UNIVERSITI TEKNOLOGI MARA

DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

SEPTEMBER 2015

It is recommended that the report of this practical training provided

By

SHAHRIZAN BIN OSMAN

2013891918

Entitled

Roof Construction

Accepted in partial fulfilment of requirement has for obtaining Diploma in Building.

Report Supervisor	:	Pn. Noor Sahidah Binti Samsudin
Practical Training Coordinator	:	Pn. Noor Rizallinda Binti Ishak
Programme Chairman	:	Dr. Mohd Rofdzi Bin Abdullah

DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITY TEKNOLOGY MARA

(PERAK)

MAY 2015

STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for the extract and the summeries for which the original references stated herein, prepared during practical training session that I underwent at Perunding ZnA (Asia) duration of 5 month starting from 25 May and ended 9 October 2015 . It is submitted as one of the requirements for obtaining the Diploma in Building

Name	: SHAHRIZAN BIN OSMAN
UiTm ID No	: 2013891918
Date	: 13 OCTOBER 2015

ACKNOWLEDGMENT

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

I would like to express my gratitude to Allah for giving me this oppurtunity, strength and ability to persue my practical training for 5 months. I would like to thank to Perunding ZNA (Asia) Sdn. Bhd. for giving me a great experience along this industrial training for complete the requirement that needed in order to gain the Diploma In Builidng. I would also like to thank Ir Zulhkiple Bin A. Bakar (CEO) for giving me this great oppurtunity working with the Project Management Department team. And also not forgotten, thanks to my chief department En Haramain Bin Sulaiman and the team Pn Suriati Binti Ab Razak and Cik Nurul Syafika Binti Mohamad for teaching and giving alot of information during this internship program. Also to all staff that really helpful in this company, thank you. It is good experince working with all of you.

Besides that, thanks much to all our lecturer that give alot of information and knowledge during the class especially Pn Sahidah my practical report supervisor and also to visiting lecturer En Redza Rosman. Not forgeting Practical Training Coordinator Pn Rizalinda Ishak and also Faculty Coordinator Dr Mohd Rofdzi Abdullah. I really appreciate the effort, time encouragements and ideas that they have contributed towards the succesful completion of my training.

Lastly, special thank to my beloved parents for their secrifices over this 20 years.

ABSTRACT

Roof is one of the important elements in every construction project as roof is a main attraction for a building. Roof refers to the protection of building and also it give and attraction for unique design of a roof. For example, tradisional malay house. Without a strong trusses, roof cannot stand it self. Therefore the combination of work between the trusses and the covering is vital. This report will explain about the important materials a numbers of manpower and machineries fabricate the trusses for double storey house. This report was conducted at Kota Puteri PKNS in Ijok. The objective of the this report is to identify the the material use for the trusses installation. This report will focus on the requirement needed in fabricating parts. This report will also look at the load received, as we know loading is the most important part that need to be considered. Moreover, this report will review on how to install the trusses in safe way.

TABLE OF CONTENT PAGE NO

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

APPENDIX

Appendix A	Layuot plan
Appendix B	Trusses detail

LIST OF ABREVIATION

N/A:	Not applicable

CHAPTER 1.0

PREFACE

1.1 Introduction

Building has a two basic parts, substructure and super structure. Substrutrure where the component or the structure located below or underneath the ground, for example, foundation. Meanwhile the super-structure is located above the ground, such as slab, column, roof truss and the others. The function of the super-structure is to spread or bear all the load that came from the building and transmit the load to the subtructure below the ground. There is a plinth that located between the ground level and floor level. According to Punmia (1984), plinth defined as the portion of the sturcture between the surface of the surrounding ground and surface of the floor, imediately above the ground.

There is a lot of components in a building, foundations, walls and columns, floor structure, roof structures, openings, finishesand others. One of the importants parts in a building is roof structure. Roof can be clasified into two, pitched roof and flat roof. The diferent between these two roof is the pitch. There is many example of roof such as pitch roof, lean to roof, gable roof, hip roof, deck roof and the others. The roof structures also known as a roof trusses.A rooftruss refers to the frames made up of timber or metal - that are nailed, bolted or pegged together to form a structurally independent shape that has a great amount of strength.According to Abi and Jason (2007), there are two main categories of a roof trusses, lightweight and heavy timber roof trusses. Basic parts for trusses are for examples, web, battens, top chord, bottom chord, fascia board, wall plate and the connections. Connections of rof tusses can be

varies such as nail, bolt and nut, glu, revet, and the sort of connection that suitable with the trusses materials.

1.2 Objective

The objective for these report are :

1. To study the construction method ofhip roof trusses.
2. To investigate the manpower and machine needed the construction of hip roof.

1.3 Scope of study

The scope for this report is only focusing on a construction method and also the manpower and michinery needed for the double storey house, at seksyen 8, Kota Puteri, Mukim Rawang, Selangor Darul Ehsan.

1.4 Method of study

The information and data for the report obtained by using these two method primary and secondary method. Primary method refers to the information and data based on observation and also interviewing. These information are original and not taken from any other academic materials. Mostly can get this information by going to the site.

i. **Observation :**

The observing can be done by going to site (Site visit). For example observing the slump test. Camera and note book is really important in this method. Function for the camera is to capture the image clearly and note book is to record the result. Thats how observation method can be done.

ii. **Interview :**

Interview can be done in many ways. Interview the workers on how they do they work. Interview the site supervisor in how there supervise the work. And also interview the site manager on how they manage the site.

Secondary method. These method refers to the information that we can get from the reading materials, it can be in the internet, jurnal, reference books, magazine and the otherb reading source materials. In completing these report I use internet and reference book to gain the data.

i. **Internet :**

Information can be easily gain using the internet. For example, the website that shows many information that relate to the report. It also come with a picture, diagram, chart that help more.

ii. **References book:**

Visiting the library, buying a reference book also help in gaining the information. There is a various of book that can help in compelting the report. Beside that, the reference book also easily to get compare to the internet that need the internet line. As there is many author that write a book of construction.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

2.1.1 Mision and Vision

" A visionary company doesn't simply balance between idealism and profitability : it seeks to be highly idealistic and highly profitable. A visionary company doesn't simply balance between preserving a tightly held core ideology and simulating vigorous chance and movement; it does both to an extreme."

