DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

CONSTRUCTION OF CAR PORCH STEEL STRUCTURE

Prepared by:

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DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

DECEMBER 2018

It is recommended that the report of this practical training provided

by

Muhammad Danish Haykal Bin Mohd Tarmizi

2016614294

entitled

Construction of Car Porch Steel Structure

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

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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 SAMION IRON ENGINEERING SDN. BHD. for a duration of 14 weeks starting from 3 September 2018 and ended on 7 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.

Name : Muhammad Danish Haykal Bin Mohd Tarmizi

UiTM ID No : 2016614294

Date : 18 December 2018

ACKNOWLEDGEMENT

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

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I would also like to thank all the UiTM lecturers that have taught and nurtured me in becoming a better student and person. I would also like to extend my deepest appreciation to the lecturers who directly involved during my training period. To Dr. Siti Akhtar Binti Mahayuddin, Supervising Lecturer, Mr. Muhammad Naim Bin Mahyuddin, Practical Training Coordinator and Dr. Dzulkarnaen Ismail, Programme Coordinator, I value the time, effort, encouragement and ideas that they have contributed towards the successful completion of my training.

Last but not least, special thanks to my beloved parents for their support and love over the years.

Million thanks.

ABSTRACT

Roof is a structure that provide shelter for human and its properties. The Structure is the important part of the roof. Therefore, this report will discuss about the construction of car porch structure. This report was conducted based on a car porch structure that were constructed at Surau An-Nur in Seri Alam, Johor. The purpose of the report is to identify the method of production steel truss and its installation. This report will also determine the equipment that was used to for fabrication and installation of the steel truss on site. The method to collect information for completing this report was by observation and unstructured-interviews with the site supervisor in-charge and related individuals. In short, this report contains the work of the construction of pad foundation, production of steel trusses and installing the truss on site with the list of equipment that was used with the specification that was stated in.

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CHAPTER 1.0

PREFACE

1.1 Introduction

Steel truss has been used in various type of building for quite the time. Roof truss is the fundamental frame structure shaped by attaching to different members to create a system of triangles, designed depending upon the span, type of loading and functional requirements. (Punmia, 2006).

Trusses are the bones for the roof. Thus, the structure must be built to last the lifespan of the building, which involves careful planning of structure and materials used. The structure of roof must be able to support a heavy load over a long period of time, yet also leave as much free room as possible in order to allow for an airy and spacious area. External loads are mostly applied at joints only. Thus, forces will be carried directly to the members of truss. Struts are the members of truss that carried compressive forces and tensile forces are carried by ties. Since length is the factor for strength in compression member. The members of roof truss need to be arranged in appropriate length, so tension can be longer. (Punmia, 2006). If not properly design and build, the structure will eventually fail and render the building exposed to all kinds of dangers. Which defeats the purpose of roof.

In addition, steel trusses last longer than wood trusses. It is also required very little maintenance, as steel does not need chemical treatments to maintain the structure and it does not subject to insect infestations. Moreover, they are lightweight which allowing easy and fast handling of material. (Dynamic, 2017). It is used in wide range of building from residential houses, schools, canteen, stadium, aircraft hangar, and many more.

1.2 Objectives

1.2.1 Aim

To investigate the construction of car porch steel structure at Surau An-Nur, Taman Daya, Johor.

1.2.2 Objectives

i. To understand the construction method of car porch steel structure.

ii. To understand the equipment and machineries used for construct and install the steel structure.

1.3 Scope of study

The production of steel structure was observed at the workshop in SAMION IRON ENGINEERING SDN. BHD. and the construction and installation were conducted at Surau An-Nur, Seri Alam, Johor. The main focus of the study is to observe the method of construction of car porch at the Surau An-Nur and the equipment was used.

1.4 Method of study

1. Observation

The study was observed through first hand, images that was taken using a handphone and notes was used to record any information that was discussed at the meeting. Moreover, observing the detail drawing that was proposed by the consultant and understand how the steel structure is designed. All the information and procedure are based on what happen at the site.

2. Unstructured-interview

Questions was asked to the supervisors and people who are related to the project during planning and construction process.

3. Literature study

Literature study were able to help in understanding the construction of the steel structure and the material that will be used by referring some relevant books, websites and articles.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

SAMION IRON ENGINEERING (SIE) was first established on January 7, 1992. Later on March 19, 2004 the company has established into SAMION IRON ENGINEERING SDN. BHD. Mr. Samion Bin Senin, the sole founder and current Managing director. Mr. Samion has a certificate in mechanical engineering from Politeknik Kota Bharu, Kelantan. With the knowledge and experience around 16 years in iron engineering and construction field.

SAMION IRON ENGINEERING SDN BHD has established and been taking care by its own director, Mr. Samion Bin Senin who have a certificate in Mechanical Engineering from Polytechnic of Kota Bharu, Kelantan. He himself already have experienced in this field around 16 years in iron engineering and construction.

SIE is specialize in steel structure works and registered under CIDB with G6 (Building), G6 (Mechanical & Electrical Engineering), and G6 (Civil Engineering). This company was operated actively in getting all the contract works in class D (registered with PKK) which has move to the next step by incerasing its registered class with Pusat Khidmat Kontraktor (PKK) to class C on 6th November 2008.

On 19th March 200, Mr. Samion Bin Senin had been invited to the NATIONAL CONVENTION OF INDUSTRIALISED BUILDING SYSTEM (IBS) panel which is organized by Lemabaga Pembangunan Industri Pembinaan Malaysia (CIDB) at Pusat Konvensyen CIDB, Jalan Cheras, Kuala Lumpur.

