UNIVERSITI TEKNOLOGI MARA

FACULTY OF CIVIL ENGINEERING

INDUSTRIAL TRAINING REPORT

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JULAI 2018

ABSTRACT

This report is set out to give the reader full information about my industrial training in Jabatan Kerja Raya Daerah Kota Tinggi in Johor. Industrial training is one of the compulsory curricular in Universiti Teknologi MARA which students need to complete it whether in private or government sector. This course is sets up for student in order to give them experience and gain knowledge in working environment before going through the real working life. My industrial training is in Jabatan Kerja Raya or known as JKR which functioning as a technical agency for Malaysia. JKR is responsible for implementing infrastructure development and maintenance projects to various ministries, departments, statutory bodies and state governments such as roads, buildings, airports, ports and jetty. During this industrial training, I have been assigned to work in Road Department from 8th July until 31st July and 1st August until 2nd September 2018 in Building Department. During my placement, I have gain a lot of new technical knowledge about road and building construction and its maintenance works. These knowledge is very useful for my future career. This report also includes the background of JKR, weekly summary of activities, technical report and the lessons learned while my industrial training.

ACKNOWLEDGEMENT

In the Name of Allah, the Most Beneficent, the Most Merciful. All praised to the ProphetMuhammad SAW. I would like to express my deepest appreciation to all those who provided me the possibility to complete this industrial training report while in Jabatan Kerja Raya (JKR) Daerah Kota Tinggi and finish it successfully. First and foremost, a special gratitude to the District Engineer, Mr Normansah Bin Bokhari and I would like to thank my industrial supervisor while in Road Department, Mr Fakhrur Rezuan Bin Mahamad, and Mr Shuhaimi Bin Abdul Rahim, my industrial supervisor while in Building Department for guidance, information and knowledge while completing my industial training in JKR. Next, I would like to thank my industrial coordinator, Mrs Saadiah Binti Suwadi for guiding me through my industrial training. Apart from that, I also want to convey my gratitude to all the staffs and technicians here for their kindness in helping me completing my industrial training. In addition, it is important to have teamwork during my training and here I really want to thank my colleagues for their kindness, exchange ideas and knowledge during my training even though we came from different universities. Then, I want to convey my appreciation to my faculty supervisor, Mr Mohd Firdaus Bin Mohd Akhbar for his willingness to evaluate my industrial training presentation, logbook and report. Last but not least, I would like to thank my family for their motivation and support throughout my industrial training in JKR. Thanks for all the ideas, opinion, knowledge and suggestion they have given to me in order for me to complete this report.

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INTRODUCTION

1.1 INTRODUCTION

The Kota Tinggi District Public Works Department (Malay: Jabatan Kerja Raya Daerah Kota Tinggi), abbreviated JKR is a department under the parent body of the JKR Malaysia which is one of the agencies under the Ministry of Works Malaysia. As a representative of the JKR in the district, Kota Tinggi District JKR is headed by the District Engineer which responsible in implementing the policy based on circulars and procedures in place to achieve the mission, vision and objective of the department at the district level.

1.2 COMPANY BACKGROUND

Previously, Kota Tinggi District had two JKR offices which are in Kota Tinggi District and KEJORA JKR Office. On 01 March 1998, JKR KEJORA was disbanded and most of its staff were transferred to the Kota Tinggi District JKR, as well as the construction and maintenance of its projects.

Kota Tinggi District JKR back then has many division such as Road Division, Building Division and Water Maintenance Division led by a District Engineer, Road Engineering Assistant, Building Assistant Engineering, Building Maintenance Assistant and Education Assistant while supported by the Administration Division, Workshop, Store and several small branches to operate and carry out maintenance work of Road Division, Government Building Maintenance.

The Kota Tinggi District JKR office was originally located at the Building, Road, Electric and Plan Maintenance Office (Figure 1.0) located at Jalan Tun Habab facing Kota Tinggi District Hospital before moving to Level 5, Sultan Iskandar Building, Kota Tinggi, Johor (Figure 1.1). In January 2009, the Kota Tinggi District JKR office then moved to its own building in Jalan Abdul Aziz, Kota Tinggi (Figure 1.2)

Figure 1.0 Building, Road, Electric and Plan Maintenance Office

Figure 1.1 Kota Tinggi District JKR Office, Level 5, Sultan Iskandar Building

Figure 1.2 Kota Tinggi District JKR Office in Jalan Abdul Aziz, Kota Tinggi

1.2.1 LOGO

Figure 1.3 JKR Logo

Generally, the exhibited logo means the diversity of fields of work entrusted to the Jabatan Kerja Raya (JKR). Starting from the base, black colored curved lines symbolizes clean water supply and reflects that JKR is a dynamic organization. The arch-shaped lines in concentrated black color denotes to construction related work and maintenance of bridges and as well as a representative of the JKR organizations assigned as one of the leading the country in implementing engineering work. Straight black lines, on the line shaped arch symbolize the participation to implement the road network nationwide. Fourteen lines on a straight line signify a pledge to executing building operations comprising 14 states and federal territories in Malaysia.

The colour selection also has its own meaning. Yellow symbolizes maturity brands of JKR as one of the oldest organizations established and replicates the image growing in achieving its objectives. Black symbolizes strength and unity quality of the branch (branch in JKR organization is entrusted in implementing development projects). Grey symbolizes existence values (values of human capital in providing services).

1.2.2 VISION

To become a world-class service provider and centre of excellence in asset management, project management and engineering services for the development of the nation's infrastructure through creative and innovative human capital and state-of-the-art technology

1.2.3 MISSION

JKR's mission is to be a factor to national improvement by:

- Helping our customers grasp the basic information and providing services through collaborations as a strategic partner.
- Standardized our procedures and systems to deliver results dependable services.
- Provides asset management services and an effective and pioneering project.
- Strengthen existing engineering expertise.
- Developing human capital and new competencies.
- Prioritizing integrity in delivering the service.
- Fostering a well-proportioned relationship with the community.
- Preserving the environment in service delivery.