2.1.2 About Perunding ZnA (Asia)

The ZNA brand, creatively introduced in 1992, has made significant inroads in responding to the increasing demands in the building industryfor 'Value Engineering' (VE). Principal, Ir. Zulhkiple A Bakar, head of ZNA since its inception 19 years ago, has firmly established the company's leading nichie position as a 'VE checker and Designer' to the civil and structural industry. As early as 1992, Ir. Zulhkiple A Bakar led ZNA to established its first influential landmark in the industy by winning the 1st prize Prime Minister Award for the Malaysian National Low Cost Housing Competition in 1995.

2.1.3 Scope of works

Services that ZNA now specializes in delivering to clientele in the area of VE includes

- Evaluations / Analysis of geotechnical studies and design.
- Checking existing civil and structure design interms of safety, efficiency and westages.
- Design and/or re-design and optimize, where necessary, the building structural system not only at component level but also at global level.

Other types of general works includes:

a) Foundation
   - Soil improvement design.
   - Technical 'in house' developed distribution load designs.

b) Struture
   - Multi level tiered houses example; single, double, detached and non.
   - Multi level tiered commercial and industrial buildings.
   - High rises
   - Manufacturing
   - IBS load bearing bricks.
   - System slab designs.

Source: Perunding ZNA (Asia) Company Profile

2.2 Company Profile

Figure 2.1: Company logo

Company name	: Perunding ZnA (Asia) sdn. Bhd
Company no	: 871000-H
Address	: Suites A-03-06, Block Alamanda, 10 Boulevard, Lebuhraya Sprint PJU 6A, 47400, Petaling Jaya Selangor Darul Ehsan.
Date started	: 1992
Founder	: Ir. Zulhkiple A Bakar
Registration	: civil and structure engineer

Source: Perunding ZNA (Asia) Company Profile

2.2 Organization Chart

The latest organization chart.

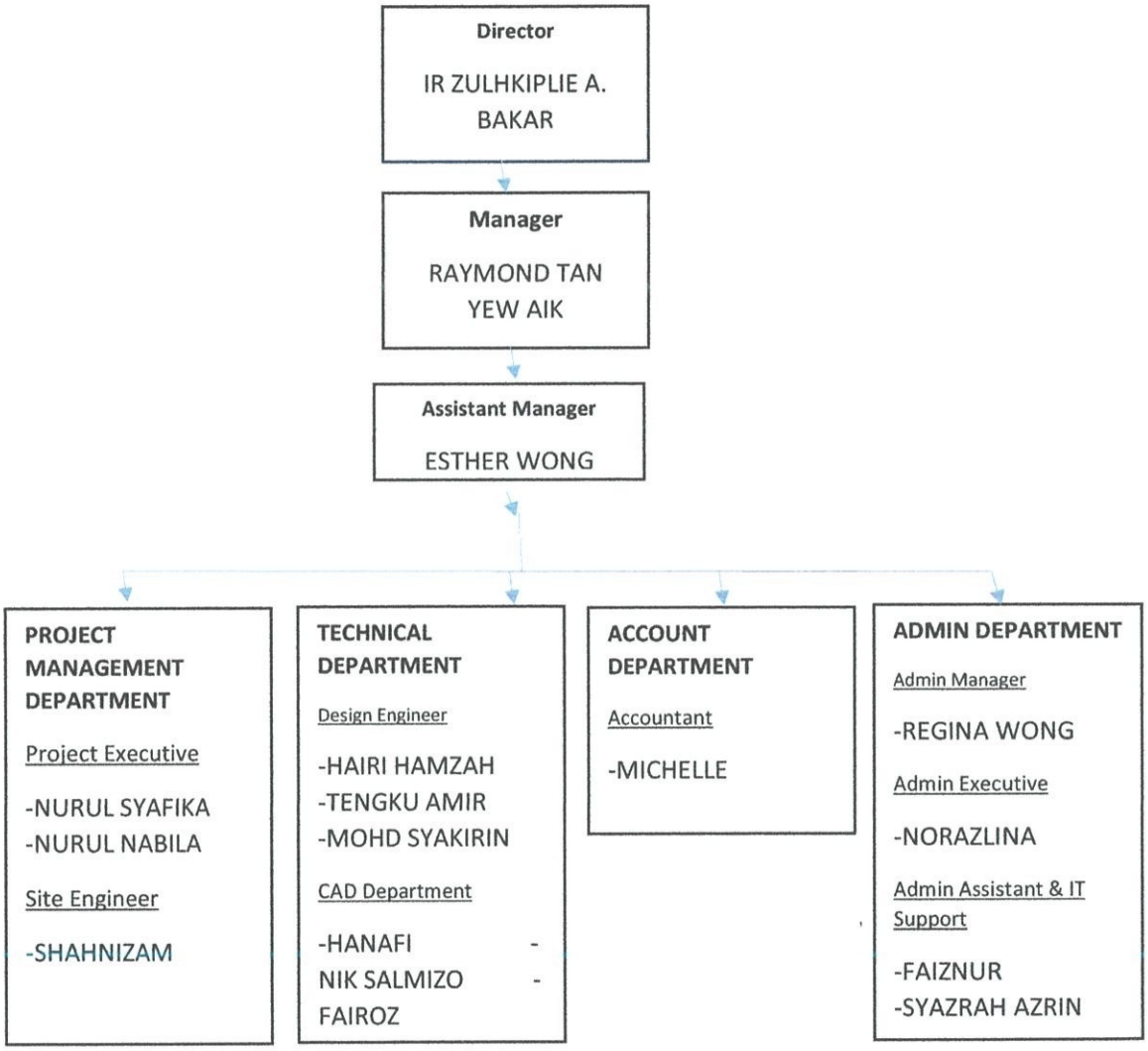


Figure 2.2 : Organization chart

Source: Perunding ZNA (Asia) Company Profile

2.4 List of Project

2.4.1 Completed Projects

1. Bandar Enstek(58+99)

Project Code	: 2009.16B
Client	: TH-NSTC Sdn. Bhd. (Owner TH Properties SB)
Name of Contract	: 58+99U, Terrace Houses, Timur@Estek, Seremban
Date of Contract Start	: 24 February 2010
Date of Completion	: 23 May 2011
Name of Architect	: Arkitek FAA Sdn. Bhd.
Name of QS	: AI Konsult
Name of Contractor	: Sigmal Construction Sdn. Bhd.
Original C&S	: N/A
Contract Sum	: RM 23,249,367.00
Total Cost Saving	: RM 1,301,800.00

Photo 2.1 : Completed project.

