UNIVERSITI TEKNOLOGI MARA

DEPARTMENT OF BUILDING

FACULTY ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

SEPTEMBER 2015

It is recommended that the report of this project training provided

By

Muhammad Akmal Bin Che Wan

2013632734

entitled

The Installation of Roof Trusses

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

Report Supervisor	:	Dr. Asmat Binti Ismail
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DEPARTMENT OF BULIDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

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SEPTEMBER 2015

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 Kasyaf Bina Sdn. Bhd.for duration 5 months starting from 25 May and ended 9 October 2015. It is submitted as one of the prerequisite requirement of DBN307 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

Name : Muhammad Akmal Bin Che Wan

UiTM ID No : 2013632734

Date : 9th October 2015

DEPARTMENT OF BULIDING

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ACKNOWLEDGEMENT

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I would like to thank ALL the UiTM lecturers that have taught and nurtured me in becoming a better student and person. I would like to extend my deepest appreciation to the lecturers who are directly involved during my training stint. To Dr.Asmat Bt. Ismail and Pn Nurul Huda Bt. Abd Hadi, Supervising Lecturer, Encik Hamdan bin Othman, Visiting Lecturer, Puan Noor Rizallinda bt Ishak and Dr. Mohd Rofdzi bin Abdullah, Programme Chair, I value the time, effort, encouragement and ideas that they have contributed towards the successful completion of my training, this report and the valuable knowledge that have been shared over the last few semesters.

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

Thank you so much.

ABSTRACT

Nowadays, construction is growing with the technology is so advanced without our conscious Trusses is an element that widely used in construction based on the building design. Furthermore, it also about the suitable chosen the installation of the trusses. There have several type of the trusses that commonly used in construction, therefore the chosen of the installation roof trusses is based on the design and type. This report will discuss about the trusses on beam procedure. Furthermore, this report also to study some type of truss that basically use of building. This paper was conducted for the building Menara Syarikat Air Darul Aman (SADA) at seminar hall. The objective this report is to study the systematic and important step during the installation of the trusses. . To illustrate it more technically, the process will be discuss from one stage to the another stage starting from the first step taken until the completion of the works.

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CHAPTER 1.0

PREFACE

1.1 Introduction

This research is about the installation of trusses on roof beam and detail by structure engineer. There have 2 common type of trusses which is pitched truss and the parallel chord or flat truss. Basically for building construction or roof construction are using pitched truss. The trusses are implementing for Menara SADA because there have some several reason. The trusses are created for the existing building cause there have some several reason such as the existing building cannot able to carry more load. Base on the engineer calculation the existing building can constructed or added above 1 floor only. So for added more than 1 floor they created trusses.

Civil and structure consultant will take responsible before approve the drawing. Civil and structure will use software to measure the load. So the software will show the correct designation or the tie beam and trusses.

1.2 Objective

The objective of this study is to identify the type of truss and determine the method statement of the installation of trusses. The objective of this study is as follow:-

1) To identify the type of trusses
2) To identify the material using for the construction of trusses
3) To study the installation method of roof truss

1.3 Scope of Study

The scope of this study focused on method statement for tie beam and trusses. For the method statement, the method to study step by step starting for construction of tie beam until the installation of trusses.

The scope of study also review the material and the component using for tie beam and trusses.

Besides that, the scope of study have make based on construction of Menara SADA Alor Setar Kedah under company Kasyaf Bina Sdn.Bhd.

1.4 Method of study

All the reference play the important role and giving many information needed. There have several method to getting the knowledge for this topic. The methodology can be divided in to part which is:-

1. Primary method

   a) Reference by person

      This method have many advantage because this information can get directly form person, it's easily method cause can get such as form asking question. The person such project manager, architect supervision, civil and structure supervisor and etc.

2. Secondary method
   a) Reference book

      From this method, many information can get such as the type of trusses, the methodology and etc.

   b) Reference from internet.

      Reference form internet very helpful while the information about trusses cannot get form another method.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of company

Minister Bina Sdn Bhd (KBSB), was incorporated in Malaysia under the Companies Act, 1965 on July 23, 2000 and 100% owned by Bumiputera. KBSB main business is focus on building construction, water works and facilities management. We maintain our commitment to integrity, teamwork, ingenuity, quality, value, sustainability and safety. Successful in obtaining quality certification from SIRIM 9001: 2008 and IQNet since 2007. The reputation KBSB have proven the ability to record in the industry for over 15 years.

