, is rotated and grinds away an annulus of rock. The stick of rock, the 'core', in the centre of the annulus passes up into the core barrel, and is subsequently removed from the borehole when the core barrel is full. The length of core drilled before it becomes necessary to remove and empty the core barrel is termed a 'run'. It can be carried out in a number of ways, but in site investigation a commonly used tool is the 'tri cone rock roller bit' or roller core bit (Figure 3.5). In site investigation such methods are usually used to drill through soft deposits, which have been previously sampled by light percussion or auger rigs. Sampling during open-holing is usually limited to collecting the material abraded away at the bottom of the borehole, termed 'cuttings', as it emerges mixed with 'flush fluid' at the top of the hole

Figure 3.5: Bits for rotary open holing

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

For rock coring, rotary core drilling is commonly used to advance the borehole and provide core samples for examination and testing.

Some of the definitions related to rock core are:

Core recovery (%) = (Length of Recovered Core / Length of Run) X 100%

RQD (%) = ([Sum of recovered core in pieces > 100mm] / Length of Run) X 100%

Where RQD = Rock Quality Designation.

3.2.2 Power Augering

According to Karol (2003) augers may be classified as either bucket augers (Fig. 3.6) or flight augers. Bucket augers are similar in construction to the flat-bottomed Sprague and Henwood barrel auger. They consist of an open-topped cylinder which has a base plate with one or two slots reinforced with cutting teeth, which break up the soil and allow it to enter the bucket as it is rotated. The top of the bucket is connected to a rod which transmits the torque and downward pressure from the rig at ground level to the base of the hole: this rod is termed a 'Kelly'. Bucket augers are used for subsurface exploration in the USA, but are rarely used for this purpose in the UK. This is probably because they require a rotary table rig, or crane-mounted auger piling rig for operation, and this is usually expensive to run. Casing also provides some problems, since a single rig cannot drill in cohesion less soil beneath the water table.

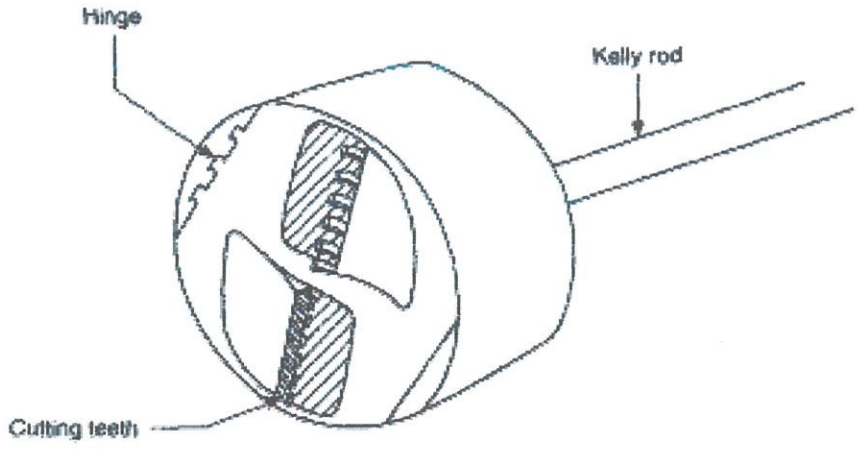


Figure 3.6: Bucket Auger

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

Flight augers may be classified as short-flight augers (Fig. 3.7) or continuous- or conveyor-flight augers. Short augers consist of only a few turns of flight above cutting teeth or a hardened steel edge. A high-spiral auger may contain three or four turns of flight. The hole is made by forcing the auger downwards at the bottom of the hole, while rotating it. The cutting teeth break up the soil or rock, which is then transferred up the auger flights. When the flights become full, or when the auger has been advanced for the height of the flights, the auger is raised to the top of the hole and the soil flung clear by rapidly rotating it. Once again, the auger is supported by a Kelly rod which transmits the torque and downward thrust from the drill rig to the auger.

The principal limitation of short augering is that the hole depth is restricted to the length of Kelly rod which the rig can handle. For many of the rigs commonly in use this is only 3 - 6m. The use of a crane-mounted auger piling rig will allow holes to be drilled to 20 - 30m if a telescopic Kelly rod is fitted, but as already noted such rigs are very expensive.

The problems of deep drilling with short augers are largely overcome by the use of continuous or conveyor augers. Continuous augers can be classed as: (i) solid stem continuous-flight augers (Fig3.8); or (ii) hollow stem continuous-flight augers (Fig 3.9).