2. 107 u KYK Balakong

Project Code	: 2005.08
Client	: KYK Development Sdn. Bhd.
Name of Contract	: 107U, 3/s Terrace Houses, Balakong, Kajang
Date of Contract Start	: 24 November 2010
Date of Completion	: 23 December 2011
Name of Architect	: Clement Wong Architecture
Name of QS	: Ng Kai Seng & Associates
Name of Contractor	: Multi-Builders Sdn. Bhd.
Original C&S	: N/A
Contract Sum	: N/A
Total Cost Saving	: RM 900,000.00 (VE Fees)

Photo 2.2 : Front elevation

3. 134 unit Setia Alam

Project Code	: 2009.25
Client	: PKNS, VEI
Name of Contract	: 134U, Seksyen U13, Setia Alam
Date of Contract Start	: 4 May 2011
Date of Completion	: 21 August 2012
Name of Architect	: Juhari & Hashim Chartered Architects
Name of QS	: MITG Group Sdn. Bhd.
Name of Contractor	: Pembinaan Tegap Tunas Sdn. Bhd.
Original C&S	: N/A
Contract Sum	: RM 27, 347, 962.85
Total Cost Saving	: RM 2,623,493.66

Photo 2.3 : Side view for block A

4. Presint 17 Putrajaya

Project Code	: 2001.31
Client	: Putra Holdings Sdn. Bhd.
Name of Contract	: Precinct 17, Putra Jaya Wilayah Persekutuan.
Date of Contract Start	: 05 November 2008
Date of Completion	: 04 January 2010
Name of Architect	: ArchiPrima Sdn. Bhd
Name of QS	: Jurukur Bahan MajuBina
Name of Contractor	: Sunway Construction Sdn. Bhd.
Original C&S	: Setia Sepakat Perunding
Contract Sum	: RM 20,663,405.15

Photo 2.4 : Main road view

5. The Heaven Ipoh

Project Code	: 201.24
Client	: The Haven Sdn. Bhd
Name of Contract	: The Haven, Ipoh
Date of Contract Start	: 20 October 2010
Date of Completion	: 20 December 2012
Name of Architect	: Wei Yeong Design Sdn. Bhd
Name of QS	: BT Global Management & Consultant Sdn. Bhd
Name of Contractor	: Superboom (PERAK) Sdn. Bhd
Original C&S	: Perunding Css Sdn. Bhd
Contract Sum	: RM 85,815,814.39
Total Cost Saving	: RM 7,100,000.00

Photo 2.5 : Main entrance view of The Heaven.

6. Uitm Seremban

Project Code	: 2011.12
Client	: Johawaki Sdn. Bhd.
Name of Contract	: UITM, Seremban 3.
Date of Contract Start	: 30 November 2010
Date of Completion	: 29 May 2013
Name of Architect	: Arkitek Residen
Name of QS	: Zahirah Ukur Bahan Sdn. Bhd
Name of Contractor	: Johawaki Sdn. Bhd.
Original C&S	: Jurutera Residen
Contract Sum	: RM 303,000,000.00
Total Cost Saving	: RM 53,800,000.00

Photo 2.6 : Front elevation of Administration Office, UITM Seremban.

7. Arkib Negara

Project Code	:2006.45
Client	:Jabatan Kerja Raya Malaysia (JKR)
Name of Contract	:Arkib Negara Malaysia, Jalan Duta
Date of Contract Start	:19 Julai 2007
Date of Completion	:17 June 2009
Name of Architect	:W&W Architects
Name of QS	:MA Quantity Surveyors
Name of Contractor	:Kumpulan AwambinaSdn. Bhd.
Contract Sum	: RM25,936,699.70
Total Cost Saving	:RM 283,409.00 (VE Fees)

Photo 2.7 : Front elevation for Arkib negara.

2.4.2 Project in Progress

Table 2.1 : Project in progress for year 2012

Project code	Name of project	Project amount (RM)
P.2012.01	47u (ENCLAVE II) BANDARAYA IPOH	66,962,295.00
P.2012.02.1	94u DSTH Seloga Phase 2A	27,023,802.80
P.2012.03	16u Seksyen19 Shah Alam (Geostream)	4,425833.07
P.2012.11	164u S&DSTH (Fasa 1 Pakej 4) Pasdec Damansara	17,978,426.40
P.2012.14	233u 27-storey apartment kinrara, Ho Hup	78,754,030.98
P.2012.23	51u Shop Office Balok Perdana (PASDEC)	8,408,888.00
P.2012.26	60u Terrace Houses, Bandar Putra, Kuantan (Pakej 7A6) – PASDEC	13,685,686.66
P.2012.27	58u 2 & 3-Storey Terrace Houses Bandar Putra, Kuantan (Pakej 7A7) - PASDEC	11,404,701.80
P.2012.28	46u of 10u, 17u & 19u Shop Office, Pekan – PASDEC	10,202,100.00
P.2012.29	224u Terrace Houses Chendor Utama Zon 2 (Fasa 2B), Kuantan - PASDEC	27,729,009.00
P.2012.34.01	105u - Pasdec Avenue (Fasa 1) ,Bandar Indera Makhkota, Kuantan - PASDEC	54,713,114.80
P.2012.36	81u, Anjung Hijau Infra	8,856,509.00
P.2012.37	34u, Anjung Hijau Apartment (Pangsapuri), Bandaraya Ipoh – SSI	8,623,606.40
P.2012.38	Taman Bidara Palma	24,660,141.00

Source: Perunding ZNA (Asia) Company Profile

Table 2.2 : Poject in progress in year 2013

Project code	Name of project	Project amount (RM)
P.2013.01	165u (160u) / 158u Bernam Jaya	45,811,984.20
P.2013.11	102u, Bernam Jaya (PKNS)	34,958,451.32
P.2013.26	Apartment in Jalan Talalla for Bina Puri (OPUS)	89,000,000.00

Source: Perunding ZNA (Asia) Company Profile

Table 2.3 : Project progress in year 2014

Project code	Name of project	Project amount (RM)
P.2014.10	71u single & double storey, gebeng, Pasdec	N/A
P.2014.11	25u 2-storey shop office, Fasa 2A Pakej 2, Chendor, Pasdec	N/A
P.2014.12	54u 3-storey terrace houses in Seremban for Three Woods Dev	13,128,427.85
P.2014.17	22u Shop Office, Balok Perdana Zon 2A2 Fasa 4 (B), Pasdec	N/A
P.2014.18	83u Balok Perdana Zon 3A Fasa 7, Pasdec	N/A