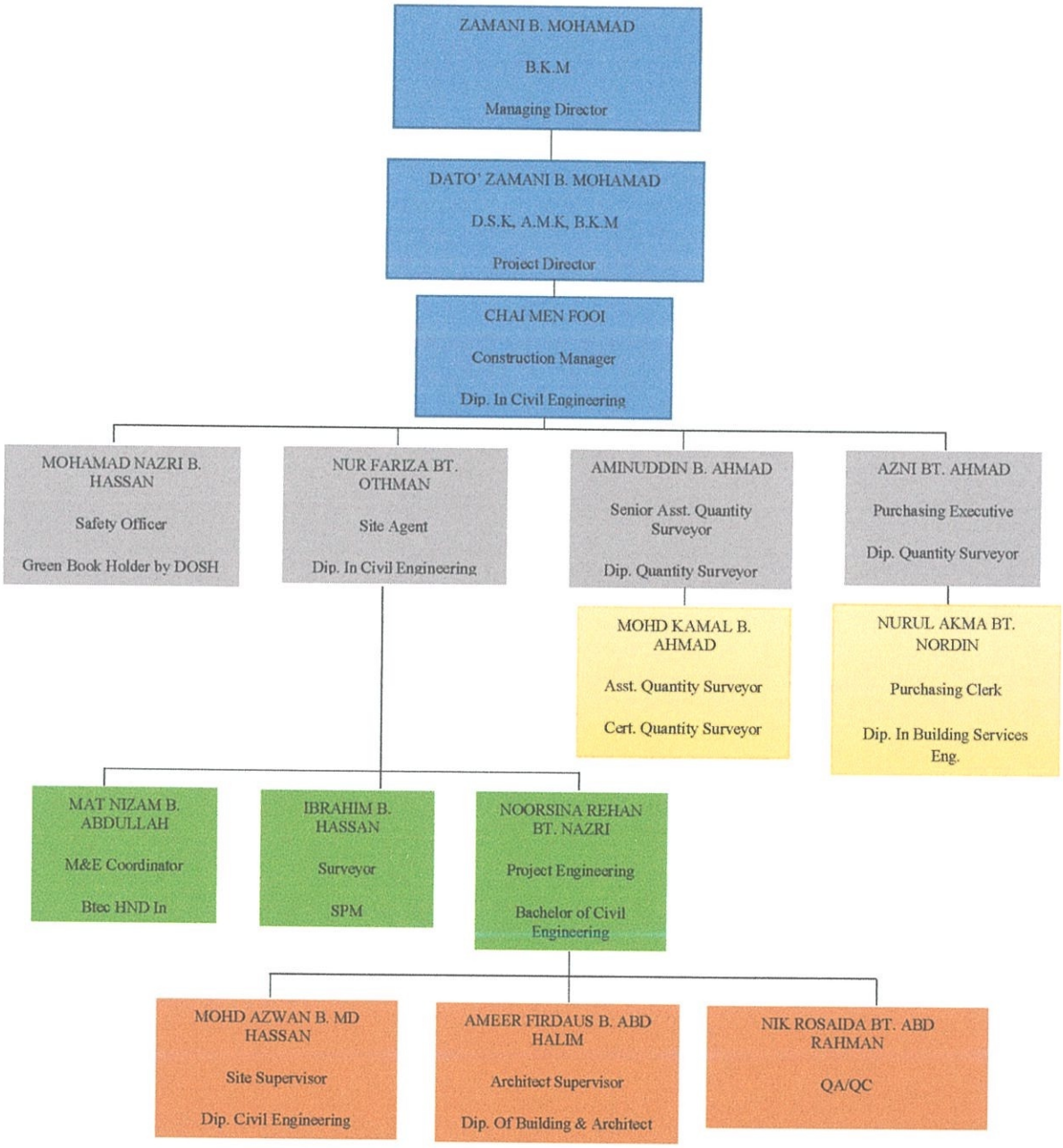
2.1.1 Company's history

On 1st June 1999, Kashaf Bina Sdn Bhd (KBSB) is known as MEDIMAZ Sdn Bhd. The name was change in 23rd July 2000 with the paid-up capital amounting to RM750, 000. 00. By registered as the contractor's license of class 'F', it begins actively. Through gained experience for about two years in a small scale of construction field and the addition of professional staff, the company try to increase their level to contractor's license of class 'C' and then class 'A' in 2005. With the concerted efforts of staff, systematic strategy of planning in marketing and good project management, it set up perfectly more number of projects that worth than RM20 million from government also not forget private employer till now.

