



DEPARTMENT OF BUILDING
UNIVERSITI TEKNOLOGI MARA
(PERAK)

ROOF TRUSSES

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It is recommended that the report of this practical training provided

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Entitled

Accepted in partial fulfillment of requirement has for obtaining 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 stated herein, prepared during a practical training session that I underwent at Jabatan Kerja Raya Pasir Puteh Kelantan. for 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.

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Thank you so much.

ABSTRACT

A truss is a frame structure that consisting a group of triangle arranged in single plane so that the load is point at the intersection of members. The main topic discussed in this report is to study about the roof trusses and structured of the building based on *Cadangan Membina dan Penambahbaikan Sekolah-sekolah DAIF menggunakan sistem Industrialised Building System (IBS), Pasir Puteh Kelantan*. This report contain the installation., material and method of roof trusses that have been constructed in this building construction.. I have used several type of ways to find and gain information such as interview and observation , information from book, and internet. As a conclusion, this report is contain about construction of trusses using steel that can produce more efficiency for the better structure.

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CHAPTER 1.0

1.1 Background and Scope of Study

Building construction is the techniques and industry involved in the assembly and erection of structures, primarily those used to provide shelter. Building construction is an ancient human activity that already been worked for a million years. It began with the purely functional need for a controlled environment to moderate the effects of climate. Constructed shelters were able to make human beings to adapt themselves to a wide variety of climates and become a global species.

Building roofs can be framed with engineer light gauge steel trusses which are manufactured from C-Shaped metal studs. Prefabricated steel trusses offer a high-strength, light-weight roof system that can be installed quickly. Roofs on more than quarter of all new commercial buildings in the Malaysia are built with light-gauge steel trusses because of the high-strength and durable.

This study were meant to understands the construction and method of installation of roof trusses that involved skills and knowledge to install. For this study, the focused topic installation of roof trusses at *Cadangan Membina dan Penambahbaikan Sekolah-sekolah DAIF menggunakan sistem Industrialised Building System (IBS), Pasir Puteh Kelantan*. Also, this study also able to understand how the process of construction work and the problems that always occurred at site. This study involves the teamwork between management and planning for the project that related with :-

- i. Understand the plan of project and material used.
- ii. Planning and manage to follow the Critical Path Method (CPM)

1.2 Objectives

The following are the objectives for this observation and study:-

- i. To understand the type of trusses that involved in the building construction.
- ii. To understand the installation of roof trusses.

1.3 Methods of Study

For this study, there's a few methods that have been done for complete the study and to ensure the good quality of information and result for this study so that the objectives can be achieved. The methods of study as a following:-

1.3.1 Main source.

- i. Interview methods

This interview methods can be used to collect data for this report. Interview was used to get any extra information about this project and can be the main factor to get input, also interview with someone who have experienced in this industry such as technical assistant, contractor, project manager, quantity surveyor and engineer was helped a lot.

- ii. Observation

This methods is commonly used during practical training directly by visiting the site. During working for this method, the information was gained by recording everything happened at the site. Recording can be in note or using smartphone to record every single things that was working at the site such as progressed of construction, equipment and machineries that used.

1.4.2 Secondary source

i. Literature review.

The main objective for the reading and literature review is to find out about the method and step of roof truss installation, the materials that used in this structure and the work flow to construct it based on literature review that can be found at JKR PASIR PUTEH construction file. Also the articles of roof truss installation guide. Book can be used as a important medium to find information for this report to complete the data for the installation method. Several of the literature studies for the construction detail roof trusses and study about the details of materials and important part based on drawing plan for the installation of roof trusses. Internet also used as a secondary source to obtain information about installation of roof trusses . There are several websites that have been used to get more information about installation of roof trusses and also the example of how to install truss and able to know the type of trusses that used lightweight gauge steel.