2.2 Company Profile

Table 2. 1: Company profile

(Source: Courtesy of SIE SDN. BHD.)

Name	SAMION IRON ENGINEERING SDN. BHD.
Managing director	Mr. Samion Bin Senin
Business status	SDN. BHD.
Registration no.	646196 – D
Company registration	PKK Grade G6 Bumiputera (Registration no: 0120040830-JH98187) CIDB Grade G6 (Registration no: 0120040830-JH98187) Kementerian Kewangan Malaysia (Registration no: 357-02035279) SPAN (Permit no: SPAN/EKS/(PT)/800-2C/2/10/316) FELDA HOLDING SDN BHD (Registration no: B-01090801097-01)
Address	1395, Jalan Sungai Tiram, Batu 18, Kg. Sungai Tiram, 81800 Ulu Tiram, Johor.
Telephone	
FAX	
Email	siendbsb@yahoo.com

2.3 Organizational chart

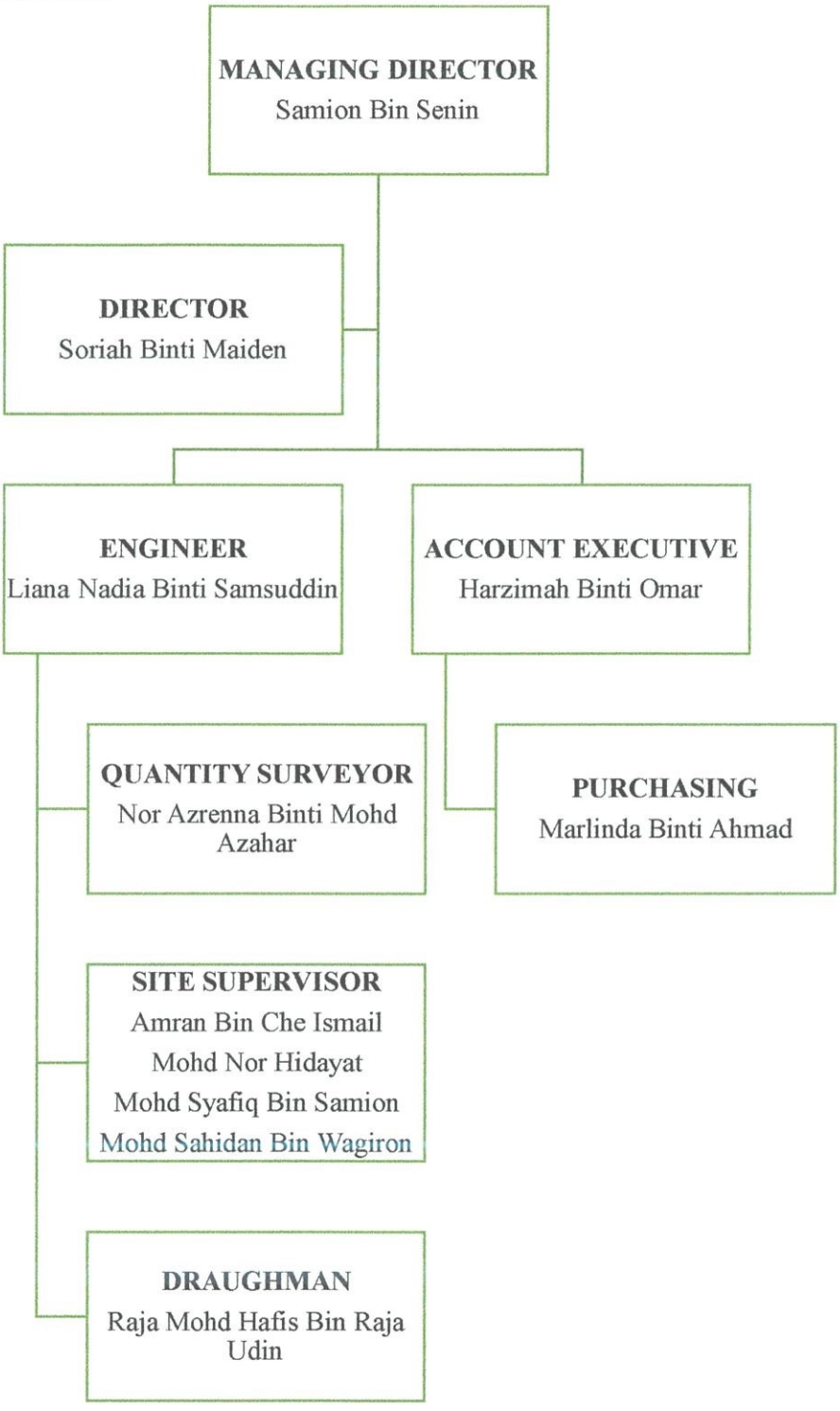


Figure 2. 1: Organization chart

(source: SIE SDN.BHD. 2018 company profile)

2.4 List of Projects

2.4.1 Completed project in year 2016

This was the projects that was successfully constructed throughout the year of 2016.