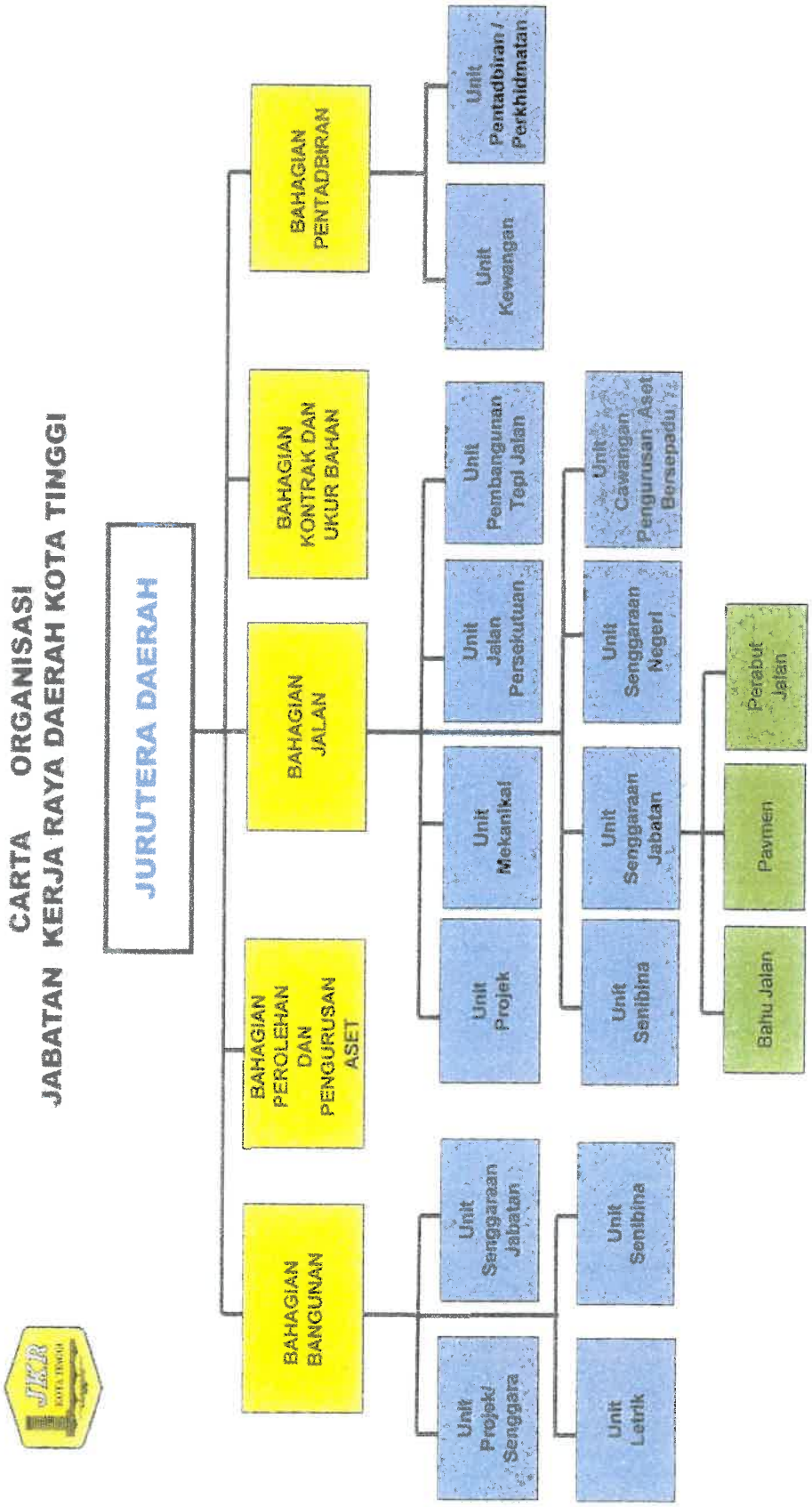
1.2.4 OBJECTIVE

" Yield the product and execute the maintenance services that congregate the quality, cost and time are set to accomplish the optimum benefit asset".

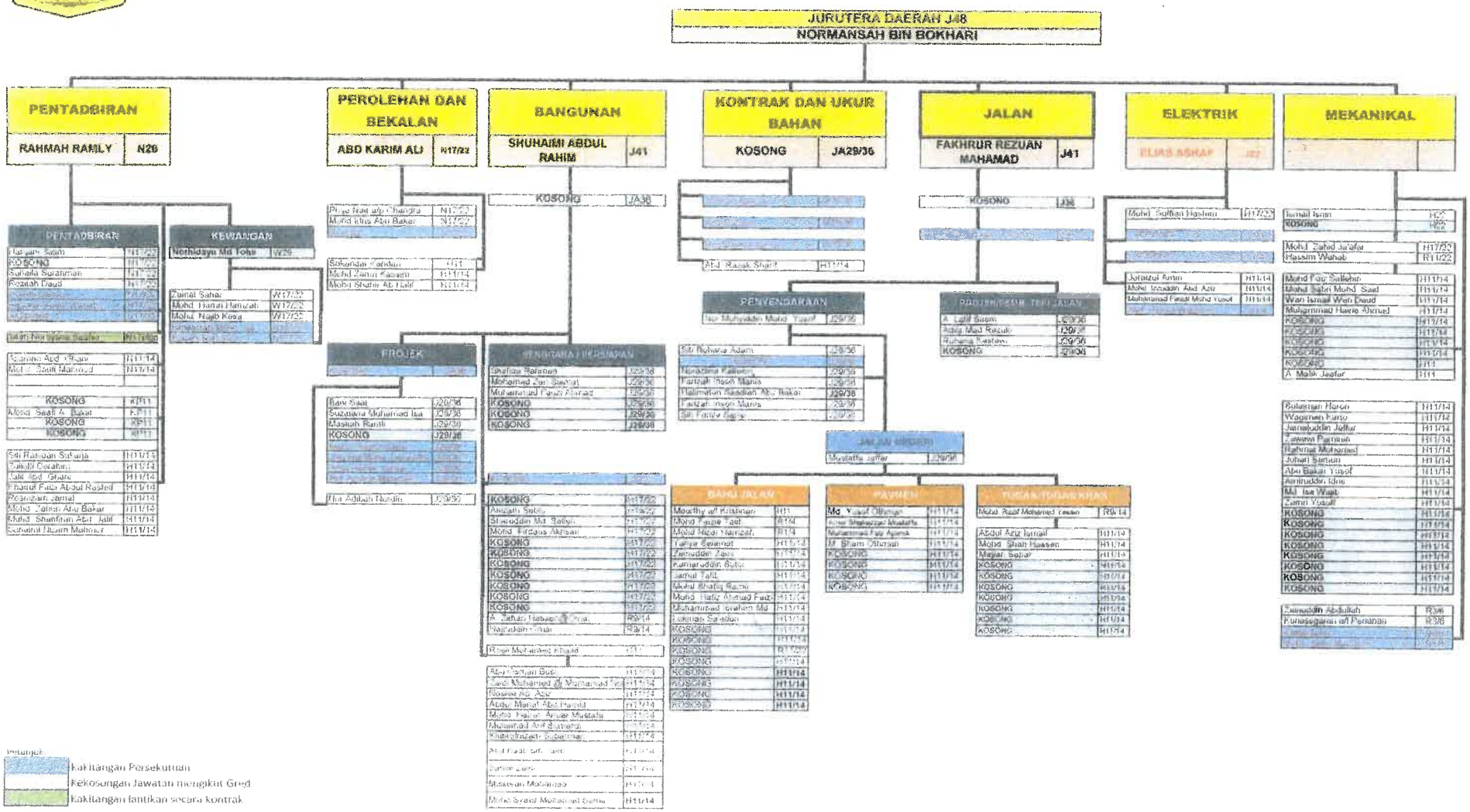
1.3 NATURE OF THE BUSINESS

JKR is responsible for planning, design and construction of infrastructure ventures such as roads, government buildings, airports, harbors, piers and related engineering works. Maintenance of roads and selected government buildings is carried out by JKR too. This company also provide technical advisory services to the Federal Government, as well as states and districts.

1.4 ORGANIZATIONAL STRUCTURE



CARTA ORGANISASI PERJAWATAN
JABATAN KERJA RAYA DAERAH KOTA TINGGI



Petunjuk:

- Kakitangan Persekutuan
- Kekosongan Jawatan mengikut Greg
- Kakitangan lantikan secara kontrak

KEMASKINI: 1.1.2018

CHAPTER 2
TRAINING ATTENDED

2.1 INTRODUCTION

Throughout this course, student was exposed to many industrial work and gained a lot of experience during eight (8) weeks of industrial training at JKR Kota Tinggi. The task given to student helps them to obtain new experience and knowledge about pavements and buildings.

2.2 WEEKLY SUMMARY

This part consists of weekly summary of all the activities carried out by trainee. It varies from self learning, learning from monitoring works and applied the technical knowledge.

2.2.1 WEEK ONE

Throughout the first week in JKR Kota Tinggi, I have learned and been taught about:

1. Rules and regulations for trainees.
2. Method in verifying bitumen content and grading of aggregate for pavement.
3. Monitor maintenance work in FT092 (Jalan Kota Tinggi - Sg. Rengit).
4. Carry out traffic census in Taman Sri Saujana to propose pedestrian bridge project
5. Routine patrol on FT092 (Jalan Kota Tinggi - Sg.Rengit)
6. Visiting site of slope treatment and culvert replacement project in FT099 (Jalan Lok Heng/Mawai/Sg.Mas).
7. Visiting site of drain replacement and sinkhole location in Jalan Bukit Samsu.
8. Monitoring road construction work in FT1390 (Jalan Felda Bukit Ramun).

