DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

DECEMBER 2019

It is recommended that the report of this practical training provided

by

MUHAMMAD IZWAN IZZUDDIN BIN HAMIDIN

2017207084

entitled

Superstructure Work Industrial Building System (IBS)

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

Report Supervisor	:	Dr. Ida Nianti Bin Mohd Zin
Practical Training Coordinator	:	En. Muhammad Naim Bin Mahyuddin.
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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 ZSME PERUNDING Sdn Bhd for a duration of 20 weeks starting from 5 August 2019 and ended on 20 December 2019. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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UiTM ID No :2017207084

Date :13 December 2019

ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah, the most merciful, the most graceful.

I would like to extend heartfelt gratitude for the guidance, advice and help rendered throughout the period of training by the following amazing individuals. First of all, I would like to thank to En. Mohd Shahrul Nizam bin Marzuki for the opportunity given, to conduct my training in his esteem department. His team of professionals comprising of PN. Nur Bayu binti Mohammad Yusoff as the clerk of work architect, also En. Razdan bin Awang as the clerk of work consultant and En. Bakhtiar Djamily bin Ahmad as the inspector of work (M&E). Also all the officer in Building Control Department, have enabled me to learn and develop my understanding, building and civil works. They also responsible towards streamlining and assessing my training. Also to the site personnel in both Rameli Said Architect, Mega Runding Consult Sdn.Bhd,, ZSME Perunding Sdn. Bhd, IM Jurukur Bahan who has extended their cooperation and help to further enhance my ability in understanding the procedures in construction and site administration, test procedures, site safety and best practices in the industry. It is an honour for me to be given the opportunity to work with all of you.

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 are directly involved during my training stint. Thank you to Dr. Ida Nianti binti Mohd Zain, Supervising Lecturer for the guidance that given during the training. Also thank you to En. Muhammad Naim bin Mahyuddin as the Practical Training Coordinator and thank you to EN. Dzulkarnain our Programme Coordinator. 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 semester.

Last but not least, my special thanks to my beloved parents for their support during the training.

Thank you so much.

ABSTRACT

Superstructure is an upward extension of an existing structure above a baseline. This term is applied to various kind of physical structures such as buildings, bridges and others. This report will discuss about the superstructure for 2 storey building as a report for BGN310. This report was conducted for 2 storey school building at Kemaman Terengganu. The objective of this report is to identify the method to construct the superstructure including type of column, beam, slab and lightweight block also the material that has been used, and machineries. Then, to determine the problems occurred and solution take to solve the problems at site. Cooperation and a good deals between contractor and Industrial Building System supplier is the key factor to make sure the project progress going smoothly and the supplier can deliver the IBS product as soon as possible.

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CHAPTER 1.0

INTRODUCTION

1.1 Background And Scope Of Study

The upward artificially built part of a structure which is construct above the ground level is called superstructure. The superstructure is the portion of a building which is serves the purpose of structure intended use. It is includes the columns, beams slab upwards including all finishes, door and window schedules, flooring, roofing, lintels and parapets. There are different between superstructure and substructure, for the superstructure it serves the purpose of building intended use and substructure transfer load receive from superstructure to supporting soil. Superstructure can be observed by many element of building construction, for example column, beam and slab.

A column or pillar in architecture and structural engineering is a structural element that transmits, through compression, the weight of the structure above to other structural below. In other words, a column is a compression member. The term column applies especially to large round support with a capital and a base which is made of stone, or appearing to be so. A small wooden or metal support is typically called a post, and supports with a rectangular or other non-round section are usually called piers. For the purpose of wind and earthquake engineering, column may be designed to resist lateral forces. Other compression members are often termed "column" because of the similar stress conditions. Column are frequently used to support beams or arches on which the upper parts of wall or ceiling rest. In architecture, "column" refers to such structural element that also has certain proportional and decorative features. A column might also be a decorative element not needed for structural purposes.

A beam is a structural element that primarily resist loads applied laterally to the beam's axis. Its mode of deflection is primarily by bending. The loads applied to the beam result in reaction forces at the beam's support points. The total effect of all the forces acting on the beam is to produce shear forces and bending moment within the beam, that in turn induce internal stresses, strain and deflection of the beam. Beams are characterized by their manner of support, shape of

cross section, length, and their material. Beams are traditionally descriptions of building or civil engineering structural elements, but any structures such as automotive automobile frames, aircraft components, machine frames, and other mechanical or structural systems contain beam structures that are designed to carry lateral loads are analysed in a similar fashion.

