DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

METHOD OF BEAM LAUNCHING FOR EAST KLANG VALLEY EXPRESSWAY (EKVE) BRIDGE

Prepared by:

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DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

February 2022

It is recommended that the report of this practical training provided

By

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2019233276

Entitled

Method of Beam Launching for East Klang Valley Expressway (EKVE) Bridge

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

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DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

10 JANUARY 2022

STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at Tanjung Manis Corporation Sdn Bhd for duration of 20 weeks starting from 23 August 2021 and ended on 7 January 2022. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

…….....…….....

Name : Nik Mazni Iryani Binti Nik Mansor

UiTM ID No : 2019233276

Date : 23/08/2021

ACKNOWLEDGEMENT

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

I would like to express my gratitude to remind the great people in the Tanjung Manis Corporation Sdn Bhd for their sincere guidance and support I received during this period of industrial training.

First and foremost, I am highly indebted to En Mohammad Jefri Bin Mohamad Ekhwan for providing me the opportunity to work as an intern at this company. I had such a wonderful and unforgettable experience being part of such a lovely and lively team.

I would like to convey my heartiest thanks to Encik Syed Firdaus, Encik Fazreen Na'im, Encik Kamarul Zaki, Encik Faiz Hakimi, Encik Fahmie Haziq and Encik and lastly, Cik Izwani for their guidance, support and generosity to share their tremendous knowledge and for constant and unlimited motivation throughout the internship period. My next gratitude to all the staff of Tanjung Manis Corporation who heartily welcomed me for the internship. It is an honour for me to be given the opportunity to work with all of you.

My appreciation would be incomplete without giving credit to UiTM, especially my supervising lecturer, Dr Nor Asma Hafizah Binti Hadzaman for her supervision and fair assessment. I would like to use this opportunity to express my gratitude to her for taking part in encouraging, giving necessary advice and guidance to complete this report.

Last but not least, my special thanks to my beloved parents and my classmates for their support and encouragement. Thank you so much.

ABSTRACT

This report briefly explains the bridge project at East Klang Valley Expressway (EKVE) which is in progress which is located at Ampang interchange. This report will be discussing proper procedure for beam launching works at EKVE highway. The objective of this report is to investigate the planning of construction works that was applied during the construction work. Moreover, the objectives of this report is to explore tools and machineries used in this construction, parties that were involved in completing this project and to investigate the process of launching works for post-tensioned beam (PTT beam). Other than that, this report explains the sequence of works according to the site planning. Further, it also explores the function of machineries used on site and roles and responsibilities of parties involved. Last but not least, this report shows the importance of these explanations in completing the project successfully.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1.0
INTRODUCTION

1.1 Background of Study

There are a very wide range of construction methods for bridges that are available such as concrete bridges, steel bridges, etc. However, this report is focusing on concrete bridges. In general, concrete is known for its high compression strength, however, concrete is weak in tension. Whereas most of the beam, especially for large size of beam should be stressed either using pre-stressing method or post-tensioned method which usually depends on the structure and design from structural engineer.

For the post-tensioned beam, which is the main focus in this project where the tendon is pulled and stretched using a hydraulic jack after concreting, and the resulting force is transferred directly to the hardened concrete through the tendon anchor. The tendon is made up of bars, single strands, or multi strands that can be placed in a variety of vertical, horizontal, and vertical profiles over the bridge deck, allowing for the most effective prestressing configurations. Precast beams, in situ or precast box girders, and cable-stayed structures are all examples of constructions that can be post-tensioned. Internal tendons are inserted inside a ducting and installed either before or after the concrete is poured, whereas external tendons are set in ducts outside the concrete section after it has been poured.

Before stressing works starts, there will be an inspection with the consultants for multi strand tendon stressing. This inspection is important before the concreting works as the contractor should get approval from the consultant and engineer in charge. During the stressing works, the site supervisor in charge will collect data from the jack meter and do the calculations right after. After that, the calculation result will be checked and approved by the consultant and engineer.

1.2 Objectives

i. To explore tools and machinery involved in bridge beam launching for EKVE project.

ii. To identify parties involved in bridge beam launching for EKVE project.

iii. To investigate the construction process of launching works for post tensioned t-beam in EKVE project

1.3 Scope of Study

This case study is carried out at package 1 East Klang Valley Expressway (EKVE) which links from Kajang interchange to Ampang interchange highway but this case study for this report is concentrated on Bridge 26 side B for its launching works. On the whole, the scope of study for this report is focusing on the lifting plan, method of statement, actual procedures on site and risk and problems occurred.

1.4 Methods of Study

i. Observation

Observation method was done by monitoring and observing the process and evaluating as it occurs especially during the site visit. This method helps directly by observing all works with much longer periods instead of using document reviews or interviews. In addition, collecting data by observing is more precise for instance, slump test data can be observed precisely when the technician conducting the slump test works instead of referring to the delivery order because it might have human error. This technique can have direct access in gathering data or for any references by taking pictures, video and squirting some short notes from the visits.

ii. Interview

Interview method can be done by questionnaire and surveys with a professional, person in charge or superior such as project engineer, site engineers, consultants, site supervisor, safety site supervisor and quantity surveyor. Moreover, the questions are scripted and openly asked to the person that is suitable to be questioned for the certain topic or discussion and this method can be conducted in person and through phone call. Interview method helps to gather information, knowledge, opinions or even experiences from the interviewee which might be useful for the task or assessment not only for formal interview but also helps to build networking with the interviewee. For instance, during the concreting works the question about the method and proper procedure for the works can be asked to the consultant. Furthermore, the data collected written in short notes can be properly understood as it helps by the detailed explanation of the professional.

iii. Document reviews

In this report, obtaining data also can be done by reviewing and analyzing the documentation from company records. This method is the most systematic procedure by reviewing data and evaluating the records from the current project as it helps in examining the data and gaining understanding by researching. The analysis can be found easily in the documentation as it has all the data, records from the project involved which is one of the important parts in any project is the documentation and records. In this study, Quality Assurance and Quality Control (QAQC) documentations, helps in gathering data and searching for the information. For example, data can be collected from beam certification, delivery order record, work program and method of statement. Other than QAQC documentation, data also can be taken from the construction drawing, shop drawings and stressing drawing for post-tensioned beams. All this data can be gathered from QAQC Engineer.

CHAPTER 2.0
COMPANY BACKGROUND

2.1 Introduction of Company

Tanjung Manis Corporation Sdn Bhd (TMC) incorporated in Kuala Lumpur, Malaysia in September 2007 under Company Act 1965, registered as contractor at CIDB and is a fully 100% Bumiputera Company Status with the main objective of participating and undertake in the infrastructure portion of any development especially in road rehabilitation works such as pavement overlay/resurfacing, mill and pave, and cold-in place recycling. Other than that, civil engineering and construction works for instance site clearing, earthworks, road works, drainage works, flood mitigation works, bridge works, revetment works etc.

This company managed by professionally qualified and skilled engineers with hands-on experience and expertise, TMC is ready to prove it capable of undertaking major infrastructure projects in the local as well as regional arena. Maintaining the philosophy of its founder, TMC has diversified in all facets of general construction services, thereby enabling the company to market negotiated general construction, design/build, construction management, and fast-track delivery systems. TMC offers a variety of technical and management approaches flexible enough to meet the demands of any project. TMC offers a cost and time saving program of early contractor involvement, which applies construction expertise to the project during the earliest stages of design.