Table 2. 2: Completed projects in year 2016

(source: SIE SDN. BHD. company profile)

No	Project	Company	Price	Date start/complete
1	Cadangan membaikpulih bangunan Sekolah Agama Taman Puteri Wangsa yang telah dibina separa siap di atas Lot PTD 45591, Daerah Johor Bahru, Johor Darul Takzim.	KPRJ Builders Sdn Bhd	RM870,445.50	15/12/15-02/04/16
2	Cadangan pembinaan loji rawatan air kumbahan berpusat dengan kapasiti 150,000 PE dan kerja-kerja berkaitan dengannya di Lot 20216 dan PTB 20476 Johor Bahru.	GTS Contractor Sdn Bhd	RM1,272,316.59	03/02/16-30/04/16
3	Cadangan membaikpulih bangunan Sekolah Angama Kangkar Merlimau yang telah dibina separa siap di atas Lot 8381, Mukim Sri Medan Daerah Batu Pahat, Johor.	KPRJ Builders Sdn Bhd	RM710,200.00	04/02/16-29/08/16
4	Cadangan merekabentuk, membina dan menyiapkan hangar serta kerja-kerja yang berkaitan di Kampus Institut Keselamatan Dan Kesihatan Pekerjaan Negara (NIOSH) Wilayah Selatan, Senai, Johor.	Seri Impian Construction	RM400,000.00	17/03/16-22/08/16

2.4.2 Completed projects in year 2017

This was the projects that was successfully constructed throughout the year of 2017.

Table 2. 3: Completed projects in year 2017

(source: SIE SDN. BHD. company profile)

No	Project	Company	Price	Date start/complete
1	Cadangan membinan dan menyiapkan sebuah dewan maan di Sekolah Menengah Kebangsaan Medini 1, Nusajaya, Johor.	MU Maju Enterprise Sdn. Bhd.	RM302,039.04	01/11/16-01/03/17
2	Cadangan pembangunan sebuah dewan serbaguna di atas Lot 75852, 75853, 75854, 125680 & 125681, Taman Pulai Utama, Johor Bahru.	HLM Sdn Bhd	RM2,063,869.60	01/10/16-28/04/17
3	Cadangan tambahan dan perubahan kepada bangunan Sultan Iskandar yang sedia ada di Bukit Cagar, Jalan Lingkungan dalam, 80300 Johor Darul Takzim.	MYASAS Eng. Sdn Bhd	RM730,000.00	25/10/16-24/04/17
4	Pembinaan kuaters dan dewan tertutup bagi Jabatan Imigresen Malaysia di Bandar Baru Uda Johor Bahru.	Gerbang Nusajaya	RM715,694.40	01/05/17/-15/06/17
5	Universiti Teknikal Malaysia (UTeM) pembinaan bangunan pencawangan pembahagi utama elektrik termasuk kerja-kerja yang berkaitan.	Jabatan Kerja Raya Malaysia	RM4,657,715.50	30/06/15-02/10/17

6	Cadangan membina dan menyiapkan kerja berkaitan di ibu pejabat Institut Keselamatan Dan Kesihatan Pekerjaan Negara (NIOSH), Bandar Baru Bangi, Selangor.	National Institute Of Ocupational Safety & Health (NIOSH)	RM878,469.17	12/06/17-02/10/17

2.4.3 Projects in progress

This is the list of projects that are still on-going.

Table 2. 4: Project in progress

(source: SIE SDN. BHD. company profile)

No	Project	Company	Price	Date start/complete
1	Cadangan pembangunan perumahan berstrata (586unit) diatas PTD 222143, fasa 4B6, Precinct 1 (SP4), Persiaran Sinaran Ilmu, Bandar Seri Alam, Mukim, Plentong.	UM LAND	RM1,100,000.00	24/04/2018-30/04/2019
2	Cadangan membina jejantas diatas sebahagian lebuhraya Pasir Gudang, Tebrau, Daerah Johor Bahru, johor	MBJB	RM1,000,000.00	01/10/2018-30/04/2019

CHAPTER 3.0

3.1 Introduction to construction car porch steel structure

The site location for 'Cadangan Pembinaan Struktur Berbumbung Letak Kereta, Surau An-Nur, Jalan Nibong 28, Taman Daya, 81100 Johor Bahru, Johor.' as referred in Figure 3.1. This project started on 7th September 2018 and finished at 30th October 2018. The duration to complete the project is 12 weeks. This project cost RM48,151.00.

The client of this project is Surau An-Nur Taman Daya and the consultant involved in this project are ENGINEER CONSULTON HRM PERKASA SDN. BHD. The appointed contractor for this project is SAMION IRON ENGINEERING SDN BHD. The method of construction for car porch steel structure will be explained in detail on 3.2, 3.3, 3.4 and 3.5 will be show the list of equipment that was used during the construction..

Figure 3. 1: Site location

(source: google maps)

3.2 The construction of truss

The first step before constructing the truss is to draw an outline of truss on the floor by using a chalk, tape measure and any straight light steel as a ruler. All the dimension of truss was drawn according to the dimension that was stated in Appendix A.

Figure 3. 2: Labor was drawing an outline on floor.

According to appendix A, there was two size of rectangle hollow steel were used for the frame of the truss. Truss A used 100mm x 75mm x 4.5mm thick rectangle hollow steel. Both Truss B and C used 75mm x 50mm x 3.2mm thick rectangle hollow steel. The steel was lifted by using an overhead crane and lay down the steel at the layout that have been drawn. In the figure 3.3 one labor was measuring and marking the excess steel that exceeded the layout and later to be cut. The labor used a steel square and chalk to measure and mark the steel.

Figure 3. 3: Labor marking the excess steel.

In figure 3.4 one labor was cutting all the end joints that marked previously with an abrasive saw.