2.2 Company Profile

Name of Company:	**KASYAF BINA SDN. BHD.** (484845-D)
Corporate Office:	No. 331-B Urban 1 Taman Melawati 53000 Kuala Lumpur Malaysia
Established On:	23rd July 2000
Registered Under:	PKK Class 'A' Contractor CIDB Grade 7
Certification Quality:	MS ISO 9001:2008 IQNet since 2007
Main Activity:	Building Construction Civil & Structure Engineering Mechanical & Electrical Engineering Facilities Management
Director:	Dato' Zamri bin Mohamad Mr Zamani bin Mohamad

2.3 Organization Chart



2.4 List of Project

Table 2.1 Completed Projects

No.	Project Title	Start	End	Project Cost
1.	Cadangan Mengubahsuai Pasar Lama dan kerja-kerja berkaitan untuk dijadikan Ruang Niaga di Padang Serai, Kulim, Kedah.	20/08/2000	22/08/2001	RM932,526.72
2.	Cadangan Menaiktaraf Medan Selera di Pekan Kepala Batas (PT 184) Mukim Bukit Tinggi, Daerah Kubang Pasu, Kedah.	25/09/2000	18/12/2000	RM257,482.52
3.	Cadangan Pembinaan sebuah masjid baru di Felda Lubuk Merbau di atas Lot HSM 2552 Mukim Tekai, Daerah Padang Terap, Kedah.	15/04/2001	17/09/2001	RM502,739.00
4.	Cadangan Membina blok tambahan di Sekolah Kebangsaan Tok Kepak, Daerah Kubang Pasu, Jitra, Kedah.	14/03/2002	13/11/2002	RM2,579,000.00
5.	Cadangan Membina Kompleks Niaga di Pekan Yan Kechil, Daerah Yan, Kedah.	24/07/2003	25/03/2003	RM1,584,255.00

6.	Cadangan Pembinaan dan kerja-kerja berkaitan di Pusat Pelancongan Pertanian @ Agrotouism Di Projek Buah-Buahan Bendang Man, Sik, Kedah.	16/11/2003	16/02/2004	RM1,197,782.25
7.	Cadangan Menyediakan kemudahan-kemudahan latihan dan prasarana Program Khidmat Negara (Zon Utara) Kem Sintok, Universiti Utara Malaysia, Sintok, Kedah.	16/11/2003	16/02/2004	RM2,282,155.00
8.	Kerja-Kerja Membina prasarana dan kemudahan untuk Kem Latihan Khidmat Negara, Lagenda Seri Negeri Langkawi, Kedah.	13/12/2005	15/05/2006	RM4,925,000.00
9.	Cadangan Membina dan menyiapkan Dewan Serbaguna UiTM Cawangan Permatang Pauh, Pulau Pinang.	28/07/2008	10/04/2010	RM10,005,709.70

Table 2.2 Project in Progress

No.	Project Title	Project Cost	Project Owner
1.	Cadangan Membina Pusat Komuniti Bersepadu Sentuhan Kasih di atas Tanah Felda, Tenggaroh, Johor.	RM6,518,361.50	IRIS Corporation Bhd / Felda FGV Berhad
2.	Cadangan Merekabentuk, Membina dan Menyiapkan Bangunan-Bangunan Asrama bagi pelajar Kolej Universiti Insaniah Fasa I, sebanyak lapan (8) unit serta kerja-kerja berkaitan di atas sebahagian Lot 3449 di Kuala Ketil, Mukim Tawar, Daerah Baling, Kedah.	RM5,000,000.00	Kolej Universiti Insaniah
3.	Cadangan Menaiktaraf dan Membina Blok Tambahan Ibu Pejabat Syarikat Air Darul Aman Sdn. Bhd. (SADA) 15 Tingkat dengan 1 Aras Tempat Letak Kereta Bawah Tanah, 3 Aras Tempat Letak Kereta Bertingkat dan lain-lain kerja berkaitan, di atas Lot 109 dan 159 di Daerah Kota Setar, Bandaraya Alor Setar, Kedah.	RM67,868,023.00	Syarikat Air Darul Aman Sdn. Bhd.
4.	Cadangan Membina Pusat Komuniti Bersepadu Sentuhan Kasih di atas Tanah Felda, Bandar Chini Timur Mukim Penyur, Daerah Pekan, Pahang.	RM8,000,000.00	IRIS Corporation Bhd / Felda FGV Berhad
5.	Projek Menggantikan Jambatan Struktur No.FT175/058/20 Kg. Charok Tenang, Laluan FT175, Jalan Gurun-Sik-Pedu Daerah Sik, Kedah.	RM3,787,999.17	Syarikat Pembinaan Nidzham Sdn. Bhd.

