



UNIVERSITI  
TEKNOLOGI  
MARA

**DEPARTMENT OF BUILDING**  
**FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING**  
**UNIVERSITI TEKNOLOGI MARA**  
**(PERAK)**

**SEPTEMBER 2014**

It is recommended that the report of this practical training provided

**By**

**Mohamad Muharjir Bin Zakaria**

**2012677248**

**entitled**

**MATERIAL WASTAGE AT CONSTRUCTION SITE**

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

Report Supervisor

Dr. Mohd Rofdzi Bin Abdullah

Practical Training Coordinator:

Pn.Wan Noordiana Binti Wan Ali

Faculty Coordinator

Dr. Mohd Rofdzi Bin Abdullah

**DEPARTMENT OF BUILDING**  
**FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING**  
**UNIVERSITI TEKNOLOGI MARA**  
**(PERAK)**

**SEPTEMBER 2014**

**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 Anjung Tulus Group Holding Sdn Bhd for duration of 5 months starting from 12 May and ended 29 September 2014. It is submitted as one of the prerequisite requirements of DBN307 and accepted as a partial fulfilment of the requirement for obtaining the Diploma in Building.

Name : Mohamad Muharjir Bin Zakaria

UiTM ID No : 2012677248

Date : 29<sup>th</sup> September 2014

## ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful. I am using this opportunity to express my gratitude to everyone who supported me .Alhamdulillah, all praises to Allah for the strengths and His blessing in completing this report exactly within given time. First and foremost, special appreciation goes to my supervisor, Dr. Mohd Rofdzi Abdullah who had taken a lot of efforts to meticulously go through my report and came out with helpful suggestion. . I am thankful for their aspiring guidance, invaluable constructive criticism and friendly advice during the project work.

Secondly,I express my warm thanks to Mr. Mohammad Azam Khairee Bin Mohd Anuar as my site supervisor and Ms. Wan Azura Binti Wan As'ari as a manager in Purchases Department for their support and guidance at ANJUNG TULUS GROUP HOLDINGS SDN. BHD.

Besides, I would also like to thank to Mr. Zurawade Bin Mat Yusoff from the Marketing Department our company and Ms. Rozilawati Binti Muhammad and all the people who provided me with the facilities being required.He didn't bother answer my each question when I am ask for problem or detailing on construction even he busy with his work. My acknowledgement also goes to all the officer and office staffs of ANJUNG TULUS GROUP HOLDINGS SDN. BHD. for their cooperation's.

Last but not least, I would like to express my heartfelt gratitude to my family, friends and also lecturer for their support, constructive suggestion and also helpful criticism.

## ABSTRACT

Construction waste originates from various sources from the inception through completion of a building project. Previous research has shown that there is a link between the quantity of waste generated and the way labour is organized in the construction industry. Practical training on site construction under **AnjungTulus Group Holding Sdn. Bhd.** for total five months has given outrageous experiences and uncountable knowledge in completion of this report. However, these studies have failed to look into the sources of waste and how it affects the waste generation. To fill this gap in the literature, this study investigated the impact of labour arrangements on construction waste generation, particularly the sources of waste origin and the attitudes of workers. Using a combination of direct observations and source evaluations on the sites, the construction waste in direct and subcontracted labour arrangements was quantified. The results show that the subcontracted labour arrangement produced higher waste than the direct labour in all three work processes considered. A lack of organizational commitment and strategy was found to be the main barrier to waste reduction. Last but not least, suggestion and precaution steps are taken to overcome problems that occur.



## TABLE OF CONTENTS

## PAGES

Acknowledgement	i
Abstract	ii
Table of Content	iii-v
List of Tables	vi
List of Figures	vii
List of Photos	viii-ix
List of Abbreviations	x

CHAPTER	1.0	PREFACE	
	1.1	Introduction	1-2
	1.2	Objective	3
	1.3	Scope of study	4
	1.4	Methodology of Study	5
CHAPTER	2.0	COMPANY BACKGROUND	
	2.1	Introduction	6-8
	2.2	Company Profile	
	2.2.1	Corporate information	9
	2.2.2	Professional adviser's corporation	9
	2.2.3	Company objective	10
	2.2.4	Company vision	10
	2.2.5	Company mission	10
	2.2.6	Company motto	11
	2.2.7	Company quality policy	11
	2.2.8	Basic company flyer	11-12
	2.3	Organizational Chart	13