Characteristic of the company's work has been the fact that many project assignments have resulted in repeat business. The success of TMC can be measured by the number of repeat clients and on-going relationships with Architects/Engineers and Subcontractors/Suppliers. Tanjung Manis's employees through their dedication and integrity have enhanced the company's reputation for superior workmanship and performance. Constructing infrastructures that meet or exceed the customer's expectations, has and continues to, perpetuate the principles of its founder.

2.2 Company Profile

2.2.1 Company Information

Figure 2.1: Logo of Tanjung Manis Corporation Sdn Bhd

Company Name	:	Tanjung Manis Corporation Sdn Bhd
Company Registration No.	:	787513-D
Date of Registration	:	06 September 2007
Corporate Status	:	Sole Proprietorship
Registration	:	a) UPEN Selangor b) DBKL c) CIDB d) SSM e) Contractor Service Centre
Business Address	:	B-3-2, Merdeka Place, Jalan MPL 3, Off Jalan Merdeka, 68000 Ampang, Selangor, Malaysia.
Phone Number	:	03-42911382
Email	:	tanjung.manis.corp@gmail.com
Registered Bank	:	Maybank Berhad

2.2.2 Registration Certificate

It is important in having a legal business in Malaysia by registering the business and becoming a legally registered entity which is compulsory according to Malaysia's law. It is necessary to obtain and to be provided with licenses and permits even though it is for a small local business. Even to operate a business within Malaysia, it is compulsory to register the business according to Malaysia legislation.

Business licenses and permits provide a legal protection under the law rom Suruhanjaya Syarikat Malaysia (SSM), separate legal entity, prove the business identity and more. Tanjung Manis Corporation Sdn Bhd has been provided with few certificates which are:

a. SSM Registration Certificates
b. CIDB Registration Certificate
c. CIDB Government Employment Procurement Certificate
d. UPEN Selangor Registration Certificate
e. Contractor Service Centre Certificate

Following are figures of licenses and certificates obtained by Tanjung Manis Corporation Sdn Bhd:

a) SSM Registration Certificate

SURUHANJAYA SYARIKAT MALAYSIA
COMPANIES COMMISSION OF MALAYSIA

BORANG 9
AKTA SYARIKAT 1965 [Seksyen 16(4)]

No. Syarikat
787513 D

PERAKUAN PEMERBADANAN SYARIKAT SENDIRIAN

Dengan ini diperakui bahawa

TANJUNG MANIS CORPORATION SDN. BHD.

telah diperbadankan di bawah Akta Syarikat 1965, pada dan mulai dari 06 haribulan September 2007, dan bahawa syarikat ini adalah sebuah syarikat berhad menurut syer dan bahawa syarikat ini adalah sebuah syarikat sendirian.

Dibuat di bawah tandatangan dan meterai saya di Kuala Lumpur pada 06 haribulan September 2007.

PUTEH BINTI MAHMOOD
PENOLONG PENDAFTAR SYARIKAT
MALAYSIA

UserID: anafsah Date: 9/6/2007 11:47:32 AM

NO. SIRI: SSM 430685

Figure 2.2: SSM Registration Certificate

b) CIDB Registration Certificate

CIDB MALAYSIA

PERAKUAN PENDAFTARAN

Adalah dengan ini diperakui bahawa kontraktor yang dinyatakan di bawah ini telah berdaftar dengan Lembaga mengikut Bahagian VI Akta Lembaga Pembangunan Industri Pembinaan Malaysia 1994. Pendaftaran ini adalah tertakluk kepada syarat-syarat yang telah ditetapkan bersama perakuan ini.

No. Pendaftaran	:	0120100810-SL130703
Nama Kontraktor	:	TANJUNG MANIS CORPORATION SDN. BHD.
Alamat Berdaftar	:	35A JALAN SG 3/1 TAMAN SRI GOMBAK 68100 AMPANG SELANGOR
Daerah	:	GOMBAK
Tarikh Mula Berdaftar	:	10/08/2010