CHAPTER 3.0

The Installation of Roof Trusses at Menara Air Darul Aman (SADA)

3.1 Introduction of Project.

Menara Air Darul Aman (SADA) has been construct based on renovation from old building of Bangunan SADA. The construction has started on 01st April 2013 and will complete on 01st April 2016 as on schedule.

Photo 3.1 Bangunan SADA before renovation

Photo 3.2 Perspective view

CLIENT'S NAME	: Syarikat Air Darul Aman Sdn. Bhd. (SADA)
PROJECT COST	: RM 67,868,023.00
PROJECT NAME	: Cadangan Menaiktaraf dan Membina Blok Tambahan Ibu Pejabat Syarikat Air Darul Aman Sdn. Bhd. (SADA) 15 Tingkat dengan 1 Aras Tempat Letak Kereta Bawah Tanah, 3 Aras Tempat Letak Kereta Bertingkat dan Lain-Lain Kerja Berkaitan, Di Atas Lot 109 dan 159 di Daerah Kota Setar, Bandaraya Alor Setar, Kedah.
NO. CONTRACT	: SADA/K/03/2013
MAIN CONTRACTOR	: Kasyaf Bina Snd. Bhd. (KBSB)
PERIOD	: 36 Months
START DATE	: 01st April 2013
END DATE	: 01st April 2016

There are several consultant involve in this project as shown in table 3.1

Table 3.1 List of consultant involve in construction

No.	Scope	Consultant	Department Position
1.	Architect	AKASHAH ARCHITECT (AA) • Ar. Akashah bin Saad • En. Muhd. Tarmizi bin Abd Rahman Syarikat Air Darul Aman (SADA) • En. Amizan bin Murad	• Principal • Associate Architect • Clerk of Work
2.	Civil & Structure	HAJARA CONSULTANT SDN. BHD. (HCSB) • Ir. Sumantri bin Abd. Hadi Syarikat Air Darul Aman (SADA) • En. Ahmad Roslan bin Md. Akhir	• Director • Clerk of Work
3.	Mechanical & Electrical	NORTH M&E CONSULTING ENGINEERS SDN. BHD. (NME) • En. Mohd Hazwan bin Zainol Abidin Syarikat Air Darul Aman (SADA) • En. Mohd. Shahrulnizam bin Md. Rodzi	• Electrical Engineer • Clerk of Work
4.	Quantity Surveyor	PERUNDING JATI (PJ) • Sr. Hj. Saadon bin Ahmad Zubir	• Principal

3.2 Trusses

A truss is basically a triangulated system of straight interconnected structural elements. The most common use of trusses is in buildings and for bridge, however for building it give some advantage because it can support to roofs, the floors and internal loading such as services and suspended ceilings, it also easily provided. The some several reasons for using trusses are:

- Long span
- Lightweight
- Reduced deflection
- Opportunity to carry and support more load

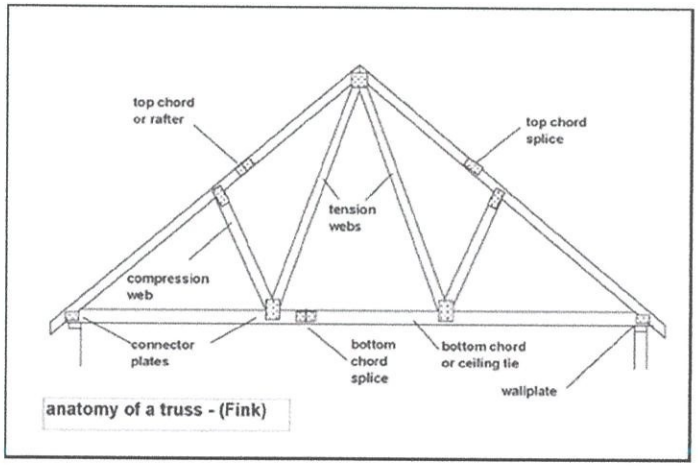


Figure 3.1 Anatomy of truss

Source: https://www.localsurveyorsdirect.co (2005)