	2.4	List of Project	
	2.4.1	Completed project	14-15
	2.4.2	Ongoing project	16
CHAPTER	3.0	MATERIAL WASTAGE AT CONSTRUCTION SITE	
	3.1	Introduction	17-19
	3.2	Project Background	20-21
	3.3	Types Of Wastage	22
	3.3.1	Wastage can avoid	22
	3.3.2	Wastage cannot avoid	23
	3.3.3	Wastage by replacement	23-24
	3.4	Building Material Often To Wastage	25
	3.4.1	Concrete	26-27
	3.4.2	Aggregate	28
	3.4.3	Bricks	29
	3.4.4	Sand	30
	3.4.5	Wood	31
	3.4.6	Reinforcement	32-33
	3.5	Causes Of Building Material Wastage On Site Build	34-35
	3.5.1	Building material management is not affective	36
	3.5.2	Accident at site construction	37
	3.5.3	Low attitude and employee competence	38
	3.5.4	Weather factor and natural disaster	39
	3.5.5	Misuse material at site build	40
	3.5.6	Negligent and less skilled employee attitude when run building material	41
	3.5.7	Storage area not suitable	41
	3.5.8	Inaccurate when do material cutting	42
	3.6	Wastage Effect In Construction Industry	43
	3.6.1	Contractor	43
	3.6.2	Worker	43
	3.6.3	Owner	44

	3.7	Method Of Prevention Building Material Wastage	45
	3.7.1	Systematic building material management	45
	3.7.2	Systematic construction waste management	46-47
	3.7.3	Layout and storage of building material	48
CHAPTER	4.0	CONCLUSION AND RECOMMENDATION	
	4.1	Conclusion	49
	4.2	Recommendation	50

## REFERENCES

Appendix A	Rank Order Of Material Wastage On Construction Site
Appendix B	Percentage Contributions Of Material Wastage To Cost Overrun
Appendix C	Factor That Contributes To Material Wastage On Construction Site
Appendix D	List Of Damage/Loss Material at Bechah Semak

## **LIST OF TABLES**

Table 2.1	List of ATGH SDN .BHD completed project.	14
Table 2.2	List of ongoing project ATGH Sdn. Bhd.	16

## LIST OF FIGURES

Figure 2.1	Figure 2.1 ATGH Sdn. Bhd. company logo.	8
Figure 2.2	ATGH Sdn. Bhd. PRIMA flyer.	11
Figure 2.3	ATGH Sdn. Bhd. House “4”ALL flyer.	12
Figure 2.4	Organisational Chart AnjungTulus Group Holdings Sdn. Bhd.	13
Figure 3.1	The Allowance Of Construction Material Wastage.	19
Figure 3.2	Percentage Of Construction Material Wastage.	25
Figure 3.3	Source Evaluation of Solid Waste in Building Construction.	35
Figure 3.4	The Step To Reduce Material Wastage.	47



## LIST OF PHOTOS

Photo 2.1	Front Elevation of ATGH Office.	10
Photo 2.2	1 Unit Banglo Satu Tingkat Di Atas Lot 1120 Mukim Chenderong Batu, Daerah Kebakat, Jajahan Tumpat, Kelantan .	15
Photo 2.3	1 Unit Rumah Kos Rendah di PT 370, Kg Lubok Mak Udang, Kelantan.	15
Photo 2.4	1 Unit Rumah Banglo Satu Tingkat di Mukim Perol , Daerah Kadok, Jajahan Kota Bharu, Kelantan.	15
Photo 3.1	Front Elevation of BechahSemak House.	20
Photo 3.2	Concrete transport by wheelbarrow.	26
Photo 3.3	Concrete have to be broken up.	27
Photo 3.4	Cement mixing place on soil can cause wastage to quantity of mortar.	27
Photo 3.5	Aggregate mixed with sand.	28
Photo 3.6	Aggregate mixed with mud.	28
Photo 3.7	Brick left too long .	29
Photo 3.8	Sand place near with work area.	30
Photo 3.9	Sand mixed with soil on unlined area.	30
Photo 3.10	Wood on open area.	31
Photo 3.11	Reinforcement bar on open area. .	33
Photo 3.12	Reinforcement for roof beam not be placed at right place.	33