GRED	KATEGORI	PENGKHUSUSAN
G7	B	B04 B05 B28
G7	CE	CE01 CE02 CE03 CE06 CE10 CE18 CE21 CE30 CE40
G7	ME	M15

Tarikh Mula Berkuatkuasa : **24/02/2021**

Tarikh Habis Tempoh Perakuan : **09/03/2022**

STATUS: AKTIF

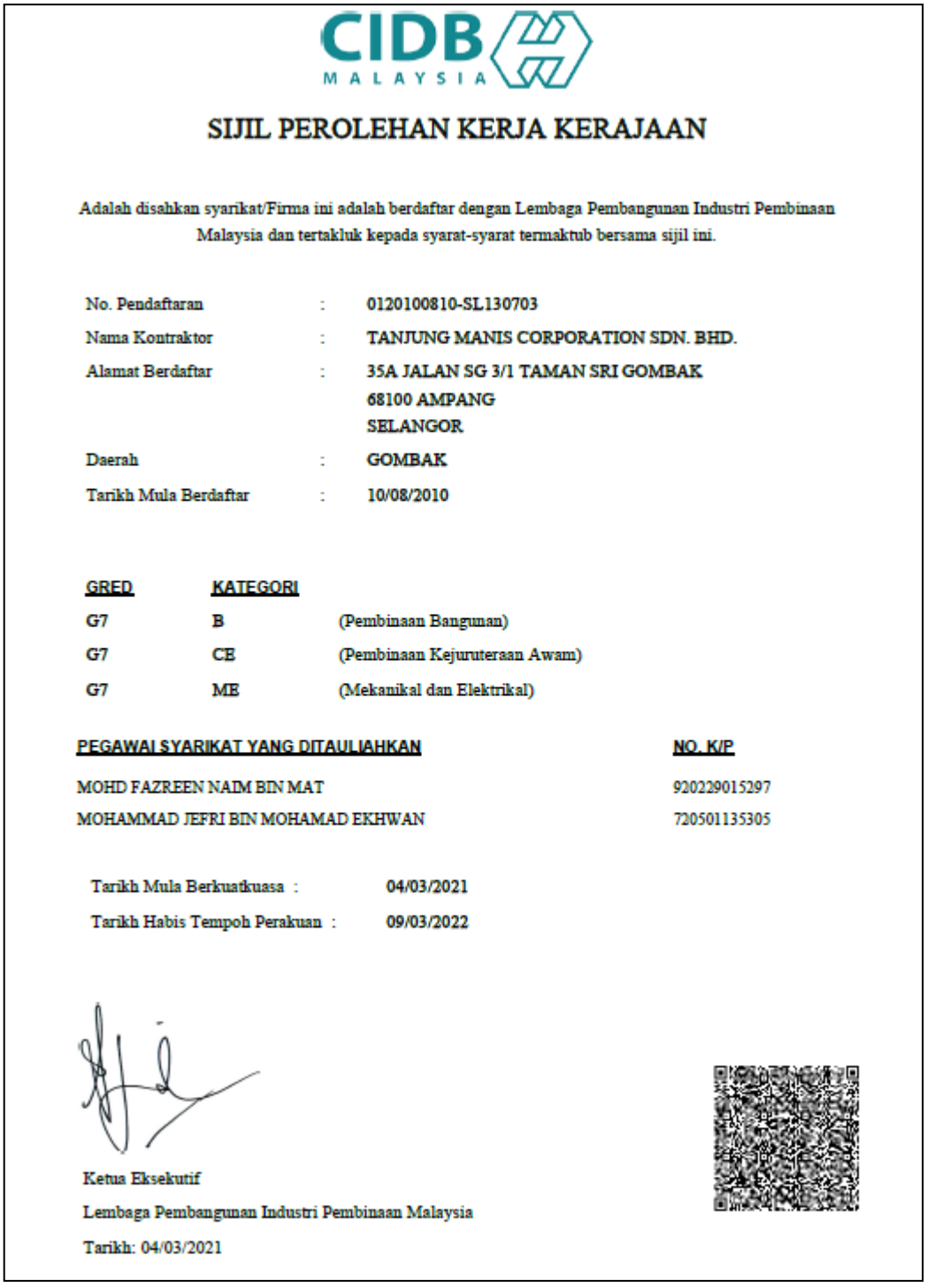
Ketua Eksekutif

Lembaga Pembangunan Industri Pembinaan Malaysia

Tarikh: 24/02/2021

Figure 2.3: CIDB Registration Certificate

c) CIDB Government Employment Procurement Certificate



CIDB MALAYSIA

SIJIL PEROLEHAN KERJA KERAJAAN

Adalah disahkan syarikat/Firma ini adalah berdaftar dengan Lembaga Pembangunan Industri Pembinaan Malaysia dan tertakluk kepada syarat-syarat termaktub bersama sijil ini.

No. Pendaftaran	:	0120100810-SL130703
Nama Kontraktor	:	TANJUNG MANIS CORPORATION SDN. BHD.
Alamat Berdaftar	:	35A JALAN SG 3/1 TAMAN SRI GOMBAK 68100 AMPANG SELANGOR
Daerah	:	GOMBAK
Tarikh Mula Berdaftar	:	10/08/2010

GRED	KATEGORI	
G7	B	(Pembinaan Bangunan)
G7	CE	(Pembinaan Kejuruteraan Awam)
G7	ME	(Mekanikal dan Elektrikal)

PEGAWAI SYARIKAT YANG DITAULIAHKAN	NO. K/P
MOHD FAZREEN NAIM BIN MAT	920229015297
MOHAMMAD JEFRI BIN MOHAMAD EKHWAN	720501135305

Tarikh Mula Berkuatkuasa : 04/03/2021

Tarikh Habis Tempoh Perakuan : 09/03/2022

Ketua Eksekutif

Lembaga Pembangunan Industri Pembinaan Malaysia

Tarikh: 04/03/2021

Figure 2.4: CIDB Government Employment Procurement Certificate

d) UPEN Selangor Registration Certificate

SALINAN

Sistem Tender Online Selangor 2.0
Pejabat Setiausaha Kerajaan Negeri Selangor

PENGESAHAN PENDAFTARAN SYARIKAT

Dengan Ini Disahkan Bahawa

TANJUNG MANIS CORPORATION SDN BHD

No. Pendaftaran: 787513-D

telah berdaftar dengan

Unit Perancang Ekonomi (UPEN)
Selangor

pada

16/01/2019

No Pendaftaran	787513-D
Daerah	Luar Negeri Selangor
No Rujukan Sijil CIDB	0120100810-SL130703
Tarikh Sahlaku Sijil CIDB	17 May 2019 - 10 Mar 2021
No Rujukan Pendaftaran MOF	✖
Tarikh Sahlaku Pendaftaran MOF	✖
Gred	• (G7) TIADA HAD Jumlah Bidang Pengkhususan: 12
Kod Pengesahan Sijil	HBD4A7Y3

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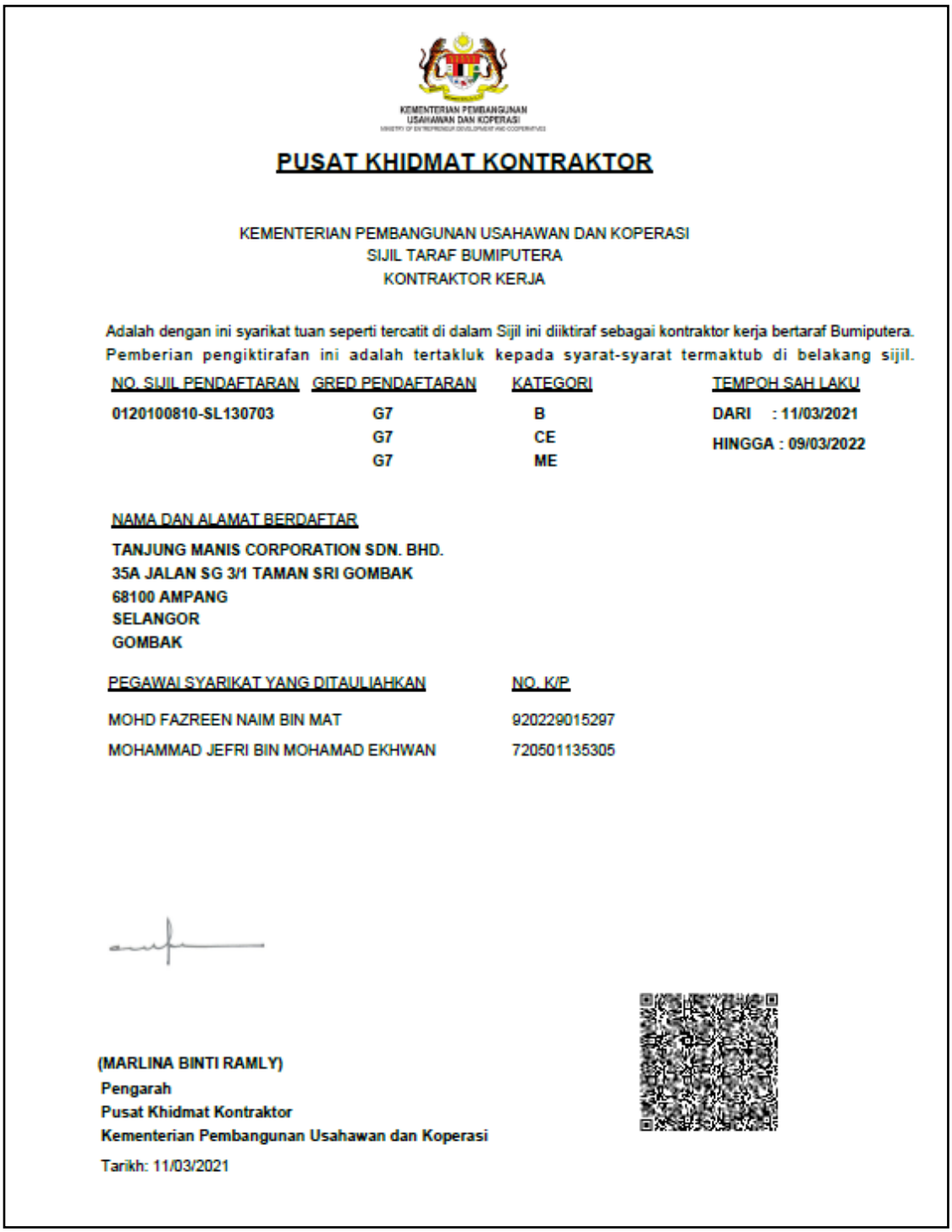
Tarikh & Waktu Janaan: 04/06/2020 15:18:21