Figure 2.0 Slope treatment and culvert replacement

Figure 2.1 Drain replacement work

Figure 2.2 Sinkhole

2.2.2 WEEK TWO

Throughout the second week in JKR Kota Tinggi, I have learned and been taught about:

1. Procedure of potholes patching and crack sealing from reading.
2. Routine patrol on FT212 (Jalan Tg. Sedili), FT213 (Jalan Sedili Kecil), FT1419 (Jalan Kg. Tenggaroh Selatan 1 & 2) and FT003 (Jalan Johor Bahru-Mersing).
3. Self learning: Read articles on stripping of pavement, and traffic light specifications.

2.2.3 WEEK THREE

Throughout the third week in JKR Kota Tinggi, I have learned and been taught about:

1. Specifications of road line from articles
2. Implementation of geoweb system in pavement construction.
3. Scope of maintenance works of State Road in Malaysia.
4. Monitor finishing work of pipe jacking installation in Jalan Felda Pasak
5. Measure road to construct entrance and exit road to site for Peninsular Hotel construction project in FT090 (Jalan Desaru - Punggai).
6. Method of measuring state road (single and dual carriageway, roundabout, road shoulder and median).

2.2.4 WEEK FOUR

Throughout the fourth week in JKR Kota Tinggi, I have learned and been taught about:

1. Micro surfacing on pavement surface from articles reading.
2. Types of crack on pavement surface.
3. Types of road pavements.
4. Types of surface deformation and surface defects of pavement.

2.2.5 WEEK FIVE

Throughout the fifth week in JKR Kota Tinggi, I have learned and been taught about:

1. Types of surface drainage in designing pavements.
2. Lightweight concrete in construction works (usage, types and characteristics).
3. Green building (objectives, advantages and disadvantages)
4. Design of roof structure (design and components).
5. Monitoring site of trial lay of pavement work for "Jalan Premix Baru Generasi Kedua" project in Felda Pasir Raja.

2.2.6 WEEK SIX

Throughout the sixth week in JKR Kota Tinggi, I have learned and been taught about:

1. Industrialized Building System, abbreviated IBS in Malaysia.
2. Evaluation presentation for all JKR's staffs (Selected topic: Routine Maintenance of Pavement).
3. Traffic management in work zone (purpose and level of services).
4. Monitoring flexible pavement construction work for "Jalan Premix Baru Generasi Kedua" project in Felda Pasir Raja.
5. Self learning: read articles on piling (classification of pile).

2.2.7 WEEK SEVEN

Throughout the seventh week in JKR Kota Tinggi, I have learned and been taught about:

1. Monitor piling work of water tank for "Pembangunan Pusat Latihan Tempur Tentera Darat (PULADA)" project in Ulu Tiram.
2. Monitor piling work of Wisma Perwira Building for "Pembangunan Pusat Latihan Tempur Tentera Darat (PULADA)" project in Ulu Tiram.
3. Types of load testing on piles.

2.2.8 WEEK EIGHT

Throughout the eight week in JKR Kota Tinggi, I have learned and been taught about:

1. Monitor coring test on pavement for "Jalan Premix Baru Generasi Kedua" project in Felda Pasir Raja.
2. Bridge inspection (causes and types of damage).
3. Interprets beam drawing plan.

Figure 2.3 Drilling pavement for coring test

Figure 2.4 Measuring thickness of core sample

2.3 CONCLUSION

In conclusion, I am able to identify the working scope of Civil Engineering course and gained working experience. I have also gained a lot of technical knowledge from visiting site, monitoring projects and reading articles. Next, able to apply my technical knowledge and engineering methods to a real-life situation.

CHAPTER 3
TECHNICAL REPORT

3.1 INTRODUCTION

Throughout the industrial training attended from 08th July until 02nd September 2018, there are abundant of technical knowledge gained ranging from construction of pavement until construction of building. This chapter consist of a more specific and detailed about the technical knowledge gained.

3.2 CONSTRUCTION OF FLEXIBLE PAVEMENT

Detail of flexible pavement construction project:

Name of Project : Kerja - Kerja Jalan Premix Baru di Lot Tanah Generasi Kedua
Location : Kampung Felda Pasir Raja, Mukim Sungai Johor, Kota Tinggi, Johor.

Flexible pavement can be defined as the one consisting of a mixture of asphaltic or bituminous material and aggregates placed on a bed of compacted granular material of appropriate quality in layers over the subgrade. Water bound macadam roads and stabilized soil roads with or without asphaltic toppings are examples of flexible pavements. The design of flexible pavement is based on the principle that for a load of any magnitude, the intensity of a load diminishes as the load is transmitted downwards from the surface by virtue of spreading over an increasingly larger area, by carrying it deep enough into the ground through successive layers of granular material.

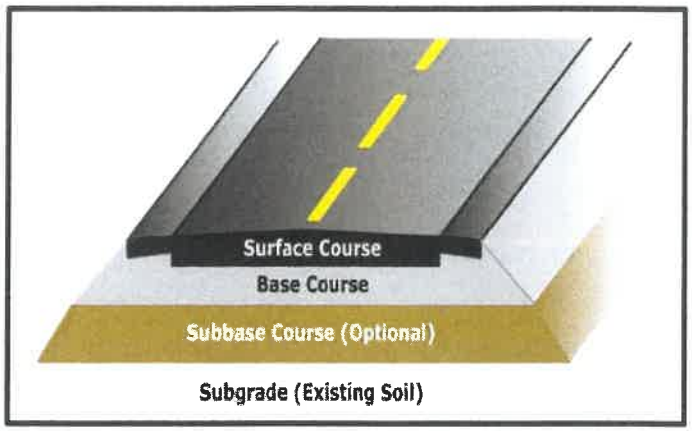


Figure 3.1 Layers of flexible pavement

Among the civil works involved in completing a construction of pavement works are as listed below:

1. Site Clearance
2. Earthworks
3. Pavement Works
4. Surface Drainage of Pavement

3.2.1 SITE CLEARANCE

Site clearance and preparations are generally the first operation to be undertaken on any road construction. In rural areas, the site clearance and preparation work involved three main processes. They are, clearing, grubbing and stripping. These three processes are defined as the removal of trees, stumps, roots, debris etc. from the area marked on the plans or otherwise designated by the engineer.

Clearing refers to the removing materials above the ground level such as tree branches, stumps, structures etc. While grubbing process means the removal and disposal of surface vegetation , roots, stumps and underground part of structures to a depth at least 0.50 m below ground level. Stripping top soil shall consist of the removal of topsoil to an average depth of at least 100 mm below ground level.

Normally clearing and grubbing constitute a single contract item that includes the removal of topsoil to a shallow depth. In areas which only involve clearing process, no topsoil shall be removed from such areas, except as directed by the engineer. Grubbing and stripping of topsoil should not be carried out on those areas where:

- embankment is to be constructed on earth designated as swamp or soft ground
- embankment is to be constructed to a height at the centre line of 1.5m or more on ground with a cross-slope of not more than 1 (vertical) to 30 (horizontal).

All the combustible material removed from the designated area is generally disposed by burning. Burning shall be carried out in proper place, time and manner as to prevent fire from damaging vegetation and property within the road reserve designated to be preserved. Where burning is not permitted at any time, the combustible materials need to be disposed together with incombustible material. These materials will be disposed in a safe and tidy manner at solid waste dump outside of the site.

Figure 3.2 Site clearance work

3.2.2 EARTHWORKS

Earthworks are the common product of civil engineering operations. Nearly all pavement construction jobs, involve a considerable amount of earthwork. Earthworks are those construction processes involving soil and rock in its natural form and preceding the building of the road pavement. Earthwork operations may be classified as excavation, construction of embankments, compaction and finishing operations. These are the process of subgrade preparation.

Excavation is the process of loosening and removing soil or rock from its original position in a cut and transporting it to a fill or to a waste deposit. This should preferably be carried out immediately after topsoil removal. Selection of equipment depends on the nature of the material, how far it is to be moved and the method of disposal. Excavation can be divided into three types: roadway and drainage excavation, excavation for structures and borrow excavation.