Source: Perunding ZNA (Asia) Company Profile

Table 2.4 : Project progress in year 2015

Project code	Name of project	Project amount (RM)
P.2015.01	68u Double Storey House Hulu Kinta for Total Investment	N/A
P.2015.03	23 & half Storey Commercial Centre in Melaka for Empire Wwide	N/A

Source: Perunding ZNA (Asia) Company Profile

CHAPTER 3.0

CASE STUDY

3.1 Introduction of project

The title for these project are, 162 unit double storey house project, that is located at seksyen 8, Kota Puteri, Mukim Rawang, Selangor Darul Ehsan.The amount of these contract are RM40,840.693.00. The duration are 104 weeks (overall) and 35 weeks for a sample house. These are the list of a project team :

Table 3.1 : List of a Project Team

Developer	Perbadanan Kemajuan Negeri Selangor PKNS
Architect	Waw Ali Akitek
Structural engineer	Perunding ZnA (asia)
Mechenical and Electrical Engineer	Perunding KJL Sdn. Bhd
Main contractor	Asal Bina Sdn. Bhd
Qs consultant	Perbadanan Kemajuan Negeri Selangor PKNS

Perunding ZnA Asia involve in structural works. So as a structure consultant we need to inspect all the structural works according to the drawings.

Source: Perunding ZNA (Asia) Company Profile

3.2 Case Study

3.2.1 Roof trusses

Roof trusses is very important in every construction works especially contruction that involes a roofing parts. Roof trusses also known as a roof framing.According to Abi and Jason (2007), there are two main categories of a roof trusses, lightweight and heavy timber roof trusses. The materials use for the trusses will effect the load as we know trusses also a part of a load. There are different types of loads that act on structures:

1. Live Loads – occupants and moveable objects in or on the structure
2. Dead Loads – weight of the building materials and the structure itself
3. Environmental Loads – created by snow, wind, and earthquake (seismic) forces

Sources : www.sbcindustry.com

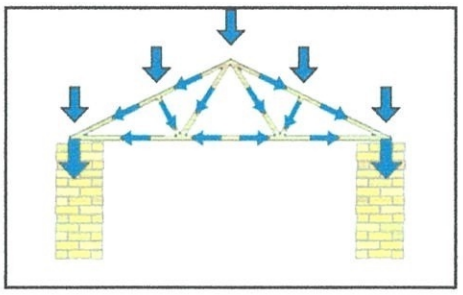


Figure 3.1 : Typical load transfer for trusses

Source: www.sbcindustry.com

The important parts in trusses are struts and tie. Struts are structural components designed to resist longitudinal compression. Ties are slender structural rods, which transfer carrying tensile loads.Struts and ties connect to top and bottom **chords** to create different kinds of trusses.

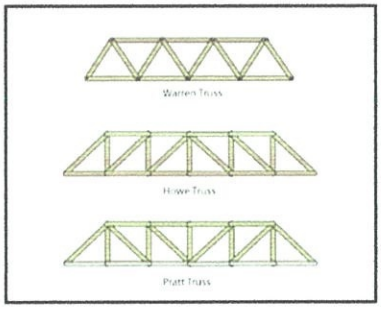


Figure 3.2 : Example of trusses

Sources : www.sbcindustry.com

3.2.1.1 Lightweight steel trusses

Nowadays many construction works prefer lightweight steel trusses compared to heavyweight trusses. Steel trusses are an alternative to the more commonly used wood trusses. Made in a similar manner and installed to the top of the house just as their wooden counterparts, steel trusses are popular in larger buildings because they are more water and fire resistant.

Sources: www.winsteel.com.my

Table 3.2 : Advantages of steel trusses

Steel	Factors
* Cad-like In-house computer software that generate truss * Fast & Flexible and informative * All member are engineered design with 5 load combination check	Design flexibility
* Will not warp, crack, sag * High Tensile G550 steel is 30% stronger than mild steel	Weather duribility

* Strength to weight ratio is greater than other building material * Not easily deformed except will be effected by weather * Steel is dimensionally stable hence it will not cause the truss moving out from It original position, which is the main reason causing roof leaking	
* All components are zinc/aluminium alloy or zinc coated * Tensile Strength is governed by mill certificate * Fabrication & erection done by skilled worker * Precision manufacturing process	Warranty insured
* Up to 10 years manufacturer's warranty on raw material * Zinc acts as sacrificial anode to protect the scratches by scarify itself * Meet standard of AS1397 or JIS G3302 * All Component are Zinc Coated	Anti corrosion
* Easily handle, thus speed up installation * Cost saving on cranage * Low foundation cost * Flexibility on handling	Light and easy handling
* No worry about chemical treatment * Steel is not attractive to termite * Huge saving on maintenance cost	Temites problems
* No waste * All cut-off waste is recycled	Enviromental friendly
WinSteel lightweight steel truss is strong, Straight and true, resistant to deformation	More accuracy
*Longer melting time hence increase safety	Fire resistant

Source : www.winsteel.com.my

3.2.1.2 Materials

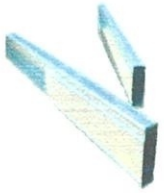
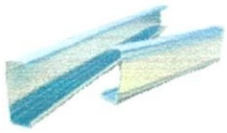
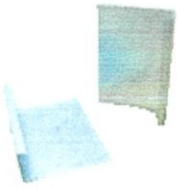
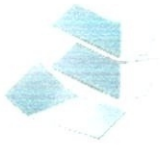
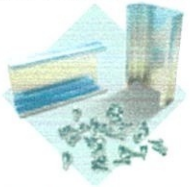
Steel trusses are an alternative to the more commonly used wood trusses. Made in a similar manner and installed to the top of the house just as their wooden counterparts, steel trusses are popular in larger buildings because they are more water- and fire-resistant.

According to James (1994) the following are some general considerations that may effect the decission about what materials to use for a particular truss design.

1. Cost – if the functional requarements are not influential, the choice is likely to be on the basis of the most economical solution
2. Other structural elements – roof deck, columns, walls, and so may have some influence in terms of logical mixing of the components of the building contructions.
3. Fire requirements – the need for a fire rates structure, or simply for use of non-combustible material may be concern.
4. Local availability – local competition of manufacturers or contracors, or the availibility of specific materials or types of a construction work may be factors in the choice of materials or types of truss contruction.

