



**DEPARTMENT OF BUILDING  
UNIVERSITI TEKNOLOGI MARA  
(PERAK)**

**CONSTRUCTION OF CHAIN BARRIER POST FOR P3 PETRONAS  
RAPID PROJECT, PENGERANG, JOHOR**

**Prepared by:  
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UNIVERSITI TEKNOLOGI MARA  
(PERAK)**

**DECEMBER 2018**

It is recommended that the report of this practical training provided

**by**

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**Entitled**

**Construction of Chain Barrier Post For P3 PETRONAS RAPID Project,  
Pengerang, Johor**

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

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**DECEMBER 2018**

**STUDENT'S DECLARATION**

I hereby declare that this report is my own work, except for extract and summaries for which the original references are stated herein, prepared during a practical training session that I underwent at Tan Bock Kwee & Sons Sdn. Bhd. for a duration of 14 weeks starting from 3rd September 2018 and ended on 7th December 2018. It is submitted as one of the prerequisite requirements of DBG307 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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Date : 18th December 2018

## ACKNOWLEDGEMENT

The internship opportunity I had with Tan Bock Kwee & Sons Sdn Bhd was a great chance for me learning thick and thin in construction industries. Therefore, I consider myself as a lucky person to be part of it. I am grateful for having chance to meet a group of amazing individuals that has lot of experience in construction field and lead me throughout my internship period.

Alhamdulillah, praise to Allah, the Most Merciful, the Most Graceful. It is a genuine pleasure to express my deep sense of thanks and gratitude for the guidance, advice and help given by Mr Alex Tan, General Manager of Tan Bock Kwee & Sons Sdn Bhd who in spite of being extraordinarily busy with his duties, took time out to hear, guide and keep me on the correct path and allowing me to carry out this project at their esteemed organization and extending during the training.

I express my deepest thanks to Mr Lau, Engineer of Tan Bock Kwee & Sons for taking part in useful decision and giving necessary advices and guidance while conduct this project. Besides that, thank you for providing me with all good facilities to make my work runs smoothly. I choose this moment to acknowledge his contribution gratefully.

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I perceive as this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way. Lastly, I would like to express my special thanks to my family and friends because help me in all possible way they can in order for me to complete my internship.

## **ABSTRACT**

Chain barrier post are extensively used to mark, delineate or block off an area. Chain post set are handy ways for utility crews to block off larger areas and can be achieve with portable barriers. Hence, setting up chain posts is a quick and cost effective solution for visibly marking an area, protecting both people and assets. Therefore this report will discuss about the construction of chain barrier post. This report was conducted for protecting oil tank area at PETRONAS RAPID Project Pengerang, Johor. The objective of this report is to identify the method used to construct the chain barrier post such as the method of cutting the angle pole, the construction of formwork use to cast the angle pole, casting and painting the angle pole. To complete this report, it requires observation and interviews with related sources. In conclusion this report contains all elements related to chain barrier post from the beginning until the completion of the chain barrier post that are according to specification such as type of steel bar used and the formwork used to cast the angle steel pole.

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## CHAPTER 1.0

### INTRODUCTION

#### 1.1 Background

A barrier is a physical structure which blocks or impedes movement. Hence a chain barrier post is a handy ways for utility crews to block off larger areas and can be achieve with portable barriers. Therefore, setting up chain posts is a quick and cost effective solution for visibly marking an area, protecting both people and assets.

This chain barrier helps to block off the refinery oil tanks in PETRONAS RAPID,Pengerang,Johor from the outsider or not authorized people from coming in.

#### Scope of study

This report shows information about implementation of first stage until final stage of construction chain barrier post at PETRONAS RAPID Project, Pengerang, Johor. The stage involved the planning and development activities consist of this related process:

- I. Determine the type and materials used.
- II. Preparing and carrying out the construction works.
- III. Determine the method used along the project.

## **1.2 Objectives**

The following are the objectives of this study:

- I. To identify the method use for cutting the angle steel pole.
- II. To determine the method use of constructing the formwork to cast the angle steel pole.
- III. To identify the method of casting and painting the angle steel pole.

## **1.3 METHOD OF STUDY**

### **1.3.1 Interview**

Interview session with several workers that was in charge at the construction site. Several people that involve is manager of the project, Alex Tan, supervisor, skilled workers and also general labor.

### **1.3.2 Case Study**

Information gained based on true experience of writer during practical training and through daily activities. Hence, the data were collected based on the type of works that has been done by the labor.

### **1.3.3 Internet**

Internet also used as a secondary source to obtain information about construction of chain barrier post. There are several websites that have been used to get more information.

## CHAPTER 2.0

### COMPANY BACKGROUND

#### 2.1 Introduction of Company

Tan Bock Kwee & Sons Sdn. Bhd. is a leading Civil and Building construction company in the Oil and Gas Industry in Negeri Sembilan. It started off as Tan Bock Kwee & Son (Partnership) and was subsequently incorporated as a limited company in 1975 with an authorized capital of RM500,000.00. From the initial paid-up capital of RM2.00 the company continues to grow to its present paid-up capital of RM1,200,000,00.

Tan Bock Kwee & Sons has grown from strength to strength through the 40 over years of business. Year 2017 marked a significant milestone for the company. Turnover has quadrupled compared to the past 2 years.

As early as 1968, the company has been registered as a Civil Contractor with both refineries in Port Dickson; Shell Refining CO (FOM) Bhd and Esso (M) Bhd. The company was also registered class 'BX' Civil contractor with Jabatan Kerja Raya. With the implementation of the Construction Industry Development Board (CIDB), the company has obtained the registration of Grade G7 for both Building and Civil Works with the board.

In the area of work safety, the company boasts of its safety record which stands at 0 LTI (Lost Time Incident) throughout its various engagements to date. The company constantly receives the annual Safety Award from Shell Refining Co (FOM) Bhd. for its safety record in the refinery. All this is possible through the company's strong commitment to safety and its well-trained and disciplined work force.

Besides the traditional civil works, Tan Bock Kwee & Sons Sdn Bhd has also undertaken various mechanical projects through its associated company, Prestasi Senadi Sdn Bhd, which has incorporated in 1993. Within three years from its inception, Prestasi Senadi Sdn Bhd had successfully completed projects valued more than RM 16.6 million. This company provides positive synergy and contribution towards the growth of Tan Bock Kwee & Sons Sdn Bhd.