CHAPTER 2.0

2.1 Introduction

The Jabatan Kerja Raya (JKR) was born in 1872 with Major J.F.A McNair as the first head of the organization. The so-called Pangkor Engagement (1874) paved the way for British influence in Malay States. On this year, they able to make create another franchise into Selangor, Perak and Negeri sembilan. They posted their Residents and Subordinate Officers to advice the Malay Rulers. Later, Pahang also accepted this residential system was administrated centrally with Kuala Lumpur as the seat of authority. Also, nowadays Jabatan kerja Raya (JKR) being establish under government sector and any affair that involved JKR were directed to government.

Jabatan Kerja Raya Daerah Pasir Puteh established on 1905. Area JKR Pasir Puteh is the fifth most wide in Kelantan which is 424 km². At first, the establishment of JKR is combined with Bachok district, as by time, Bachok now already have their own JKR Bachok and it's a another successful for JKR Malaysia.

Based on the successful completion of the previous projects, the government is confident it will contribute positively towards the development of Malaysia's "1 Malaysia" and create Bumiputera entrepreneurs in line with the government's goal of achieving "VISION 2020.

COMPANY BACKGROUND

2.2 COMPANY PROFILE

The logo for JKR is shown in Figure 2.1



Figure 2.1 logo of JKR Pasir Puteh

- Company name : Jabatan Kerja Raya Pasir Puteh
- Address : Jabatan Kerja Raya (JKR) Jajahan Pasir Puteh,
16800 Pasir Puteh,
Kelantan.
- Year of establishment : 1986
- No. Tel/Fax :
- Email : PasirPutih@jkr.gov.my

2.2.1 Company Vision

- To become a world-class service provider and centre of excellence in asset management, project management, and engineering services for the development of nation's infrastructure through creative and innovative human capital and state-of-the art technology.

2.2.2 Company Mission

JKR contributes to the nation-building through:

- Helping our clients deliver policy outcomes and services by working with them as strategic partners.
- Standardising our processes and systems to deliver consistent outcomes.
- Providing effective and innovative project and asset management.
- Strengthening our existing engineering competencies.
- Developing our human capital and new competencies.
- Upholding integrity in delivering our services.
- Building harmonious relationships with the community.
- Taking good care of the environment in delivering our services.