Figure 2.5: UPEN Selangor Registration Certificate

e) Contractor Service Centre Certificate



KEMENTERIAN PEMBANGUNAN USAHAWAN DAN KOPERASI

PUSAT KHIDMAT KONTRAKTOR

KEMENTERIAN PEMBANGUNAN USAHAWAN DAN KOPERASI
SIJIL TARAF BUMIPUTERA
KONTRAKTOR KERJA

Adalah dengan ini syarikat tuan seperti tercatit di dalam Sijil ini diiktiraf sebagai kontraktor kerja bertaraf Bumiputera. Pemberian pengiktirafan ini adalah tertakluk kepada syarat-syarat termaktub di belakang sijil.

NO. SIJIL PENDAFTARAN	GRED PENDAFTARAN	KATEGORI	TEMPOH SAH LAKU
0120100810-SL130703	G7	B	DARI : 11/03/2021
	G7	CE	HINGGA : 09/03/2022
	G7	ME	

NAMA DAN ALAMAT BERDAFTAR

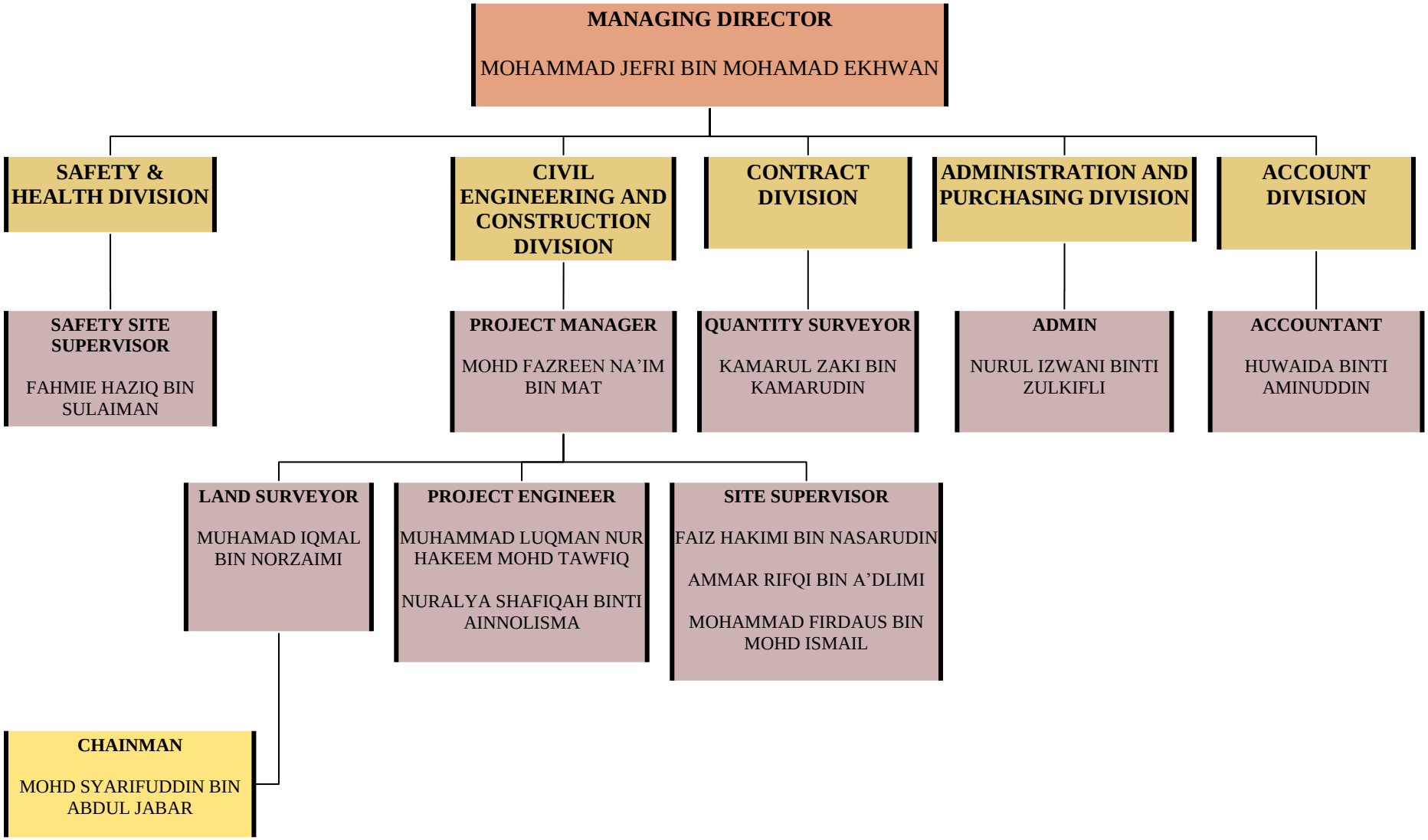
TANJUNG MANIS CORPORATION SDN. BHD.
35A JALAN SG 3/1 TAMAN SRI GOMBAK
68100 AMPANG
SELANGOR
GOMBAK

PEGAWAI SYARIKAT YANG DITAULIAHKAN	NO. K/P
MOHD FAZREEN NAIM BIN MAT	920229015297
MOHAMMAD JEFRI BIN MOHAMAD EKHWAN	720501135305

(MARLINA BINTI RAMLY)
Pengarah
Pusat Khidmat Kontraktor
Kementerian Pembangunan Usahawan dan Koperasi
Tarikh: 11/03/2021

Figure 2.6: Contractor Service Centre Certificate

2.3 Organizational Structures



2.4 List of Projects

2.4.1 Completed Projects

NO	DESCRIPTION	CLIENT	CONTRACT VALUE	SITE POSSESSION	COMPLETION
1	Piling Works (1500) Points) for Cadangan Pembangunan Tambahan Kepada Maktab Teknik Porim Bakri sedia ada serta kemudahan ke atas sebahagian Lot Ptd2520 dan Ptd 3390, Mukim Bakri, Daerah Muar, Johor Darul Takzim	Bumisetia Management	RM 3,000.000.00	15 March 2008	17 Oct 2008
2	Piling Works for Projek Pembangunan Hotel Bertaraf 5 Bintang di atas Lot Pt5509 seluas 3.3 ekar, restoran di atas Lot Pt5508 seluas 4.7 ekar dan S.O.H.O di atas Lot Pt5507 seluas 4.92 ekar di Pusat Dagangan Antarabangsa Melaka (Mitc), Ayer Keroh, Mukim Bukit Katil dan Mukim Bukit Baru, Daerah Melaka Tengah, Melaka Bandaraya Bersejarah	Perspec Prime Sdn Bhd	RM 1,147,398.00	28 March 2009	29 Jan 2010