Tan Bock Kwee & Sons Sdn Bhd also prides itself in its excellent record past engagements. Although the company is small, the strength of the company lies in the “Hands-On” policy of its directors. The directors spend considerable amount of time in the fields, to ensure quality, timeliness, and safe delivery of work. The personal commitment and dedication of the directors is well reflected in the growth of the turnover of the company through time.

Tan Bock Kwee & Sons Sdn Bhd stands proud today as the in-house civil contractor for Hengyuan Refinery as well a Site Service Contractor for PRPC Utilities & Facilities for the Petronas RAPID Project.

It is the result of the company’s commitment towards quality and safety supported by its well-trained and disciplined workforce. With such an excellent track record, Tan Bock Kwee & Sons Sdn Bhd is well-poised to undertake greater challenges in the years to come.



**AKTA SYARIKAT 1965**  
**PERAKUAN PEMERBADANAN SYARIKAT SENDIRIAN**  
 BORANG 9  
 (Menurut Seksyen 11(2)(b)) **CERTIFIED TRUE COPY**

No. Syarikat  
 22979 A

Adalah diperakui bahawa  
**TAN BOCK KWEE & SONS SDN. BHD.**  
 telah diperbadankan di bawah Akta Syarikat 1965 pada dan mulai dari  
 22 hari bulan May 1975 dan bahawa syarikat ini adalah sebuah syarikat  
 berhad menurut syer dan bahawa syarikat ini adalah sebuah syarikat  
 sendirian.

Dibuat di bawah tanda tangan dan metera saya di Negeri Sembilan pada 6  
 hari bulan November 2007.



**Figure 2.1 : Company Certificate**



**PERAKUAN PENDAFTARAN**

Adalah dengan ini diperakui bahawa kontraktor yang dinyatakan di bawah ini telah berdaftar dengan  
 Lembaga mengikut Bahagian VI Akta Lembaga Pembangunan Industri Pembaikan Malaysia 1964.  
 Pendaftaran ini adalah tertakluk kepada syarat-syarat yang telah ditetapkan bersama perakuan ini.

No. Pendaftaran: 1961114-NS014951  
 Nama Kontraktor: TAN BOCK KWEE & SONS SDN. BHD.  
 Alamat Berdaftar: LOT 333, KG PAYA BATU 2, JALAN SEREMBAN  
 71000 PORT DICKSON  
 NEGERI SEMBILAN  
 Daerah: PORT DICKSON  
 Tarikh Mula Berdaftar: 28/10/1987

SEKELAH	KATEGORI	PENOKSUSULAN
G7	CE	CE01 CE21 CE2N CE31 CE3N
G7	ME	M15
G7	B	B04 B26

Tarikh Mula Berkuasanya: 20/02/2018  
 Tarikh Habes Tempoh Perakuan: 31/03/2021  
 STATUS AKTIF



**Figure 2.2 : CIDB Certificate**



陳木桂父子有限公司  
**TAN BOCK KWEE & SONS SDN. BHD.** (22979-A)

**QUALITY POLICY**

TAN BOCK KWEE & SONS SDN BHD strives to deliver products and services to its clients within schedule while maintaining the highest standards of safety, reliability and operational integrity.

With respect to this mission, TAN BOCK KWEE & SONS SDN BHD adopts the following Policy:

**"To provide products and services that meets and exceeds Customer's specifications and expectations."**

This could be achieved through:

- ⇒ Establishing and maintaining an effective and efficient Quality Control Program
- ⇒ Sharing, disseminating, and training knowledge through all levels of the Company
- ⇒ Encouraging "First Time Right" work culture throughout the company.

Lot 333 Kampung Paya Batu 2 Jalan Seremban 71000 Port Dickson Negeri Sembilan Darul Khusus  
 E-mail : tbsksb@pd.jaring.my

**Figure 2.3 : Quality Policy**



陳木桂父子有限公司  
**TAN BOCK KWEE & SONS SDN. BHD.** (22979-A)

**HEALTH AND SAFETY POLICY**

TAN BOCK KWEE & SONS SDN BHD holds the view that the good management of health and safety aspects of its employees, sub-contractors, or any person involved with the company's business operations, is a critical key of success of its business.

The Company believes that accidents are preventable if jobs are effectively planned and managed. The company will not tolerate on any poor safety attitude towards work and will endeavor to eliminate work accident for the wellbeing of all parties involved in its business operations.

We are committed towards to policy of ...

- Practicing pre-emptive safety management so as not to risk the health and safety of all parties involved in our business operations
- Continuous promotion of safety awareness among our workers
- Complying with the relevant laws and regulations of the authorities and owners of the place where we carry out our business

Lot 333 Kampung Paya Batu 2 Jalan Seremban 71000 Port Dickson Negeri Sembilan Darul Khusus  
 E-mail : admin@tbsksb.com.my

**Figure 2.4 : Health and Safety Policy**



## 2.2 Company Profile

**Table 2.1: Company Profile of Tan Bock Kwee & Sons Sdn Bhd**

Name	Tan Bock Kwee & Sons Sdn Bhd (22979-A)
Address	Lot 333 Kampung Paya 71000 Port Diskson Negeri Sembilan Darul Khusus
Nature Of Business	Civil Engineering and Earthwork Contractor
Equity Structure	Project Director: Tan Hun Tiong 70% Managing Director: Tan Han Peng 30%
Telephone No	
Fax No	
Email	<a href="mailto:dc@tbkssb.com.my">dc@tbkssb.com.my</a> <a href="mailto:hr.tbkssb@gmail.com">hr.tbkssb@gmail.com</a>
Date Of Incorporated	22 <sup>nd</sup> May 1975
Authorized Capital	RM 1,500,000.00
Paid-Up Capital	RM 1,200,000.00
Bankers	Maybank Berhad Public Bank Berhad CIMB Bank Berhad Asian Finance Bank Berhad UOB Bank Berhad
CIDB Registration	Grade: G7 Categories: B- B04, B26 CE- CE21, CE01, CE24, CE34, CE36 ME- M15

Specialization	<p>Oil &amp; Gas Industry – Civil Contractor for PRPC Utilities &amp; Facilities Sdn Bhd, Hengyuan Bhd, Petron Bhd and Sub-Contractors for MMC ( Amec Foster Wheeler, Fluor, Technicas, JGC, Sankyu, Lotte E&amp;C, Punj Llyod (M) Sdn BHd, MIE Industrial Sdn Bhd, etc)</p> <p>Power Plant Construction – Tuanku Jaafar Power Plant Phase 1 &amp;2</p>
Associate Company	<p>Prestasi Senadi Sdn Bhd (255107-W)</p> <p>Mechanical &amp; Civil Engineering Contractor</p> <p>CIDB Grade: G5 Category: B, B04, CE, CE21, ME, M15</p>

### 2.2.1 Objective of the Company

God's law is the basis of science and technology. Tan Bock Kwee & Sons Company strives for a comprehensive and integrated development and technology development for the wellbeing and prosperity of the universe in accordance with its will.