Figure 3. 4: Labor was cutting steel for frame.

Afterwards, one semi-skilled labor fabricated the jointing of the truss by using a MIG welding machine as in figure 3.5 and can proceeding to start working on the strut and diagonal members of truss.

Figure 3. 5: Labor was fabricating the steel frame.

Referring to appendix A, the size for strut and diagonal for Truss A is 65mm x 65mm x 4.5mm thick square hollow steel. Both truss B and C used the same size of 50mm x 50mm x 2.3mm thick square hollow steel. The labor has measured the length for every strut at the layout and mark the measurement on the steel. Later, one semi-skilled labor cut the steel at the mark using the abrasive cutting saw as in figure 3.6.

Figure 3. 6:Labor was cutting steel for strut and diagonal members.

Strut and diagonal of the truss was fabricated to the frame of the truss by one semi-skilled labor with using the MIG welding machine as in figure 3.7.

Figure 3. 7: Labor fabricating struts and diagonal to the frame of truss.

Moreover, the joint that have been fabricated then grinded by one semi-skilled labor as in figure 3.8 to smoothen the surface of the steel like in figure 3.9.

Figure 3. 8: Labor was grinding the excess material of welding.

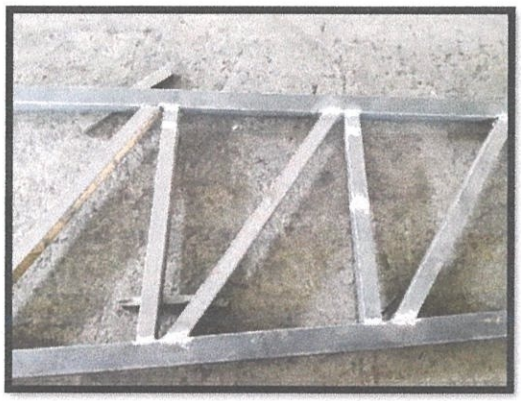


Figure 3. 9: Results of smooth surface after grinding.

Next is to produce plates for connecting the truss to other structure. Plates were cut using oxy-acetylene cutting torch by one semi-skilled labor with various sizes.

Plate sizes was referred to appendix A section 1-1, section 2-2. Except for truss C as section 3-3 was changed on site because the load of the truss is much higher which can fail the structure with the current plate connection. Thus, the size of plate for Truss C were changed like Truss B.

Later another labor starts to mark the plates using a sledgehammer and a center punch as in figure 3.10 for later to punch holes on the plate.

Figure 3. 10: Labor was marking the plate using a sledgehammer and a center punch.

The plate later was brought to the hydraulic steel bender machine that was operated by one semi-skilled labor as figure 3.11 to pierce various size hole on the plate.

Figure 3. 11: Labor was punching a hole on the plate.

Figure 3. 12: Plates that has been punch out.

The plates were fabricated to the truss with 6mm thick fillet weld as in figure 3.13 by one semi-skilled labor by using the MIG welding machine.

Figure 3. 13: Labor fabricating with 6mm thick fillet weld.

The area that were fabricated were later grinded and brushed off to smoothen the surface of the jointing between the plate and the truss by one semi-skilled labor.

Figure 3. 14: Labor was grinding the excess material.

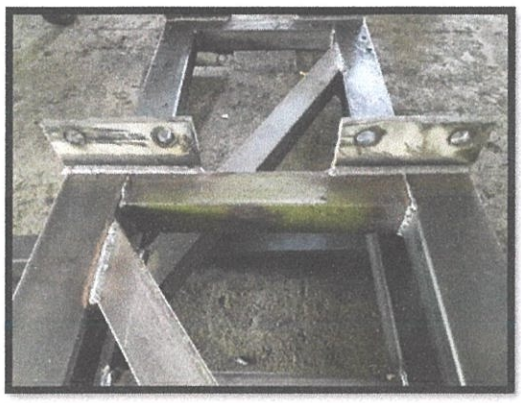


Figure 3. 15: Results of grinding.

After all truss have finished fabricated. The truss was painted with undercoat and one coat of enamel gloss paint by 3 unskilled labor as in figure 3.16.

Figure 3. 16: Labors were painting undercoat and finishing paint.

Figure 3. 17: Finished truss painting.

3.3 The construction of steel column

The size for column C1 was 150mm x 150mm x 5mm thick square hollow steel and Column C2 using 100mm x 100mm x 4.5mm thick square hollow steel as referred to APPENDIX B in pad footing type F1&F2 detail. Both of the steel column was measured 2400mm length by one semi-skilled labor and mark using a chalk and steel square as in figure 3.18.

Figure 3. 18: Labor was measuring and marking the steel column.

The mark then was cut using oxy-acetylene cutting torch by one semi-skilled labor like the figure 3.19.

Figure 3. 19: Labor was cutting the steel column using oxy-acetylene cutting torch.

The 15mm thick plate were cut using oxy-acetylene cutting torch to 350mm x 350mm and 300mm x 300mm with 15mm thickness. The hole of the plate was also cut using oxy-acetylene cutting torch at the chalk mark which is 50mm cover distance.