Embankments are used in road construction when the vertical alignment of the road has to be raised above the level of the existing ground to satisfy design standards, or prevent damage from surface or ground water. Many embankments are only 0.50-1.5m high, but heights of 5m or more may be used on major highways. Earth embankments are constructed using relatively thin layers of soil. On equipment-based projects, the material is usually dumped at the required location by trucks, and spread by bulldozers or graders. The maximum thickness of loose soil is usually 250-300mm. The soil is thoroughly compacted before the next layer is placed. During the construction operation, the embankment should be kept well drained at all times, especially when material of high plasticity is used.

Compaction increases the density of a material by expelling air from the voids in the material and, thereby, bringing the particles into more intimate contact with each other. Soils in embankments and subgrades in cuttings are usually compacted using special compacting equipment, such as rollers, vibrators and tampers. After the compaction work has complete, field density test on each layer of compacted soil need to be done in order to check the quality of work. Several methods are used such as core cutter method, sand replacement method and nuclear density gauge method.

Figure 3.3 Earthworks

3.2.3 PAVEMENT WORKS

Road pavement works are done when the formation level of reclamation, cutting and alignment is fully completed. This is to prevent damage to the road. There are several stages in the construction of roads as illustrated in Figure 3.1, named:

1. Subgrade
2. Subbase Course
3. Base Course
4. Surface Course:
    - Binder Course
    - Wearing Course

The thickness of each stages or layers are designed as below:

Pavement Layer		Standard Thickness (mm)	Single Thickness (mm)
Wearing Course	ACW 20	50	50
	BMW 20	40 - 50	40 - 50
Binder Course	ACB 28	50 - 100	50 - 100
	BMB 28	50 - 100	50 - 100
Road Base	BMR 40	70 - 100	70 - 100
	BMR 28	50 - 150	50 - 100
	Wet Mix	100 - 150	100 - 150
	Crushed Aggregate	100 - 200	100 - 200
Subbase		150 - 300	150

Table 1 Thickness of Pavement Layer According ATJ 5/85, Amendment 1/93

3.2.3.1 SUBGRADE

The provision of road subgrades is very important in pavement construction. The strength of the road structure depends on the strength of this subgrade. Characteristics of a good subgrades are stable under various vehicle loads and weather conditions, have long term strength throughout the design, and able to drain water.

Subgrade could be a part of embankment or natural soil and considered 1 meter layer below formation level (finished subgrade surface). it is a layer to provide platform for materials above it to be constructed. Subgrade materials should be materials that considered suitable. Material that is unsuitable can be classified as follows (JKR/SPJ/1988):

- Running silt, peat, logs, stumps, perishable or toxic material, slurry or mud, or
- Any material that
  - Consists of highly organic clay and silt;
  - Has liquid limit, LL > 80% and/or plasticity index, PI > 55%;
  - Is susceptible to spontaneous combustion;
  - Has loss on ignition, LOI > 2.5%;
  - Contains large amounts of roots, grass and other vegetable matter.

Materials that are soft or unstable due to too wet or dry for effective compaction are not classified as unsuitable. Soils to be used as subgrade materials must have acceptable strength and stability to withstand traffic load and the environmental effect. Among factors that influence the strength are:

- Types of soil - granular or gravel soils are best and peat is the worst.
- Moisture content - optimum moisture content normally required during construction.
- Methods and effort of compaction - types of compaction and numbers of rolling.

Dredging works are done to obtain the actual level of the pavement. After dredging work, leveling and compaction work is done to obtain a stable and robust subgrade and meet specified standards. A roller weighing 25 tons is used for the purposes of subgrade compaction. To ensure that the subgrade reaches the specified strength, field density test is performed to obtain compressive strength of the subgrde. For this project, the required compressive strength must reach 95% maximum dry density.

Among the tests required for subgrade materials are:

- Loss on ignition (LOI) : BS 1377: Part 3: 1990
- Liquid Limit (LL) and Plastic Limit (PL) : BS 1377: Part 2: 1990
- Compaction : BS1377: Test 13: 1975 (Part 4: 1990)
- California Bearing Ratio (CBR): BS 1377: Test16: 1975 (Part 4: 1990)

3.2.3.2 SUB-BASE

The sub-base should be laid as soon as possible after final stripping to formation level. It is done in order to prevent deterioration of the formation due either to:

- Rain, which causes the exposed ground to become soggy and cause erosion.
- Sunshine, which can dry out the surface and cause cracking in the subgrade.

Both rain and sun on the exposed subgrade may result in a loss of bearing strength of the ground. It is good practice to extend the subbase beyond the curb line and as far as the side drains. This helps to remove surface water during construction and for it to run off well clear of the main road structure and to support the curb race. Once the subgrade is fully prepared, the work of pouring and leveling of sand on the surface of the subgrade is done. This sand layer is known as sub-base. Sub-base thickness is as much as 50mm thick and also compacted by roller weighing 25 tons.

The degree of compaction for subbase must not less than 95% of the maximum dry density determined in the BS 1377. Compaction for subbase need to be carried out in a longitudinal direction along the carriageway, and shall generally begin at the outer edge and progress uniformly towards the centre on each side, except on super-elevated curves where rolling shall begin at the lower edges and progress uniformly towards the higher edge.

Functions of subbase includes:

- Platform for road base and assist in distributing loads.
- Drainage layer.
- Temporary access road during construction.
- Protection for subgrade.
- Separator layer between subgrade material and roadbase material.

Typical material used for subbase :

- Laterite with CBR > 20%
- Crushed aggregate - well graded with size 75mm to dust, CBR > 30%
- Stabilized soilstable - CBR > 60%
- The materials should pass the requirements for CBR, LL, PI, Ten Percnt Fine Value, Los Angeles Abrasion Value and Sieve Analysis.

3.2.3.3 ROADBASE

Roadbase is the main layer of pavement which support load. The material used can be as follow:

1. *Dry Bound Macadam* - Unbound material and the strength depends on the aggregate interlocking. Constructed in two layers; the first layer is single size coarse aggregate placed 75-100mm thick and compacted. Fine aggregate is then spread 25-50mm thick and vibratorily compacted to allow sand to fill the voids between aggregate. The advantage is less segregation and low cost.
2. *Wet Mix Macadam* - Well graded crushed aggregate mixed with 2-5% water at plant and transport to site for laying. The advantage is less segregation during transportation and laying due to moist material and ease the compaction process. This material is typically constructed 200-300mm.
3. *Bituminous Macadam Roadbase* - Produced at asphalt plant by mixing aggregate, filler, and bitumen about 4-5%. This material is more costly but it can distribute load much better than unbound material. It could reduce the overall pavement thickness as well.

4. *Cemented Stabilized Base* - Crushed aggregate mix with ordinary cement about 3-6% either on site or at the plant. It has better bearing capacity at reasonable cost. The compacted cement stabilized layer needs to cure before the surface layer can be laid.
5. *Composite* - Base that has two layers where the lower layer will be the unbound material and the top is the bound material either bituminous Macadam or Cemented Stabilized Base.

All materials must pass the requirements of CBR, PI, Aggregate Crushing Value, Flakiness Index, Durability and Sieve Analysis.

The process for constructing roadbase layer is similar to subbase. Once the sub-base is fully ready, crusher-run is poured on the sand layer. This crusher-run aggregate layer is known as the roadbase. For this project, a 450mm thick roadbase layer is used. The process of compaction for roadbase is similar to the compaction process of subgrade and subbase layer. The machineries involved in roadbase construction are grader and paver. To obtain the desired compaction level, the same compaction test as in subgrade layer is performed on this roadbase layer.

If the roadbase material is stable and dry, placement of the prime coat or the new asphalt mix should be permitted to start. Prime coats are obtained by spraying bituminous materials onto non-asphalt roadbase. Prime coats are mainly used to:

- Provide a waterproof surface on the roadbase.
- Fill capillary voids in the roadbase.
- Facilitate the bonding of loose mineral particles.
- Facilitate adhesion between roadbase and binder course (surface course).