### 2.2.2 Vision, Mission, and Moto of the Company

**Vision:**

Public study, building builder & exhaust engineering company in the "all & gas" industry in Malaysia reaching towards ISO 9001: 2000 quality insurant.

**Mission:**

Trying to fulfill the request of the customer more than they want.

**Moto:**

'Quality, Time & Safety'

## 2.3 Organization Chart

### 2.3.1 Company Organization Chart

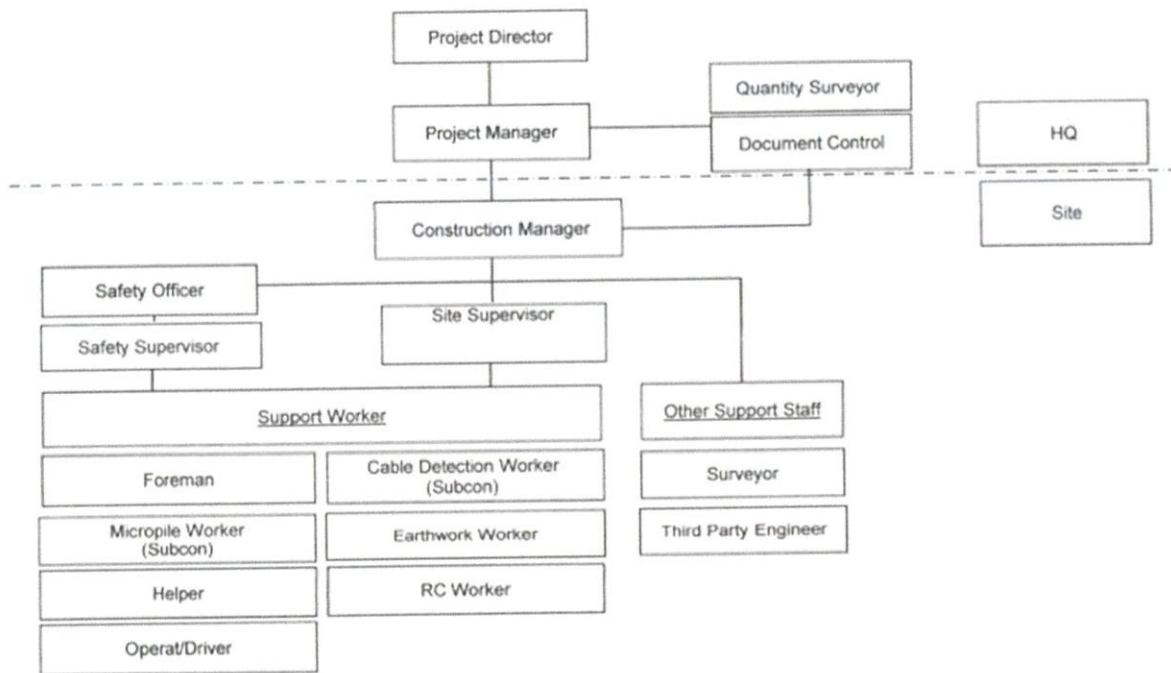


Figure 2.1: Company Organization Chart

## 2.4 List of Project

### 2.4.1 Completed Project

**Table 2.2: Completed Project of Tan Bock Kwee & Sons Sdn. Bhd**

No	Description	Client	Year Start	Year Completed
1.	Rapid P7, Camp	MIE Industrial Sdn Bhd	2016	2017
2.	Rapid Package 14, TCF	Kejuruteraan QKS Sdn Bhd	2016	2017
3.	Jimah East Power, Temporary Laydown Preparation Work	Equator Engineering Sdn Bhd	2016	2017
4.	TE3 Project, Civil Work (PC-1, PC-2)	Lotte E&C Malaysia Sdn Bhd	2016	2017
5.	TE3 Project. Civil Work (BTX, TBA)	Lotte E&C Malaysia Sdn Bhd	2016	2017
6.	Rapid Package 5, TCF	Sankyu (M) Sdn Bhd	2016	2016
7.	Civil, RC, Steel Structure & Architectural Work for RAPID P1 CAMP, Pengerang, Johor	STAM Engineering Sdn Bhd	2015	2015
8.	Civil and Building Work ATB Phase 2, Hydrocarbon Storage & Distribution Facility at Tanjung Bin Johor	Frontken Malaysia Sdn Bhd	2014	2015
9.	Civil and RC Work for Honda Showroom at Kawasan Perindustrian Terbau III, Mukim Tebrau,	AFC Plus Sdn Bhd	2015	2015

	Tebrau Johor			
10.	Civil Work for Package B of Flare Gas Recovery Unit (FGRU) Project at Petronas Penapisan (Melaka) Sdn Bhd	Kejuruteraan QKS Sdn Bhd	2014	2014
11.	Civil and RC Work at Tanjung Langsat, Pasir Gudang, Johor	Lotte Engineering & Construction	2013	2014
12.	Supply of Skill Worker for Institu Teknologi Petroleum Petronas (INSTEP) Project at Kuala Terengganu	Petrofac Engineering & Construction Sdn Bhd	2013	2014
13.	To Supply Manpower, Equipment, Consumables, Tools & Etc for Erection & Dismantle Scaffolding for Sour Water Tank (T-8551) in Shell Refining Port Dickson	MSPL Engineering Sdn Bhd	2013	2013
14.	Civil Works for Portable Demin Water Treatment Plant at Tuanku Jafar Power Station, Port Dickson	Tyden Engineering Sdn Bhd	2013	2013
15.	M Project Johor Bahru Excavation, Rc Work Inclusive Preliminary	Taisei Corporation	2013	2013
16.	Site Preparation, Temporary Facilities, Piling Work, Civil, Underground Piping, Roadway Lighting and Earthing Work for Hijau Gasoil Project, Shell Port Dickson	Shell Refining Co (FOM) Bhd	2010	2013