A concrete slab is a common structural element of modern buildings, consisting of a flat, horizontal surface made of cast concrete. Steel reinforced slabs, typically between 100 and 500 mm thick, are most often used to construct floors and ceilings, while thinner mud slabs may be used for exterior paving. In many domestic and industrial buildings, a thick concrete slab supported on foundations or directly on the subsoil, is used to construct the ground floor. These slab are generally classified as ground bearing or suspended.

For this project, Industrial Building System (IBS) product has been chosen. IBS is a building element that has been produced at the factory and be send to the construction site for installation such as column, beam and hollow core slab. There are a lot of advantages of using IBS, First of all we can achieve high quality and good acceptance which is the IBS product can control environment in factory, better material selection and using high mechanized technology. Then, we can reducing on-site workers significantly reducing labour cost for contractor. Also we can make the faster completion of projects due to advance off site preparation and simplified installation process. IBS is a product to make sure that all the construction can go through easily and achieve to complete the project in time that has been set.

This study will be focusing on the installation of precast concrete column, precast concrete beam, precast concrete hollow core slab and lightweight block for SMK Permai, Desa Salehah, Kemaman, Terengganu.

1.2 Objective

1.2.1 To determine the method of construction for superstructure work

1.2.2 To determine the problems occurred and solution taken to solve the problems site

1.3 METHOD OF STUDY

1.3.1 Observation

- Firstly, observed the progress of the construction and installation of IBS product everyday which is how they lift the column, beam and hollow core slab using the mobile crane and learn how grouting process for IBS product.
- The observed and collect the data of the IBS product that arrived at construction site and determine the number of IBS product needed on each floor. While collecting data, monitor the product that crack before lifting from trailer to construction site and recorded by writing and taking picture of crack product.

1.3.2 Interview

- Second, interview the project supervisor of the site regarding the topic Industrial Building System product by preparing question and spontaneous communication based on the topic selected. The interview were carried out about 30 minutes while visiting site and watch how the IBS installation were proceed

1.3.3 Document Reviews

- Lastly, for the document review by referred the structure and architecture drawing as detail. List the detail of IBS product in a document and recorded the price. Write site diary everyday based on activity in construction site and list workers in site.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 INTRODUCTION OF COMPANY

ZSME PERUNDING SDN. BHD.

ZSME PERUNDING SDN. BHD. is an engineering consulting company that was set up on September 6, 2007 with 100% bumiputera equity. A visionary company to contribute towards the dynamic development of the Malaysian economy. Our company provides professional consulting services covering the areas of mechanical and electrical engineering consulting and project management.

The scope of services we provide are project implementation and planning, technical specification, project management, testing and installation completion. Also we provide engineering services by designing and providing technical drawings to authorities on systems, such as automatic building control systems, fire protection systems, ventilation and air conditioning, water and sanitary plumbing and etc.

ZSME Perunding Sdn. Bhd. head office located at P3-7 Taman Desa MPKT, Jalan Kubang Ikan 21080 Chendering, Kuala Terengganu, Terengganu Darul Iman. Then the Perak Branch is located at No 153, Taman Fasa 2B Sri Manjung, Perak Darul Ridzuan.

Managing director of ZSME Perunding Sdn. Bhd. Mr. Zahram Bin Salleh, has education in Barchelor of Science in Electrical Engineering (BSEE) University Technology Mara Kuala Lumpur, Diploma in Electrical Instrumentation Engineering University Technology Mara Shah Alam and registered with BEM & IEM as professional engineer.

2.1 COMPANY'S PROFILE

Table 2.1 Company Profile

Nama syarikat	**: ZSME Perunding Sdn. Bhd.**
N0. Pendaftaran Syarikat	:787598-X
Tarikh Penubuhan	:6 September 2017
Saham	: RM 100,000.00
Wakil Syarikat	: Ir. Zahram bin Saleh
N0 telefon bimbit	:
N0 Telefon Pejabat	:
Email	:zsmeperunding@yahoo.com.my :zsmeperunding@gmail.com
Sekretari Syarikat	:Imbasan Nilai Sdn. Bhd. K-9643, Tingkat 1 Taman Chukai Utama, Jalan Kubang Kurus 24000 Kemaman, Terengganu