These are some example of the steel trusses part:

Table 3.3 : Example of a materials use for steel trusses

 Top Hat batten 35/40 Typically for all types of roof such as concrete tiles roof, clay tiles or metal roof.	 C 75/90 Channel (box up) Typically used as top and bottom chards as well as for webbing. For added strenght,channel can be box up as shown
 Hip Bracket	 C75/C90 Channel
 L Bracket	 Apex Plate
 Rafter Bracket	 Teks Screw / Knee Plate

Source : www.winsteel.com.my

3.2.2 Roof Tiles

Roof tiles act as a covered for a roof trusses. A good appearence of a roof come from a roof cover. There is a lot of example of a roof cover. One of the example is roof tiles. Concrete roof tile is made of sand, cement, and water. The exact materials vary somewhat with each manufacturer but basically contain Portland cement, blended hydraulic cements and fly ash, sand, and other aggregates. The products from most manufacturers look very similar in size and shapes and colors. There are several manufacturers of concrete tile.

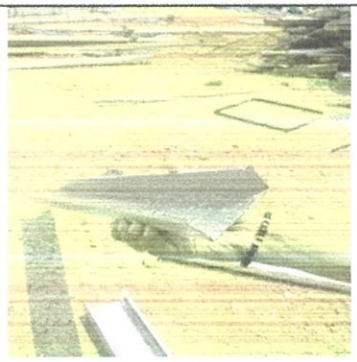
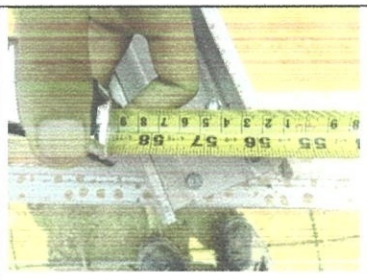
Concrete roof tile has three main appearances based on their profiles:

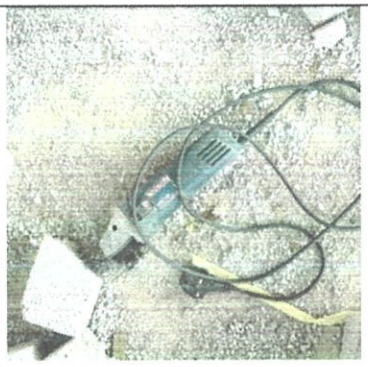
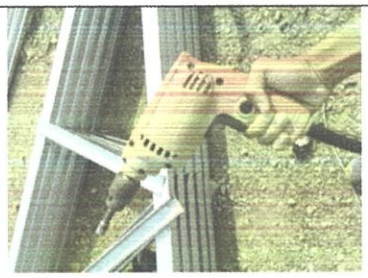
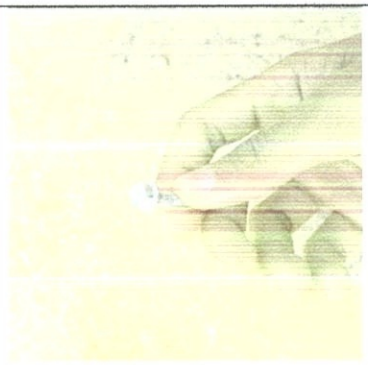
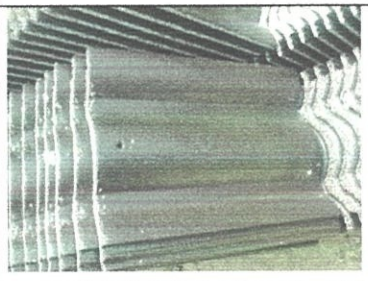
- Flat Profile concrete roof tile is flat - no curves when viewed from its butt.
- Low Profile concrete roofing tile has small curves when viewed from its butt that have a rise to width ratio equal to 1:5 or less.
- High Profile concrete tile has larger curves when viewed from its butt that have a rise to width ratio greater than 1:5. Sources : www.roofkey.com

3.2.3 Materials and tools on site.

This are the materials that had been used in site, kota puteri. They used lightweight steel trusses and monier roof tiles.

Table 3.4: Material and tools

Materials / tools	Photos	Functions
Batten		As a battens.
C-channel		As a web and the trusses.
L-plate		Connect the trusses with the roof beam.
Measuring tape		Measure the parts of trusses

Cutter machine		Cut the materials according to the drawings.
Hand drill		Fasting the screw
Screw		Connect the parts of trusses
Foil paper		Insulation
Roof tiles		Covered the roof trusses.

3.2.3 Manpower and machineries

Manpower and machineries depends on a contructions work, for example, high rises building it might involves many manpower and also machinaries compared to residential house that need a few peoples and one machinaries. Mostly the machinaries use are mobile crane. For our project double storey house, the manpower require are 5 workers.

Photo 3.1 : 2 Workers measured and cutting the c-channel.

Photo 3.2 : 2 Workers connect the c-channel to become a trusses.

Photo 3.3 : Mobile crane use to lift up the trusses.

Photo 3.4 : the same 2 workers connect the trusses to the roof beam.

3.3.5 Method of roof construction

3.3.5.1 Construction flow chart:

This chart will show the sumarry on installing roof trusses.