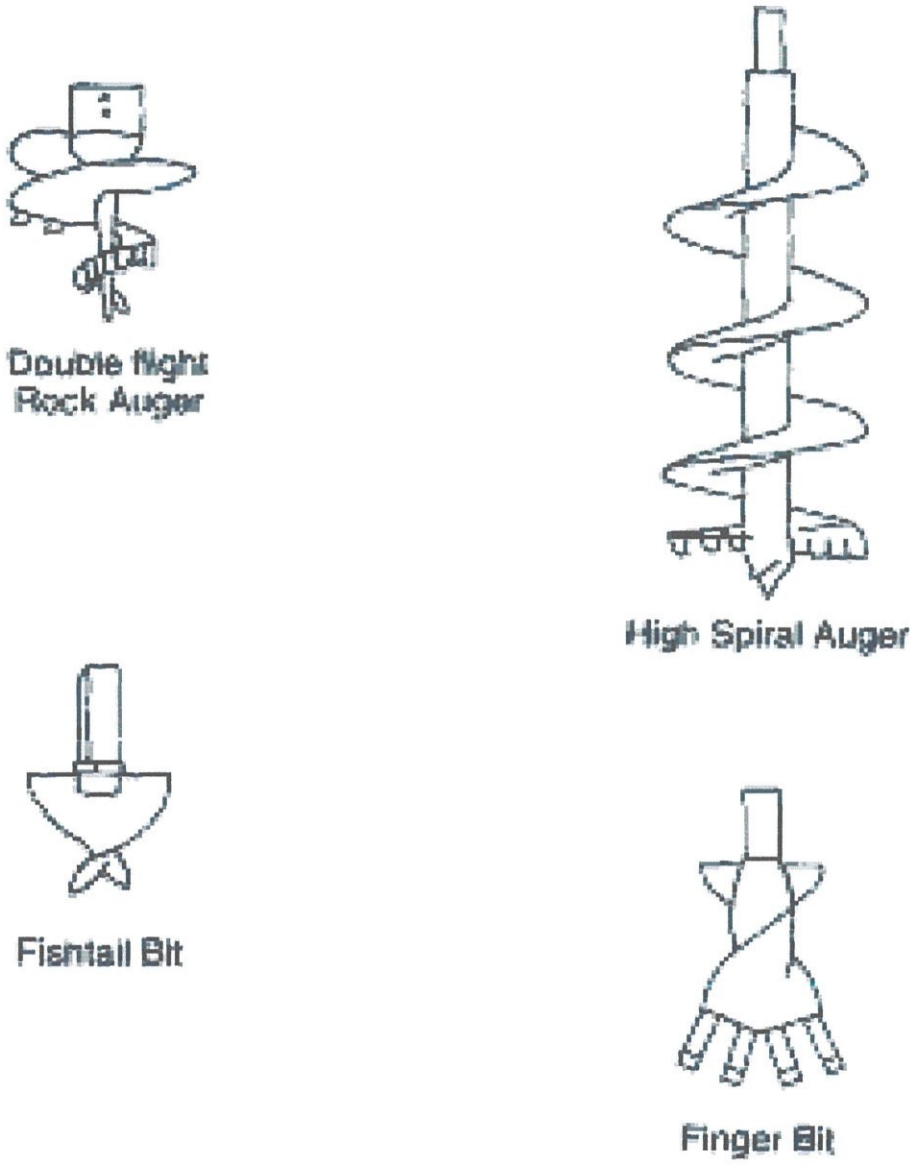


Figure 3.7 Short-flight augers and auger bits

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

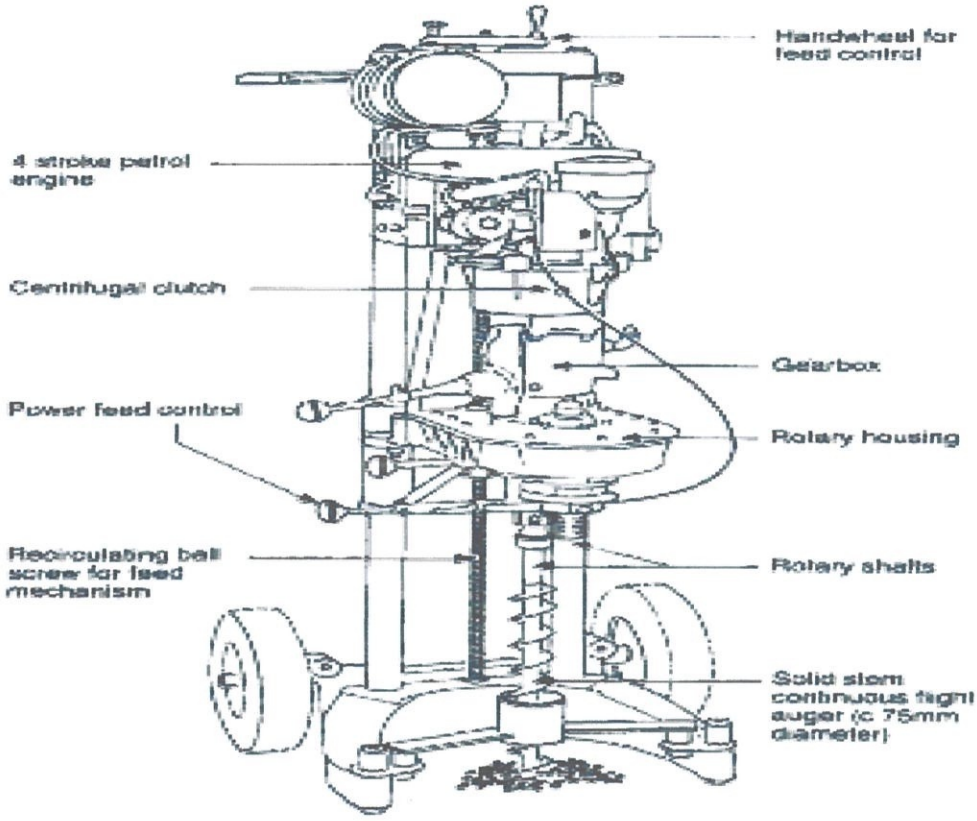


Figure 3.8 'Mobile Minuteman' small diameter solid stem continuous-flight auger rig.

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

Clayton et al (1982) also stated that hollow-stem augers (Fig. 3.9) consist of an outer spiral continuous flight with a separate inner rod which blocks off the base of the hole when the auger is being advanced. Both the outer flights and the centre plug are furnished with a bit at the base. The auger is forced into the ground in the same way as a solid-stem auger, with the inner and outer sections rotating together. When samples are required, the inner rods and plug are removed and samples can be taken from the material below the base of the auger. Hollow-stem auger drilling would at first sight seem to be the ideal method of producing site investigation holes, because it is often fast and reliable. There are, however, several problems which should be considered.

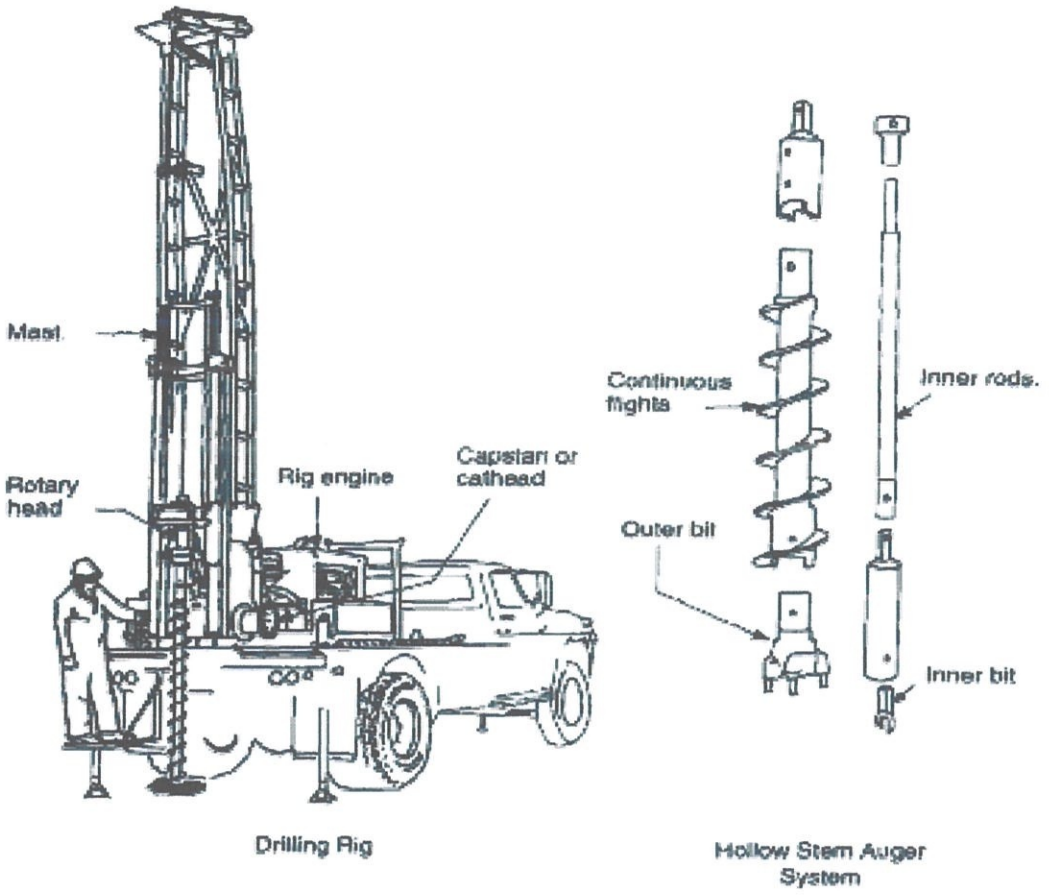


Figure 3.9 Acker ADII drilling rig and hollow-stew auger system

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

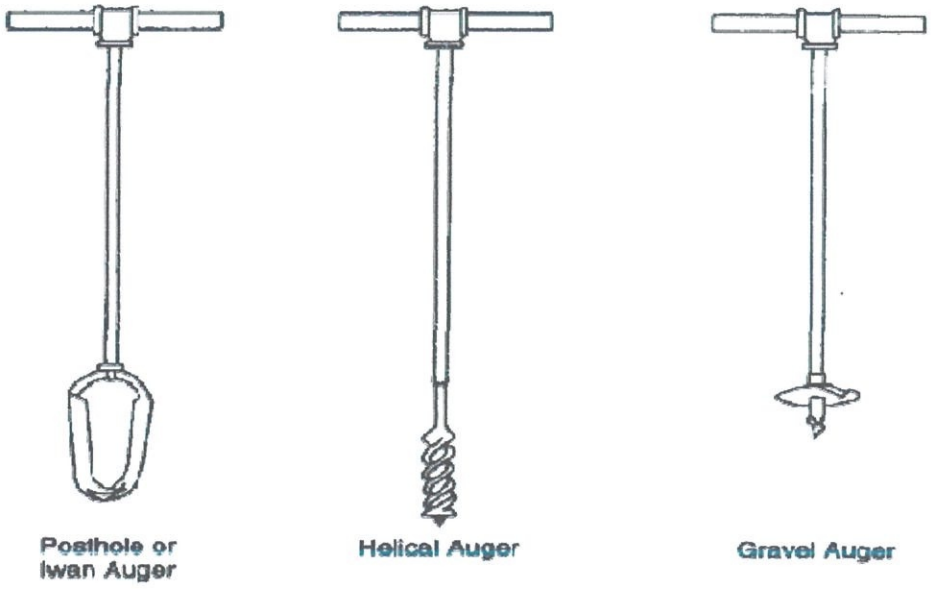
First, fissured clays or soils with fabric require relatively large samples for the determination of undrained shear strength and consolidation properties. This means that the hollow stem of the auger must have a large internal diameter (typically 140 - 150mm to allow the use of U100 sampling). This in turn means that a relatively powerful and therefore large drilling rig is required. Even if such a rig is available, access to the site of the borehole may be a problem.