Photo 3.13	Messy layout at site build.	36
Photo 3.14	Staging not tough enough.	37
Photo 3.15	Smoking when do wiring work.	38
Photo 3.16	Site builds flooded.	39
Photo 3.17	Wrong equipment used.	40
Photo 3.18	Cement not over cover.	41
Photo 3.19	Not accurate when cutting material.	42
Photo 3.20	Wood cannot used because wrong when cutting work.	42
Photo 3.21	Locked store.	45
Photo 3.22	Cement lined to avoid contact with water.	48
Photo 3.23	Tiles fully cover.	48

## **LIST OF ABBREVIATIONS**

ATGH	Anjung Tulus Group Holdings
UiTM	Universiti Teknologi MARA

## **APPENDICES**

Appendix A	Rank Order Of Material Wastage On Construction Site
Appendix B	Percentage Contributions Of Material Wastage To Cost Overrun
Appendix C	Factor That Contributes To Material Wastage On Construction Site
Appendix D	List Of Damage/Loss Material at Bechah Semak

# CHAPTER 1

## PREFACE

### 1.1 Introduction

Undergone practical training for 20 week <sup>is</sup> ~~in make~~ compulsory on all part 5 UiTM student Diploma In Bangunan. <sup>The aim of</sup> ~~This~~ practical training <sup>is</sup> ~~aims~~ to provide early exposure to <sup>to</sup> ~~students~~ see clearer condition on <sup>to</sup> ~~site build or working~~ <sup>environment in</sup> ~~construction industry~~. Positive impact that can see as a result of this practical training is student could use this experience while undergoing practical training into class or lecture and this experience can give facilitate more easy to understanding and make easier learning process not just only just a theory.

In early stage, writer has been placed in office of ANJUNG TULUS GROUP HOLDINGS Sdn. Bhd. in Kelantan. Here writer have been many obtaining knowledge and way to prepare of tender document. Writer also have learned about method to make mention price and also learn how to measure material. For two week writer stationed at main office, it can give a little bit knowledge that is very useful that applicable in the future weather in classroom or in another work condition.

In week 3, writer has been placed in a few construction sites around Kelantan such as Lot 205 Semak Bechah, Lot 1106 Pantai Cahaya Bulan, Pt 556-561 Pengkalan Chepa and Pt 849 Pengkalan Chepa. In early stage, writer have a very difficult to use self in construction site, because at site environment is dusty, dusty, scorching and also risk of danger and any possible accident that need to be faced when writer go to the site.



Construction sector in Malaysia is one most important sector in generating national economy income. Existence construction sector in our country not just provide various job opportunities to all people but also produce many specialist contractor that able to compete with contractors from another overseas contractor.

Cooperation, understanding, team spirit, efficient management, systematic and high discipline is very important in managing any construction company. However, most incapable construction company do that. For site manager, they always neglecting wastage which occurred at the site. They also discounted steps that need to be dripped make heavier to mitigate wastage problem on site build.

Most managers on site knowledge on will wastage problem, but due to unaware of how the wastage can come about, the matter in look easily by all parties. Due to this, to overcome this problem from continue to happen, responsible party necessary take actions that rightly and overcome so that can in evasion in the future.

## 1.2 Objectives

The objectives of this report are:

- i. Identifying the types building material which commonly related wastage on site.
- ii. Evaluates the cause and effect of wastages on site.
- iii. Analysing steps that need to be taken to mitigate building material wastage on site.

### **1.3 Scope Of Study**

The purposed of this report was analyzed and identifies the types, causes and effect of building material wastage in construction site. There are two scope of study was being conducted is included:

- i. Focus given to Anjung Tulus Group Holdings Sdn. Bhd project in Kelantan area only because the main of company is located at Pasir Pekan, 16250Wakaf Baharu, Kelantan and major of our company project is located here.
- ii. Focus also been given on Lot 205 Bechah Semak that is near from our company is located.

