

**THE CONSTRUCTION OF ROAD DIVERSION IN SWAMPY AREA AT  
JALAN LENCONGAN KURONG TENGAR, PERLIS**

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THE CONSTRUCTION OF ROAD DIVERSION IN SWAMPY AREA AT JALAN  
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***Special thanks to:***

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*Who always give me supports and help throughout my study..*

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## **ABSTRACT**

There are many road projects being implemented in Malaysia. Since Malaysia is developing fast, new technology are constantly being used either in building or road construction. However, some of the terrain in Peninsular Malaysia differs from each other. One of the challenges faced in road projects are the construction of roads in swampy areas. The engineers will have to use their skills and experience in order to construct the roads in swampy areas. The aim of this study is to assess the road construction method in swampy areas and the problems faced by the contractors in carrying out the construction works. The objectives of the study are to study the methods used for road construction in swampy area, to identify the factors taken into consideration for the construction of road diversion, to identify the problems faced by the contractor in construction of the road diversion in swampy area and to evaluate the factors that influence the duration of the project for construction of road in swampy area. This is a case study and the data are collected through questionnaires and interviews. The data is analyzed using statistical analysis and average index. From the study, the construction of road in swampy areas involves removal and replacement of soil, construction of prefabricated vertical drain and by surcharge. The factors taken into consideration in constructing roads over swampy areas are the safety factor in the design, location of site area and the life span of the method used. The problems faced by the contractor in road construction in swampy areas are soil treatment, weather and high ground water table. The factors that influence the duration of completion of the project are design changes, difficult to estimate time as they are influence by the type of soil problems and unexpected weather.

## ABSTRAK

Terdapat banyak projek pembinaan jalan dilaksanakan di Malaysia. Oleh kerana Malaysia berkembang pantas, teknologi baru sering digunakan samada di dalam pembinaan bangunan ataupun jalan. Walaubagaimanapun, keadaan tanah di sesetengah kawasan di Semenanjung Malaysia berbeza antara satu sama lain. Salah satu cabaran yang di hadapi di dalam projek pembinaan jalan adalah pembinaan di kawasan berpaya. Jurutera perlu menggunakan kemahiran dan pengalaman mereka untuk membina jalan di kawasan berpaya. Tujuan utama kajian ini adalah untuk menilai pembinaan jalan di kawasan berpaya dan masalah yang dihadapi oleh kontraktor dalam menjalankan kerja-kerja pembinaan. Objektif kajian ini adalah untuk mengkaji kaedah yang digunakan untuk membina jalan di kawasan berpaya, mengenal pasti faktor-faktor yang perlu di ambil kira untuk pembinaan jalan lencongan, mengenal pasti masalah yang dihadapi oleh kontraktor untuk pembinaan jalan di kawasan berpaya dan menilai faktor yang mempengaruhi tempoh pembinaan jalan di kawasan berpaya. Kajian ini adalah satu kajian kes projek dan pengumpulan data dilakukan secara temuramah dan menggunakan borang soal selidik. Data yang dikumpul dianalisa menggunakan kaedah indeks purata. Daripada kajian ini, pembinaan jalan di kawasan berpaya melibatkan pemindahan dan penggantian tanah, penggunaan 'prefabricated vertical drain' dan kaedah penambakan. Faktor-faktor yang diambil kira untuk pembinaan jalan lencongan adalah faktor keselamatan di dalam rekabentuk, lokasi tapak pembinaan dan jangka hayat kaedah pembinaan yang digunakan. Masalah yang dihadapi oleh kontraktor di dalam pembinaan jalan di kawasan berpaya ialah rawatan tanah, cuaca dan kawasan yang mempunyai aras air bawah tanah yang tinggi. Faktor yang mempengaruhi tempoh siap projek adalah perubahan rekabentuk, sukar menganggar tempoh masa disebabkan oleh masalah jenis tanah dan perubahan cuaca yang tidak diduga.

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## **LIST OF ABBREVIATIONS**

PWD	-	Public Work Department
PVD	-	Prefabricated Vertical Drain
OGI	-	Original Ground Level
RC	-	Reinforced Concrete
RE	-	Reinforced Earth
SI	-	Site Investigation
EOT	-	Extension of Time
JKR	-	Jabatan Kerja Raya
EIA	-	Environmental Impact Assessment
SIA	-	Social Impact Assessment

## LIST OF SYMBOL

% - Percent

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

Road diversion is a process of re-positioning or re-locates the existing road to the other way for several purposes. It will be done if there are some problems occurred with the existing road. The common problem occurred is the road is not safe for the traffic. In order to divert a road, there are several factors that need to be considered.