Secondly, there are considerable dangers of disturbing soil ahead of the auger if the driller is overeager in soft or firm soils. Heavy downward thrust may cause the auger to be forced into the soil, displacing material ahead of it instead of boring through it. The hand auger provides a light, portable method of sampling soft to stiff soils near the ground surface

At least six type of auger are readily available:

- Posthole or Iwan auger
- Small helical auger (wood auger)
- Dutch auger
- Gravel auger
- Barrel auger
- Spiral auger

Figure 3.9.1 will show all these type of auger.



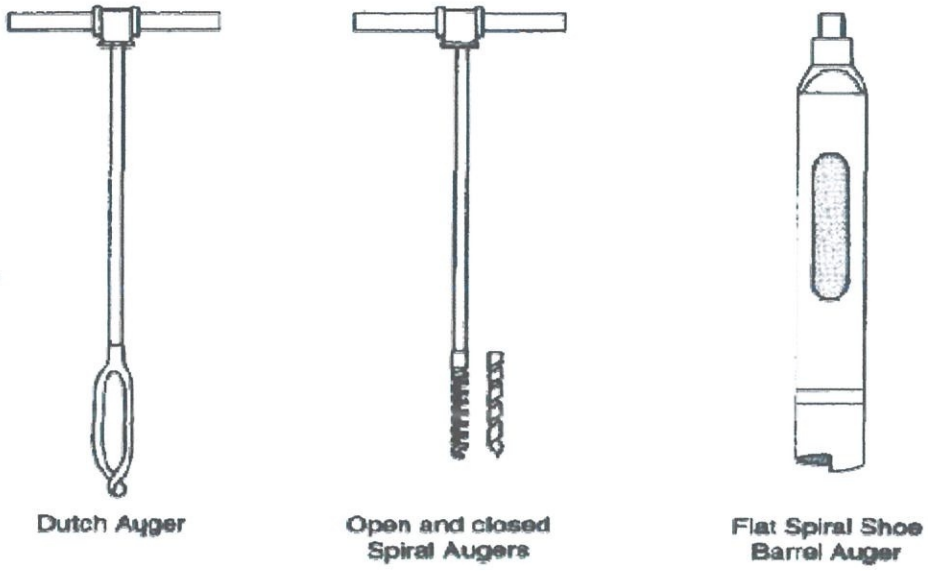


Figure 3.9.1 Selection of hand-operated auger.

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

Tan (2000) also stated that hand augers are used by one or two men, who press down on the cross-bar as they rotate it thus advancing the hole. Once the auger is full, or has collected sufficient material, it is brought back to the surface and the soil removed. Although the method is cheap because of the simplicity of the equipment, it does suffer from several disadvantages.

The most commonly used auger for site investigation is the 'Iwan' auger. This is normally used at diameters of between 100 and 200 mm. Small helical augers are quite effective in stiff clays, but become difficult to use once the water table is reached.

3.2.3 Light percussion drilling

Clayton et al (1982) also stated that the light percussion drilling often called 'shell and auger' drilling, this method is more properly termed light percussion drilling since the barrel auger is now rarely used with this type of equipment. The drilling rig (Fig. 3.9.2) consists of:

- A collapsible 'A' frame, with a pulley at its top
- A diesel engine connected via a hand-operated friction clutch (based on the brake drum system)
- A winch drum which provides pulling power to rig rope and can be held still with a friction brake which is foot-operated.

The rope from the winch drum passes over the pulley at the top of the 'A' frame and is used to raise and lower a series of weighted tools on to the soil being drilled. The rig is very light, and can be readily towed with a four-wheel drive vehicle. It is also very easy to erect, and on a level site can be ready to drill in about 15 mm. Where access is very limited, it can be dismantled, and rebuilt on the other side of an obstruction such as a doorway.

In clays, progress is made by dropping a steel tube known as a 'claycutter' into the soil. This is slowly pulled out of the borehole and is then generally found to have soil wedged inside it. The claycutter normally has a solid or slotted weight, called a sinker bar, attached to its upper end, the top of which is connected to the winch rope. When the claycutter is withdrawn from the top of the hole, the soil is removed with a metal bar which is driven into it through the open slot in the claycutter side.

In granular materials, such as sands or gravels, a shell is used. At least 2 m of water is put in the bottom of the borehole, and the shell is then surged, moving about 300mm up and down every second or so. Surging the shell upwards causes water to be drawn into the bottom of the hole, and this water loosens the soil at the base of the hole and forces it to go into suspension. As the shell is dropped on the bottom of the hole the mixture of soil and water passes up the tube of the shell, past the simple non- return value (sometimes called a 'clack'). As the shell is raised, the clack closes and retains the soil, which precipitates above it.

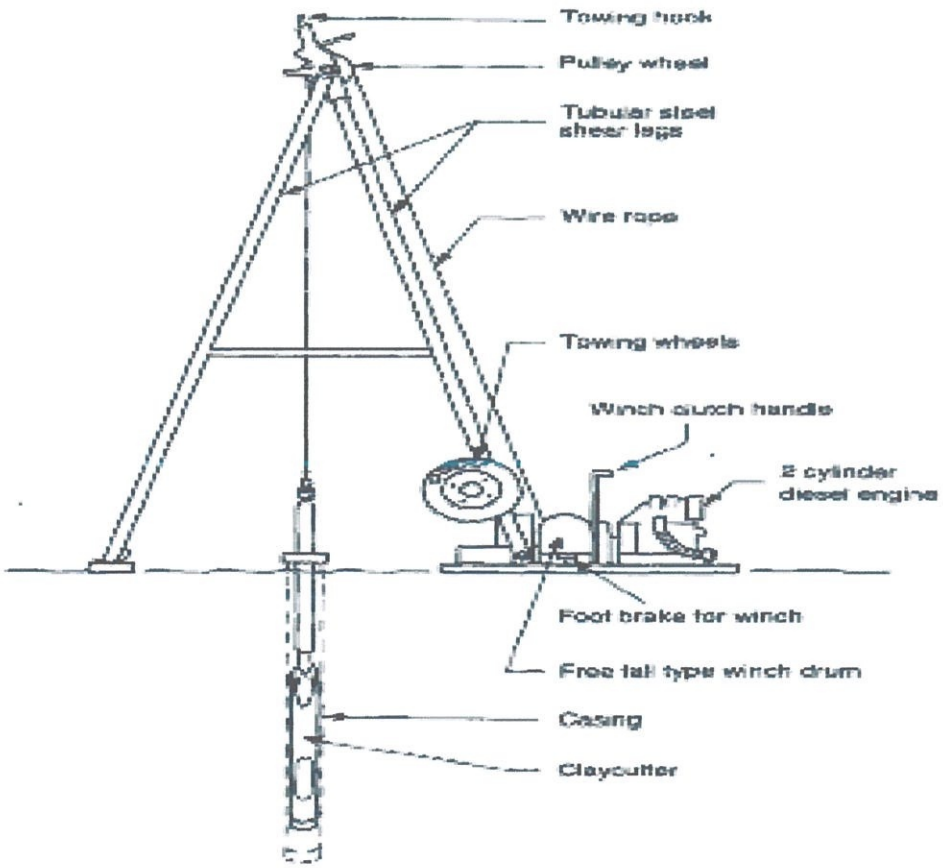


Figure 3.9.2 Light percussion drilling rig

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

Karol (2003) stated that by repeatedly surging the shell up and down at the base of the hole, soil can be collected and removed from the hole. The casing should either be allowed to follow the hole down (if it is loose) or should be driven so that it is just above the base of the hole, otherwise progress will be slow, and either large cavities will be formed on the outside of the casing or the soil will be loosened for a considerable distance around the hole. Of course, casing is nearly always used with the shell, because most granular soils will not stand vertically if unsupported in the presence of water.