## 2.4.2 Project in Progress

**Table 2.3: Project in progress of Tan Bock Kwee & Sons Sdn. Bhd**

No	Description	Client	Year Start	Year Estimated To Be Complete
1.	RAPID P14-SS17D, Civil & Infrastructure Work	OUI JV	2017	2020
2.	Rapid Package 28A, Civil Work	Tehnicas Reunidas	2017	2018
3.	EURO 1V Early Work & Piling Package	Hengyuan Refining Company Berhad	2017	2018
4.	ATLAS-2 LRCCU Regenerator Cyclone Replacement Project	Sankyu (Malaysia) Sdn Bhd	2017	2018
5.	Tank Pad Foundation, Tank Farm Area Development, Drainage with valve pits (within the dyke walls) and dyke walls – RAPID Project, Pengerang Johor	Punj Llyod Ltd	2016	2018
6.	Rapid Package 3, Building Work	Tehnicas Reunidas	2015	2018
7.	Engineering, Maintenance and Support Services of Civil Work	Sankyu (Malaysia) Sdn Bhd	2013	2019
8.	MDE5 Project, Melaka Temporary Facilities Work	Hyundai Engineering (M) Sdn Berhad	2018	2018
9.	MDE5 Project, Melaka Civil Work, Package A	Hyundai Engineering (M) Sdn Berhad	2018	2019

## CHAPTER 3.0

### CASE STUDY

#### 3.1 Introduction to Case Study

The project carried out during the practical training is construction of the Chain Barrier Post for Petronas RAPID Project Pengerang, Johor. The client of this project is Petroliam Nasional Berhad (PETRONAS) and the main contractor is Tecnicas Reunidas Malaysia. The total amount of this project is Ringgit Malaysia five hundred thousand (RM 500,000). The duration of this project and the completion date is 16 weeks starting from 31<sup>st</sup> August 2018 until 30<sup>Th</sup> November 2018.

The construction of the Chain Barrier Post conducted at the yard and transferred to the site at Pengerang, Johor. This chain barrier post are used to block off each area of refinery oil tanks at the site. Based on this project, the work started with cutting off the angle steel bar until painting. Therefore, this project was not very complex and heavy.



**Photo 3.1: Construction of Chain Barrier Post in yard**

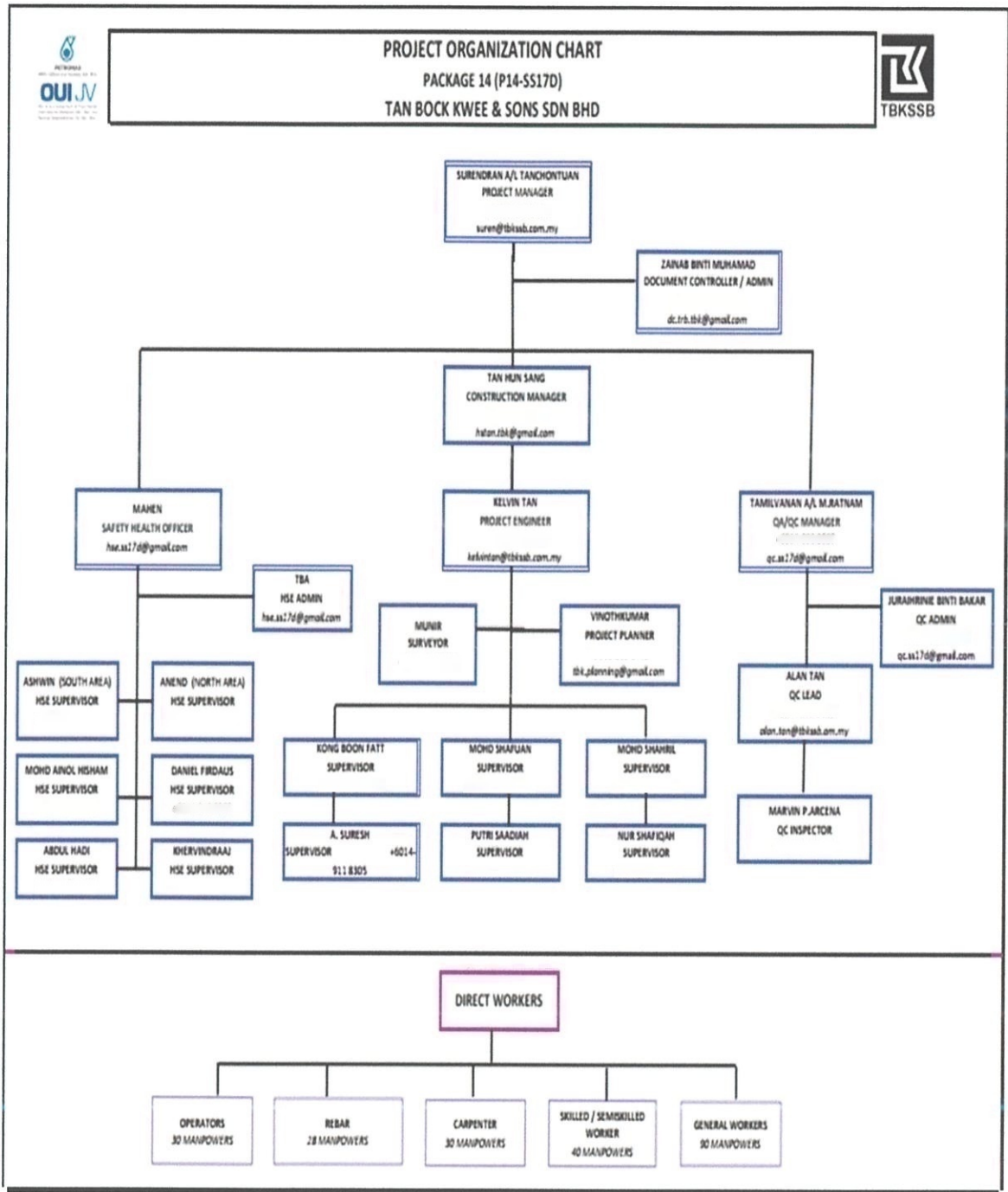


Figure 3.1: Project Organization Chart





## 3.2 Construction of Chain Barrier Post

### 3.2.1 Cutting, Grinding, Welding and Galvanization of Angle Pole

Angle steel bar is the main item used in this fabrication. The steel bar that used for the chain post is 100mm x 75mm x 75mm x 6m mild steel angle iron. For each 6m steel bar will be cut to 1.3m to obtain 12 000 pieces angle steel bar.

The 1.3m angle steel bar will be polish by grinder machine to obtain the smooth surface of the steel bar.