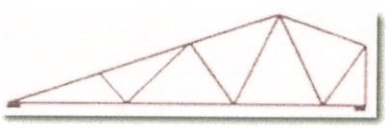
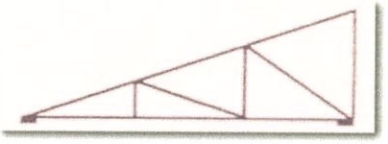
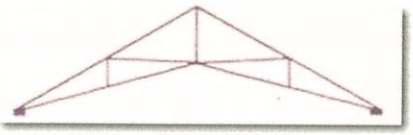
3.2.1 Use of truss in building

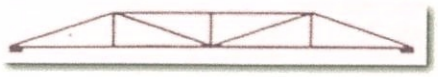
Trusses are used in a broad range of buildings, mainly where there is a requirement for very long spans, such as in airport terminals, aircraft hangers, sports stadia roofs, and other leisure buildings. Trusses are also used to carry heavy loads and used as transfer structures. Where trusses are widely used to serve two main functions:

- To transfer load on truss
- To provide horizontal stability.

3.2.2 Type of trusses

Table 3.2: Common type of truss

No.	Common truss	Figure	Explanation
1.	Cut-off (bobtail)	 Figure 3.2: Cut-off (bobtail)	Used as a Chimney Split Truss or where building plans dictate that a symmetrical truss will not fit. This is ideally suited for an offset wing of a split level building.
2.	Nano	 Figure 3.3: Nano	Used for single slope roofs. These trusses are widely used for industrial and commercial applications. It can also be used for shed or porch roof construction.
3.	Scissors	 Figure 3.4: Scissors	Architects use this truss to create a vaulted ceiling effect. Applications include residential, church and commercial projects. These trusses are usually designed with the bottom chord slope equal to 1/2 the top chord slope.

4.	Base	 Figure 3.5: Base	These trusses are as practical as Common trusses. They provide for easy to install Hip roof systems, this saving many hours of cutting and erection
5.	Gable End or Piggyback	 Figure 3.6: Gable End or Piggyback	These are not trusses in the true sense as they are not designed to clear span. They are not triangulated and must be supported along the entire length of the bottom chord.

Source: http://awtfa.com/information/common (2015)

3.2.3 Load on trusses

The main types of loads on trusses are dead, imposed and wind load.

I) Dead load

The dead load is due to sheeting or decking, insulation, felt, ceiling if provided weight of purlins and self-weight. The weight of the roofing material can be expressed as weight (kg) per unit area of roof (square metres), (kg/m2)

II) Imposed load

Imposed load are the non-permanent load that cause by the weather condition such as snow, wind, rain, or seismic force are live load. Furthermore, it also cause by the weight of temporary construction material and occupant floor are live load.

III) Wind load

The wind load is depend to the building design and dimension of the roof slope. The wind blowing over the roof cause a suction or pressure on the windward slope and a suction on the leeward one. The wind load are important in the design of light roof where the suction can cause reversal of load in truss members.

3.2.4 Material

There have some several material that commonly using in steel truss which is lightweight steel truss and mild steel truss.

I) Lightweight steel truss

For lightweight steel truss basically can fabrication or assemble whether on site or factory. The reason why the lightweight steel truss been chosen for construction because it is light and easy to handle. However, lightweight steel truss have some disadvantage which is it cannot carry more load compere to mild steel truss.

II) Mild steel truss

However mild steel truss opposite with lightweight steel truss, basically fabrication at factory it is because mild steel truss is too heavy for manual progress by worker. Commonly it come on site with 2 pieces in 1 truss. So it will assemble at site.

Photo 3.3: Assemble the mild steel truss

Table 3.3: Material and Dimension Standards

TABLE A - MATERIAL & DIMENSION STANDARDS			
Form	Material Quality	Dimension	Dimension Tolerances
H - Sections	BS EN 10025[1]	JIS G3192	JIS G3192
Joists		JIS G3192	JIS G3192
Channels (C-Sections)		JIS G3192	JIS G3192
Angles		JIS G3192	JIS G3192
Plates & Flats		Not Applicable	BS EN 10029[3]
Structural Hollow Sections Hot Finished	BS EN 10210-1[2]	BS 4848:Pt.2	BS 4848:Part 2
Hollow Sections Cold Formed	BS 6363	BS 6363	BS 6363
Galvanised Open Sections & Strip	BS EN 10147	Not Applicable	BS 2989