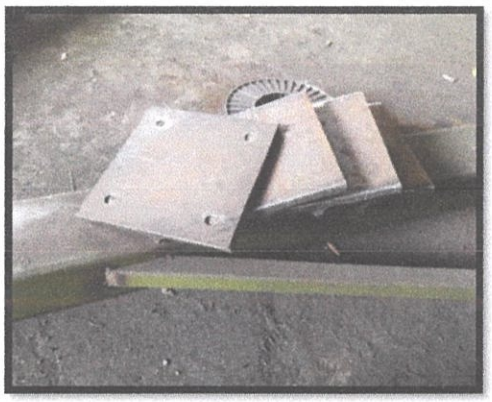


Figure 3. 20: Plates for column steel.

The plate and the steel column were welded with 6mm fillet weld and later grinded to smoothen the surface of the joint by one semi-skilled labor.

Figure 3. 21: Labor was fabricating the plate to the steel column.

3.4 The construction of pad foundation

According to APPENDIX B the soil and premix were excavated 900mm x 900mm x 1000mm for pad footing type F1 and 600mm x 600mm x 1000mm for pad footing type F2 of soil and premix were excavated using a backhoe which was operated by one skilled labor. afterwards, 1:3 ratio lean concrete with 50mm thick was added and spreaded evenly using a trowel by one unskilled labor as in figure 3.22.

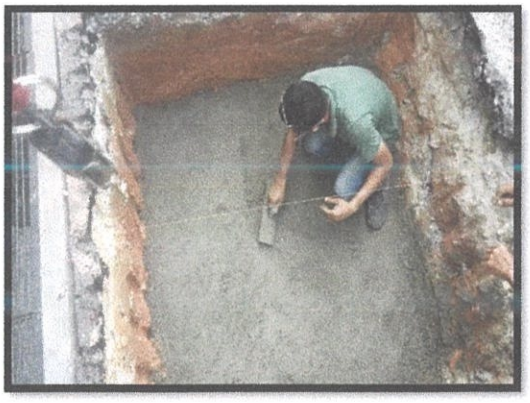


Figure 3. 22: Labor was rendering lean concrete smooth and evenly spread.

Reinforcement bar consist of Y12 and Y16 for main bar and R10 for links were ready and installed in the 900mm x 900mm x 300mm size of formwork for pad foundation according to APPENDIX B pad footing F1&F2.

Figure 3. 23: Formwork and reinforcement bar.

After reinforcement bar has ready installed to six formwork of pad foundation. A total of $1m^3$ G25 concrete were ordered to fill the formwork for pad. Cement mixer truck arrived at the site like in figure 3.24 and ready to pour in the formwork as in figure 3.25

Figure 3. 24: Cement mixer truck was arrived at site.

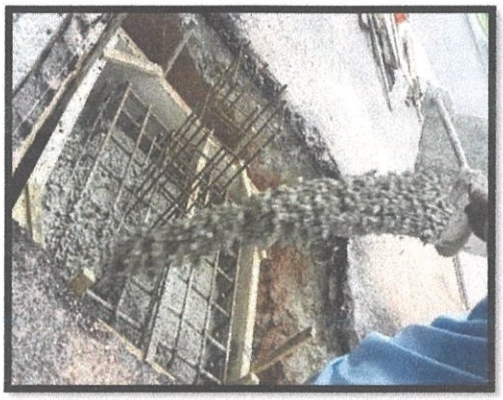


Figure 3. 25: Formwork were poured concrete.

The surface of the concrete was rendered by 2 unskilled labor with using trowels like in figure 3.26.

Figure 3. 26: Labors were rendering the concrete smooth.

Formwork for column stump was installed after 3 days of concrete pad footing has cured. Then every six column stump were filled with concrete G25 with a total of $0.5m^3$ of concrete.

Figure 3. 27: Formwork of column stump

Formwork were removed and cured for 3 days. After 3 days, the formwork were removed by using claw hammer.

Figure 3. 28: Column stump after cured 3 days.

3.5 The Installation of steel column and truss at site

The steel column than lifted by 4 labor and put on the column stump like in figure 3.29. Then the labors screw the bolt and nut to the plate and tightening the screws using spanner.

Figure 3. 29: Labors are lifting the steel column.

2 unskilled labor were erecting scaffolding at two points of the steel column as in figure 3.30.

Figure 3. 30: Labor were erecting scaffolding.

Truss C was lifted by 4 labors onto the scaffolding as in figure 3.31.

Figure 3. 31: Labors lifting truss on scaffolding.

2 labors on one side lift the truss and the other 2 labors holding the truss to prevent from falling as in figure 3.32.

Figure 3. 32: Labor lifting truss on one side.

Slide a round bar in one of the hole in the plate for temporary support as in figure 3.32

Figure 3. 33: Labor puts a round bar for temporary structure.

Afterwards 4 M16 bolt and nut were inserted to the plates by 2 unskilled labor as in figure 3.34 and later screwed with a nut by tightening it with using a spanner.

Figure 3. 34: Labors screwing bolt and nut at the plate.

Truss A was then hooked to 3 chain block. One at the left corner, middle and right corner. Then the truss was lifted slowly upwards and installed 10 numbers of M20 bolt and nut in the hole at the plate and screwed the nut onto the plate at the column.

Figure 3. 35: Labor were lifting truss A using chain block.

Truss B was also lifted using chain block and repeating the same process as Truss A. then the truss B were connected to the plate using M16 bolt and nut to the plate that was welded to the truss A and C.

Figure 3. 36: Labor was lifting truss B using chain block.

After truss A, B, and C were successfully installed to the column. The labors proceed to install 150mm x 6.5mm x 1.6mm thick high tensile galvanised C purlin onto the truss with 750mm centres by piercing the purlin with a drill and connected using M12 bolt and nut to the angle bar that was welded during the production of truss.