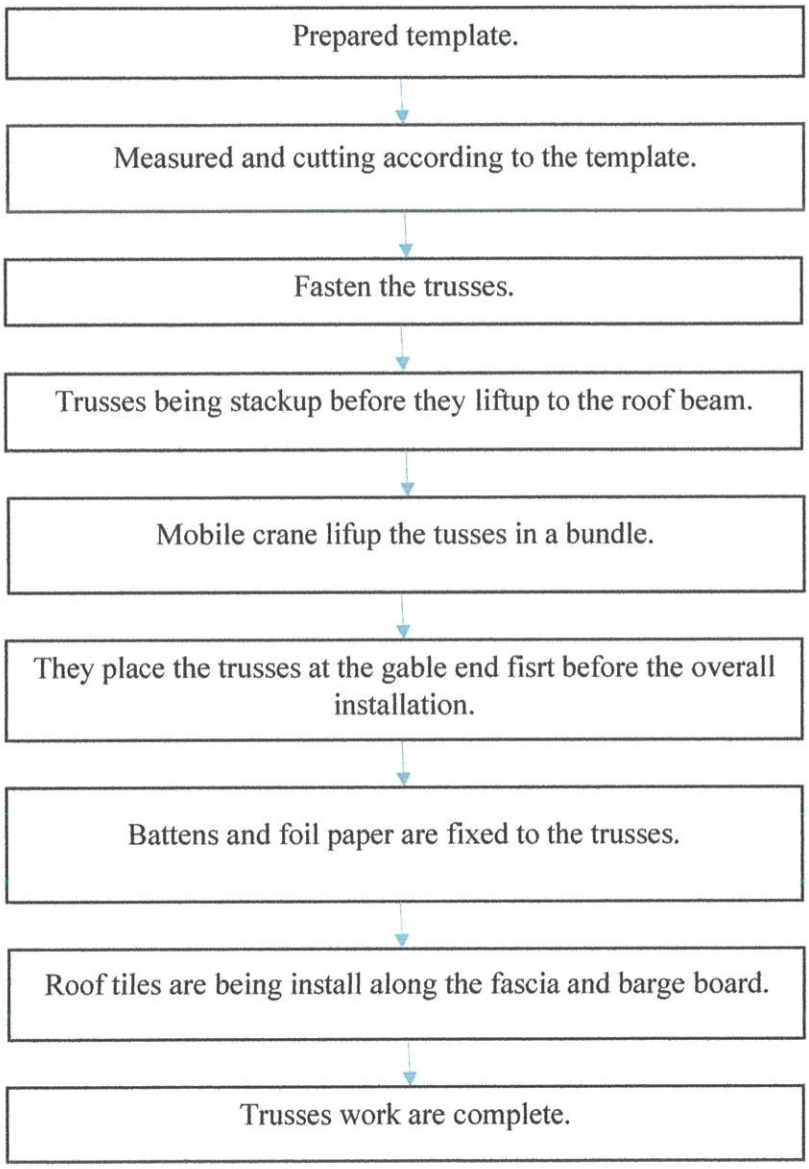


Figure 3.3 : Construction flow chart

Source: Perunding ZNA (Asia) Company

3.3.5.2 Method installation

This method of statement will show the eraction and installation for light weight trusses for double storey house.

1. Creating a truss template. This tamplate will form the basis of similar trusses in the project. This method will ensure that subsequent trusses will have the configuration and slope.

Photo 3.5: Example of a template.

2. Subsequent trusses are being installed over the truss template. Here the installers are arranging the members before fastening them together.

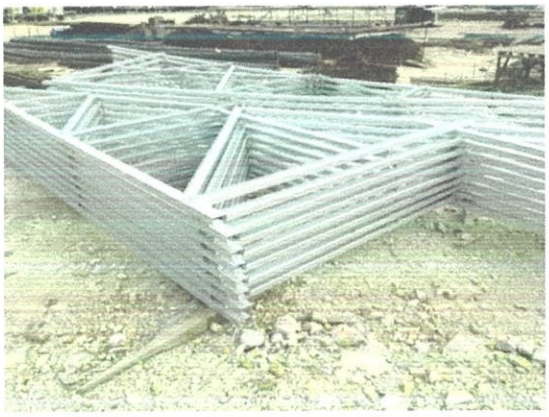


Photo 3.6: Subsequent of trusses.

3. Inverted tools are used to align truss membes.

Photo 3.7: Example of a inverted tools.

4. Installers use a drill gun to fasten the screw at the bottom cord and web members. This work required two skill workers.

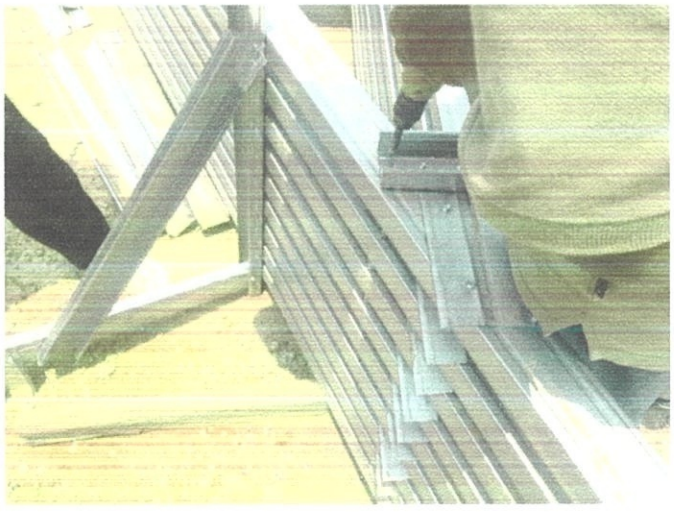


Photo 3.8: Fastening work.

5. Screw are being fastened at the apex joint.

Photo 3.9: Workers fasten the apex joint.

6. Close up of drill gun being used to fasten the web and the bottom cord members.

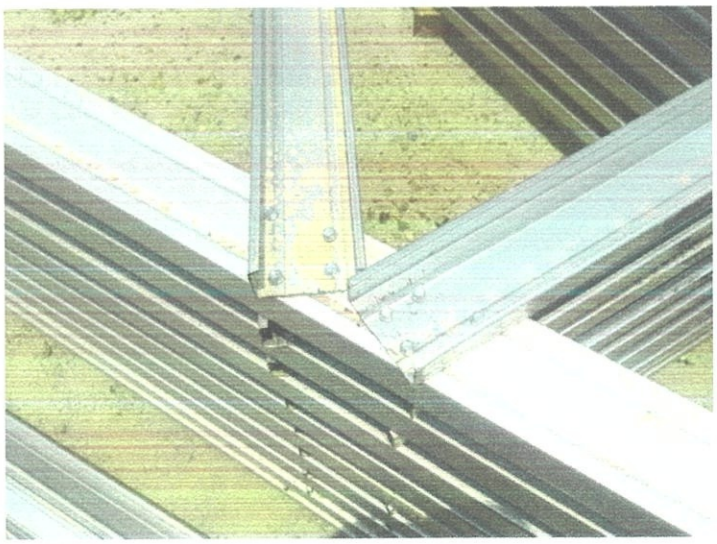


Photo 3.10: The connections

7. If required, web members are being boxed up for added stiffening.

Photo 3.11: Web members if required.

8. Continuing assembly of trusses by stacking over priviously assembled trusses to follow the template outline.

Photo 3.12: Trusses being stack up.

9. After completing the installation of trusses, the trusses are then moved from the template stack and the to the storing area. These trusses are ready to be installed onto roof beams or transported.