3	Projek Menaiktaraf Jalan Lenggeng – Broga (N34), Daerah Seremban, Negeri Sembilan Darul Khusus (Ch 851.864 – Ch 3470.323)	Sutracom Sdn Bhd	RM 19,000,000.00	22 April 2009	09 Nov 2010
4	Cadangan Membina Jambatan Melalui Landasan Keretapi Di Antara M420-792d, M420-826u Dan M420-826d Di Inch Kenneth Estate Kajang, Selangor Untuk Tetuan I&P Menara Sdn Bhd	Perspec Prime Sdn Bhd	RM 3,452,348.93	15 May 2009	10 Jun 2010
5	Pavement Works for Period Maintenance Works 2014 (Pavement) at Route Ft 02, Section 8.00 – 9.00, Jalan Jambatan Kota, District of Klang, Selangor Darul Ehsan.	Roadcare (M) Sdn Bhd	RM 349,455.90	15 October 2014	13 Nov 2014
6	Supply And Install Cuplock Scaffolding for Kerinchi Interchange, Highway Kerinchi.	INL Engineering Sdn Bhd	RM 200,000.00	15 November 2014	15 April 2015
7	Federal Road Maintenance Zone 2a, Sarawak Periodic Maintenance Heavy Patching and Resurface at Route No 1 – 57, Sibu/Bintulu Boundary – Sg Semanok Section Km680+800 – Km659+700,	HCM Engineering Sdn Bhd	RM 622,637.60	May 2015	07 Oct 2015

	Bintulu.				
8	Pavement Works for Periodic Maintenance Works 2015 (Pavement) At Route 05, Section 466.00 – 468.00, Jalan Klang – Sabak Bernam, District of Kuala Selangor, Selangor Darul Ehsan.	Roadcare (M) Sdn Bhd	RM 474,880.00	4 May 2015	3 June 2015
9	Rancangan Tebatan Banjir Lembah Bertam Cameron Highlands, Pahang – Projek Melebar Dan Mendalamkan Sungai Bertam Dan Kerja-Kerja Berkaitan (Pmc)	Pending Makmur Sdn Bhd	RM 375,000.00	21 November 2014	30 Sept 2016
10	Propposed Free Flow Access from Bandar Tasik Puteri To Kl-Kuala Lumpur Selangor Expressway (Klse) Construction Of New Jersey Barrier (Njb)	Aktif Unggul Sdn Bhd	RM 383,693.50	1 November 2016	14 Mar 2017
11	Projek Kerja-Kerja Pembinaan "Overhead Motorcycle Bridge" Dan Menaiktaraf Sistem Perparitan Lebuhraya Persekutuan, Daerah Petaling, Selangor Darul Ehsan.	HCM Engineering Sdn Bhd	RM 1,600,000.00	22 January 2018	October 2018
12	Cadangan Kerja-Kerja Pengisaran Dan Penurapan Semula Jalan Di Sekitar Parlimen Segambut Dan Parlimen Batu Wilayah	DBKL	RM 3,006,046.80	13 December 2017	September 2018

	Persekutuan Kuala Lumpur Utuk Dewan Bandaraya Kuala Lumpur (2017/A166)				

Table 2.1: Projects Completed

2.4.2 Projects in Progress

NO	DESCRIPTION	CLIENT	CONTRACT VALUE	SITE POSSESSION
1	East Klang Valley Expressway (EKVE) Bridge Structure Works – Bridge No.2x, For Package 1 (Code:241001)	Ahmad Zaki Sdn. Bhd	RM 8,786,582.00	17 October 2019
2	East Klang Valley Expressway (EKVE) Bridge Structure Work – Bridge No.18	Ahmad Zaki Sdn. Bhd	RM 1,461,466.78	22 June 2020
3	East Klang Valley Expressway (EKVE) Bridge Structure Work – Bridge No.25 To Bridge 28	Ahmad Zaki Sdn. Bhd	RM 38,604,210.31	1 October 2020
4	East Klang Valley Expressway (EKVE) Bridge Structure Work – Bridge No.30x To Bridge 31x	Ahmad Zaki Sdn. Bhd	RM 25, 872, 890.00	1 October 2021
5	East Klang Valley Expressway (EKVE) Bridge Structure Work – Bridge No. 24	Ahmad Zaki Sdn. Bhd		12 December 2021

Table 2.2: Project in Progress

2.4.3 Current project pictures

Figure 2.7: Structure of Bridge 28

Figure 2.8: Structure of Bridge 27

Figure 2.9: Bridge 26

Figure 2.10: Beam of Bridge 27

Figure 2.11: Bridge 2X

CHAPTER 3.0
METHOD OF BEAM LAUNCHING FOR EAST KLANG VALLEY EXPRESSWAY (EKVE) BRIDGE 26B

3.1 Background of the project

This report is to identify the construction works of the expressway of East Klang Valley Expressway (EKVE), which would run between Bandar Sungai Long and Ukay Perdana, will be a dual-two-lane toll expressway with a mainline route of 24.16 kilometres and spur roads of 12.0 kilometres. Each section of the Expressway will be developed to a dual-three configuration once it reaches its capacity. This future expansion will be possible due to the acquisition of sufficient land.

Tanjung Manis Corporation (TMC) is nominated as a subcontractor by Ahmad Zaki Resources Berhad which is the main contractor of this project and was awarded for bridge structure works through Letter of Awards (LOA). For further information, Tanjung Manis Corporation was awarded to construct bridge structure works for a few bridges in EKVE which are bridge 2X and 18 for package 1 and bridge 24, 25, 26, 27, 28, 30X and 31X for package 2 whereas all the bridges located at Ampang except for bridge 2X which is located at Sungai Long. Furthermore, TMC will receive site instruction to take over the bridge works after a nominated subcontractor for bored piles works is handed over and TMC will start with constructing the structures and beams.

3.2 Tools and Machineries Used for The Beam Launching Works

3.2.1 Machineries

Heavy machinery is now an essential component of a cost-effective and on-time construction project and it is used whenever a company constructs any form of construction structure. In addition, heavy equipment makes it easier to execute heavy-duty activities with less risk, and it also minimises the need for physical labour. Here are the heavy machineries used in beam launching works:

i. Mobile Crane

Mobile cranes are designed to allow moving things to a worksite as easy as possible. These cranes usually have a boom at the end of which sheaves and wire rope suspend a hook. Moreover, prime movers help to control the wire ropes, which are routed through many transmissions which usually heavy objects are lifted using mobile cranes. Mobile crane services allow the ability to access sites that are difficult to access with other crane models.

Figure 3.1: 500 tonne Mobile Crane

Figure 3.2: 400 tonne Mobile Crane

Figure 3.3 120 tons Mobile Crane

ii. Prime Mover

Heavy-duty trucks, such as prime movers and semi-trailers, play an essential role in allowing products and equipment to be transported that would otherwise be impossible with smaller vehicles. In this beam launching works, prime mover helps in transporting beams from the beam yard to the launching area by lifting the beams using the mobile cranes and placing them on the prime mover. .

Figure 3.4 Prime Mover

iii. Excavator

Excavator is the most used plant in every construction work. This plant can excavate the soil of various types forcefully and then using a hydraulic system a hydraulic force is generated and utilizing this force bucket is pulled back towards the machine. Furthermore, the bucket of the excavator is replaceable. If the front bucket is exchanged with some other attachments then the excavator can be used for multi-purpose.