Some factors that need to be considered in road diversion are travel time, delay time, number of signalized intersections, number of turns and length of the route. The travel time is the most important factor for the road user's choice behavior. They usually prefer the little travel time to reach their destination. Other than that, the driver also often prefer longer length route with little delay time than shorter length route with considerable delay time (Kim H.R. et al, 2005). The road that will be diverted must be safe, convenient and reasonable road for users. The reasonable needs of the road users must be properly considered to divert the road (Guidance Note, 2009).



There are several challenges in road diversion or road construction such as the area contains unsuitable material. One of the areas that has large amount of unsuitable material is swampy area. Refer to Vernon J.A., swampy area can be defined as the area that usually flooded with water and saturated. This area usually occurs near the lake, shorelines, in river basins and floodplains. Besides that, swampy area is an area which is poor drain and cover with shallow body of water. This area act as sponge because of it temporarily store runoff. It usually refers as muck, peat, marsh and muskeg which are deposit of organic matter. This condition happened when the plant that has been grown at the place was died and decomposed. These materials have low bearing capacity and high moisture content.

Construct a road over swamp is more challenging than in ordinary soil. It needs a special attention in order to prepare a good base for the road. Swampy or marshy land is periodically or permanently flooded with water. At swampy area, the type of soil contains large quantities of vegetable matter, clay and mud. The classification of swamp divided into two which are brackish or fresh water depending on the salt content of the water. In the road construction project, the shallow deposits can be removed and deeper deposits can be strengthening by suitable materials or methods (Ramachandran V., 2010).

There are several treatments for road construction at swampy area that can be used to solve the problem. The treatment methods involve are by using vertical sand drains, lightweight materials, geo-textiles and geogrids (Ramachandran V., 2010). These methods can be used to improve the unsuitable soil for preparing a good road base.

The construction of roads on swamps need a special treatment and techniques compared to the ordinary soil (Ramachandran V., 2010). This treatment depends on the characteristics of the underlying soil which are:

- i. Partial or total removal of undesirable material
- ii. Construction stage and surcharge fill
- iii. Use of sand drains
- iv. Use of lightweight material

Some of the road construction in swampy area such as at Brunei use pile foundation, geogrid system and chemical stabilization in order to improve the soils. The Brunei Public Work Department (PWD) concludes that chemical stabilization maybe the most satisfactory construction method used for swampy area (Gafar S. et al, 2004).

However, the material at swamp will not excavated or replace in some situations. The top mat of the soil is left undisturbed and geotextile can be placed on top of the swamp material in order to increase the bearing capacity of the soil. It can be place either longitudinally or laterally with the successive sections overlapped.

## **1.2 Background of Study**

Diversion a road will give challenges to the contractor due to the new location or site area. The site area may involve residential area, paddy field or unsuitable soil materials that will influence the road diversion process. An experience contractor is needed to solve any problem regarding the project. In road

diversion, there are some factors that need to be considered such as the safety factor for the road user.

Road construction over a swamp area is a challenging project that needs a lot of consideration and special attention (Ramachandaran V., 2010). This condition happens because of the unsuitable soil type that contains water and has low bearing capacity. These factors will affect the scheduling and construction method use during the earthworks and geotechnical works. Unsuitable soil improvement and treatment used will give problem due to the settlement of the road after completion.

The unsuitable materials at swampy area will give a lot of problems to the contractor during the construction works. Because of the unsuitable material, additional time needed for the construction process compare to ordinary soil. These problems will sometimes affect the time of completion which is by delaying the completion time if there is poor planning and scheduling.

This study will investigate what are the methods used for road construction in swampy area especially during geotechnical process. Besides that, it will cover the factors that taken into consideration for road diversion. Other than that, this study will determine the problems that usually face by the contactor for road construction in swampy area. In addition, this study will evaluate the factors that influence the duration of the project for construction of road in swampy area.