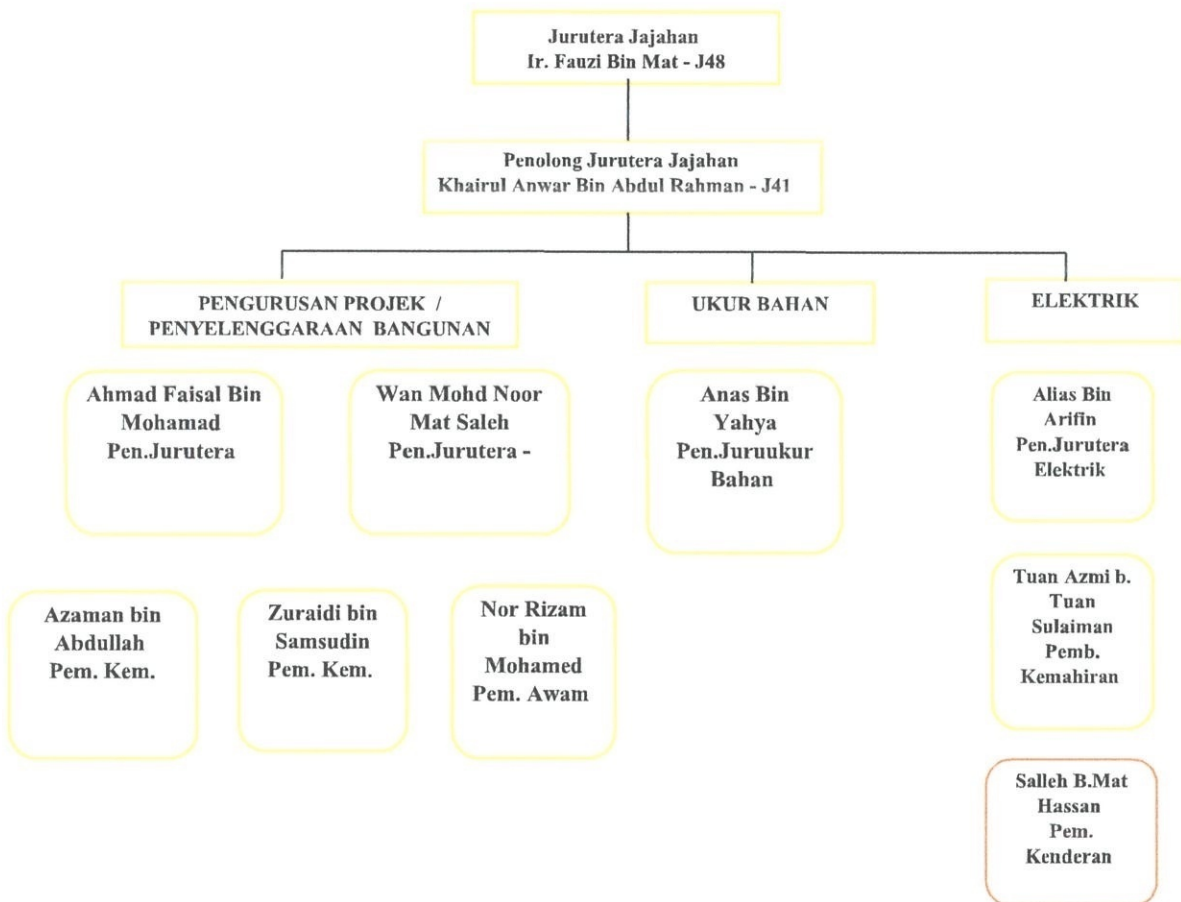
2.2.3 Company Objective

- Yield the product and execute the maintenance services that congregate the time, quality and cost are set to accomplish the optimum benefit asset

2.3 ORGANIZATION CHART

The organisation chart of Building Department of JKR Pasir Puteh is shown in table 2.1.

Table 2.1 Organization chart of Building Department



2.4 LIST OF PROJECT

2.4.1 Completed Projects

Table 2.2 completed project

Bil.	Location	Date	Cost (RM)
1.	Construction of Pejabat Jabatan Pendaftaran Negara (JPN) Pasir Puteh, Kelantan	27 th August 2013 to 23 rd February 2015	3,876,891.00
2.	Purposed of Reconstruction and Upgrading Sekolah DAIF Using Industrialised Building System (IBS)	26 th March 2018 to 24 th June 2018	4,369,900.00

2.4.2 Project in Progress

Table 2.3 list of progress project

Bil.	Location	Date	Cost (RM)
1.	Project Upgrading Jalan Cherang Ruku Pasir Puteh ke Tok Saboh Besut, Pasir Puteh Kelantan.	22th June 2018	1,120,890.00
2.	Project Construction of Kompleks Islam Jajahan Pasir Puteh, Kelantan.	12 th December 2018	11,845,800.00

CHAPTER 3.0

ROOF TRUSSES

3.1 Introduction of project

The project that carried out during practical training was *Cadangan Membina dan Penambahbaikan Sekolah-Sekolah DAIF menggunakan sistem Industrialised Building System (IBS), Pasir Puteh Kelantan*. This project cost about ringgit Malaysia four million three hundred sixty nine thousands and nine hundred (RM 4,369,900) . This project take about 14 weeks to be done 26 March 2018 untill 24 June 2018. The consultant that involved in this project is Teknik Padu Bina Sdn. Bhd. For this project only two party involved for the construction and JKR as a civil & structures.

This project is more focussed on normal classroom space with typical wide area for a classroom and also focussed on Industrialised Building System (IBS) . However, this project fully award to Teknik Padu Bina Sd. Bhd.for the whole construction of the building up to finishes work that monitored by the contractor of the company.

There are officers was in charged on site to ensure the construction work will be smooth running. For this case study, the focus topic will be only on **roof trusses** accordance the (IBS) as suitable topic due to process of construction is not very complex and time taken to finish this project is not too long to build and complete the DAIF Schools Using (IBS) , Pasir Puteh, Kelantan.