10. Hand cutter for cutting members and remove flanges.

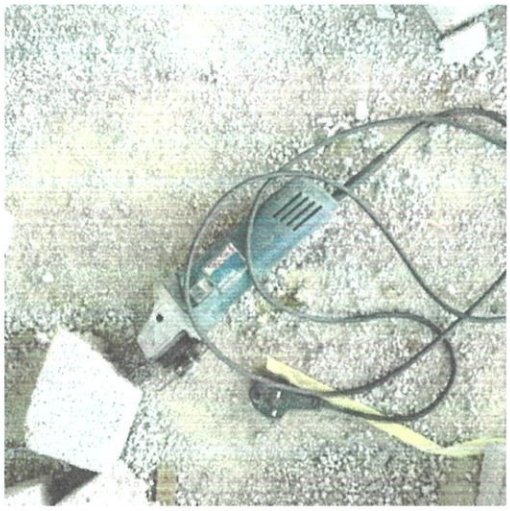


Photo 3.13: Hand cutter

11. Drill gun with torque limiter control to prevent over tightening of fasteners.

Photo 3.14: Hand drill

12. Trusses bundle is being lifted to the top of the roof beam for installation. Signal man is important during lifting up the trussses as connection between the mobile crane and the worker at the roof beam.

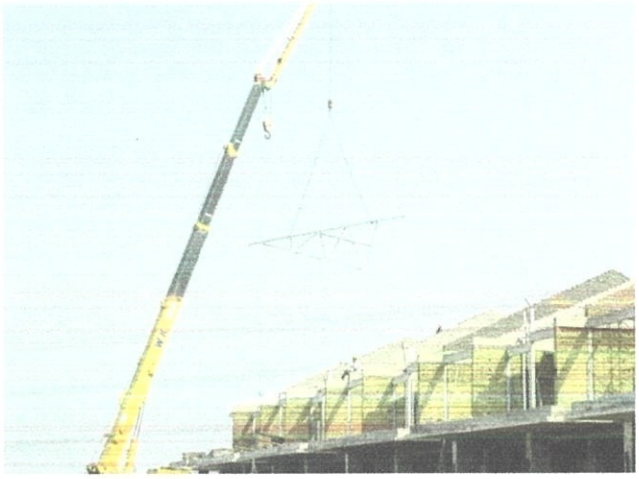


Photo 3.15: Mobile crane liftup trusses.

13. Trusses are being temporary propped to allow installers to fix the trusses supports into place by two workers. This work required two skill workers.

Photo 3.16: Workers allign the trusses.

14. Trusses are being installed at the gable end first and worked towards to the other gable end.

Photo 3.17: Trusses being arranged.

15. L-bracket are installed to the beam and trusses are fixed to the L-bracket using self tapping fastener according to the drawings.

Photo 3.18: L- barcket

16. All trusses are braced according to the specification.
17. Battens and the foil paper are fixed to the trusses and spacing for the fixing of the battens shall be accordance to the tiles manufacturer specifications.

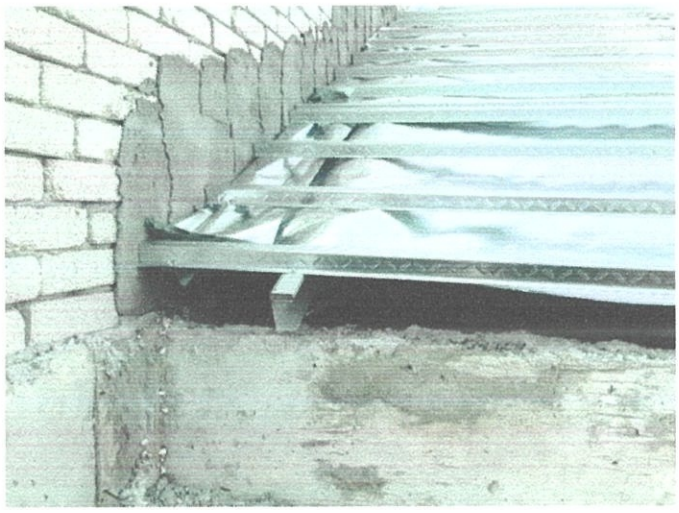


Photo 3.19: Battens and foil paper.

18. At the same time, fascia and barge board are installed by using screw at the trusses.

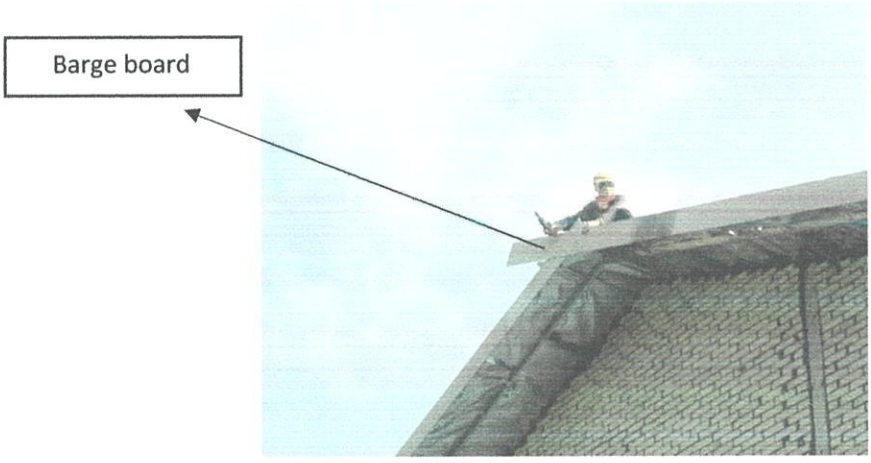


Photo 3.20: Worker install the barge board.

19. Valley battens are fixed to the trusses and the spacing of the valley battens need to be in accordance with the gutter details. If is the responsibility of the installer to check the dimension of the gutter for that particullar project and installed the valley battens accordingly.
20. Concrete tiles to be laid down to the trusses correctly.