Notes: 1 Material quality requirements for Fine Grain Steels are given in EN 10113
Material quality requirements for Weather Resistant Grades are given in EN10155
2 BS EN 10210 -1 contains material quality requirements for non alloy and fine grain steels
3 Tolerances for plates cut from wide strip produced on continuous mill are given in BS EN 10051

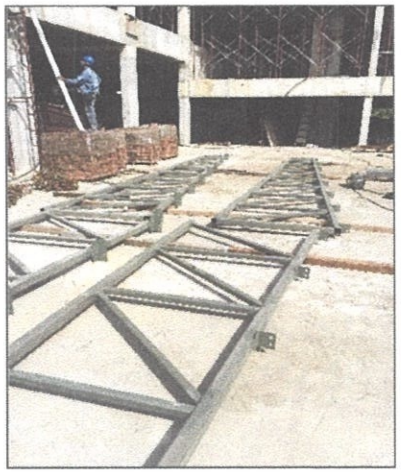
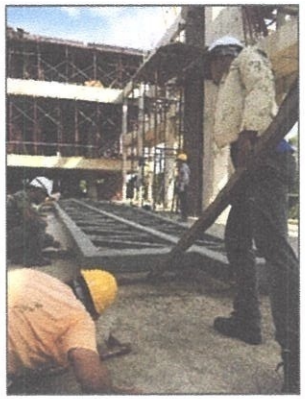
Source: https://www.jkr.gov.my (2005)

If the contractor have another propose for structure steel, the contractor may using approval of the S.O. The contractor shall submit with his proposal hi design calculations, sketches, detailing and specifications which shall be certified by a professional.

3.2 Method statement

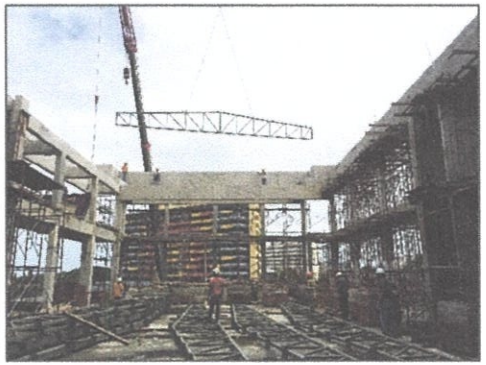
No.	Type of work	Explanation	Figure	Labour	Material/Machineries	Duration
1.	Delivered at site	The truss will be ordered and delivered from factory to site by lorry. After that, the trusses will carry by using tower care	 **Photo 3.4:** Delivered at site	5 nos. general worker	• Tower crane	1day
2.	Setting out	Each pieces of truss need to be installed follow to the details and level.	 **Photo 3.5:** Level marking	2 nos. truss worker	• Measurement tape • Plastic tube • Marking pen	1 day

3.	Setting out	The bolt that have been concrete at corbel should be clear before install the steel plate, it because to prevent some matter while instaltion of steel plate.	 **Photo 3.6:** Clear the bolt	1 nos truss worker	• Hammer • Chesel	1 day
4.	Installation of plate.	The important thing to install the plate is ensure following the drawing and same level at all plate. The installation of plate using bolt and nuts.	 **Photo 3.7:** Installation steel plate	2 nos. truss worker	• Measurement tape • Spirit level • Marking pen	1 day

5.	Welding prosess	The trusses must be welded first causes the pieces of truss that order from factory are large so it devided in two pieces in one truss. So, before welded process, ensure the trusses already same level and stable because to prevent tilted on truss. After the 2 peaces of truss are already same level the next step is connect the 2 peace of truss by welded	 **Photo 3.8:** Truss by peaces  **Photo 3.9:** Balancing process	7 nos. truss worker	• Tower crane • Welded mechine • Hammer • Seel plate	2 days

		it together. After welded the trusses, it should add steel plate at evey side welded location to additional strength on the connection and welded it.	 **Photo 3.10:** Welded process  **Photo 3.11:** Additional steel plate			

6.	Clearance at welded area	After welded the trusses will be painting to improve aesthetic value. The step is to close the welded area.	 **Photo 3.12:** Clear at welded side  **Photo 3.13:** Painting at welded area	2 nis. Truss worker	• Paint • Hammer and chisel	1 day

7.	Lifted truss to building	Next, after the trusses already combine , it will checked by consultant on work to approve the truss before be install on building. Then, the truss will be lifted up to on top of building by tower crane.	 **Photo 3.14:** Tower crane lifted truss to building	1 Tower crane, 4 truss worker, 2 welder	• Tower crane • Welder mechine	1 day