**Photo 3.4: 100mm x 75mm x 75mm x 6m Mild Steel Angle Iron**

The round bar bracket are welded at the surface of the angle pole. The function of the round bar bracket is to hang the steel chain.

Since the steel will rust if in touch with water and store in an open area, the angle steel bar are sent up to Industrial Galvanization Corporation to be coated with zinc coating. It is carried out by hot dip galvanizing process.

The function of zinc coating is:

- I. The zinc coating serves as a barrier to the corrosive environment which the rebar are exposed to when embedded in concrete.
- II. Zinc also provides cathodic protection where zinc corrodes preferentially when in contact with unprotected steel. This means that in case of any gap in zinc coating the surface of bare steel is protected by the surrounding zinc.

### 3.2.2 Construction of Formwork and Casting and Painting Process

Since the galvanize angle steel pole will be plant in the ground, the bottom part of the angle steel pole will be concreted as the base.

The formwork are construct with 200mm x 300mm x 12mm thick plywood. Hence, there are 410 box of formwork of the same dimensions are built.



**Photo 3.5: Construction of angle steel bar formwork**

The concreting process are carry out after the angle steel pole has been strengthen up. Usually one day can cast 410 post. There is 12 000 pieces angle steel bar need to be

concreted. The concrete grade used to cast the angle steel pole formwork is Grade 25 chipping stone. Chipping stone used to enhance the strength of the concrete.



**Photo 3.6: Concrete Grade 25 Chipping Stone**

### **3.2.3 Painting Process**

In order to cover the galvanize angle steel pole, paint are applied to enhance the beauty of the angle steel pole and at the same time giving the warning sign for people.

The paint are applied with undercoat and topcoat. Undercoat or a primer is a preparatory coating put on materials before painting. Priming ensures better adhesion of paint to the surface, increases paint durability, and provides additional protection for the material being painted.

While topcoat or Top coating is a transparent or translucent coat of paint applied over the underlying material as a sealer. In a paint system, the topcoat provides a resinous seal over the intermediate coats. The topcoat is the first line of defense of many coatings against aggressive agents.

Therefore, this paint used to protect the galvanize angle pole from getting rust if in contact with water or oxidation thus increase the durability of the pole from rusting.

### 3.2.4. Methodology of Chain Barrier Post

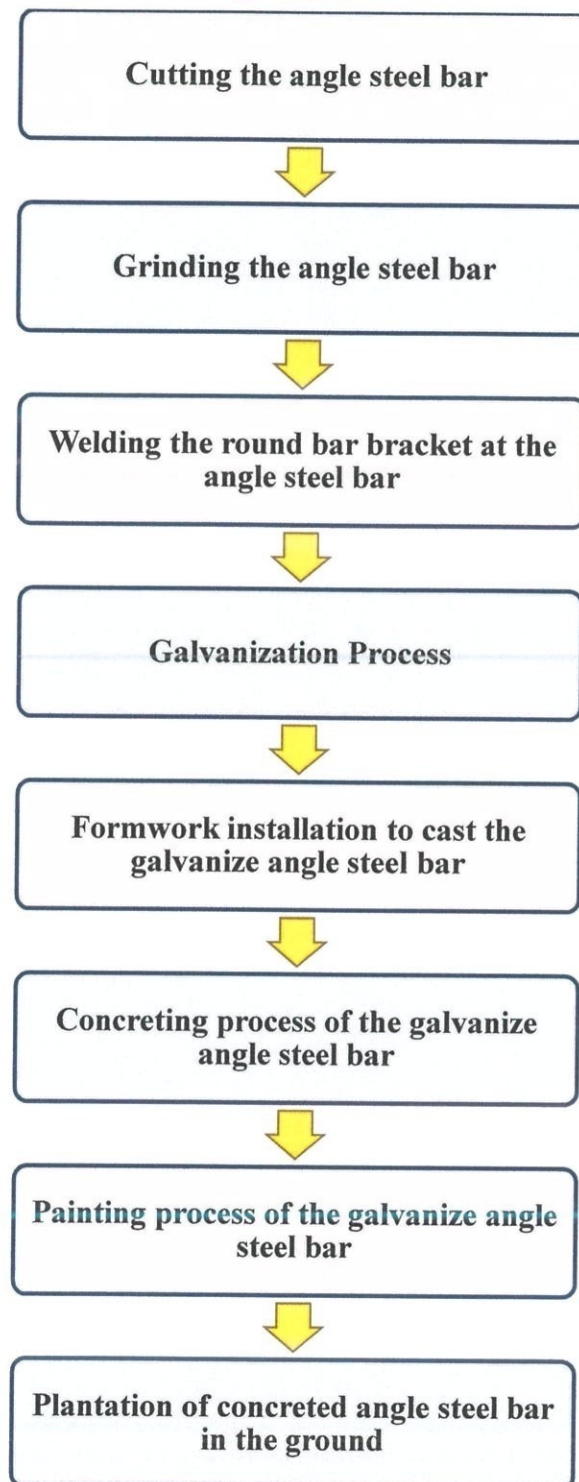


Figure 3.2: Methodology of Chain Barrier Post Chart

### **3.3 METHOD CONSTRUCTION OF CHAIN BARRIER POST**

#### **3.3.1 Cutting the angle steel bar.**

The 100mm x 75mm x 75mm x 6m long angle steel bar are cut into 1.3m each to achieve 12 000 pieces bar as per order from the site. There are four (4) general labor handling this rebar cutting by using metal forming (punching & shearing) cutting machine.



**Photo 3.7: 1.3 angle steel bar**

#### **3.3.2 Grinding the angle steel bar.**

The bottom and the top surface area of the 1.3m angle steel bar are grinded to smoothen the surface. There are three (3) general labor conduct this grinding activity by using BOSCH hand grinding machine.



**Photo 3.8: Grinding the end tail of each side of the angle bar**

### **3.3.3 Welding the round bar bracket at the angle steel bar**

Round bar bracket or called as 'C' ear are welded at the surface of the angle steel bar. Both bottom and top of the round bar bracket are welded. The function is to hang the steel chain. There are three (3) welder responsible in this activity. They used three (3) sets of ARC welding machine and three (3) tong oxygen and three (3) tong acetylene.