2.3 ORGANIZATION CHART

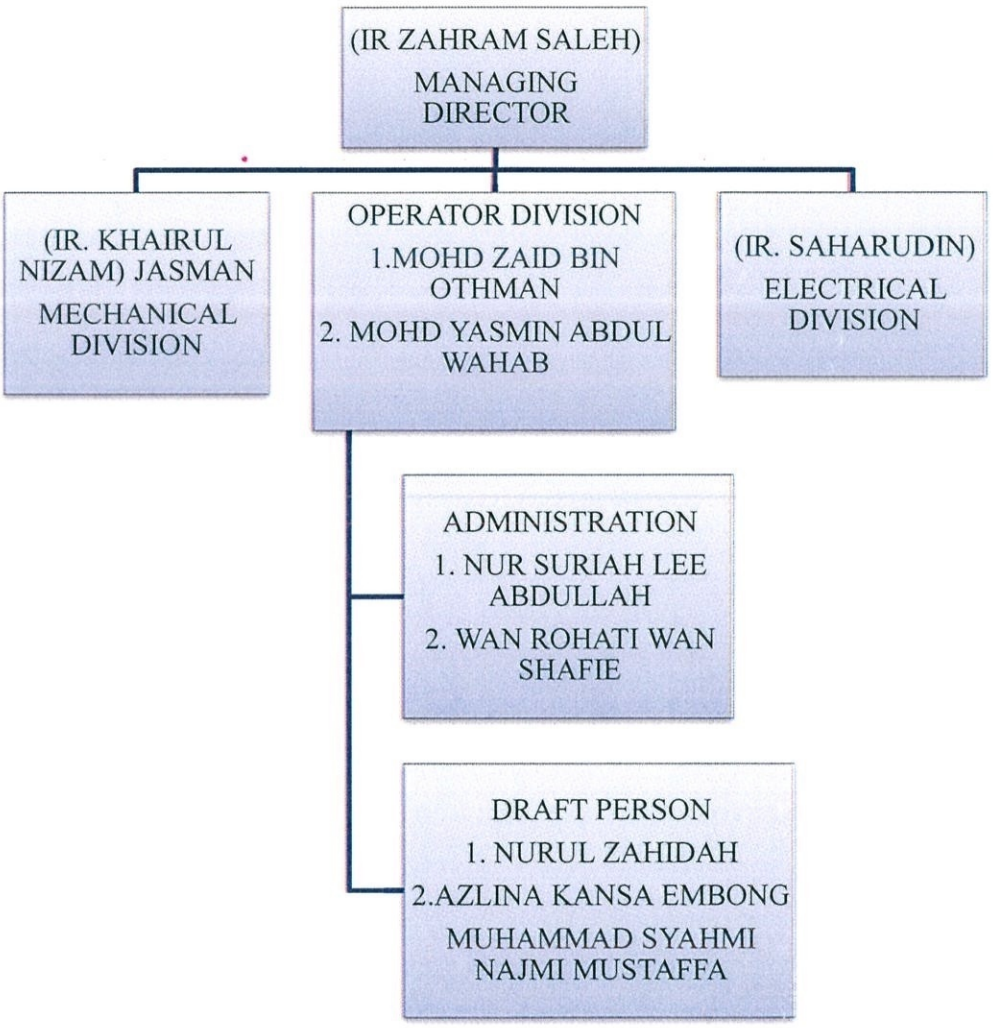

Figure 2.1 Organization Chart

2.4 LIST OF PROJECT

2.4.1 Completed Project

Table 2.2 Completed Project

NO	MAKLUMAT PROJEK	PROJEK	PEMAJU	NILAI PROJEK	STATUS
1.	Cadangan Pembinaan Pejabat dan Warehouse di KSB Kemaman, Terengganu	Bangunan baru	Mushtari Engineering	0.5 Juta	Completed
2.	Cadangan Pembinaan Kilang Lynas di Gebeng Kuantan	Bangunan baru	Lynas Advanced Material Project	200 Juta	Completed
3.	Cadangan Membina Dan Menyiapkan Sebuah Bangunan Pencawang 33kv Di Atas Lot 2329, Mukim Sungai Udang Daerah Melaka Tengah, Melaka Untuk Tetuan Petronas Gas Berhad.	Bangunan baru	Petronas Cari Gali		Completed
4.	Cadangan Pembinaan Bangunan Asrama Desa Taqwa	Bangunan baru	Persatuan Bekas Pegawai Perkhidmatan Pendidikan Terengganu	9 Juta	Completed
5.	Cadangan Pengubahsuaian Bangunan Sejarah Terengganu	Pengubahsuaian Bangunan	Bangunan Sejarah Malaysia Cawangan Terengganu	0.5 Juta	Completed
6.	Cadangan Pembinaan Warehouse di PT13853 di Chukai Kemaman.	Bangunan baru	ANZ Engineering Services Sdn.Bhd	2.5 Juta	Completed