Casing is not only used when drilling in granular soils, but is also necessary when drilling in very soft soils or when drilling in clays, to seal off groundwater after it is encountered. The presence of water in the base of the hole will allow samples to swell, but the reason that most drillers seal off water is more basic: stiff plastic clays become difficult to recover with the claycutter if large quantities of water are present and if this water cannot be controlled the driller will usually be forced to drill more slowly using the shell.

The light percussion rig normally has 1000 – 1500 kg capacity and most commonly uses 150 -200mm diameter, casing and tools. It will have little difficult in boring to 45m depth in a very stiff clay such as the London clay, but in sandy soils more casing size will often be needed to reduce friction.

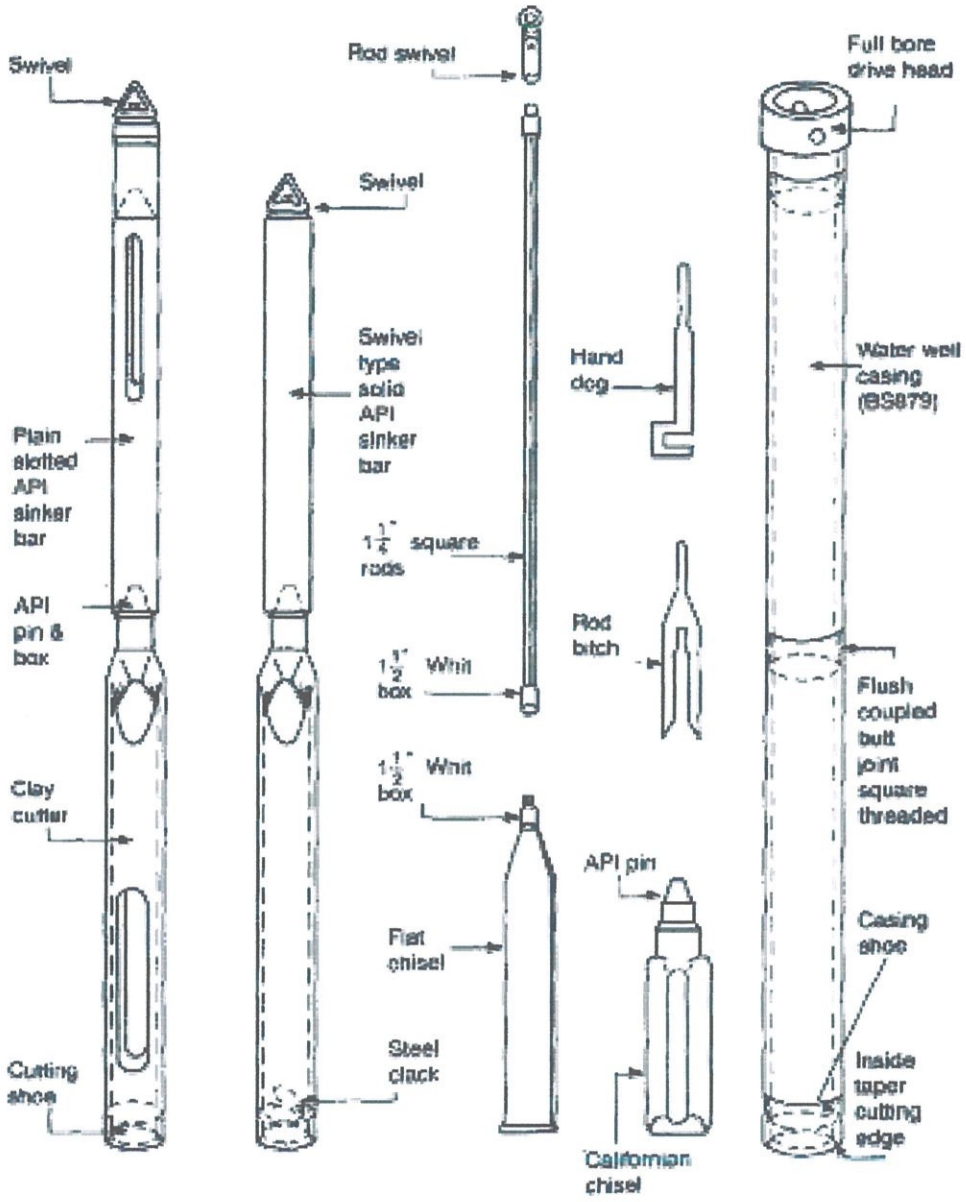


Figure 3.9.3: Light Percussion Drilling Tools.

Source: http://www.geotechnique.info/SI/SI%20Book%20Chapter%205.pdf

The friction transmitted by sand or chalk to the outside of casing will often be too great to allow the rig to pull more than 10 - 20m of casing out of the ground without the use of short-stroke hydraulic jacks. Under these conditions strings of casing of different diameters are used to allow a greater depth of drilling. As an example, if a borehole were to be advanced to 50m in

sand, the driller might start the boring using 300 mm dia. casing and tools and drill until the rig began to have problems pulling the casing, which might occur at 15 m depth. At this stage the driller would insert a string of 250 mm dia. casing and pull back the larger casing 1 m or so to make sure that it would still be loose at the end of boring the hole.

The inner 250 mm dia. casing, of course, would receive no friction on the upper 14m of its length, and the hole could now be advanced until its second string became tight, when a 200mm string of casing would be inserted at, say 30 m below ground level (GL). At the end of boring the hole might be cased with four different sizes, as in Table 3.1.

Depth (m)	Casing (mm dia)
GL – 14	300
GL- 29	250
GL- 41	200
GL – 50	150

Table 3.1 : Example of casing for 50 mm borehole.

3.3 MACKINTOSH PROBE OR JKR.

3.3.1 Introduction

According to Gue & Tan (2000) wide range of dynamic and static penetrometers are available, with different types being used in different countries. However, the objective of all probing is the same, namely to provide a profile of penetration resistance with depth, in order to give an assessment of the variability of a site. Probing is carried out rapidly, with simple equipment. It produces simple results, in terms of blows per unit depth of penetration, which are generally plotted as blow count/depth graphs.

The Mackintosh prospecting tool consists of rods which can be threaded together with barrel connectors and which are normally fitted with a driving point at their base, and a light hand-operated driving hammer at their top (Fig. 3.9.7). The tool provides a very economical method of determining the thickness of soft deposits such as peat.

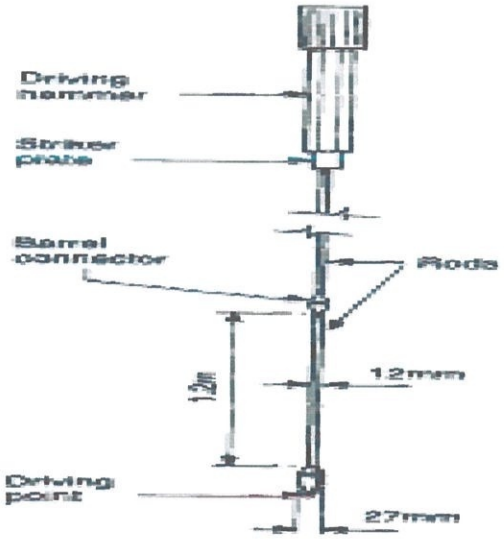


Figure 3.9.4 Mackintosh Probe

Source: http://www.gnpgeo.com.my/download/publication/2000_03.pdf

The driving point is streamlined in longitudinal section with a maximum diameter of 27mm. The drive hammer has a total weight of about 4kg. The rods are 1.2 m long and 12mm dia. In the UK the device is often used to provide a depth profile by driving the point and rods into the ground with equal blows of the full drop height available from the hammer: the number of blows for each 150 mm of penetration is recorded. When small pockets of stiff clay are to be penetrated, an auger or a core tube can be substituted for the driving point. The rods can be rotated clockwise at ground level by using a box spanner and tommy bar. Tools can be pushed into or pulled out of the soil using a lifting/driving tool. Because of the light hammer weight the Mackintosh probe is limited in the depths and materials it can penetrate.

JKR or Mackintosh probes are used for:

- Detection of weak or shear plane at shallow depth.
- Determination of shallow bedrock profile.
- For design of shallow foundation on natural ground with recent fill and for structure of low risk.