**Photo 3.9: Round bar bracket are welded into the surface of the angle steel bar**

### 3.3.4 Galvanization Process

After the angle steel pole welded with round bar bracket, the pole are stack together to be sent out for galvanization. The galvanization process took place at Industrial Galvanization Corporation (M) SDN BHD, Selangor Darul Ehsan, Malaysia. Since, the amount of the angle steel pole is 12 000 pieces, the item sent out to be galvanize are by batch. Below are the table of Standard Operating Procedures Inspection Records of galvanization process.

**Table 3.1: Standard Operating Procedures Inspection Records of Galvanization Process.**

Tag No	Qty	Description	Steel Thk	Coating Thickness ( $\mu\text{m}$ )						Average Reading ( $\mu\text{m}$ )	Average Reading ( $\text{g}/\text{m}^2$ )
			(mm)	1	2	3	4	5	6		
2626	1	ANGLE C/W ROUND BAR BRACKET	7	90	106	107	100	90	98	99	704
2626	1	ANGLE C/W ROUND BAR BRACKET	7	95	100	107	105	120	100	105	746
2626	1	ANGLE C/W ROUND BAR BRACKET	7	100	105	107	108	120	130	112	798
2626	1	ANGLE C/W ROUND BAR BRACKET	7	90	95	100	85	86	90	91	650
2626	1	ANGLE C/W ROUND BAR BRACKET	7	100	105	105	100	90	100	100	714
2686	1	ANGLE C/W ROUND BAR BRACKET	7	87	88	90	95	100	90	92	655



### 3.3.5 Formwork installation to cast the galvanize angle steel bar

The formwork with dimension 200mm x 300mm x 12mm thick are constructed to cast the bottom part of galvanize angle steel bar. To construct the square formwork, the six (6) carpenter used 12mm plywood and 1" x 2" timber (*kok cai*). Therefore, there are 410 box of formwork with the same dimensions constructed.



**Photo 3.10 : Formwork Installation**



**Photo 3.11: Formwork 200mm x 300mm x 12mm constructed**

### 3.3.6 Concreting process of the galvanize angle steel bar

Before cast the bottom part of the angle steel bar, the concrete spacer are placed inside the formwork. Then, the galvanize angle steel bar are straighten and strengthen up and ready to be cast. The quantity of 5m<sup>3</sup> vibrated concrete Grade 25 chipping stone are poured and flattened into the formwork.



**Photo 3.12: Angle Steel Pole are strengthen up before casting**



**Photo 3.13: Concrete spacer are placed inside the formwork**



**Photo 3.14: The concrete are poured and flattened**

### **3.3.7 Painting process of the galvanize angle steel bar**

After the concreted galvanize angle bar dismantle, the painting process are conducted. The pole are arranged in one line in order for the painter to paint easily. The galvanize angle steel bar painted with undercoat as the first layer. For the undercoat, the paint are mixed together with thinner to make it dry faster. The paint used is Jotun Jota-Etch (yellow) and Jotun Thinner no 4. After the undercoat painting are done, the painter paint the pole with topcoat as the second layer. Topcoat paint used is Jotun Hardtop XP Base (bright yellow) mixed together with the Jotun Hardtop XP Comp B (paint glue) and Jotun Thinner no 10. There are two (2) professional painter conduct this activity by using high pressure airless compressor.



**Photo 3.15: Topcoat paint of Angle Steel Pole**

### 3.3.8 Plantation of concreted angle steel bar in the ground

After painting process finish, the concreted angle steel bar are plant 200mm in the ground. The general labor use hoe to dig a hole 200mm depth. The distance between each pole are 3m long. Hence, it cover the plantation area from one area to another area. After the planting process ends, the steel chain painted with yellow color are assemble into the round bar bracket.



**Photo 3.16: Chain Barrier Post has been set up at the site**

## CHAPTER 4

### CONCLUSION AND RECOMMENDATION

#### 4.1 CONCLUSION AND RECOMMENDATION

This report is about construction of chain post barriers that located at Petronas Rapid, 81600 Pengerang, Johor. The objective of this report is to identify the method use for cutting the angle steel bar, to determine the method use of constructing the formwork to cast the angle steel bar, to identify the method of casting and painting the angle steel bar.

However, in construct this chain barrier post, there are several problems occur. One of it is honeycomb in concrete. Honeycomb occur due to lot of water presence in the concrete mix. Therefore to overcome this problem, the sand are added during mixing to reduce the honeycomb and the concrete compacted two times by using the vibrator machine. Meanwhile, to cover the presence of honeycomb in dry concrete, the worker mixed the cement, sand and water and paste it at the hole where the honeycomb occur.

Besides, there are several defects occur during cutting the angle steel bar. To overcome this problems, worker used a grinding machine and grinded at the defect area to obtain smooth surface of the angle steel bar. Therefore, numbers of unwanted injuries can be reduced.

As a conclusion, chain barriers post is very important in order to protect and block off a large area from outsider or unauthorized people from coming in. By looking at the appearance of the chain barriers post, people will notice that the area are forbidden for them to get in. In oil and gas industries, chain barriers post are one of the major unit need to be install. This is because, the chain barriers post helps in mark their own area besides protecting it.

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# APPENDICES

## Appendix (A) Topcoat Paint Application Guide



### Application Guide

#### Hardtop AS

##### Product description

This is a two component chemically curing aliphatic acrylic polyurethane coating. It has a high gloss finish with excellent gloss retention. It has good chemical resistance. To be used as topcoat in atmospheric environments.

##### Scope

The Application Guide offers product details and recommended practices for the use of the product.

The data and information provided are not definite requirements. They are guidelines to assist in smooth and safe use, and optimum service of the product. Adherence to the guidelines does not relieve the applicator of responsibility for ensuring that the work meets specification requirements.

Liability is in accordance with general product liability rules.

The Application Guide (AG) must be read in conjunction with the relevant specification, Technical Data Sheet (TDS) and Safety Data Sheet (SDS) for all the products used as part of the coating system.

##### Referred standards

Reference is generally made to ISO Standards. When using standards from other regions it is recommended to reference only one corresponding standard for the substrate being treated.

##### Surface preparation

The required quality of surface preparation can vary depending on the area of use, expected durability and if applicable, project specification.

When preparing new surfaces, maintaining already coated surfaces or aged coatings it is necessary to remove all contamination that can interfere with coating adhesion, and prepare a sound substrate for the subsequent product. Inspect the surface for hydrocarbon and other contamination and if present, remove with an alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area using fresh water. Paint solvents (thinners) shall not be used for general degreasing or preparation of the surface for painting due to the risk of spreading dissolved hydrocarbon contamination. Paint Removers can be used to treat small localized areas of contamination such as marks from marker pens. Use clean, white cotton cloths that are furmed and replaced often. Do not bundle used solvent saturated cloths. Place used cloths into water.