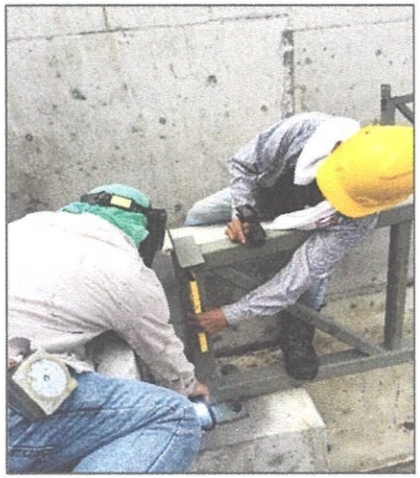
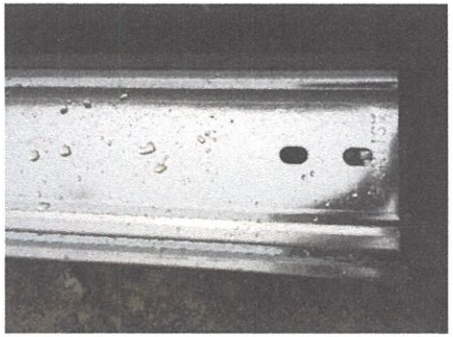
8.	Lifted truss to building	The workers will then waiting on the position of truss installation, and truss will be connected to the plate on corbel. This work need 2 person welder at the same time. Furthermore, it also need one more porson to checked level at two side of trusses. The connection is between trusses and corbel.	 **Photo 3.15:** Welded truss on steel plate  **Photo 3.16:** Welded process	1 tower crane, 4 truss worker, 2 welder.	• Tower crane • Welded mechine • Spirit level • Measurement tape	1 days

			 **Photo 3.17:** Lifted truss to building  **Photo 3.18:** Done lifted truss to building	-	-	-

9.	Installation C channel	The C channel will ordered by followed the detail and drawing. It will install on purlin. The purlin is already install at the factroy.	 **Photo 3.19:** C channel  **Photo 3.20:** Purlin	4 nos. truss worker	Bolt and nuts	1 day

10.	Installation C channel	C channel will be installed to purlin of truss using bolt and nut based on construction drawing.	 **Photo 3.21:** Installtion C channel  **Photo 3.22:** bolt and nut	4 nos. truss worker	• Bolt and nuts	1 day

CHAPTER 4.0

4.1 Conclusion

As a conclusion, trusses is the some of the component on a building that which is always used. The selected of trusses is depend to the usage and size the area. Furthermore, the important thing is while to install the trusses on the building. The installation of trusses needed the conscientious work cause any unexpected cases can happen such as C channels cannot filled to the purlin cause the purlin not parallel at all, no stable and etc. In addition, trusses have advantage and disadvantage base on the material using and type of trusses has been chosen that suitable on building.