### **1.3 Problem Statements**

The existing road which is Jalan Persisiran Pantai Kuala Perlis- Sungai Baru in Perlis gives problem to traffic safety because there are several unsafe curves that

become a cause of traffic accidents at that road. Many accidents have been recorded at this road due to the design of the road which is dangerous for road user.



**Figure 1.1:** One of the unsafe curves at the existing road



**Figure 1.2:** The second unsafe curve for the existing road

Other than that, the road becomes narrow at one part because of the irrigation system for the paddy field. This condition will give problem to the road users in term of time delay because they need to allow traffic from the opposite lane passes

through the road when passing the narrow road. Because of these problems, a new road is constructed to straighten the road and provide a comfortable road for users.

However, the new divert road is construct in the mangrove swampy area. This is because the area is located near the sea. There is also a residential area at the propose location of road diversion.



**Figure 1.3:** The irrigation system for paddy field that narrowing the existing road

Road construction project at swampy area will face some problems regarding the type of unsuitable soil. This is because the area cover with water and the soil contains large quantities of vegetable matter, clay and mud. It needs a special attention during the construction process. This type of soil is unsuitable for the road construction. Swampy area has greater chance to swell compare with normal area. This is because it contains high quantities of plastic fine particles (Donald L.B et al, 2004).



**Figure 1.4:** The stagnant water in swampy area



**Figure 1.5:** The swampy area contains large amount of vegetable matters

Guideline for Embankment Construction of New York (2007) stated that swamp is a typical unsuitable embankment foundation. Swampy area consists of unsuitable material which is organic. It is usually wet, black and extremely weak. This type of area is incapable in supporting any significant load. Treated unsuitable materials with improper way will cause settlement.

Unsuitable type of soil at swampy area will give problem in order to prepare a suitable base for the road. This area has low bearing capacity. The main problem is there is no fix method for road construction in swampy area. The methods choose will be depend on the soil investigation result. Unsuitable method use for construction will give problems for the road such as settlement and crack. A good construction method and materials must be used to ensure the road will have a good quality. Based on the Standard Construction Procedures (2004), the special construction method needed for construction over swamp, marsh and old lake bed areas.

Other than that, the area will become soggy during the rainy day. This condition will lead the soil to settlement during the working time. Besides that, the swampy area has many problems during construction works due to the soft condition of the soil. These problems are faced by the engineer during the earthworks which are difficult to access the site area, limited accessibility to the site, high ground water level and the embankment easy to settle and fail (Mesyuarat Pengurusan JKR Pahang, 2011). These factors will cause the delay of completion time.



**Figure 1.6:** Swampy area contains water and temporarily store water after runoff

In preparing the foundation for embankments that are constructed over swamp, marsh and old lake bed areas, the specifications should be carefully followed. In these areas, a special construction methods is required and it is must be considered during design stage. A special fill which is also called as porous fill is a method of backfilling at the areas that contain water such as muck and swamp excavation areas. The special fill materials that used to place in water are clean sand, crushed or uncrushed gravel or crushed stone. The material used should be free from frozen material, wood or any extraneous matter (General Earthwork Information, 2004). The fill material will end dump in order to construct embankments in trenches excavated in a wet marshes or swamp area. The material will filling by starting at one end of the swamp and proceed for all the area.

The fill material which is other than rock may be placed in the wet condition that exists at site. This backfill material need to be placed for the embankment may be up to 600mm above water level. There is no compaction process will be done after backfilling process (Ontario Provincial Standard Specification, 2009).

#### **1.4 Aim and Objectives**

The aim of this study is to assess the road construction method in swampy areas and the problems faced by the contractors in carrying out the construction works. There are four objectives in order to achieve the aim of the study which are:-

- i. To study the methods used for road construction in swampy area.
- ii. To identify the factors that taken into consideration for the construction of road diversion
- iii. To identify the problems faced by the contractor in construction of the road diversion in swampy area.



- iv. To evaluate the factors that influence the duration of the project for construction of road in swampy area.

### **1.5 Scope of Study**

This study only limited into several elements. It is only focused on several parts which are:

- i. The parties involved in this study to achieve the project's aim are clients and contractors.
- ii. The road construction project involve in this study is Membina Jalan Lencongan Kurong Tengah, Perlis.
- iii. This study covers the geotechnical treatment works for road construction in swampy area.

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