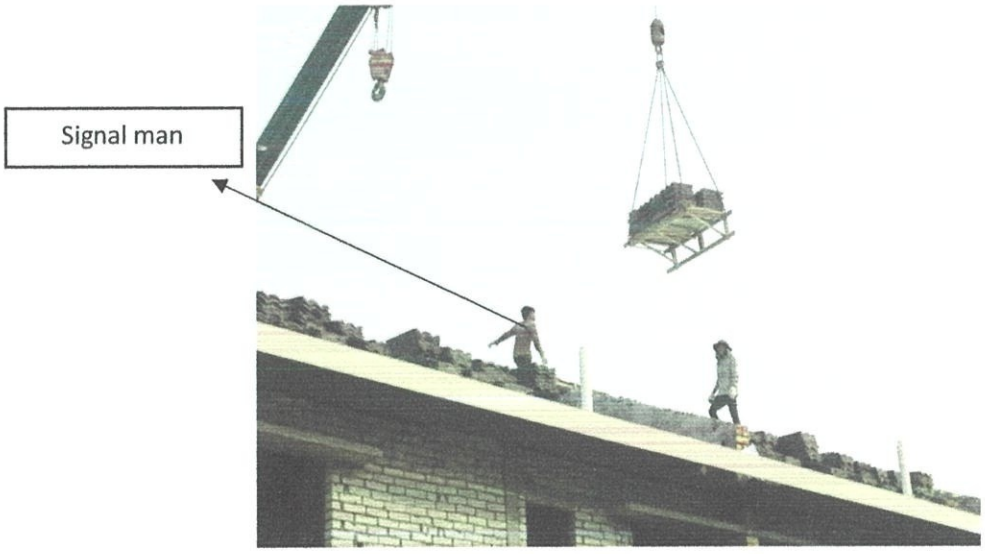


Photo 3.21: Roof tiles are being liftup.

21. Workers should no stack up to many tiles to the trusses as it only destroy the trusses.

Photo 3.22: Roof tiles before the installation.

22. All the tiles laid to the trusses correctly by two workers. This work required two skill workers.

Photo 3.23: Workers install the roof tiles.

23. Air conducting/services load was added correctly with design requirements.

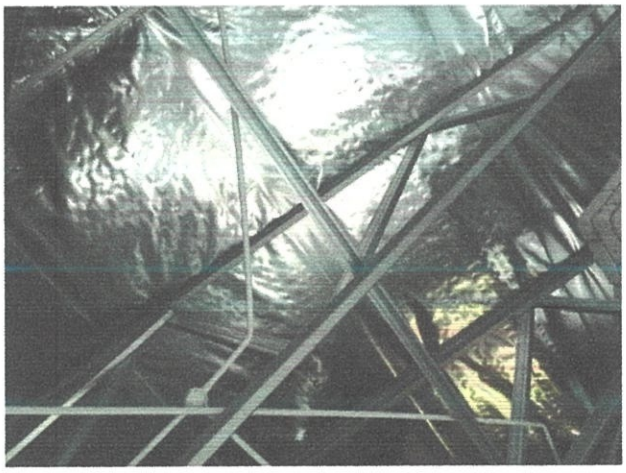


Photo 3.24: The services piping below the trusses.

24. Trusses work complete.

Photo 3.25: Trusses are fully installed.

3.2.4 Safety precautions during works.

Accidents, especially falling can occur anywhere, including in installation of a roof trusses. As we know risk can bring to the hazard and hazard lead us to the danger. So accidents might happen.

For example at Kota Puteri site, workers did not care a about the safety during installation of a roof tiles or trusses. This photo shows, workers without any harnest or other safety tools except for the safety helmets.

All accident can be reduce by following the regulations that have been set up by the Department of ocupational safety and health. These are the example from Sources: www.osha.gov

1. Bracket scaffold – A bracket scaffold can be placed on the interior or exterior of a structure. The scaffold can provide a stable working platform. When bracket scaffolds are used on the interior of the structure, the exterior wall can limit employee exposures to fall hazards.

Figure 3.3: A worker installing roof trusses from an interior bracket scaffold.

Sources: www.osha.gov

Exterior bracket scaffolds can also be used for installing roof trusses and other rooftop construction works. The guardrail system on the scaffold can provide fall protection. With the addition of toeboards, falling object protection can be provided to the areas below.

Figure 3.4: Workers using an exterior bracket scaffold to install roof trusses.

Sources: www.osha.gov

Photo 3.26: Roof installations without any safety.

2. Ladders - Platform ladders and step ladders can provide a stable, elevated platform from which to work.

Figure 3.5: Platform ladders can be set up inside a structure and used to install roof trusses.

Sources: www.osha.gov

Photo 2.27 : No ladders use.

3. Safety net system - Safety net systems can be used as fall protection for workers installing roof sheathing.

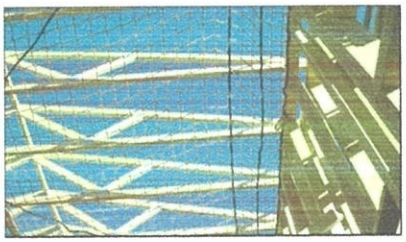


Figure 3.7: An example of a safety net system.

Sources: www.osha.gov

Photo 3.28 : No net system use.

Using all this method, accidents during installation works can be reduce. Workers also can do they work in good condition.

CHAPTER 4.0

CONCLUSION

4.1 CONCLUSION

In conclusion,a well constructed roof trusses is important in every contruction as a trusses is the main attraction for a building. Thus, roof trusses give an impact for a asthetic value and also give a proctection for a building.

While achieving the objective for this study, it give an oppurtunity to understand the method on how lightweight trusses is being install and also a numbers of manpower and machineries needed to completing the installation. Furthermore, learn the advantages on using lightweight trusses for a roof construction as it fasten the overall works. Moreover, I also get to know the safety way wheninstalling the trusses as it is really important when involve the workers life.

Safety during works also is vital as it is involve the workers life. By guidence from OSHA, accidents can be reduce.

Lastly, lightweight trusses for a roof construction and the guidence for a workers to install the roof construction works need to be done parallely. By this a good roof construction can be build and also accidents can be reduce.

REFERENCES

Books :

Abi, A. & Jason, V. (2007). Suctrural Wood Design: A Practice-Oriented Approach, John Wiley & Sons, 2007. New York.

B.C. Punmia. (1984). Building Constructions.Laxmi Publications (P) LTD. New Delhi.

James, A. (1994). Design of Building Trusses. John Wiley & Sons, 2007. United State of America.

Web Site :

Load Trusses design. (n.d). Available from: https://www.sbcindustry.com/content/3/loads-truss-design.

Lightweight steel truss. (2013). Available from: http://www.winsteel.com.my/Lightweight-Steel-truss.aspx.

Osha guidline. (n.d). Available from: https://www.osha.gov/doc/guidance.html

Concrete Roof Tiles. (n.d). Available from: https://www.rofkey.com/rooftiles

Layout plan

Based on the 162 unit double storey house at Kota Puteri.

Trusses details

Based on trusses report that had been prepared by the trusses sub contractor (Prima Wahyu Sdn. Bhd). these are the example of the truss and rafter plan layout.