Figure 3. 37: Purlin were installed.

0.4mm thick metal deck were installed by screwing it to the purlin. 150mm diameter PVC gutter and rain water down pipe then installed to the truss.

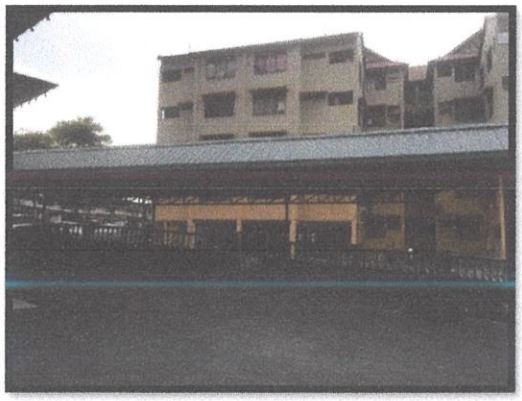
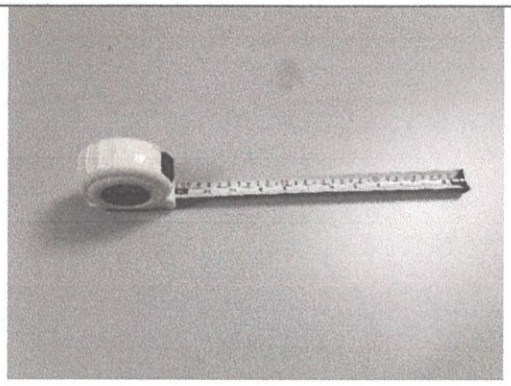
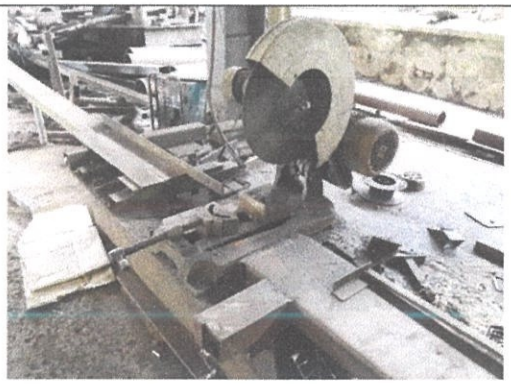


Figure 3. 38: Metal deck and gutter were installed.

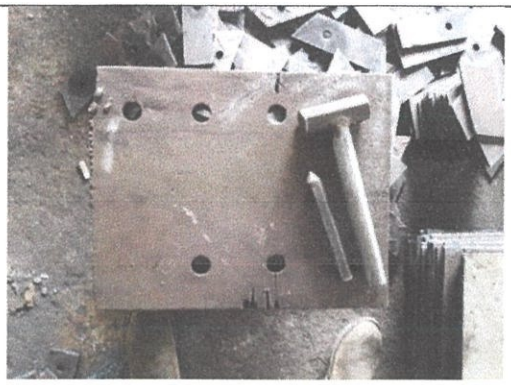
3.6 List of Equipment

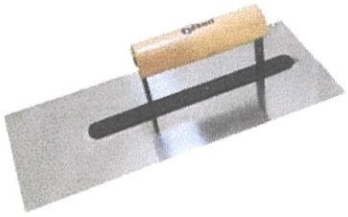
This is the list of equipment that were used during the whole production.

No	Name of Equipment	Diagram	Functions
1	Chalk		• To mark points that have been measured.
2.	Measuring Tape		• To measure distance
3.	Steel Square		• To measure angle

4.	Spanner size 24 and 30		• To provide grip to the nut and tightenning screws.
5.	Drill		• Used to pierce holes, and screwing.
5.	Abrasive Cutting Saw		• To cut the steel hollow

6.	MIG Welding Machine		• To join two base materials together
7.	Welding Mask		• To protect the eye while welding.
8.	Angle Grinder		• To remove excess welding material.
9.	Wire Brush		• To clean the surface of place of welding.

10.	Sledgehammer & Center punch		• Sledgehammer is used to hit the center punch to make a mark on the steel plate. • Center punch is used to mark the center of point on the steel plate.
11.	Hydraulic Steelworker Machine		• To punch holes on steel plates.
12.	Roller Brush		• To paint the primer coating and finishing coating on steel hollow and plates.

13.	Trowel	 Figure 3. 39: Trowel (source: https://www.kisspng.com/png-trowel-tool-plaster-handle-cement-6278690/)	• Used to smooth the surface of concrete.
14.	Cement Mixer Truck		• To mix the cement, sand and aggregates to produce concrete and to deliver to site.
15.	Claw Hammer		• Used to remove the formwork at site.

16.	Oxy-Acetylene Cutting Torch		• Used to cut the steel hollow and plates
17.	Scaffolding		• Used as a temporary structure to support the workers and materials on it.
18.	Chain Block	 Figure 3. 40: Chain block (source: https://www.liftingequipmentstore.com/product/tiger-tcb14-chain-block)	• Used for heavy duty lifting and material handling.

19.	Overhead Crane		• Used to lift and move extremely heavy steel or structure.

CHAPTER 4.0

4.1 Conclusion

This report is about construction of car porch steel structure that is located at Jalan Nibong 28, Taman Daya, Johor for Surau An-Nur. The objective of this report was to study the method of construction and to identify the machineries and equipment that was used.