Table 3.1 Project information

<p>PROJECT</p>	<p>Cadangan Membina dan Penambahbaikan Sekolah-sekolah DAIF menggunakan sistem Industrialised Building System (IBS), Pasir Puteh Kelantan.Selecting</p>
<p>CONTRACTOR</p>	<p>TEKNIK PADU BINA SDN. BHD.</p>
<p>PRICE</p>	<p>RM 4,369,900</p>
<p>DATE</p>	<p>26 MARCH 2018 – 24 JUNE 2018 (14 WEEKS)</p>
<p>CLIENT</p>	<p>GOVERNMENT PROJECT</p>

3.2 Type of roof trusses

Based on my research topic, namely the construction of roof trusses and type of roof trusses use at the site *Cadangan Membina dan Penambahbaikan Sekolah-sekolah DAIF menggunakan sistem Industrialised Building System (IBS), Pasir Puteh Kelantan*. Selecting the best type of roof truss for a project is quite challenging. Functionality and aesthetic conditions lead the considerations of the type of roof truss that is selected. Costs can vary considerably, but there are ways to keep expenditures low.

A roof truss is a prefabricated structure that is designed to support a roof on a building. They come in two main types that is flat and pitched. Those types can be broken down into more specific roof truss types that can suit all manner of construction projects. Typically triangular in shape, they are made off site and usually lifted into place before being secured.

The structure often include these triangle shapes in various shape and sizes to fit the pitch, size or design of a roof. Triangles are very efficient shapes that allow control of load which is why they are used in construction. As they have to support the entire weight of a roof, they need to be strong and stable, which a triangle the most efficient choice of shape.

Roof trusses are made of different elements. The exterior frame members are called chords and the interior triangle structures are webs. These two elements can be manufactured in different shapes and sizes depending on its functions.

3.2.1 King post truss

A king post truss is typically used for short spans. They are often used in extensions, garages, porches and outbuildings. It is the simplest form of truss in that it is constructed of the fewest number of truss members. Figure 3.1 show example of king post truss that has two principal rafters, a tie beam, and a central vertical king post. The simplest of trusses, it is commonly used in conjunction with two angled struts.

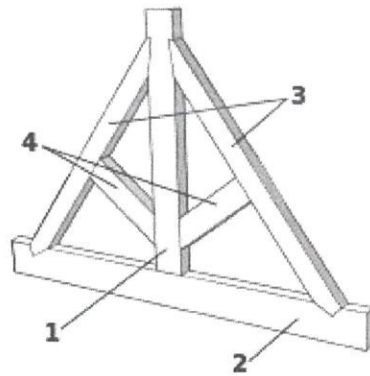


Figure 3.1 example of king post truss

1: king post 2: tie beam 3: rafters 4: struts.

The truss consists of two diagonal members that meet at the apex of the truss, one horizontal beam that serves to tie the bottom end of the diagonals together, and the king post which connects the apex to the horizontal beam below. For a roof truss, the diagonal members are called rafters and the horizontal member may serve as a ceiling joist or tie beam.

3.2.2 Queen post truss

Meanwhile, a queen post truss is typically a vertical upright with two triangles either side. As Figure 3.2 show these are not commonly used anymore as they have been succeeded by the Fink truss. The queen post truss has two principal rafters and two vertical queen post. The queen post truss extends the span, and combined with spliced joints in the longer members extends the useful span for trusses of these types. As with a king post, the queen posts may be replaced with iron rods and thus called a queen rod truss.

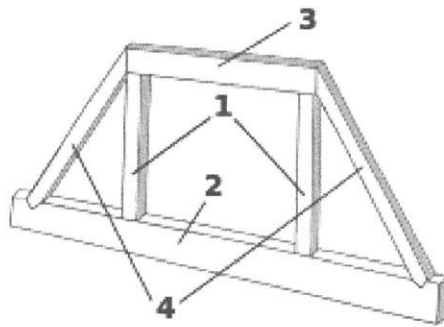


Figure 3.2 example of queen post truss

1: queen posts **2:** tie beam **3:** straining beam **4:** rafters

3.2.3 Scissor roof truss

A scissor truss is a kind of truss used primarily in buildings, in which the bottom chord members cross each other, connecting to the angled top chords at a point intermediate on the top chords' length, creating an appearance similar to an opened pair of scissors. The scissor roof truss reduces the need for a bearing beam. Figure 3.3 show example of scissor roof truss that uses lower chords that slope inward, instead of being horizontal.