The bituminous priming material for prime coat shall be either cutback bitumen or bitumen emulsion. This project used bitumen emulsion slow setting, grade SS1K. Cutback bitumen for this purpose shall be grade RC-70 or MC-70. The bitumen emulsion is sprayed on to the clean roadbase surface by means of a pressure distributor. The rates of application usually in the range of 0.5-1.0 litres/sq.m with spraying temperature in the range of 25°C to 45°C. The prime coats shall normally be left undisturbed for at least 24 hours after application and shall not be opened to traffic until it has penetrated the roadbase and cured sufficiently.

Figure 3.4 Crusher-run layer as roadbase

Figure 3.5 Spraying prime coat process

Figure 3.6 Roadbase sprayed with prime coat (bitumen emulsion SS1K)

3.2.3.4 SURFACE LAYER

Surface layer consists of two layers, which are binder course (at the bottom) and wearing course (on top). This layer is cambered for drainage purpose and constructed with asphaltic concrete or hot mix asphalt (HMA) mixes. The materials used are aggregate, filler and bitumen.

Road pavement can only be carried out during good weather and not raining. It will cause the premix temperature to drop and at the same time causes asphalt impact during compaction. Before the paving process is carried out, the temperature of the premix must be checked in three places which is premix temperature in the truck (while in quarry < 163°C and on site > 130°C), the temperature of the premix after being transferred to the paver machine and the temperature of the premix after the road is paved right before compaction (>120 °C). Compaction shall be ended if the asphalt temperature < 80°C.

1. *Binder Course* - Distribute load to roadbase and provide flat and even platform for wearing course layer. Typical maximum aggregate size is 28mm and mixed with bitumen between 3.5-5.5%. AC28 mix is used with laying thickness of 75-80mm and 60mm thick after compaction. AC28 stands for Asphaltic Concrete with 28mm maximum aggregate size. As the truck arrived on site, the premix on the truck is transferred onto paver machine. Paver machine is used to lay the premix on the road base. It is equipped with leveling device which can be set according desired laying thickness. The laying thickness can be confirmed by dipping. After paving, the premix is compacted.

Figure 3.7 Transferring premix from truck into paver machine

Figure 3.8 Measuring temperature of premix on paver machine

Figure 3.9 Laying premix using paver machine

Figure 3.10 Dipping to determine laying thickness

2. *Wearing Course* - the top layer of a pavement. Among its function are:
   - Skid resistance surface
   - Protection for underneath layers
   - Provide good and safe riding
   - Support traffic loading
   - Drainage layer

   Typical maximum aggregate size is 14mm and mixed with bitumen between 4.0-7.0%. The mix used for this project is AC14 with thickness of 50mm. Before wearing course is laid, tack coat is applied on binder course surface. The rate of spraying tack coat is on average of 0.25-0.55 litre/sq.m. RS-1K and RS-2K are the types of tack coat usually used.

	RS-0K/K1-40	**RS-1K**	**RS-2K**	RS-3K
Bitumen (%)	38	**50**	**60**	65
Water (%)	62	**50**	**40**	35

Table 2 Percentage rate of bitumen and water in tack coat

3.2.3.4.1 COMPACTION OF SURFACE COURSE

The same compaction method applied on both binder and wearing course. After the placement of the premix, premix is compacted by using two types of machine which are tandem roller and pneumatic tyred roller. The rolling temperature is recorded right before compaction. Surface course has four stages of compaction known as rolling pattern. Common rolling pattern used are 2-2-8-2, 2-2-10-2 or 2-2-10-2. It is described as below:

- 2 ways of tandem roller on normal condition
- 2 ways of tandem roller with vibrator
- 8, 10 or 12 ways of pneumatic tyred roller
- 2 ways of tandem roller on normal condition

Figure 3.11 Tandem roller

Figure 3.12 Pneumatic tyred roller

3.2.4 SURFACE DRAINAGE

Road drainage is defined as the process of controlling and eliminating excess water on pavement and underground water within the right-of-way and adjacent areas. The flow of water on the surface of the pavement is due to rain. Some surface water permeates into the soil, while some remain on the surface as water reservoirs. This water reservoir should be removed from the vehicles hallway as it will cause damage of pavement surfaces and possess danger to vehicle drivers due to 'aquaplaning'. The steps to control surface water is referred as 'surface drainage'.

3.2.4.1 CROWNED ROADWAYS

Road surface normally cambered or superelevated to facilitate the removal of surface water from the road surface to road shoulder and to culvert. Generally, the slope of the road camber is 2.5%. According to LLM, the slope of the road camber must not be less than 2%.

Types of Surface	Camber slope
Road shoulder	3 – 4 %
Gravel roads	3 – 4 %
Bituminous and concrete surface	2 – 3 %

Table 3 Camber slope according to types of surface

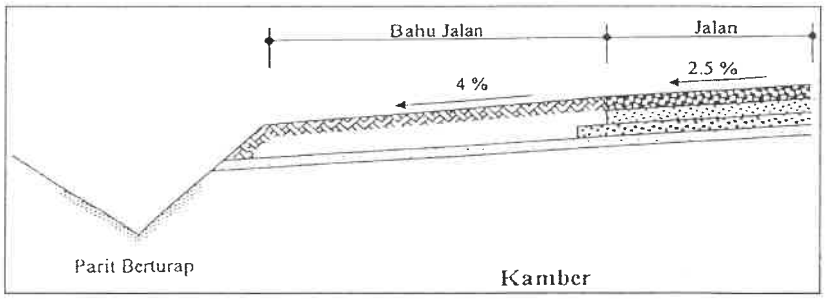


Figure 3.13 Camber slope for pavement and road shoulder

3.2.4.2 SHOULDER SLOPE

Shoulder slope is needed especially for road shoulder, trenches drains. The slope shall not too flat from 0.5%. According to LLM, the shoulder slope must be 0.2 - 0.3% while according to JKR, the shoulder slope must be 0.35 - 0.5%.

3.2.4.3 ROADSIDE DRAINS

Roadside drains are constructed along the road edge to collect water from shoulder and can also cater drainage for the abutting developed areas. In the cut-off area, it also prevents water from highlands entering the road. In that case, a catch drain is built. In the embankment area, this types of drain catches water to prevent erosion of the embankments. Trenches with slope of less than 0.5% must be paved.

3.2.4.4 CULVERT

Culvert is used as a route to drain surface water through the bottom of the road without interrupting and damaging the road. Factors to be considered in designing and construction of culverts are:

- Provide adequate waterways especially when heavy rain.
- Strong structural strength to bear embankment load and traffic load.
- Sufficient gradient design to avoid sedimentation and erosion. The 1-2% gradient is to obtain the water velocity at the permissible level.
- Walls should be constructed at the outskirts of the culvert if its constructed on a hilly or high pit.

Figure 3.14 Box culvert

Figure 3.15 Pipe culvert

CHAPTER 4
CONCLUSION

As an undergraduate, I would like to say that this training program is an excellent opportunity for us to get to the ground level and experience the things that we would have never gained through going straight into a job. Industrial training is very much essential for Civil Engineering students. During my training period, in the industry I acquired lots of experiences in the course scope. This will help me to clarify my theory knowledge. The main objective of the industrial training is to provide an opportunity to undergraduates to identify, observe and practice how engineering is applicable in the real industry. It is not only to get experience on technical practices but also to observe management practices and to interact with fellow workers.

The eight weeks of training has provided me the opportunities to develop and improve my soft and functional skills. All of this valuable experience knowledge that I have gained were not only acquired through the direct involvement in task given but also through other aspect of the training such as work observation, interaction with the staffs and local people. I have learned to do work systematically with conducive environment without any problem. The environment of the work place has also taught me to organize the work properly based on the date that had been agreed with the client. This industrial training also taught me about punctuality. The punctuality has taught me to complete the task within the time given. Teamwork skill is very important while working on site. This is because it is important to make sure from the team is doing the work safely as we are exposed to more danger while on site.