2.4.2 On Going Project

Table 2.3 On Going Project

NO.	MAKLUMAT PROJEK	PROJEK	PEMAJU	NILAI PROJEK	STATUS
1	Pembinaan Sekolah Baharu 30 Bilik Darjah & lain-lain Kemudahan di SMK Permai, Kemaman, Terengganu.	Bangunan Baharu	Kementerian Pendidikan Malaysia	48 Juta	50%
2	Pemasangan MSB untuk Rumah Pam Batu Pahat Perlis	Upgrading of Supply	JKR Perlis	0.1 Juta	50%
3	Pendawaian Elektrik PLKN Kem Timah Tasoh, Perlis	Upgrading of Supply	Perlis Holding	0.1 Juta	50%

CHAPTER 3.0

3.0 SUPERSTRUCTURE IBS

3.1 Introduction to Superstructure IBS

The construction of Sekolah Menengah Kebangsaan Permai, Kemaman Terengganu was commence since 27 December 2017 and the contract term is 96 weeks, which is 672 days. The project's completion date is October 30, 2019. Since there is a problem during the project, the project's completion date is February 27, 2020. The project's completion time is 643/792 days which is 81.19%. The actual cost to completed the project is RM 38,732,409.23. This project was implemented through design and builds concept, where the appointed contractor was responsible for the design and construction of the project. It is consist of the construction for school block of 2 storey building. The site is nearby the road and surrounded by the jungle and river at the backside of the site. In surface, this report is focusing on the superstructure work. The topic has been choose in Industrial Building System (IBS). On the first topic it will describe about the meaning of superstructure work of IBS. This project are choosing IBS product because it is suitable for this construction and IBS product has their own advantages that can help construction go through wisely without having so many problems.

Figure 3.1 Site Signboard

Figure 3.2 Construction Area

Figure 3.3 Overall Site View

3.2 METHOD INSTALLATION FOR IBS PRODUCT

This section will be discussed on the method of the installation of Superstructure IBS. This will cover the installation of precast concrete column, precast concrete beam and precast concrete hollow core slab.

3.2.1 PRECAST COLUMN

Figure 3.4 Precast Concrete Column

All precast columns was designed as rigid connection between beams to form the moment frame for stability purpose. All jointing between precast column to precast column and foundation was be grouted sleeve connections, which is by method of grouting bars projecting from the lower column or foundation into corrugated sleeves cast in precast column

Pitching of precast column is hoisting at the lifting hook provided at the top of column. Precast column was guided carefully by slotting the sleeves into protruding bars from the foundation or lower columns. Columns was held vertically during construction by push-pull props rigidly secured to the precast column to a sufficiently strong stable kentledge concrete blocks, beam or slabs. After the precast column have been surveyed and aligned the corrugated sleeve shall be grouted. Before the grout has gained sufficient strength, the props was not able being disturb or removed. For column to column connection, the column / beam junction was fixed with column's stirrups prior to concreting the insitu portion of column at beam junction.

Flow of installation precast concrete column:

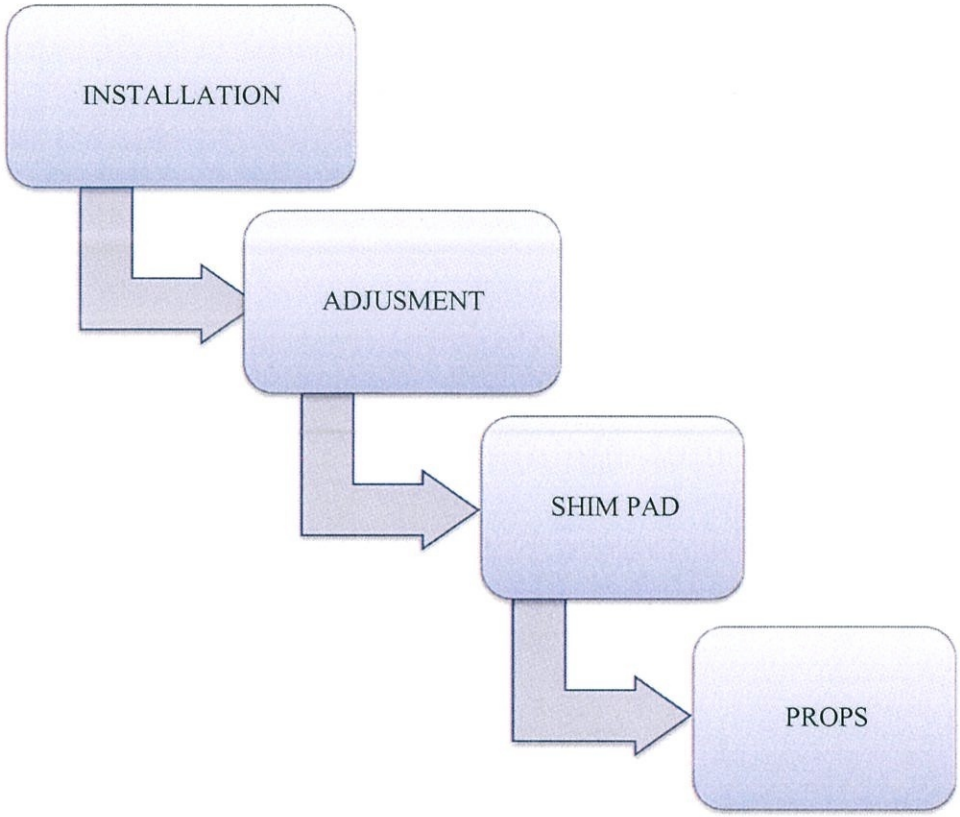

Figure 3.5 Flow of Installation Column

3.2.1.1 INSTALLATION OF PRECAST CONCRETE COLUMN

Figure 3.6 Installation precast column

a) Put the column on the starter bar available on the site and adjust accordingly.
b) Make sure that starter bar enter into the column hole
c) Make sure column positioning in setting out area
d) Lifting column using mobile crane 20 tan

3.2.1.2 ADJUSTMENT OF COLUMN CONDITION

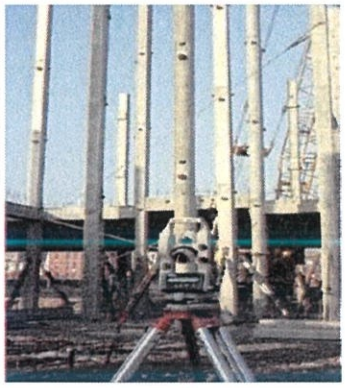

Figure 3.7 Setting out for precast column

a) Measure column adjustments installed so that the positions between the column are in the same position
b) Setting out the level of slab are same to make sure the column straight.

3.2.1.3 SHIM PADS

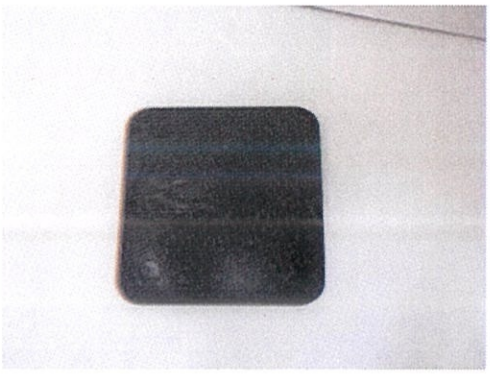

Figure 3.8 Shim pad

a) Use the shim pad in case of height differences between the columns, layer the bottom of the column using the shim pad
b) Cut the shim pad accordingly needed

3.2.1.4 PROPS

Figure 3.9 Props attach to the column

a) Attach the prop to the column for the purpose of holding and getting the straightness in the column
b) Grouting process to the column proceed after column adjustment. Grouting purpose is to fixed the column and the starter bar at the floor

3.2.2 PRECAST BEAM

Figure 3.10 Precast Concrete Beam

Precast beam was hoisted with chain of sufficient capacity to minimize handling damage. Also, precast beam was supported on column's corbel/nibs or connector are unpropped during installation hollow core slab. Negative reinforcement which is placed at the precast beam top was be rigidly tied to protruding stirrups from top of precast half beam. Subsequently, the infill concrete to the beam top and compacted to the level or to the top surface of hollow core slabs

Material that used for precast concrete beam is concrete grade provided by approved ready mix supplier of precast reinforced beams not be less than grade 40. Concrete grade provided by approved ready mix supplier of infill concrete on precast beam top shall be not less than grade 40. Reinforcement installation to comply with item 2.