##### Process sequence

Surface preparation and coating should normally be commenced only after all existing, degreasing, removal of sharp edges, weld spatter and treatment of welds is complete. It is important that all hot work is completed before coating commences.

##### Coated surfaces

###### Verification of existing coatings including primers

When the surface is an existing coating, verify with technical data sheet and application guide of the involved products, both over suitability and the given maximum over coating interval.

###### Organic primers/intermediates

### Application Guide

#### Hardtop AS



The surface of previous coats shall be free from contamination by water, hydrocarbon based products, wax, mud, mortar droppings and loose, chalked and flaking coating. Inspect the surface for hydrocarbon and other contamination and if present, remove with an alkaline emulsifying detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area by low or medium water pressure method to W 1 (ISO 8501-4) using fresh water. Surfaces not contaminated with hydrocarbon deposits shall be washed to W 1 (ISO 8501-4) using fresh water to reduce surface chlorides. When applied on coatings past maximum over coating interval light abrading may be required to achieve proper inter coat adhesion.

##### Application

###### Acceptable environmental conditions - before and during application

Before application, test the atmospheric conditions in the vicinity of the substrate for the dew formation according to ISO 8502-4.

###### Standard grade

Air temperature	0 - 50 °C
Substrate temperature	0 - 60 °C
Relative Humidity (RH)	10 - 85 %

The following restrictions must be observed:

- Only apply the coating when the substrate temperature is at least 3 °C (5 °F) above the dew point.
- Do not apply the coating if the substrate is wet or likely to become wet.
- Do not apply the coating if the weather is clearly deteriorating or unfavourable for application or curing.
- Do not apply the coating in high wind conditions.

##### Product mixing

###### Product mixing ratio (by volume)

The coating shall be mixed with an air powered mechanical paint mixing tool that is clean and fit for purpose. Mix complete with only:

Hardtop AS Comp A	4 part(s)
Hardtop AS/HS Comp B	1 part(s)

###### Induction time and Pot life

Paint temperature	23 °C
Pot life	4h

The temperature of base and curing agent is recommended to be 18 °C or higher when the paint is mixed.

###### Thinner/Cleaning solvent

Thinner: Jotun Thinner No. 10 / Jotun Thinner No. 25

Jotun Thinner No. 10 for fast evaporation.  
Jotun Thinner No. 25 for slow evaporation.

### Application Guide

#### Hardtop AS



##### Application data

###### Airless Spray Equipment

Pump ratio (minimum)	32:1
Pump output (litres/minute)	0.7-1.5
Pressure at nozzle (minimum)	150 bar (2100 psi)
Nozzle tip (inch/1000)	1:1.8
Filters (mesh)	70-100

###### Material hose length

Several factors influence, and need to be observed to maintain the recommended pressure at nozzle. Among factors causing pressure drop are:  
- long paint and whip hoses  
- low rated connector hoses  
- high paint viscosity  
- single spray nozzle unit  
- inadequate air capacity from compressor  
- wrong or clogged filters

###### Air Spray Equipment

Pressure at nozzle (minimum)	2.1 bar/30 psi (HP/LP) / 2.1 bar/30 psi (pressure per)
Nozzle tip (inch/1000)	1:1.8 (HP/LP) / 1:1.9 mm (pressure per)

##### Film thickness per coat

###### Typical recommended specification range

Dry film thickness	40 - 60 µm
Wet film thickness	80 - 120 µm
Theoretical spreading rate	12.5 - 8.3 m <sup>2</sup> /l

Bright colour may need film thickness in the high end of the recommended specification range to achieve opacity.

###### Wet film thickness (WFT) measurement and calculation

To ensure correct film thickness, it is recommended to measure the wet film thickness continuously during application using a painter's wet film comb (ISO 2466 Method A). Use a wet to dry film calculation table to calculate the required wet film thickness per coat.  
A wet to dry film thickness chart is available on the Jotun Web site.

###### Dry film thickness (DFT) measurement

When the coating has cured to hard dry state the dry film thickness can be checked to SSPC #4.2 or equivalent standard using statistical sampling to verify the actual dry film thickness. Measurement and control of the WFT and DFT on welds is done by measuring adjacent to and no further than 15 cm from the weld.

###### Ventilation

Sufficient ventilation is very important to ensure proper drying/curing of the film.

###### Coating loss

### Application Guide

#### Hardtop AS



The consumption of paint should be controlled carefully, with thorough planning and a practical approach to reducing loss. Application of liquid coatings will result in some material loss. Understanding the ways that loss occurs, and the factors that influence the loss, can help reduce material loss. Some of the factors that influence the loss of coating material are:

- type of spray gun/unit used
- air pressure used for airless pump or for atomization
- surface size of the spray tip or nozzle
- fan width of the spray tip or nozzle
- the amount of thinner added
- the distance between spray gun and substrate
- the profile or surface roughness of the substrate - higher profiles will lead to a higher "dead volume"
- the shape of the substrate target
- environmental conditions such as wind and air temperature

##### Drying and Curing time

###### Substrate temperature

Substrate temperature	0 °C	5 °C	10 °C	23 °C	40 °C
Surface (touch) dry	8 h	4 h	2 h	1 h	30 min
Walk on dry	40 h	30 h	15 h	8 h	4 h
Dry to over coat, minimum	24 h	18 h	10 h	5 h	2.5 h
Dried/cured for service	20 d	15 d	10 d	5 d	2 d

Drying and curing times are determined under controlled temperature and relative humidity below 85 % and at or above of the DFT range for the product.

Surface (touch) dry: The state of drying when slight pressure with a finger does not leave an imprint or reveal tackiness.

Walk on dry: Minimum time before the coating can tolerate normal foot traffic without permanent marks, imprints or other physical damage.

Dry to over coat, minimum: The shortest time allowed before the next coat can be applied.

Dried/cured for service: Minimum time before the coating can be permanently exposed to the intended environment/medium.

##### Maximum over coating intervals

Maximum time before thorough surface preparation is required. The surface must be clean and dry and suitable for over coating. Inspect the surface for chalking and other contamination and if present, remove with an alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area by low pressure water jetting to W 1 (ISO 8501-4) using fresh water.

If maximum over coating interval is exceeded the surface should in addition be carefully roughened to ensure good inter coat adhesion.