During the training period, I learnt new structural features and standard procedure of construction works. Site management, site controlling, labour handling, material handling, perform quality task, work in critical environment, complete the task within planed time frame and deal with sub-contractors which are important parts or responsibilities have to be developed working as Site Engineer.

In conclusion, JKR Kota Tinggi is a suitable place for students to have their industrial training because of its conducive environment and job scope related to civil engineering course.

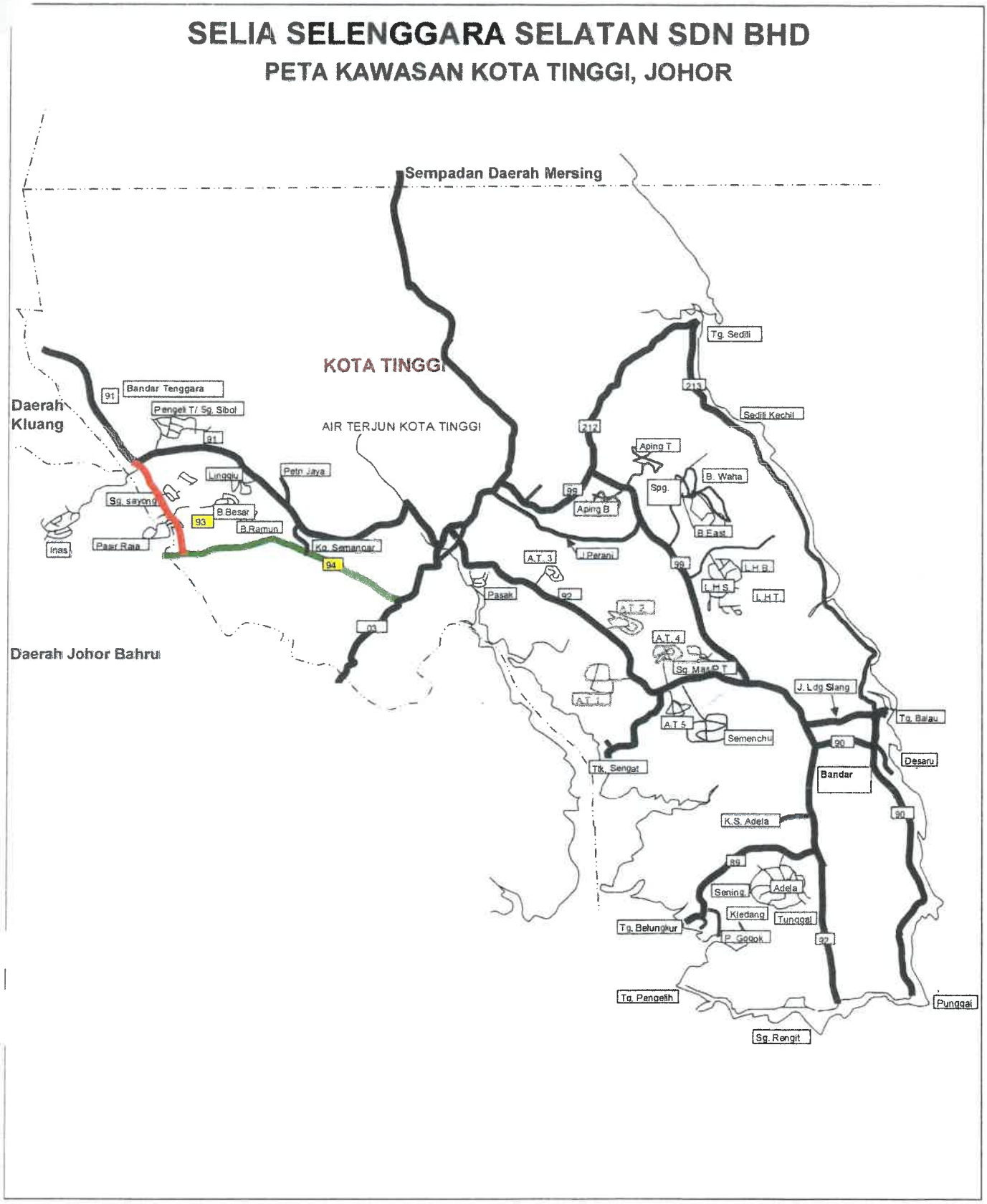
REFERENCES

1. Highway Engineering Lecture Notes (SAB 2832), Faculty of Civil Engineering, Universiti Teknologi Malaysia, PM Dr. Mohd Rosli bin Hainin, Tn. Hj. Che Ros bin Ismail, Dr. Haryati bt Yaacob, Edition 2013/14.
2. JKR's Official Website, https://www.jkr.gov.my/en
3. Arahan Teknik Jalan, ATJ 5/85, Pindaan 1/93
4. Standard Specifications for Roadworks JKR/SPJ/1988

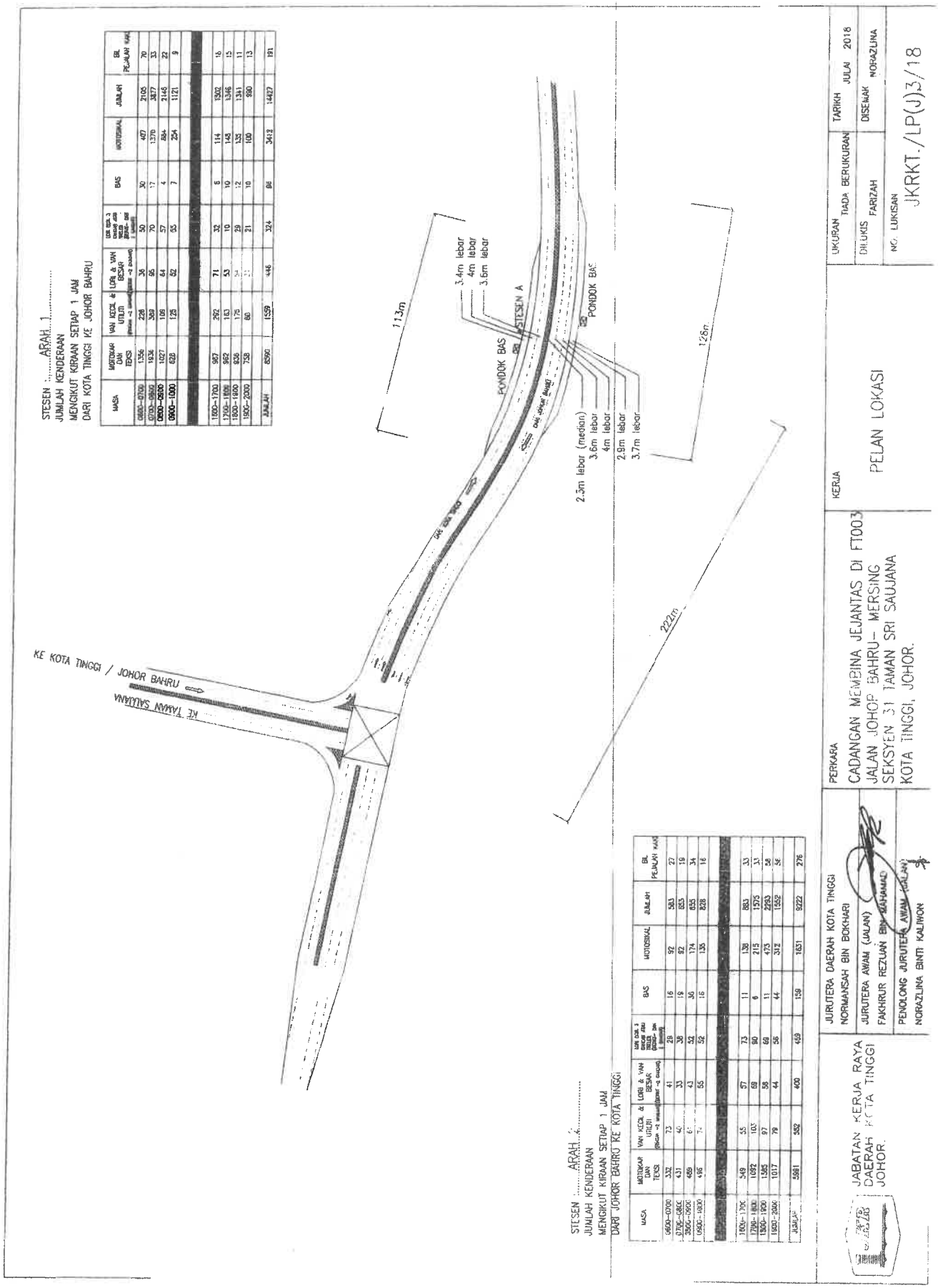
SENARAI JALAN-JALAN PERSEKUTUAN DI DAERAH KOTA TINGGI, JOHOR.