Figure 3.5 Excavator

iv. Welding Set / Generator Set

The importance of welding set in beam launching is to secure the beam temporarily after launching. Beam will be welded with rebar with size required after the beam was positioned in its place. So the welding set is important during the launching works as securing the beam is one of the important steps in this work that should be prioritized.

Figure 3.6 Generator Set

3.2.2 Tools and Materials

i. Bearing Pads

These pads are in between superstructures like the bridge beam and substructures like the piers, which are vertical supports. The major purpose is to distribute superstructure loads to the foundation and to allow the superstructure to move as needed in unfavourable weather conditions without causing detrimental stresses that could compromise the bridge's structural integrity. The bridge's structural integrity could be affected, causing it to collapse. Moreover, an elastomeric bearing pad's primary function is to prevent collapse. The pads help bridges last longer by decreasing wear and tear on the materials. The pads help save

money by extending bridge replacement, similar to how shoes enable humans to walk great distances.

Figure 3.7: Bearing Pads

ii. Reinforcement Bars (High Yield)

For beam launching the usage of steel bar to tie it with the previous beam is basically as a temporary position to prevent the beam from moving from its position and further, steel bar also acts as beam security.

Figure 3.8: High Yield Bar

iii. Timber Wedges

Timber wedges help in securing beams which are included as temporary works before the installation of diaphragm. The beam will be locked and placed firmly by timber wedges. For further information, this action is compulsory in making sure the beam will not move from its position after launching.

Figure 3.9 Timber Wedges

iv. Post Tensioned Beams

In completing this beam launching works, the post-tensioned beam is the most important material that is needed on site, without the beam this work cannot be done. The function of the beam is to receive dead load and live load from objects which are car, human, deck slab etc. moreover, the design of the beam will be determined by the Structural Design and the calculation involved in selecting the beams. Besides, the concrete grade used also depends on the design given to the contractor. All the calculations have been done before handing over the task to the contractor.

Figure 3.10: Post-Tensioned Beam (PTT)

v. Lifting Accessories (Wire Rope, Shackle, Sling and etc)

Slings and their components are also considered lifting accessories. Lifting accessories are components or equipment that are not tied to the lifting machinery that allow the load to be held, that are placed between the machinery and the load or on the load itself, or that are intended to be an integral part of the load and are independently placed on the market. Chains, ropes, slings, shackles, eyebolts, lifting/runway beams, lifting frames, and vacuum lifting devices are just a few examples of these accessories.

Figure 3.11: Lifting Accessories

(Source : https://theportalcranegroup.com/precision-crane/cranes-lifting-equipment/lifting-slings)

vi. Turn Buckle (for securing beam)

A turnbuckle is a basic rigging device for adjusting tension and reducing slack in a rope, cable, or other tensioning system. Further, turnbuckles are a broad product category with a wide range of uses in a variety of sectors. Other than that, it can be used for anything from producing tension in a fence or perimeter cable to the construction of a suspension bridge.

Figure 3.12 Turn Buckles

(Source : https://www.certifiedslings.com/what-is-a-turnbuckle/)

3.3 Parties Involved

The effectiveness of the project depends on manpower and parties involved in the project. By using knowledge from each department it helps in completing the project more efficiently and effectively. The industry could improve its efficiency and quality of work by having a steady supply of well-trained labour. This is because the greater the number of people available to work, the greater the number of products or outputs that may be created.

i. Project Manager

The Project Manager is in charge of ensuring that the Project Team completes the project on time and engages with the team to design the project plan and oversees the team's completion of project duties. Other than that, Project Manager is in charge of communication, which includes status reporting, risk management, escalation of issues that cannot be handled within the team, and ensuring that the project is delivered on time, on budget, and within scope

ii. Construction Manager

Construction Manager’s role is overseeing and directing construction projects from conception to completion. Reviewing the project in-depth to schedule deliverables and estimate costs. Overseeing all onsite and offsite constructions to monitor compliance with building and safety regulations.

iii. Site Engineer

A Site Engineer is the person who has been assigned by the employer to monitor the construction project. Before exercising any special authority, the engineer is normally needed to acquire the employer's approval, according to the specific restrictions of the construction contract. The engineer may assign duties and delegate authority to assistants at any moment, and may remove that assignment or delegation at any time.

iv. Site Supervisor

In general, a site supervisor's job includes managing and supervising a construction site in accordance with health and safety regulations. The site supervisor is responsible for assessing hazards, determining risks, conducting frequent inspections, and maintaining a safety programme. The site supervisor will normally report to the project manager and closely work with the site engineer, who is in charge of organising construction activity on site.

v. Safety Supervisor / Health and Safety Officer

The health and safety law enforcement employs a health and safety supervisor to ensure that the construction project site follows the safety standards and codes of practise relevant to the Health and Safety at Work Act.

vi. Welder

Welder will be responsible for joining the beam with rebar using a number of techniques as a welding fabricator, typically to secure the beam for the temporary works. Cutting and welding materials according to technical drawings made by other construction specialists. In general, the person who is in charge of putting metal pieces together or fixing damage in metal components by melting the metal into shape with heavy machinery that releases intense heat. Reviewing blueprints, cutting metal into the proper shape, and smoothing molten metal to remove creases are among their responsibilities.

vii. Surveyor

Land surveyors measure and evaluate sites for public, government, and private property with specialised equipment. Land surveyors are responsible for setting up land survey reports as well as executing measurement and assessment calculations. In beam launching works, the surveyor is responsible for checking the beam position, verticality of beam and more. So, it is important to have a surveyor during launching works as it helps to prevent any problems before inspection with the consultants start.

viii. Lifting Supervisor

A lifting supervisor was appointed to oversee the whole lifting operation and ensure the safe system of work for lifting operation is fully implemented.

Lifting supervisor should have the qualification, experience and competency requirements of a lifting supervisor to carry out all lifting activities during the launching works as they are required to plan, coordinate and supervise.

ix. Operators

Operators will be hired with the licenses and certificates that allow them to drive heavy plants. Such as cranes, excavator, prime over and even lorry. Besides, operators help in transporting material on site which is most important for beam launching works. All heavy stuff cannot be lifted using human's energy so that is why the operator is also one of the important parties involved.

x. Rigger

At manufacturing factories, shipyards, logging yards, construction sites, and movie sets, riggers setup and repair rigging. They're in charge of aligning and anchoring machinery, attaching loads, managing heavy machinery movement, and making sure the rigging is secure to use.

xi. Signal Man

A signalman is a person who uses hand signals, flags, or other communication instruments to guide crane operators. Other than that, lifting, suspending, dropping, and transferring actions must be directed and supervised by signal man and also responsible for giving crane operators a signal and making crane-related decisions.

xii. Consultant

Developing and supporting the design, dealing with project management, contract administration, inspecting the work of construction contractors, advising on sustainability, and giving guidance and assisting develop the project are all examples of consulting activities. Consultants can help you

avoid delays and gaps in construction projects, accomplish your operational goals, enhance the ROI of your building, and improve the construction process more efficiently in general.