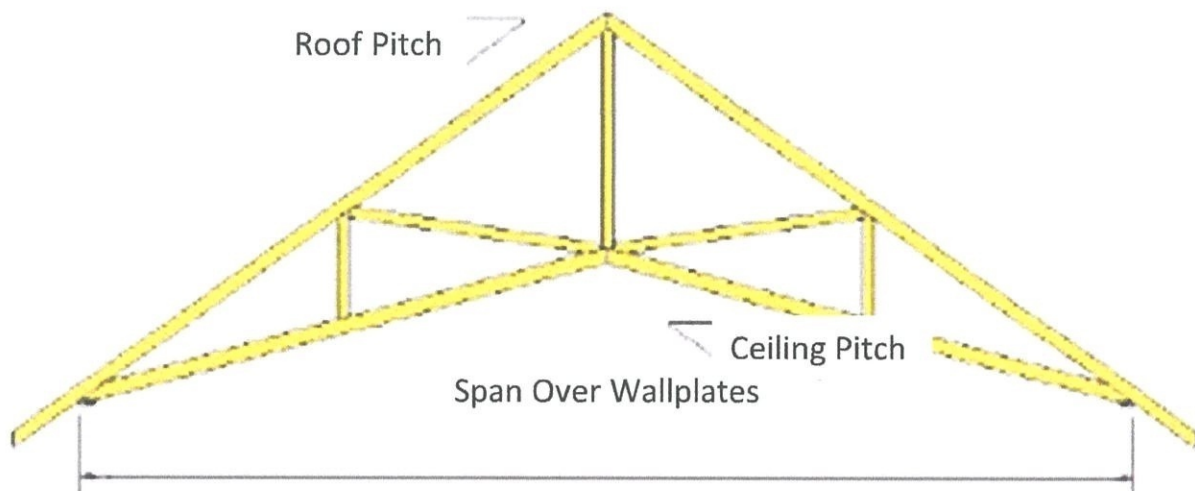


Figure 3.3 example of scissor roof truss

One of the disadvantages of using this type of truss is the problem in completing insulation, which, while already hampering aesthetic appeal, also hikes construction costs.

3.3 Installation of Roof Trusses

The progress of the installation of roof trusses is about four days to cover all the building of the classroom. The type of roof trusses that are used is lightweight steel gauge which is suitable for the building to resist the load. Below is step of roof trusses installation:-

3.3.1 Measure the area of the building.

There are skilled labours were measuring the wide of the area to cover up the entire building. The aim of this task is to know how many the roof trusses that needed to resist the load from the roof which is zinc. Figure 3.4 show the wide of the area for the roof trusses that been measured.



Figure 3.4 Area that been measured

3.3.2 Making the roof trusses.

The contractor was ordered the roof trusses from Arit Truss System Sdn. Bhd. based on the drawing that was given to their sub con. They have to prepare the truss and made the truss based on the drawing given using the material that suitable. In order to have the best quality, the trusses are recommended to use lightweight steel gauge. Figure 3.5 show the cross section for the type of material used and the size of roof trusses.