If in doubt use borehole instead.

3.3.2 Component of probe mackintosh

i. Cone

The cone is a triangle-shaped device attached to a long iron rod. This is made of hardened steel and installed at the end of the rod to facilitate the initial test rod into the soil.

ii. Steel rod

Rod is an iron rod with a length of between 1200 to 1220mm. The rod is made of strong steel because it will bear the pressure that is given to it when the hammer dropped on it. It is cylindrical shape and it is straight. It is used to hold the cone and the hammer in mounted on top of it.

iii. Connectors

The rod is connected with other by using the connection. This connection provides additional support to prevent the rod from bending during the test.

iv. Hammer

Hammer used to hit the iron rod to go into the ground, the tools has a different weight depending on the appointed, the tools is usually weights 4 – 25 kg.

3.4 CLASSIFICATION OF SOIL

3.4.1 Non – representative samples.

According Gue & Tan Yean Chin (2000) stated that a sample containing mixes of soil or rock from different layers, or soils where certain fractions have been removed or exchanged by washing or sedimentation. This type of sample is now not normally considered as useful in site investigation, particularly since considerable skill may be required even to obtain a preliminary classification of the sub-soil. This type of sample is typically produced by the following:

i. Wash boring: Where progress is made by jetting, and tests are made on open drive samples, fine granular soils may be washed away, and coarse granular particles may collect at the base of the hole, giving false particle size distributions in samples

ii. Bailing: The use of a 'shell'; bailer, or 'sand pump' while percussion drilling forces the soil at the base of a borehole into suspension in the water. The coarse fraction of suspension in the water, and will often either be left in the borehole or tripped away before samples are taken.

iii. Rotary open – holding: This uses a similar technique to wash boring to advance the holes. Gravel-size particles will not be lifted up the hole, except by unacceptably high up-hole flush velocities which will lead to excessive borehole erosion.

3.4.2 REPRESENTATIVE SAMPLES

A sample of soil from particular stratums which have not been contaminated by minerals or particles from other levels in the borehole, and have not been chemically altered, but may have been remoulded and have had their moisture contents changed. These samples may be obtained from samplers which are unsuitable for the soil conditions, or where samples are taken from the cutting shoe of samplers before they are sealed. In addition representative disturbed samples may be obtained from material obtained from relatively uniform soils by claycutter, or where clay materials are removed from the sampler shortly after sampling and placed in containers which allow them to alter their moisture content with time.

3.4.3 UNDISTURBED SAMPLES

A samples in which the soil is subjected to little enough disturbance to allow laboratory experiments to determine the approximate physical characteristics of the soil, such as strength, compressibility and permeability.

3.5 METHOD OF SELECTING THE SITE INVESTIGATION.

In selecting the most appropriate method for soil investigation, there are 4 things that should concern

- Geological condition of the soil at the site.
- Design Of the site surface
- Type of information that are require
- Time and cost

3.6 SPECIFICATION ON SOIL INVESTIGATION WORKS (DEEP BORING).[1]

3.6.1 Boring plants.

The plants used shall be capable of boring/drilling to the maximum depth indicated in the Bill of Quantities/Drawings, etc. For work carried out under Schedule of Rates, the plants used shall be capable of boring/drilling up to a depth of 80 metres from existing ground level.

The plants used shall be suitable for advancing the bore, sampling, insitu testing and rock drilling in accordance with the relevant specification of each of the operations.

3.6.2 Method of advancing boreholes.

The method used shall be such that an accurate and continuous observation of the soils from different levels shall be allowed to occur. When an undisturbed sample is to be taken, a reasonably clean hole shall be provided and the portion of soil to be sampled is not unduly disturbed.
Recommended methods are wash boring, continuous augering, continuous sampling and rotary drilling or a combination of these methods. Percussion boring shall not normally be permitted unless otherwise specified. When it is allowed such information will be clearly stated in the Bill of Quantities/Drawings, etc.

[1] Perunding Abadi Sdn. Bhd. Soil Investigation manual works for Jabatan Kerja Raya

3.6.3 Uncased and case boreholes

Unless otherwise stated boring without casing may be permitted provided that there is no collapse of the borehole. A collapse is considered to have occurred when, in the opinion of the S.O. (superintendent officer) there is a mingling of soil or rock from different depths inside the borehole.

Casing shall be provided as soon as there are signs that the walls of the boreholes are collapsing.

3.6.4 Other methods of stabilization of the boreholes.

Other methods of stabilization of the boreholes may be carried out subject to the prior approval of the S.O. on the procedure used. Nevertheless, casing shall be used when, in the opinion of the S.O. there is considerable doubt on the effectiveness of the method of stabilization proposed or practiced.

3.6.5 Heaving of the bottom of the boreholes

To prevent heave and disturbance of the soil at the bottom of the borehole, the level of drilling fluid in the hole must at all times be equals to or higher than the elevation of the ground water. This condition shall be strictly observed in formations of fine sand or silt, or in operations involving undisturbed sampling.

3.6.6 Size and depth of boreholes

The size of the boreholes shall be such that the requirements of size in sampling, insitu testing and etc. are satisfied.

In general, boring in soil shall be stopped when the standard penetration test values over a depth of 9 metres are equals to or greater than 50 blows/0.30m. The S.O. shall modify this general rule depending on the actual site condition.

When rock is encountered, drilling shall be carried out to penetrate at least 3.0 m into rock if the rock is limestone, or 1.5m if the rock is not limestone. Additional drilling shall be carried out if instructed by the S.O.

3.6.7 Rock drilling

The procedure for rock drilling shall be in accordance with ASTM. D2113 – 70(1976) "Diamond Core Drilling for Site Investigation)

The minimum diameter of cores acceptable shall be 30.2 mm (AWX, AWM core barrels). However, when directed by the S.O. cores of 54.0mm diameter (NWX, NWM core barrels) shall be taken.

The Core Recovery Ratio (CRR) and the Rock Quality Designation (RQD) as described below shall be reported for each core run.

3.6.8 Core Recovery Ratio (CRR) and Rock Quality Designation (RQD)

Good quality core is defined as intact core having a fully circular circumference or in the case of broken rock fragments assembled to form core with a fully circular circumference. The CRR shall mean the ratio of the total length of the good quality cores over the drilling, expressed to the nearest 5%. The RQD is the ratio of the total length of good quality cores each exceeding 100mm in length, over the drilling run, correct to the nearest 5%.

3.6.9 Unnatural obstructions and abandoned boring

Should unnatural obstructions to boring be encountered, the S.O. shall be informed immediately so that a decision may be made regarding the use of any special technique, including chiselling or diamond drilling, or termination of the borehole. Boreholes terminated with the consent of the S.O. shall be measured.

Under no circumstances shall the contractor abandon or terminate a borehole without the approval of the S.O. Boreholes so abandoned or terminated will not be measured.

However, should the Contractor be unable to complete any borehole due to encountering underground services or structures which cannot be reasonably foreseen after the clause in the preliminaries "Damage of overhead and underground mains and services" has been complied with, the completed borehole may be allowed to be measured.

3.6.9.1 Backfilling of borehole

Boreholes shall be backfilled with free-flowing sand or silt as the borehole casing is withdrawn, in such a manner that collapse of the sides of the borehole is precluded. The cost of backfilling shall be deemed to be included in the rates for boring.

CHAPTER 4

SOIL INVESTIGATION USING

4.1"*WASH BORING*" METHOD.

4.1.1 Introduction

This soil investigation was carried out by BUMIMETRO ENGINEERING SDN BHD, that is being appointed by the client that is PERUNDING ABADI SDN BHD to do the soil investigation at No 8, Jalan 3, Ampang, Selangor Darul Ehsan. The soil investigation was conducted for 1 week because the size of the site is small.

Soil investigation that has been carried out including:

1. Wash Boring
2. Mackintosh Probes

4.1.2 NUMBER OF EMPLOYEES

1. Operator – His work is dredging the site while being monitored by a supervisor. It is his responsibility to make sure the hole is dug in the position set by the surveyor. His responsibility is to ensure that all samples taken are stored in proper containers to be brought to the laboratory. In addition, what type of sample that is going to be taken will be the responsibility of the operator.