BIL.	NO. LALUAN	NAMA LALUAN	SEKSYEN		PANJANG (KM)	CATATAN
			DARI	HINGGA		
1	FT003	Jalan JB - Mersing - Endau	22.90	83.60	60.70	
2		Jalan Persimp Arked MARA - Rest Jenggo	40.50	42.20	1.70	
3	FT089	Jalan Belungkor	0.00	16.93	16.93	
4	FT090	Jalan Desaru - Punggai	4.30	9.20	4.90	
5	FT091	Jalan Kota Tinggi - Kluang	0.00	61.35	61.35	
6	FT092	Jalan Kota Tinggi - Sg. Rengit	0.00	69.75	69.75	
7	FT093	Jalan Sg. Sayong	0.00	14.32	14.32	
8	FT094	Jalan Kulai - Spg. Kota Tinggi/Kulai	12.30	36.00	23.70	
9	FT099	Jalan Lok Heng/Mawai/Sg. Mas	0.00	43.80	43.80	
10	FT212	Jalan Tanjung Sedili	0.00	19.30	19.30	
11	FT213	Jalan Kuala Sedili Kecil/Tg. Sedili	0.00	12.07	12.07	
12	FT1389	Jalan Felda Bkt. Besar	0.00	13.12	13.12	
13	FT1390	Jalan Felda Bkt. Ramun	0.00	10.55	10.55	
14	FT1391	Jalan Felda Pasir Raja	0.00	9.90	9.90	
15	FT1401	Jalan Felda Air Tawar 1	0.00	13.28	13.28	
16	FT1402	Jalan Felda Air Tawar 2	0.00	16.04	16.04	
17	FT1403	Jalan Felda Air Tawar 3	0.00	12.43	12.43	
18	FT1404	Jalan Felda Air Tawar 4	0.00	12.86	12.86	
19	FT1405	Jalan Felda Air Tawar 5	0.00	12.34	12.34	
20	FT1406	Jalan Felda Semenchu	0.00	19.18	19.18	
21	FT1407	Jalan Felda Aping Timur	0.00	14.09	14.09	
22	FT1408	Jalan Felda Aping Barat	0.00	12.72	12.72	
23	FT1409	Jalan Felda Bkt. Waha/Spg. Waha/Bkt. Easter	0.00	32.70	32.70	
24	FT1410	Jalan Felda Lok Heng Barat/Timur/Selatan	0.00	30.74	30.74	
25	FT1411	Jalan Felda Adela (Kilang)	0.00	1.25	1.25	
26	FT1412	Jalan Felda Adela/Sening/Tunggal/Kledang	0.00	46.56	46.56	
27	FT1413	Jalan Felda Sg. Mas/Papan Timur	0.00	33.74	33.74	
28	FT1414	Jalan Felda Pengeli Timur/Sg. Sibol	0.00	22.68	22.68	
29	FT1415	Jalan Felda Linggiu	0.00	10.54	10.54	
30	FT1416	Jalan Felda Inas	0.00	15.53	15.53	
31	FT1419	Jalan Masuk Tenggaroh Selatan (Dari Sempadan Mersing - Kota Tinggi)	9.40	13.99	4.59	
32	FT1419	Jalan Kampung Tenggaroh Selatan 1 & 2	0.00	6.45	6.45	
33	FT1422	Jalan Felda Simpang Waha (Kilang)	0.00	3.60	3.60	
34	FT1428	Jalan Felda Sg. Sayong	0.00	8.26	8.26	
35	FT1429	Jalan Felda Pasak	0.00	9.53	9.53	
JUMLAH BESAR					**701.20**	

Appendix 1 List of federal roads in District of Kota Tinggi



Appendix 2 Map of Kota Tinggi



Appendix 3 Proposed location plan for pedestrian bridge

[Borang (BPJ) J.K.R.335 Pin.5/93]

Borang : KKR-B42
No Keluaran : 3
No Pindaan : 2
Muka Surat : 1 / 1

Bahagian Kejuruteraan Trafik
JABATAN KERJA RAYA MALAYSIA

LAPORAN BANCI PERSIMPANGAN

Rekod Kiraan Manual

Negeri : JOHOR | Daerah : KOTA TINGGI | Tarikh : 10.7.2018
Hari : SELASA
No. Stesen : | *Jenis Kajian : 0 / 1 / 3 | Hari ke :

Maklumat Lokasi

Lokasi : KM 31 | Seksyen 31 | Koordinat:
No. Laluan FT 003 | Jalan J. BAHRU - K. TINGGI | N : 1° 40' 20.35"
Deskripsi lokasi / *Landmark* berhampiran PONDOK BUS | E : 103° 57' 3.48"
Lalulintas dari JOHOR BAHRU | ke KOTA TINGGI | *Arah : 2

Maklumat Lorong

*Jenis Lorong : Berkembar | Jumlah Bilangan lorong : 4 | Lebar selorong : 4.0 m

Maklumat Bahu Jalan

*Bahu Jalan : Ada | Jenis bahu jalan: tanah | Lebar bahu jalan (sebelah) : 3.1 m

Maklumat Keseragaman Jalan (lingkungan 1km dari stesen banci)

*Bil. lorong : seragam | *Keadaan jalan : rata | *Lebar lorong : seragam

Masa	Motokar dan Teksi	Van kecil & Utiliti (Ringan - 2 gandar)	Lori & Van Besar (Berat - 2 gandar)	Lori dengan 3 Gandar atau Treler (Berat - dan melebihi 2 gandar)	Bas	Motosikal	Jumlah	Bil Pejalan Kaki
0600-0700	332	73	41	29	16	92	583	27
0700-0800	431	40	33	38	19	92	653	19
0800-0900	489	61	43	52	36	174	855	34
0900-1000	496	74	55	52	16	135	828	16
1600-1700	549	55	57	73	11	138	883	33
1700-1800	1,092	103	69	90	6	215	1,575	33
1800-1900	1,585	97	58	69	11	473	2,293	58
1900-2000	1,017	79	44	56	44	312	1,552	56
Jumlah	5,991	582	400	459	159	1,631	9,222	276

Catatan : *potong yang tidak berkenaan **Tandatangan, Cop Nama & Jawatan dan No. Tel. Untuk Dihubungi