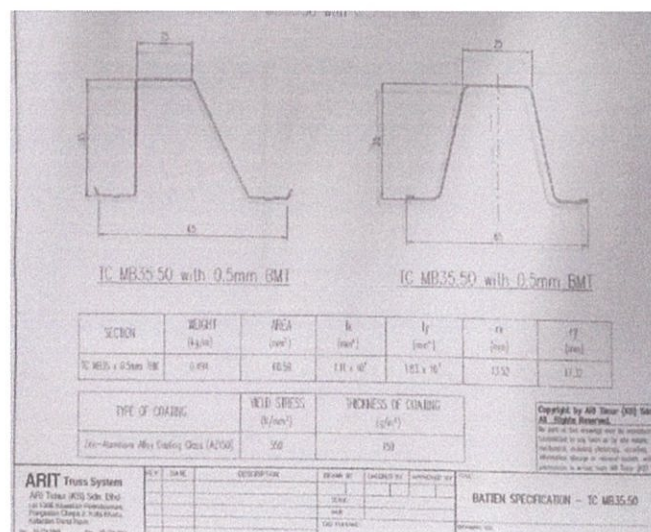


Figure 3.5 cross section of material used for truss

3.3.3 Installation trusses

After the ordered trusses has arrived on site for the installation, there are skilled labour using a crane to lifted up the trusses and the unskilled labour was given a task to attached the trusses to the roof beam that already mark with support point. L-bracket together with anchor bolt at every support point, and skilled labour were in charged to complete this task. This task was repeated until 25 times to installed 25 trusses. As the trusses were erected vertically, straightness, and squareness was checked. For the verticality the

span need to be less than 200, 50mm or angle 50°, for the straightness also not be more than span over 200 and 50mm and also the straightness.

After that, the fixing brackets were line up with the outside of the top plate at the centre of the hip end wall to install the crown end rafter. Using two hex head tek screws, it was screwed through the fixing bracket. The crown end rafter square was keeping to the hip end wall. Multi grip were used to screw two tek screws at the top chord of each truncated truss. The top chords of all truncated trusses need to be straight and plumb.

Before fixing all jack rafters it is needed to construct the external corner of the roof first. The truss company were given hip corner to form the roof structure at the eave line and to assist in the fitting of the fascia. Two hex head tek screws were used to fix the hip corner to the top plates at external corners and to the top of the first truncated truss as per a standard jack rafter. Figure 3.6 show trusses before erected and connected.



Figure 3.6 Truss before erected

Lastly is, the positions of the jack rafters need to mark up on the hip end wall. Also the design spacing is sure to be maintained. The fixing brackets with the outside of the top plate were line up to fix the jack rafters to the hip end wall. Two hex head tek screws were used to screw through the fixing bracket. Also, the jack rafter were keep in square to the hip end wall, an Multi Grip with two screws used to screw the top chord of each truncated truss in each face at each each intersection. Last, the top chords of all truncated trusses were sure in straight and plumb according to their verticality, straightness and squareness.

CHAPTER 4

4.1 Conclusion

Overall after involvement in the construction field at *Cadangan Membina dan Penambahbaikan Sekolah-sekolah DAIF menggunakan sistem Industrialised Building System (IBS), Pasir Puteh Kelantan.*, when construct pile foundations, a proper care is very important so that it would not cause problem in the future. A few precautions have been established to make sure no accidents occur during the construction.

One of the main precautions that had been applied at that site is every equipment and machineries must in a good condition and arranged accordingly to the correct place based on the drawing plan. This small mistake needs to be avoiding because it might cause a long term problem, especially in a few years due to weakness of material used.

In completing this report, the method of installation of roof trusses explained in detail. The construction of roof trusses starting with measuring the area of roof, cutting, lifting, and jointing. Every single work done should base on the method statement to make sure the quality of the final result. However, site supervisor need to monitor all the construction work in order to ensure the quality of the work. Machineries such as scaffold, multi grip, crane, were used to install the roof trusses. This equipment and machineries will give new experience and knowledge for student practical. The surroundings of site construction full with equipment like nail, hammer, and reinforcement bar. This situation will created intention to learn something new and develop this skill using certain equipment for benefit.

Lastly, for the safety and health. It can be conclude that construction site area is safe to enter. Although, there are certain worker not wearing personal protective equipment (PPE) and protective clothing, there are no injuries or fatal cases that occur during the construction work process. Therefore, it is recommended to all parties to taken safety precaution regarding the construction of roof trusses part to minimize other contribution factor in building defect and human injury.

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