2. Labour-Force needed to help the operators doing the dredging works. The type of work like connecting the "casing", installing the SPT (Standard Penetration Test) for sampling, and all the others works including the flow of the water

4.1.3 COMPONENT FOR SOIL INVESTIGATION

i. Multi-speed Rotary Spindle (Boring Machine)

The boring machine is one of the most versatile machine tools used to bore holes in large and heavy parts, which are practically impossible to hold and rotate in an engine lathe or a drilling machine. Boring machines can, therefore, it been developed primarily to do this. In addition to its primary purpose of boring the range of speeds and feeds provided to the various traversing components allow drilling, milling and facing to be performed with equal facility. This type of machine is using the diesel to operate.

Figure 4.1: "MULTI-SPEED ROTARY SPINDLE (BORING MACHINE)

ii. Steel Casing

Steel casing is large diameter pipe that is assembled and inserted into a recently drilled section of a borehole. The type of casing that is been used is HW casings (101mm I.D) and NW casing (76mm I.D). The HW casing (101mm I.D) is used to prevent the soil collapse while the dredging work still in progress. While the NW casing (76mm I.D) is used for taking samples and the end of the casing will be jointed when using SPT or Core Barrel.

The purpose of using casing is:

1. Prevent unstable formation from caving-in and sticking the drill string.
2. Seals off high pressure zones from the surface, avoiding potential for a blowout.
3. Prevents fluid loss into or contamination of production zones.
4. Provides a smooth internal bore for installing production equipment.

Figure 4.2: HW casing (101mm I.D) and NW casing (76mm I.D)

iii. Split Spoon

This tool is used in the SPT (Standard Penetration Test) test. The samples are taken by using the "Piston Sampler" ways. These samples are taken by using the "Split Spoon" with diameter 50.8mm, which connected to the NW casings (76mm I.D) and will be stomp by the stomper at the weight of 63.5 kg falling through 760mm without any resistance. The test drive will be terminated after 300 mm penetration or a total of 50 blows, whichever is reached first.

Figure 4.3: Split Spoon

iv. Core Barrel

A cylindrical rock-drilling tool, designed to cut an annular space around a central cylindrical core of rock, which can then be removed to classify the material or in the case of a drilled shaft removed to deepen the hole. The investigation use the "core barrel" that it diameter is 54mm and this tool is only limited to 1.5meters only.

Figure 4.4: CORE BARREL

v. Water Pump

This tool is used to distribute water to the digging machine. Water will be channeled into the casing to remove soil that is at the bottom of "casing". Water also will facilitate the dredging works for the extended high velocity. Dredging works can be made easier because the ground can be softened by the presence of water.

Figure 4.5: Water Pump

vi. Water Tank

This water tank will be used if the source of water is far from the drilling site. This tank will provide the water that is needed while dredging.

4.1.4 Soil Investigation Procedure.

The performance while doing the investigation should be monitor by the contractor or the client. For this project the task is being monitored by the client. The samples that have been collect will be sent to the laboratory for the soil testing.

4.1.5 Step for Soil Investigation Using Wash Boring

1. All components will be installed in the place that has been indicated for placing the machine. The machine will be derived by using a tripod that is 5 meters high.

Figure 4.6: Installation of the machine.

2. Water source must be near the place that is going to be dredging, if there is no water source nearby, the water should be filled in the water tank and place it near the work place.

3. After all components installed and the place of water resources have been identified, digging work can start.

Figure 4.7: Work can start if all the preparation is complete.

4. The first casing that is HW casing (101mm I.D) will be connect to the boring machine to start the dredging.

Figure 4.8: Start Dredging

5. Every 1.5meter, the NW casing (76m I.D) that is already being connected with split spoon with 50.8mm diameter will be put in the HW casing (101mm I.D) for taking the samples.

6. The standard penetration tests were carried out according to BS 1377: Part 9:1990 Method 3.3, using an open-ended longitudinally split spoon sampler.

7. A cutting shoe at the lower end and a coupling at the upper end connect the sampler to the NW rod. The sampler was driven into the soil by a 65kg automatic trip hammer free-falling through a height of 760mm onto an anvil and a standard sampler tool a distance of 450mm.

Figure 4.9: 65kg automatic trip hammer free-falling through a height of 760mm.

Figure 4.9.1: A standard sampler tool a distance 450mm

8. During the test (SPT test), the number of blow for two increments of 75mm, or the penetration of the tool after 25 blows will be recorded as the "seating drive". The seating drive will be terminated after 150mm penetration or 25 blows, whichever is reached first and the test drive will be started.

9. After the seating drive, the number of blows required for each of four increments of 75mm penetration will be recorded as the "test drive". The "test drive" will be terminated after 300mm penetration or a total 50 blows, whichever is reached first.

10. The number of blow for two increments (75mm) of the "seating drive" and the number of blows required for each of four increments (75mm) of the "test drive" will be record as penetration resistance or N-value.

11. The SPT were conducted at every depths of 1.5 meter interval. A small disturbed sample for the split spoon sampler will be taken.

12. The details of the SPT will be recorded on the borehole log. The size and depth of the casing and depth of water will be recorded.

Figure 4.9.2: SPT that are just taken out from the hole

Figure 4.9.3: The result/soil sample

13. While dredging, it will there will be facing rock layer, the front will be change with a "core barrel" and it will be dredging for another 3 meter depth just for caution and for taking the samples of the rock for lab test.

Figure 4.9.4: Changing to Core Barrel

Figure 4.9.5: Result/Sample that are taken by using Core Barrel

4.2 JKR @ MACKINTOSH PROBE

4.2.1 Introduction

The Mackintosh Probe is a lightweight and portable penetrometer. It is a considerably faster and cheaper tool than boring equipment especially when the depth of exploration is moderate and the soils under investigation are soft or loose.

4.2.2 Component for Mackintosh Probe

Figure 4.9.6: Mackintosh Probe Equipment

i. List of Mackintosh Probe Equipment

The JKR Probe complete with:-	
13 nos	Penetration Rod (1 meter each)
13 nos	Coupling
2 nos	Pipe Wrenches
2 nos	Penetration Cone
2 nos	Hammer Nut
1 no	Hammer
1 no	Lifting Handle
1 no	Heavy Duty Steel Carrying Case

Table 4.1: List equipment for Mackintosh Probe

4.3 METHOD OF USING MACKINTOSH PROBE

1. Collect all the test equipment.

2. The steel rod is marked using a pen marker every 300mm

3. Place the steel rod on the ground and installed it in straight or vertically (90 degrees)

Figure 4.9.7: Doing Mackintosh Probe

4. Then the hammer will be lift approximately 280mm high.

5. Release the hammer without stopping it or without any barriers. With this pressure that has been given from the hammer, the cone will be penetrated the soil.

Figure 4.9.8: The hammer that has been release

6. Then lift the hammer again approximately 280mm again and release it. Repeated the step and calculate the total impact that has been given by the hammer in every 300mm in penetrate the soil. Record the number of impacts.

7. Do the same method for every 300 mm it penetrated.

8. Repeat the step until it reaches the desire depth or the total impact that has been given by the hammer in every 300mm that has exceed 400 times stomping.

Figure 4.9.9: Doing Mackintosh Probe

4.4 MACKINTOSH PROBE PROCEDURE

There are several requirements that must be known by those who perform these tests:

1. Equipment is not allowed to reach any hard layers with a thickness exceeding 2.5 cm layer although it is a soft layer.

2. When the steel rod enters the ground, the possibility of the wall to collapse is high. When the wall is collapsed, they will cause a friction between the surface and the steel rod. This will affect the amount of impact that is given by the hammer.

3. For soft soil or a soil that containing a high viscosity, there will be a little friction between the rod surface and the soil particles, thus this will make the test readings not accurate.

Based on this procedure, the test is not appropriate to determine the length of the pile. This test is commonly used to determine what type of piling is going to be used for smaller projects.