3.4 Methods of Beam Launching Works

3.4.1 Preparation at Launching Area

First and foremost, Tanjung Manis Corporation (TMC) and Ahmad Zaki Sdn Bhd (AZSB) Safety Officer attended the beam launching works and conducted a briefing prior to commencement of site works to ensure all workers are aware of the safety requirement and make sure all the works runs according to the plan.

Figure 3.13: Briefing from Site Safety Supervisor

Mock-up training to all the staff and workers involved from AZSB, Consultant from Perunding ZKR and TMC before the actual work begins. By referring to the Field Density Test by AZSB, all crane platforms were inspected and tested before the launching works. Further, the lifting plan are used to position the cranes before the launching works. This action is

purposely done to ensure the safety during the works and to avoid any risk and problems during the launching or even after.

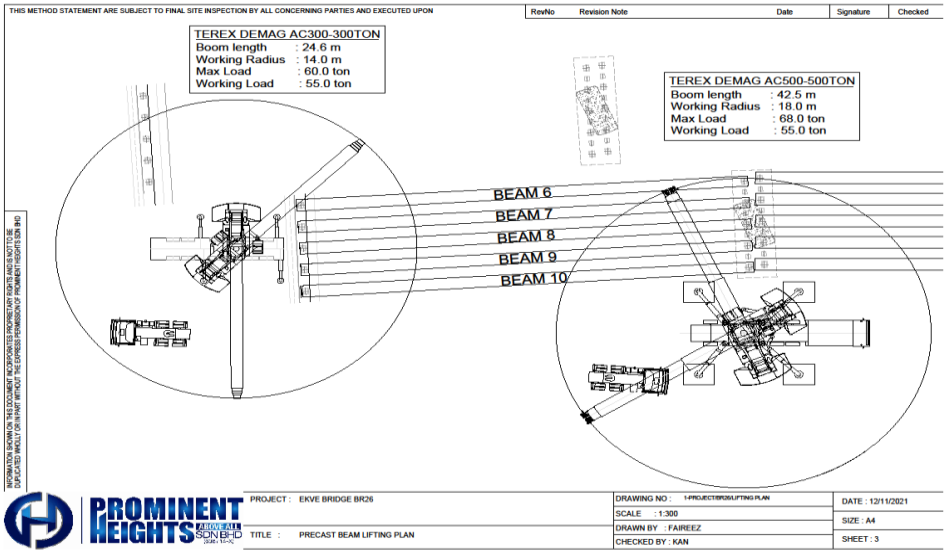


Figure 3.14: Lifting Plan from Nominated Sub-Contractor

Site supervisor checked all soffits which are from the bottom flange of the beam were levelled and cleared from any unwanted material before the launching works. Other than that, engineer and site supervisor in charge checked and verified all epoxy plinths and pedestals as specified in the Beam Launching Checklist.

Other than that, there are few instructions that were instructed by the Safety Site Supervisor which to remind workers to move away from the beam lifting area when the taglines or tail ropes are used to swing the beam which link with the cranes 500 tons and 400 tons. Other than that, Safety Site Supervisor keep reminding workers and manpower involved on site to avoid the places where they could be trapped or crushed between the suspended beams during the launching works.

Temporary drainage provided by the Environment team from AZRB to avoid water ponding or intrusion which might come from the river nearby that might affect the crane platform areas. As to make sure the cleanliness of the river and by not ruining the environment of the forest.

3.4.2 Survey and Setting Out

By referring to the shop drawing, the bearing plinths were set up correctly. In making sure the structure is ready for the launching works, joint inspection with the principal contractor which involved Assistant Resident Engineer from AZRB, Consultant from PZKR and Site Engineer from TMC was held at Bridge 26B structure. The pier was marked with the position of the beam edges as a guide for workers to lay the beam on point. Land Surveyor from TMC was on hand to ensure that each seating beam is level.

3.4.3 Beam Loading at Casting Yard

Before loading beam from casting yard, all pre-stressed T-beams of the span 1B, 2B and 3B all approved and certified by Main-Contractor AZRB and Consultant PZKR and the references number was written on all the beams to ease the works for the workers before lifting the beams as it can avoid confusion. In addition, the bearing plinth's compressive strength was rechecked before launch works began as it needs to attain 48N/sq.mm on the seventh day and the position precisely fitted on the beam seat.

For loading beams at casting yards, two 120-tonnes mobile cranes were provided to lift the beam and put it on the prime mover. As a rule, all soffits which are located at the bottom flange of the beam were levelled and cleared from any unwanted material before the launching works.

Before moving the beams to the Bridge 26B structure, the sling was properly inserted into the beam and the beam was transferred onto the prime mover trailer as the beam is not casted near the bridge structures, it needs to be moved from the beam yards to the bridge structures.

Figure 3.15: Rigger Is Inserting The Sling Into The Beam

Figure 3.16: Preparing The Beam To The Launching Site

3.4.4 Transport Beam to the Launching Site

For transporting the beam to the launching site, signal man was stationed at the entrances of casting yards and launching site to control traffic during the

prime mover arrival and departure. This is important for the traffic flow as it needs to be controlled along the launching progress until the launching works are done to prevent conflict and constriction along the access route. Meanwhile, the signal man instructed all the workers and manpower to make sure all vehicles were prohibited to trespass the launching area. This action to prevent the delay of the works and also for the safety purpose on site. The prime mover trailer movements all instructed and assisted from the signal man.

Activity	Start Time	End Time	Duration
SPAN 1/B BR26 – (2021)			
Safety toolbox and crane inspections	8.00 am	9.00 am	1 hour
Crane mobilisation and preparation at site	8.00 am	9.00 am	1 hour
Beam enter launching area	8.00 am	8.30 am	0 min – 30 min
Beam launch			
Lift beam A into position	9.00 am	9.30 am	0 min – 30 min
Lift beam B into position	9.30 am	10.00 am	0 min – 30 min
Lift beam C into position	10.00 am	10.30 am	0 min – 30 min
Welding	10.30 am	11.00 am	0 min – 30 min
Lift beam D into position	11.00 am	11.30 am	0 min – 30 min
Lift beam E into position	11.30 am	12.00 pm	0 min – 30 min
Final adjustment and inspection	12.00 pm	1.00 pm	0 min – 30 min
Demobilisation cranes	1.00 pm	1.30 pm	0 min – 30 min

Table 3.1: Target Sequence of Beam Launches Bridge 26 Span 1/B

3.4.5 Beam Launching to Bridge

The launching works of Bridge No.26 B side was completed in 3 sessions (3 days) which consists of 15 beams that launched across abutment A to abutment B side B. The span launching sequences started from Span 2/B, 3/B and lastly Span 1/B and for the beam launching sequences started from Beam A, Beam B, Beam C, Beam D and lastly ended with Beam E.

To begin with, 1 nos of 400 tonne Kobelco CKE4000 and 1 nos of 500 tonne mobile crane TEREX Demag AC500 were provided at the launching area to receive the beam from the prime mover trailer. Both of the launching cranes were parked in position as planned in the lifting plan drawing that was provided by the nominated sub-contractor for the lifting works, Prominent Heights Sdn Bhd. For further information, the lifting plan drawing is important in organizing the launching works as it helps in ease and the smoothness of the launching works. In addition, it helps in making sure launched beams are secure from any damage during the lifting works. The positioning of the lifting cranes was considered based on the platform location and site conditions and few other aspects that had been considered from the site survey beforehand.