To summarize, construction with steel components is very fast compared to wood. Steel structures are also a cost saving solution because of its characteristics of being lightweight, cheap, resistant to termite and long lasting.

Therefore, steel is much more suitable material to replace the wood for structure in terms of its yield strength, cost, and durability.

REFERENCES

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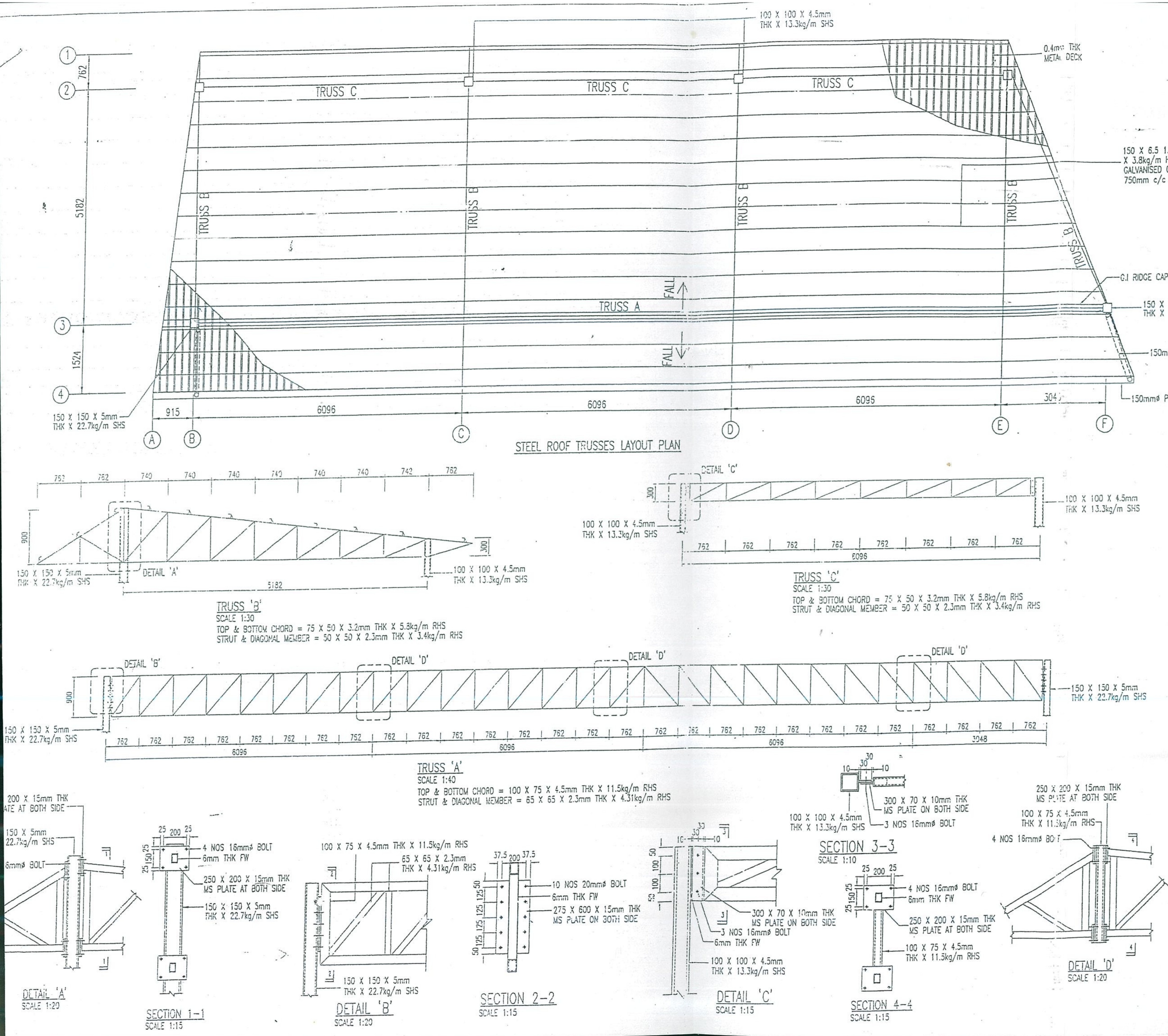
Punmia, D. B. (2006). Comprehensive Design of Steel Structures. India: Laxmi Publications.