##### Areas for atmospheric exposure

###### Average temperature during drying/curing

Average temperature during drying/curing	0 °C	5 °C	10 °C	23 °C	40 °C
Itself	extended	extended	extended	extended	extended

Sources : <http://www.jotun.com> (2018)

# Appendix (B) Undercoat Paint Application Guide



Technical Data Sheet



## Jota-Etch

### Product description

This is a one component epoxy modified with primer containing phosphoric acid. Designed as a primer as a part of a complete coating system. Can be used as primer in atmospheric environments. Suitable for primarily prepared galvanneal steel, stainless steel and aluminum substrates.

### Typical use

Can be used for general fabrications and OEM equipment

### Colours

light grey, yellow, black

### Product data

Property	Test/Standard	Description
Solids by volume	ISO 3233	14 ± 2 %
Gloss level (50°)	ISO 2413	matte (0-35)
Flash point	ISO 1619 Method 1	25 °C
VOC EU	RED (2010/75/EU) (calculated)	653 g/l

The provided data is typical for factory produced products, subject to slight variation depending on colour. Gloss level given according to Jotun Performance Coatings definition.

### Film thickness per coat

#### Typical recommended specification range

Dry film thickness	5 - 15 µm
Wet film thickness	35 - 105 µm
Theoretical spreading rate	28 - 9.3 m <sup>2</sup> /l

### Surface preparation

To secure lasting adhesion to the subsequent product all surfaces shall be clean, dry and free from any contamination.

#### Surface preparation summary table

## Technical Data Sheet Jota-Etch



Substrate	Surface preparation	
	Minimum	Recommended
Galvanneal steel	Clean and dry surface	Cleanliness corresponding to description of Sa 1 (ISO 8501-1)
Stainless steel	Clean and dry surface	Cleanliness and surface profile corresponding to Sa 2 1/2, Fine G (ISO 8503-2)
Aluminium	Clean and dry surface	Cleanliness corresponding to description of Sa 1 (ISO 8501-1)

### Application

#### Application methods

The product can be applied by:

Spray	Use airless spray.
Brush	Acceptable for small areas and areas not accessible for spray coating. Care must be taken to avoid excessive thickness.

#### Product mixing ratio (by volume)

Single pack

#### Thinner/Cleaning solvent

Thinner Jotun Thinner No. 4

#### Guiding data for airless spray

Nozzle tip (mm) (D00)	13-17
Pressure at nozzle (minimum)	100 bar (1450 psi)

### Drying and Curing time

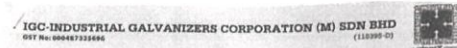
Substrate temperature	23 °C - 40 °C
-----------------------	---------------

Surface (touch) dry	5 min - 1 min
Walk on dry	1 h - 40 min
Dry to over coat, minimum	4 h - 1 h
Dry to over coat, maximum, atmospheric	30 h - 30 h

Drying and curing times are determined under controlled temperatures and relative humidity below 85%, and at a distance of the 80° angle for the product.  
Surface (touch) dry: The state of drying when slight pressure with a finger does not leave an imprint or reveal tackiness.

Sources : <http://www.jotun.com> (2018)

# Appendix (C) Certificate of Zinc Coating



## CERTIFICATE OF ZINC COATING

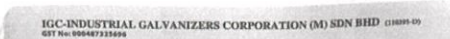
This is to certify that the following articles / products have been hot-dip galvanized in our Nibai / Subang plant and comply to ISO 1461 : 2009 (E)

Date	Customer No.	IGC/ITIN/2016/11	ISO 970 No.	19-17	Invoice No.	N18110083
24 OCTOBER 2018						
Customer Name & Address	TAN BOCK KWEE AND SONS SDN BHD LOT 333, K.G. PAYA, 71000 PORT DICKSON, NEGERI SEMBILAN.					
Project	P14					
Description of Articles / Product	2104 PCS 100MM X 75MM X 75MM ANGLE, L = 1.3M (BATCH 10)					

Article as per Thickness	Local coating (minimum)		Mean Coating (minimum)	
	g/m <sup>2</sup>	µm	g/m <sup>2</sup>	µm
Steel > 6mm (0.236 in) thickness	305	70	610	85
Steel < 6mm (0.236 in) > 3mm (0.118 in)	295	55	505	70
Steel < 3mm (0.118 in) > 1.5mm (0.059 in)	275	45	305	25
Steel < 1.5mm (0.059 in)	250	35	325	45
Coating < 6mm (0.236 in)	305	70	575	80
Coating < 3mm (0.118 in)	430	60	305	70
Coated/Alf Articles with Thread :				
> 6mm (0.236 in) in diameter	285	40	360	50
< 6mm (0.236 in) in diameter	145	20	180	25
Coated/Alf articles (including coating) :				
> 3mm (0.083 in)	325	45	395	55
< 3mm (0.083 in)	250	35	325	45

Subang Factory  
No. 842, Jalan Selangor 4, Taman Perindustrian Subang,  
40150 Subang Jaya, Selangor Darul Ehsan, Malaysia.

Nibai Factory  
Lot 118, Jln. Jln. Permatang Lela,  
71000 Port Dickson, Negeri Sembilan, Malaysia.



## STANDARD OPERATING PROCEDURE

### INSPECTION RECORDS

To	TAN BOCK KWEE AND SONS SDN BHD	Report No.	IGC/ITIN/2016/11
At	LOT 333, K.G. PAYA, 71000 PORT DICKSON, NEGERI SEMBILAN.	Date	24 OCTOBER 2018
		ISO NO.	19-17
		Job No.	P14

Tag No	Qty	Description	Steel Tkg (mm)	Coating Thickness (µm)						Average Reading µm	Average Reading g/m <sup>2</sup>
				1	2	3	4	5	6		
2086	1	ANGLE C/W ROUND BAR BRACKET	7	87	88	90	91	100	90	85	
2086	1	ANGLE C/W ROUND BAR BRACKET	7	105	118	120	100	85	86	102	
2086	1	ANGLE C/W ROUND BAR BRACKET	7	100	115	130	90	88	100	104	
2086	1	ANGLE C/W ROUND BAR BRACKET	7	85	86	87	88	90	89	85	
2086	1	ANGLE C/W ROUND BAR BRACKET	7	90	88	85	87	86	90	89	
TOTAL 5											

VEHICLE INSPECTION - Acceptable according to BS EN ISO 1461 : 2009 (E)

Sources : IGC-Industrial Galvanization Corporation (M) Sdn Bhd (2018)