Figure 3.18: Placing Beam on its Position

Figure 3.19: Placing Beam on its Position

Rubber bearings were placed on plinths as per survey markings. Next, the Rigger assisted and secured the beam with lifting sling once the beam arrived and was put on the prime mover trailer. After the beam secured with the sling and safely on the prime mover trailer, the beam was moved to the launching area and after everyone was ready, the beam was lifted from the prime mover trailer onto the crosshead with the assistance of Signal Man.

Figure 3.20: Signal Man Giving Instruction

Two Site Supervisors with safety harness hooked properly to the lifeline on each side of the crosshead guided the T-beam to sit on the bearing pads. These Site Supervisors ensured the T-beam was placed slowly on the bearing support without creating unnecessary push or push effect on the supporting bearing. This action prevents sudden loading that might cause a pounding effect which is strictly prohibited. Once the T-beam was placed on the bearing pads, the mobile crane was held in position while the Site Supervisors made a double check to ensure the beam was totally seated on the bearing pads. On the other hand, Site Supervisors made sure there is no gap between the down stand plinth and bearing pad. Meanwhile, the Land Surveyor also checked and confirmed the beam position.

3.4.6 Secure Launched Beam

Later, timber wedges were plugged into the left and right edge below the bottom flange of the beam. Every beam launched was tied with the crosshead for further security. The subsequence beam was tied to the previous beam with welded 2 pieces of T32 & 4 pieces T16 rebar across 2 beams after the final position was confirmed. The cable used to tie the beams cannot obstruct the construction of the diaphragm, this act checked by the Site Supervisors. For further information, the cable only can be removed after construction of the diaphragm is done.

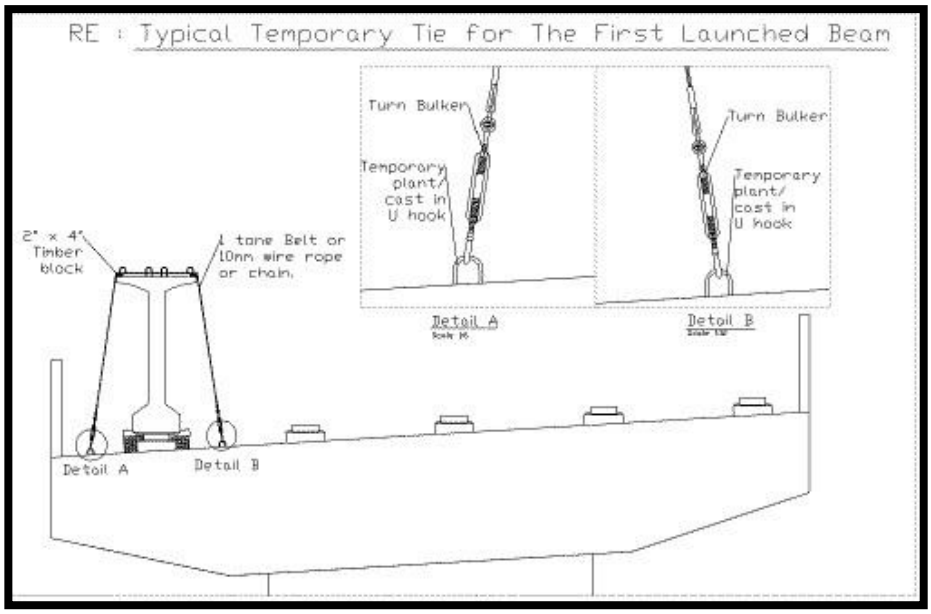


Figure 3.21: Typical Temporary Tie for the First Launched Beam

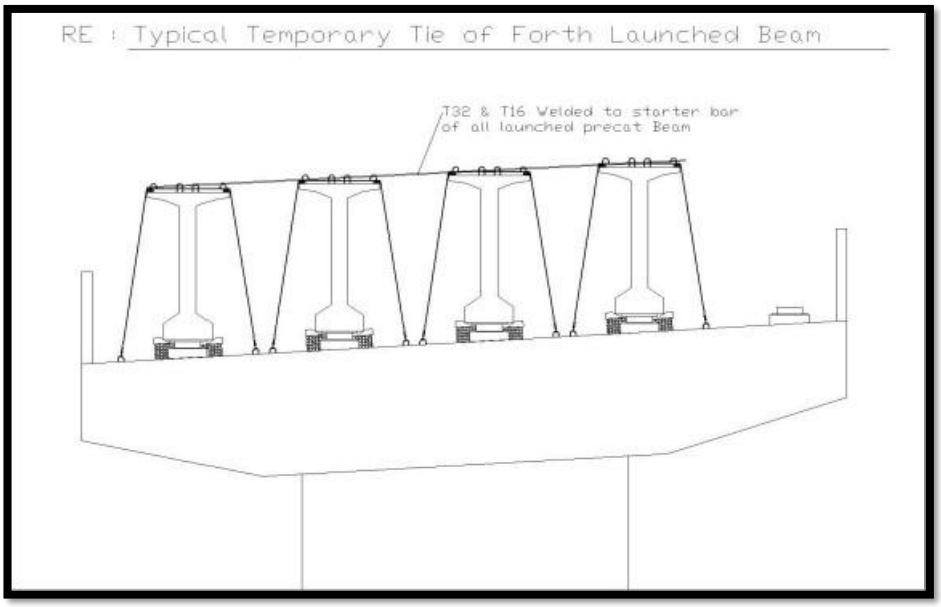


Figure 3.22: Typical Temporary Tie the Sub Sequence Launched Beam

Before all the temporary secure works were completed, the lifting sling was kept in use. Once temporary secure works are completed, the lifting load is released to 0 by the mobile cranes which can be checked on the crane load meter and remain for at least 1 minute to confirm the secured beam is located properly and stable. The lifting sling was removed after a signal was given by the Signal Man. Secured rebar was placed and welded to the starter bars of each beam.

Figure 3.23: Removing Sling From the Beam

The inspection of beam positions was checked by the Consultants and Assistant Resident Engineer from the main contractor, both parties in charge of making sure the beams were placed according to the specifications. The result of all the checklists for the inspection will be given after the consultants and main contractor approved the work.

Figure 2.24: Inspection by Consultants

CHAPTER 4.0

CONCLUSION

To sum it up, in constructing a bridge the first step that needs to be considered is the site investigation. In general, a site plan is a comprehensive plan that depicts proposed renovations or additions to a specific piece of property. Site planning such as for the structure design, material selection for example, types of steel, concrete, aggregates, and mix design, concrete placement and curing techniques, and management and maintenance of the structure throughout its life are all part of the concrete bridge construction process. In fact, any structure, no matter how minor, is subjected to site investigations. Further, one of the most significant aspects of a site plan is that it depicts the relationship between what already exists and what you intend to construct. Site plans are all unique and will not be designed in the same way. Moreover, the investigation of the site's suitability to meet the bridge structure's criteria is the important part in constructing bridges. As a result, all the works that should be done can be completed smoothly and the progress of the site would not be delayed and can be run smoothly.

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