3.2.2.1 INSTALLATION PRECAST CONCRETE BEAM

Figure 3.11 Installation Precast Beam

a) Install beam after grouting column achieve the setting time
b) Grouting the beam when in position to tied beam with the column
c) Lifting precast concrete beam using mobile crane 20 tan

3.2.3 HOLLOW CORE SLAB

Figure 3.12 Precast Concrete Hollow Core Slab

A hollow core slab, also known as a voided slab, hollow core plank or simply a concrete plank is a precast slab of pre-stressed concrete typically used in the construction of floors in multi-story apartment buildings. The precast concrete slab has tubular voids extending the full length of the slab, typically with a diameter equal to the 2/3-3/4 the thickness of the slab. This makes the slab much lighter than a massive solid concrete floor slab of equal thickness or strength. The reduced weight also lowers material and transportation costs. The slabs are typically 120 cm wide with standard thicknesses normally between 15 cm and 50 cm. Reinforcing steel wire rope provides bending resistance.

3.2.3.1 INSTALLATION PRECAST CONCRETE HOLLOW CORE SLAB

Figure 3.13 Lifting Hollow Core Slab

a) Lifting the slab using the lifting beam that provide by the supplier.
b) Lift the slab from lorry and install on the beam and fixed with the beam starter bar
c) Lift the hollow core slab using crane 25 tone

3.2 PROBLEMS OCCURRED AND SOLUTION TAKEN TO SOLVE THE PROBLEMS

This project is a delay project from the due date, it is because:

1) **Lack of Workers**

Problem:

- There we not many workers at this construction site because of contractor could not find numbers of workers that has request from KEMENTERIAN PELAJARAN MALAYSIA (KPM) which is their minimum request are 100 workers per-day. Lack of workers can cause the project going slow and the progress of the project is disappointed.

Solution:

- The contractor must find out the way to find more workers no matter foreign or local workers until capacity of workers reach (KPM) request.
- Hire more local workers to speed up construction progress
- Make sure all workers do their works very well everyday without wasting time

2) **Weather Condition**

Problem:

- Weather condition is a thing that we can't control, sometimes we are having the bad weather which is heavy rain and sometimes its sunny day.

Solution :

- When facing the bad weather we only do the interior work such as plastering, repairing honey comb and do the lightweight installation. This work is safe to proceed and didn't harm the workers because we care about their safety.

3) **Delay of industrial building system (IBS) product**

Problem:

- Sometimes we are having the problem because of delay of (IBS) product arrived at the site. This can cause the progress of the project is being slow and the workers of (IBS) installation only do nothing. Also, this can wasting time of workers at the site construction

Solution:

- A deep investigation has been done and the contractor has having the meeting with the (IBS) Officer and they promise that they wont delay their delivery after this. Delay is because of so many request for (IBS) product so they can't delivery product on time

CHAPTER 4.0

CONCLUSION

4.1 CONCLUSION

In nutmeg, Industrial Building System is a part of the superstructure work in construction. Industrial Building System should be seen as an innovative improvement in the construction industry. In construction, this innovation agenda has been promoted worldwide and it is imperative that IBS is seen as an evolution of the construction.

From this study, we can learn that how is the actual method of installation for IBS product by following the instruct that given by supplier. For IBS product, there are different method installation between precast column, precast beam and hollow core slab.

Then, using the IBS product for the superstructure work can cut the cost and time for the project to be construct because its has the easier and faster way than construct superstructure with insitu work.

Lastly, learn how to solve the problem on site which is the problem that can slow the project progress. All of the problem on site must be settle down quickly.

In conclusion, using the IBS product in construction give a lot of advantage and suitable for modern type of buildings.

REFFERENCES

https://www.google.com/search?q=precast+column&rlz=1C1AVFB_enMY752MY752&oq=PRECAST&aqs=chrome.2.69i57j0j69i59j0l5.4608j0j9&sourceid=chrome&ie=UTF-8

https://www.google.com/search?q=precast+beam&rlz=1C1AVFB_enMY752MY752&oq=PRECAST+BE&aqs=chrome.0.0j69i57j0l6.7419j0j9&sourceid=chrome&ie=UTF-8