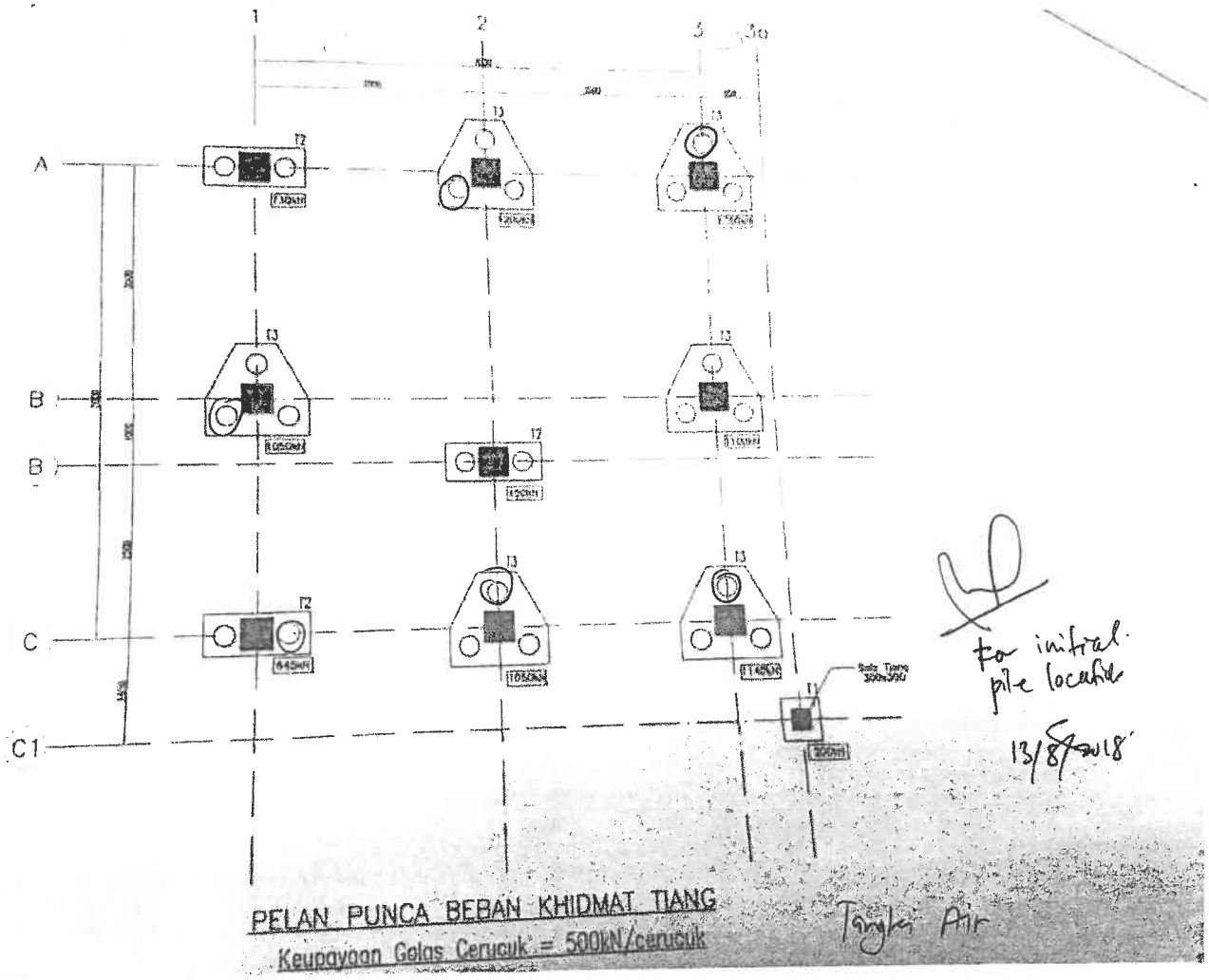
** Disediakan oleh (Ketua Stesen Banci):

NORAZLINA BINTI KALIWON
Penolong Jurutera
IKR Daerah Kota Tinggi

Disahkan Oleh:

FAKHRUR REZUAN BIN MAHAMAD
Jurutera Jalan
JKR Daerah Kota Tinggi

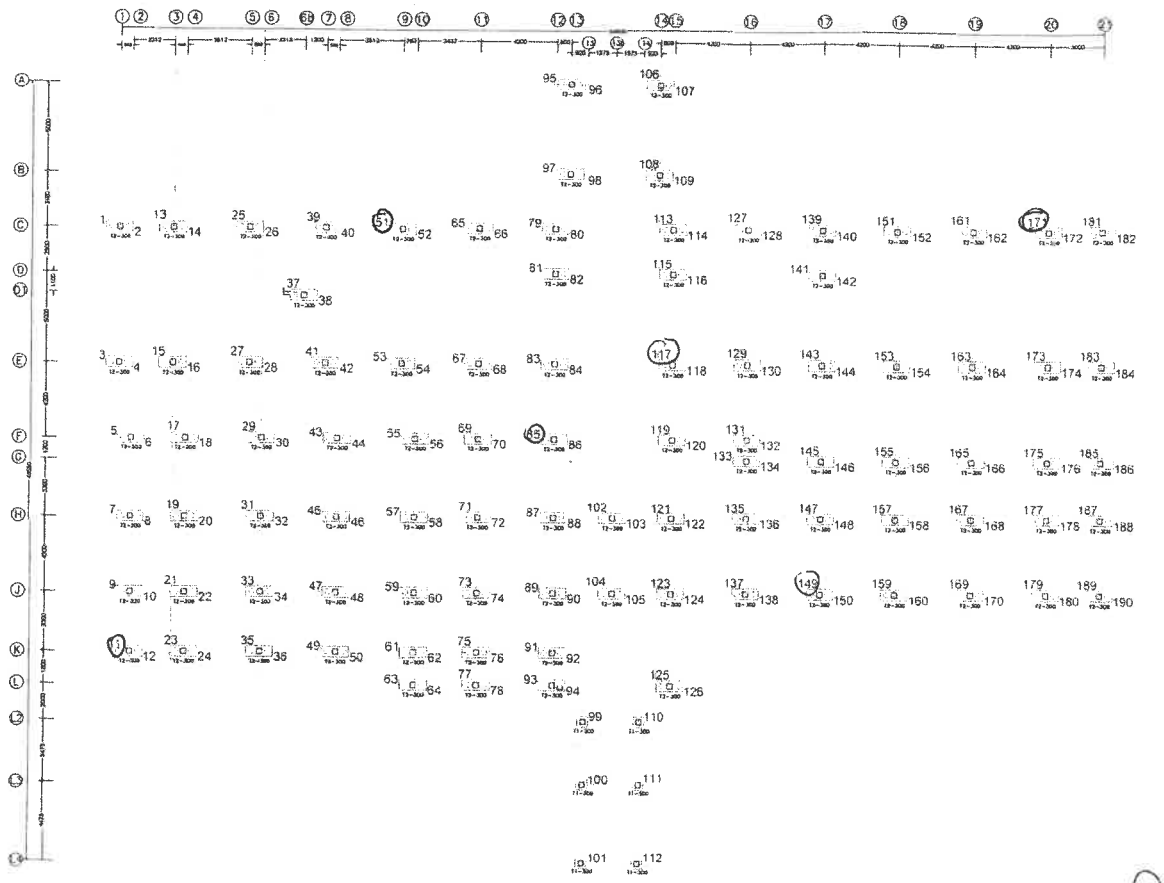
Appendix 4 Traffic census report



Appendix 5 "Pelan Punca Beban Khidmat Tiang"

Appendix 6 Pile numbering plan Wisma Perwira

WISMA PERWIRA



PILE NUMBERING PLAN
WISMA PERWIRA

SP 300ø

PILE TYPE	PILE SIZE (SP)	TOTAL
T1	300	6
T2	300	184
TOTAL		190

SHUHAIRIN ABDUL RAHIM
Juruter a Awam J41
JKR Daerah Kota Tinggi, Johor.

for initial pile location.

16/8/2018

DATE	REV	DESCRIPTION
16 JULY 18	A	FOR APPROVAL

OWNER

KEMENTERIAN PERTAHANAN
ANGKATAN TENTERA DARAT MALAYSIA

ARCHITECTS

C&S ENGINEER

PILING CONTRACTOR

LUNG KEE PILING WORKS SDN. BHD.

PROJECT TITLE

DRAWING TITLE

PILE NUMBERING PLAN
WISMA PERWIRA

DRAWN FAIRUZ	PLOT SCALE NTS
CHECKED FIRDAUS	DATE 16 JULY 18
REVISION A	SHEET NO. 1 OF 1
JOB NO. ST01-6	DRAWING NO.