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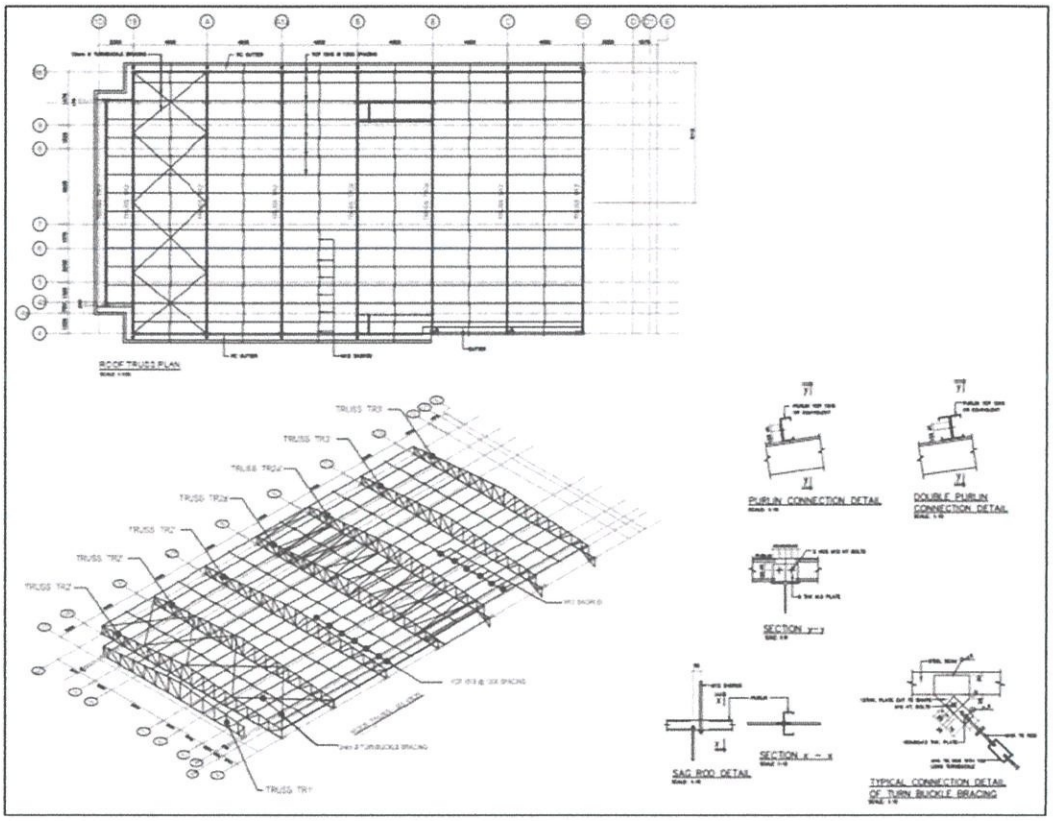
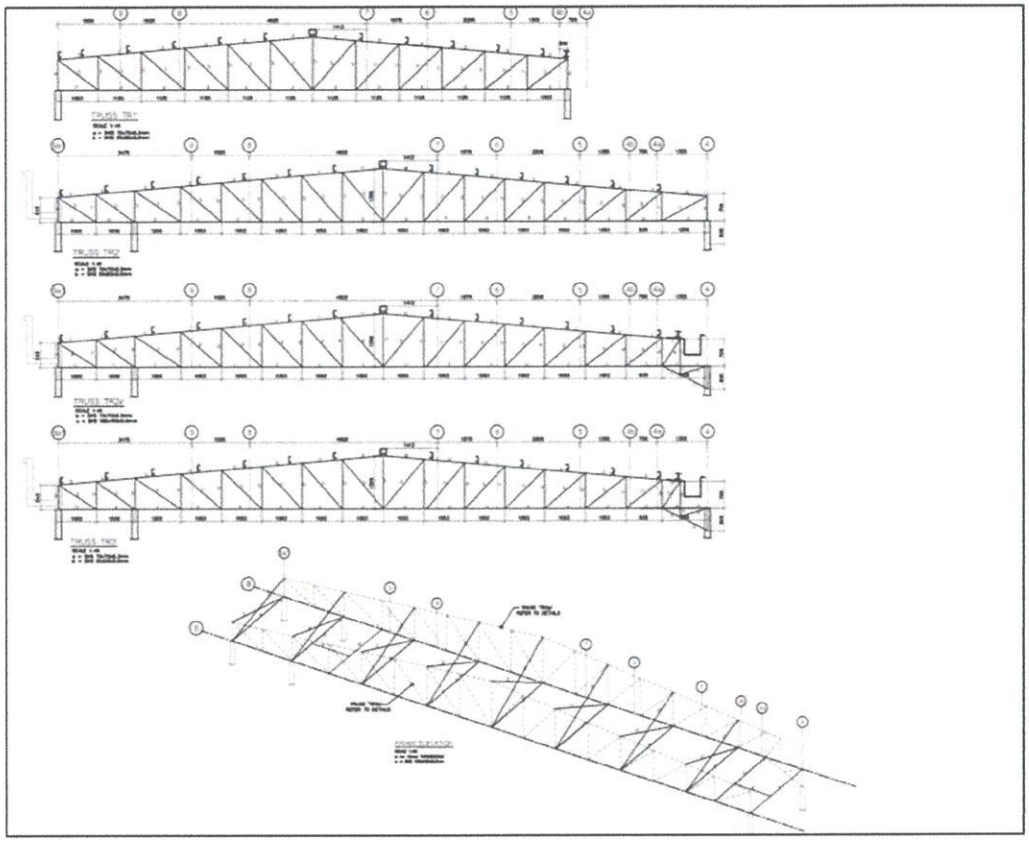
Trussed Rafter Construction. (2007). Available from: https://www.localsurveyorsdirect.co.uk

Appendix A: Detail drawing 01



Appendix B: Detail drawing 02



Source: Project detail drawing