CHAPTER 5

PROBLEM IN CASE STUDY AND WAY TO OVERCOME IT

5.1 PROBLEM

1. Hydraulic pump oil leak while doing the soil investigation.
2. Far from water source/hard to get water for dredging works.

Figure 5.0: Oil dripping

5.2 WAYS TO OVERCOME IT

1. Change the compartment at the place where the oil is dripping, where one of the components inside is damage.
2. Standby water tank nearby and filled it till it full, refill it if it is nearly finish.

CHAPTER 6

CONCLUSION

In conclusion, the soil investigation function is to identify the type of the soil. It is because by knowing the type of the soil and it strength as well as it characteristic, we can make an appropriate design and type of material will be used based on the result of the soil investigation. This test must be conduct efficiently as any mistake that is made during the soil investigation or during the taking of the sample will affect the result and bring disaster because soil investigation is like the starting point in every construction. As the result of these, will influence test as well as will be influence the design work, therefore only those who are experience and knowledgeable in soil investigation and also about using the right technique in performing these test are qualify taking in charge of the soil investigation while it is in works. This is because only those works with ethics and dedication can meet the specification and standards that are set by the government.

The soil investigation is not costly and not needed a lot of labour, what is important is that the result that is got from the soil investigation, because it is involving the safety of the owner and public in that building if the result that we get is not accurate and the design that has been made is not appropriate to the soil. Thus with this we can conclude that the implementation of the soil investigation is very important and it is need to be run efficiently with less mistake or none.

REFERENCE

REFERENCE

1. Reuben H.K. (2003) Chemical Grouting and Soil Stabilization, Third edition, revised and expanded, Rutgers University, New Brunswick, New Jersey, U.S.A.

2. C.R.I Clayton, M.C. Matthews and N.E. Simons (1982), Site Investigation, Second Edition, Department of Civil Engineering, University of Survey.

3. Andrew schofield and Peter Wroth (1968), Critical State Soil Mechanics, Lecturers in Engineering at Cambridge Universiy

4. Method Statement for soil sampling and site investigation, retrieved on October 5, 2010 (http://www.explorationltd.com//download/Soil%20Sampling%20Method%20Statement.pdf)

5. Gue S.S and Tan .Y.C. (2000), Subsurface Investigation and Interpreatation of Test Result for Foundation Design in Soft Clay, Gue and Partners Sdn. Bhd.

6. Methods Statement for Soil Investigation, retrieved on October 5,2010, (http://www.i-astm.com/pdf/Method_SoilInvestigation.pdf)

7. Soil Investigation Specification, retrieved on October 7, 2010, (http://www.gea.com.my/resource/SI_Spects_cidb%202.pdf)

8. Wikipedia, Geotechnical Investigation, retrieved on June 20, 2010, (http://en.wikipedia.org/wiki/Geotechnical_investigation)

9. Perunding Abadi Sdn. Bhd. Soil Investigation manual works for Jabatan Kerja Raya.

APPENDIX

BUMIMETRO ENGINEERING SDN BHD

(Company No. 393007-V)

BOREHOLE: BH 1
Job No:
Sheet: 1 of

ENGINEERING LOG BOREHOLE

Client: Consultant:
Project: S.I. W AT NO 8 JALAN 3 AMPANG

Date Start: 19-7-10 Drill Type: Rotary Barrel Type: W.W.E D90 R R.L. Surface:
Date Comp: 19.07.10 G.W.L.: 0.40 m w.

Depth Metre/feet	Sample No.	Depth (Metre/feet)	Log	Soil Description & Lithology	Recovery Ratio	S.P.T. 3" 75mm	3" 75mm	3" 75mm	3" 75mm	3" 75mm	3" 75mm	N	Remarks
0.00	D1	0.00 to 0.30		Top Soil: Yellowish Brown Silty CLAY with some Sand.									19.07.10 8.00 AM Start.
1.50	P1/D2	1.50 to 1.95		Dense Yellowish grey Mottled with Dark grey Silty SAND.	230/450	2	2	3	9	9	8	29	
3.00	P2/D3	3.00 to 3.45		Dense — Ditto —	310/450	2	3	7	9	14	14	44	
4.50	P3/D4	4.50 to 4.95		Dense Yellow grey Mottled with white grey Silty SAND.	250/450	5	8	11	11	13	13	48	
6.00	P4/D5	6.00 to 6.450		VERY DENSE Yellow grey Mottled with white grey Silty SAND.	210/410	5	9	11	16	20	35	50/260mm	
7.50	P5/D6	7.50 to 7.800		VERY DENSE — Ditto —	210/300	18	20	23	27			50/150mm	
9.00	P6/D7	9.00 to 9.270		— No Recovery —	NIL/270	8	26	28	23	22		50/120mm	

STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
ROCK CORING
VANE SHEAR TEST

N = NO. OF BLOW/300 mm: BLOW/FT.

Cohesive Soil: 0 2 4 8 15 30 — /S S M.St St V.St H

Non-Cohesive Soil (N): 0 4 10 30 50 — VL L MD D VD

S (soft); St (stiff); H (hard); L (loose), D (dense)

BUMIMETRO ENGINEERING SDN BHD

(Company No. 393007-V)

BOREHOLE: BH-1
Job No:
Sheet: 2 of

ENGINEERING LOG BOREHOLE

Client: Consultant:
Project: S.I.W AT NO 8. JALAN 3. AMPANG.

Date Start: 19.07.10 Drill Type: Rotary Barrel Type: Y.W.E 090R R.L. Surface:
Date Comp: 19.07.10 G.W.L.: 0.40 mm

Depth Metre/feet	Sample No.	Depth (Metre/feet)	Log	Soil Description & Lithology	Recovery Ratio	S.P.T. 3" 75 mm	3" 75 mm	3" 75 mm	3" 75 mm	3" 75 mm	3" 75 mm	N	Remarks
9.50	C1	9.50 – 11.00		Light grey Mottled with Medium grey Slightly, Fractured, Strong GRANITE.	CL: 1500 mm CR: 1500 mm RQD: 48.7 %								
11.00	C2	11.00 – 12.50		— Ditto —	CL: 1500 mm CR: 640 mm RQD: NIL								
				End OF BOREHOLE AT DEPTH - 12.50 mm Comp Date and time 19.07.10 - 3.42 pm Zulhelmy B Za'aba									

STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
ROCK CORING
VANE SHEAR TEST

N = NO. OF BLOW/300 mm. BLOW/FT.

Cohesive Soil (N): 0 2 4 8 15 30 — VS S M.St St V.St

Non-Cohesive Soil (N): 0 4 10 30 50 — VL L MD D VD

S (soft); St (stiff); H (hard); L (loose); D (dense)

BUMIMETRO ENGINEERING SDN BHD

(Company No. 393007-V)

BOREHOLE: BH-2
Job No: ____
Sheet: 1 of 2

ENGINEERING LOG BOREHOLE

Client: _____ Consultant: _____

Project: S.I.W AT NO.8, JALAN 3, AMPANG.

Date Start: 20.07.10 Drill Type: Rotary Barrel Type: Y.W.E BOOR R.L. Surface: _____

Date Comp: 21-7-10 G.W.L.: _____

Depth Metre/feet	Sample No.	Depth (Metre/feet)	Log	Soil Description & Lithology	Recovery Ratio	S.P.T. 3" 75mm	3" 75mm	3" 75mm	3" 75mm	3" 75mm	3" 75mm	N	Remarks
00	D1	0.00 to 0.30		Top Soil: Yellowish Brown Silty CLAY with some Sand.									20.07.10 8.00AM Start
1.50	P1/D2	1.50 to 1.95		STIFF Yellowish Brown Silty Clay with some Sand.	300/450	2	2	3	2	2	2	9	
3.00	P2/D3	3.00 to 3.45		Medium Dense Yellow Brown Mottled Light grey Silty SAND.	250/450	3	3	3	3	4	4	14	
4.50	P3/D4	4.50 to 4.95		Medium Dense —Ditto—	260/450	3	4	4	4	5	4	17	
6.00	P4/D5	6.00 to 6.45		VERY DENSE White grey Silty SAND.	210/450	5	5	10	13	13	14	50/300mm	
7.50	P5/D6	7.50 to 7.860		VERY DENSE —Ditto—	200/360	9	10	20	21	9/60		50/210mm	
				HIT ROCK AT DEPTH 8.0m									

STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
ROCK CORING
VANE SHEAR TEST

N = NO. OF BLOW/300 mm : BLOW/FT.