APPANDIX A



DATE	AMMENDMENTS	REMARKS

PEMILIK:
SURAU AN NUR
TAMAN DAYA

PROJECT:
CADANGAN PEMBINAAN STRUKTUR BERBUMBUNG LETAK KERETA

CIVIL & STRUCTURAL ENGINEERS
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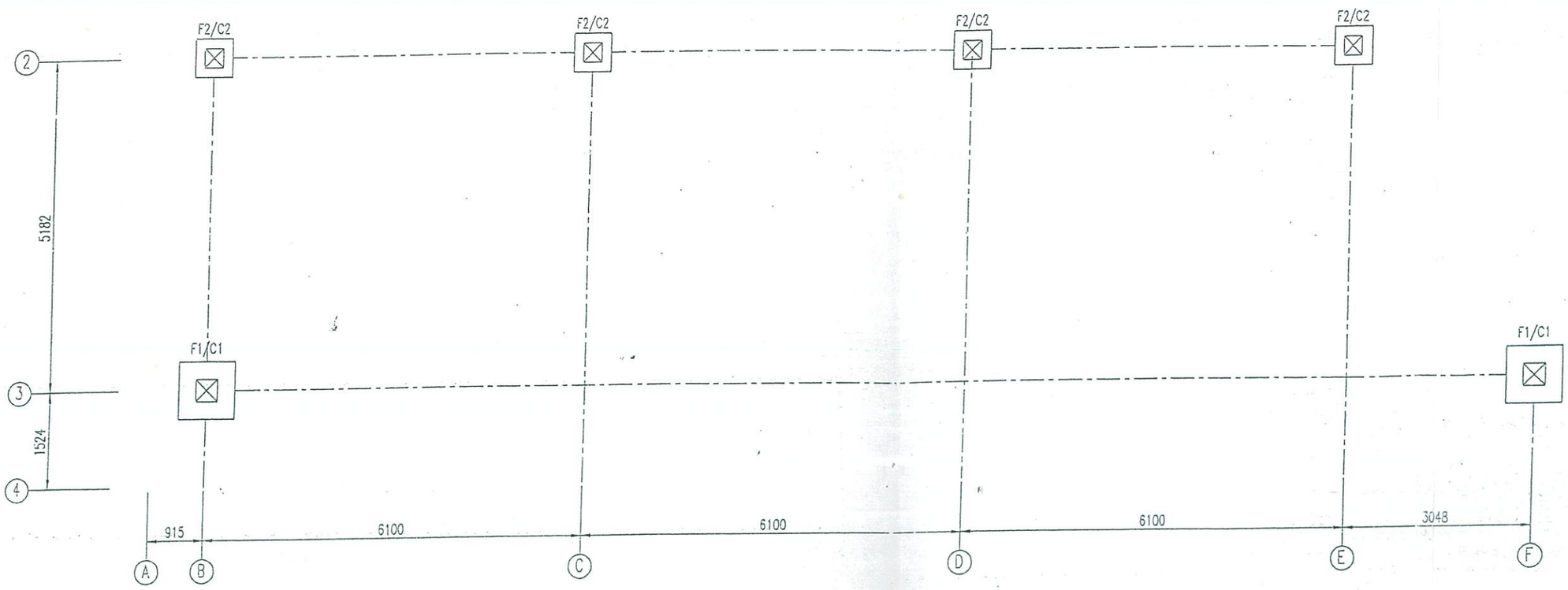
TITLE:
LUKISAN KEKUDA BESI

DESIGN: LAV
DRAWN:
DATE:
CAD:
SCALE:
APPD:
DRG. NO.:
REV:

APPANDIX B



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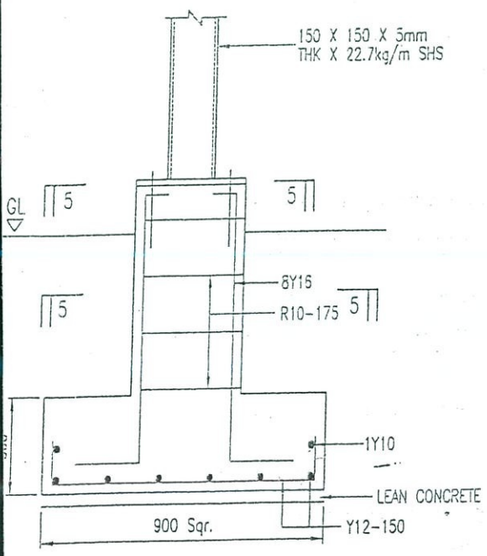

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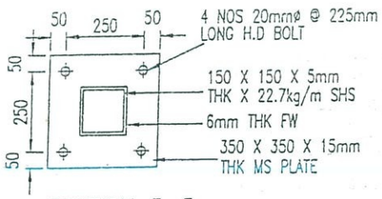

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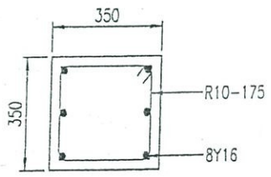

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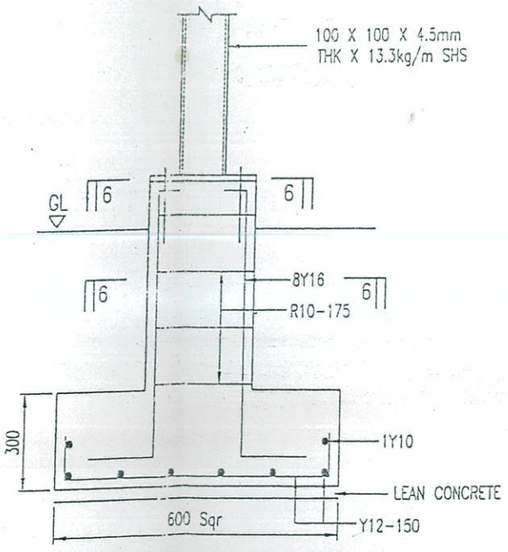

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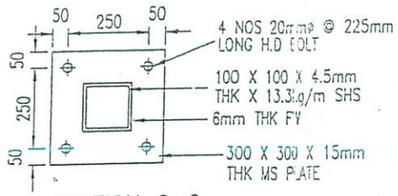

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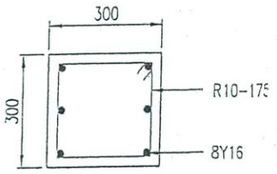

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DATE	AMMENDMENTS	REMARKS

PEMILIK:

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SCALE : 1:50	APPD :
DWG NO. : HRM/SURAU AN-NUR/001	REV :