Cohesive Soil (N) 0 2 4 8 15 30 — VS S M.St St V.St H

Non-Cohesive Soil (N) 0 4 10 30 50 — VL L MD D VD

S (soft); St (stiff); H (hard); L (loose); D (dense)

BUMIMETRO ENGINEERING SDN BHD

(Company No. 393007-V)

BOREHOLE: BH 2
Job No:
Sheet: 1 of 2

ENGINEERING LOG BOREHOLE

Client: Consultant:
Project: SIW AT NO 8 JALAN 3 AMPANG

Date Start: 20-7-10 Drill Type: Barrel Type: R.L. Surface:
Date Comp: 21-7-10 G.W.L.:

Depth Metre/feet	Sample No.	Depth (Metre/feet)	Log	Soil Description & Lithology	Recovery Ratio	S. P. T. 3" 75 mm	3" 75 mm	3" 75 mm	3" 75 mm	3" 75 mm	3" 75 mm	N	Remarks
8.00	C1			Light grey. Moderately Weathered GRANITE.		CL = 1.50 m		RQD = 26%					CR = 1.00 m
9.50	C2			— DITTO —		CL = 1.50 m		RQD = NIL					CR = 0.70 mm
11.00				END OF BH AT DEPTH 11.0 m Zulhelmy B Zaaba									

STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
ROCK CORING
VANE SHEAR TEST

N = NO. OF BLOW/300 mm : BLOW/FT.

Cohesive Soil (N) 0 2 4 8 15 30 — VS S M.St St V.St H

Non-Cohesive Soil (N) 0 4 10 30 50 — VL L MD D VD

S (soft); St (stiff); H (hard); L (loose); D (dense)

GROUND WATER LEVEL OBSERVATION

BUMIMETRO ENGINEERING SDN BHD

Project : SK ST NO 8 JALAN 3 AMPANG

Borehole: BH 1

DATE	TIME	BH-DEPTH (m)	CASING DEPTH (m)	WATER TABLE (m)	REMARK
20-7-10	6.0pm	9.50m	8.0m	1.0 m	
21-7-10	9.35am	9.50m	8.0m	0.90m	
	11.30am	11.0m	NIL	1.80m	

BUMIMETRO ENGINEERING SDN. BHD.

MACKINTOSH PROBES

Client:

Date: 21-7-10

Project & Location: S.I.W. Lot No 8 Jalan 3 Ampang

PROBE. NO.	mp-1	mp-2	mp3	mp3 A	mp 4
R. L.				c/s 0.5m	
DEPTH (METRE)	NUMBER OF BLOWS PER 0.30 METRE				
0.00 – 0.30	30	71	57	78	58
0.30 – 0.60	37	30	400/	43	400/
0.60 – 0.90	21	28	↓	190	↓
0.90 – 1.20	17	21	21cm	201	20cm
1.20 – 1.50	29	31		240	
1.50 – 1.80	48	56		400/	
1.80 – 2.10	38	39		↓	
2.10 – 2.40	45	51		30cm	
2.40 – 2.70	22	33			
2.70 – 3.00	138	140			
3.00 – 3.30	400/	190			
3.30 – 3.60	↓	400/			
3.60 – 3.90	24cm	↓			
3.90 – 4.20		30cm			
4.20 – 4.50					
4.50 – 4.80					
4.80 – 5.10					
5.10 – 5.40					
5.40 – 5.70					
5.70 – 6.00					
6.00 – 6.30					
6.30 – 6.60					
6.60 – 6.90					
6.90 – 7.20					
7.20 – 7.50					
7.50 – 7.80					
7.80 – 8.10					
8.10 – 8.40					
8.40 – 8.70					
8.70 – 9.00					
9.00 – 9.30					
9.30 – 9.60					
9.60 – 9.90					
9.90 –10.20					
10.20 –10.50					
10.50 –10.80					
10.80 –11.10					
11.10 –11.40					
11.40 –11.70					
11.70 –12.00					
12.00 –12.30					
12.30 –12.60					
12.60 –12.90					
12.90 –13.20					
13.20 –13.50					
13.50 –13.80					
13.80 –14.10					
14.10 –14.40					
14.40 –14.70					
14.70 –15.00					
REMARKS:					

BUMIMETRO ENGINEERING SDN. BHD.

MACKINTOSH PROBES

Date: 21-7-10

Client:

Project & Location: SIW A1 NO 8 JLN 3 AMPANG

PROBE. NO.	MP4 A	MP 4 B	MP 5	MP 5A	MP 5 B
R. L.	O/S 0.5m	O/S 1.0m		O/S 0.5m	O/S 1.0m
DEPTH (METRE)	NUMBER OF BLOWS PER 0.30 METRE				
0.00 – 0.30	51	56	58	54	56
0.30 – 0.60	400/	400/	400/	400/	400/
0.60 – 0.90					
0.90 – 1.20	12 cm	19cm	14 cm	18 cm	13 cm
1.20 – 1.50					
1.50 – 1.80					
1.80 – 2.10					
2.10 – 2.40					
2.40 – 2.70					
2.70 – 3.00					
3.00 – 3.30					
3.30 – 3.60					
3.60 – 3.90					
3.90 – 4.20					
4.20 – 4.50					
4.50 – 4.80					
4.80 – 5.10					
5.10 – 5.40					
5.40 – 5.70					
5.70 – 6.00					
6.00 – 6.30					
6.30 – 6.60					
6.60 – 6.90					
6.90 – 7.20					
7.20 – 7.50					
7.50 – 7.80					
7.80 – 8.10					
8.10 – 8.40					
8.40 – 8.70					
8.70 – 9.00					
9.00 – 9.30					
9.30 – 9.60					
9.60 – 9.90					
9.90 –10.20					
10.20 –10.50					
10.50 –10.80					
10.80 –11.10					
11.10 –11.40					
11.40 –11.70					
11.70 –12.00					
12.00 –12.30					
12.30 –12.60					
12.60 –12.90					
12.90 –13.20					
13.20 –13.50					
13.50 –13.80					
13.80 –14.10					
14.10 –14.40					
14.40 –14.70					
14.70 –15.00					

REMARKS:

BUMIMETRO ENGINEERING SDN. BHD.

MACKINTOSH PROBES

Client: _____ Date: _____

Project & Location: _____

PROBE. NO.	MP-5 C	MP-4C			
R. L.					
DEPTH (METRE)	NUMBER OF BLOWS PER 0.30 METRE				
0.00 – 0.30	87	25			
0.30 – 0.60	60	400/ 12CM			
0.60 – 0.90	120				
0.90 – 1.20	155				
1.20 – 1.50	234				
1.50 – 1.80	350				
1.80 – 2.10	400/ 18CM				
2.10 – 2.40					
2.40 – 2.70					
2.70 – 3.00					
3.00 – 3.30					
3.30 – 3.60					
3.60 – 3.90					
3.90 – 4.20					
4.20 – 4.50					
4.50 – 4.80					
4.80 – 5.10					
5.10 – 5.40					
5.40 – 5.70					
5.70 – 6.00					
6.00 – 6.30					
6.30 – 6.60					
6.60 – 6.90					
6.90 – 7.20					
7.20 – 7.50					
7.50 – 7.80					
7.80 – 8.10					
8.10 – 8.40					
8.40 – 8.70					
8.70 – 9.00					
9.00 – 9.30					
9.30 – 9.60					
9.60 – 9.90					
9.90 –10.20					
10.20 –10.50					
10.50 –10.80					
10.80 –11.10					
11.10 –11.40					
11.40 –11.70					
11.70 –12.00					
12.00 –12.30					
12.30 –12.60					
12.60 –12.90					
12.90 –13.20					
13.20 –13.50					
13.50 –13.80					
13.80 –14.10					
14.10 –14.40					
14.40 –14.70					
14.70 –15.00					
REMARKS:					