## 1.4 Methodology Of Study

For overall process of producing this practical reports, there are four main method that be used to attained the study as following approaches. There are:-

### i. Work experiences

One of the preliminary methods is through work experiences. As we learned and gain knowledge on what we have been gone through during the period of practical training of total five months. In brief, less or more the material wastage at site construction experienced by the author herself in order to produce this practical reports.

### ii. Observation

Based on the observation, all the information gathered from site implementation will enhance this report. Through this method too, it helps to focus on develop main causes of material wastage as a loss for any company.

### iii. Mass media and electronic media

The widely usage of mass media and electronic media as one of the searching tools and sharing information at a fast rate have been commonly used by the researcher since then. Therefore it is also one of the applications that attribute in come out with this report.

### iv. Interview and discussion

Beside the above stated methods, an interview with the workers and discussion with consultants had conceiving and contributing ideas of various types of material wastage at site build. Meanwhile, from this positive feedback from them, it was inferred that the presence of project team such as quantity surveyor, developer, consultants had responsible on task given that to produce good quality of works to reduce wastage material wastage at site build.

## CHAPTER 2

### COMPANY BACKGROUND

#### 2.1 Introduction

ANJUNG TULUS GROUP HOLDING SDN.BHD. (857503-H) (Anjung Tulus) (prior to operating as SIHAT AURA BODYCARE SDN. BHD) Is the original commercial that combines power and creativity of young professionals compete in commerce, in addition to help the government to take part in a range of new growth and move personnel in the field of business for local entrepreneurs caliber bore.

When operating as a SIHAT AURA BODYCARE SDN. BHD. which was registered on 20 September 2009 with business activities related to the analysis of beauty products. On July 13, 2011 changed its name to ANJUNG TULUS GROUP HOLDING SDN. BHD. who was conducting business activities related to construction highlight the core business of the company. At first, ANJUNG TULUS only retail building materials from cornering activities, supply and sale. Based on the performance of the company lead, ANJUNG TULUS to move to the next field to complete the construction of housing projects entrusted to it.

In the early days of the business from product marketing activities in the retail and small scale, now that we have taken upon ourselves to be the producer of the construction and expand into international markets.



With the ability of skilled workers available, the company is confident that can hike further and more advanced in the future. In order to realize the dream of ANJUNG TULUS GROUP HOLDING SDN. BHD. also ventured into manufacturing mirror and aluminum which has been the establishment of another subsidiary, which is also known as Porch Glass Aluminum & Iron Work. It thus can facilitate and reduce the cost of construction as Porch Glass Aluminum & Iron Work indirectly became a major supplier in the supply of goods related to a window, door, and aluminum frame to construction projects in particular.

In order to improve the businesses ATH continue expanding it with an established Event Management as one of the core businesses of the company. This action was followed by the establishment of ATH (919 439-U), a company incorporated in Malaysia under the Companies Act, 1965 on October 21, 2010.

To strengthen the management of this event, the company has taken steps to give the responsibility to Mr. Rozi bin Mohd Yazid to manage this part. Rozi bin Mohd Yazid is a former Manager Production in Pak Ngah Production that has a lot of skill and experience in handling big event, both nationally and internationally.

During his involvement in the management of this event, a lot of event which has been successfully operated by him as World Water Day in Kangar Perlis, National Youth Day Celebration Opening Terengganu, History Award Winners 4-Faizal AF in Marang, Terengganu and also successfully handle events organized by DiGi Telecommunications Sdn. Bhd. by creating a name, GegeRiuh.

Based on the experience, expertise, high effort and professionalism that is owned, ATH is confident to compete and penetrate the markets in the future.

ATH are committed to conducting ongoing efforts to develop, establish friendly relations and to create goodwill, credibility and caliber with all Ministries and Government Agencies, Statutory Authorities and private companies.



Figure 2.1 ATGH Sdn. Bhd. company logo.

Sources: ATGH Sdn. Bhd. (2014).



Photo 2.1 Front Elevation of ATGH Office.

## **2.2 Company Profile**

### **2.2.1 Corporate information**

Company Name : Anjung Tulus Group Holding Sdn. Bhd.  
No. Registration : 857 503-H  
Date of incorporation : 19 May 2009  
Address : PT 2043, 1st Floor SBJ Putra Pasir Pekan 16250 Wakaf  
Baharu, Kelantan.  
No. Phone :  
No. Fax :  
Email : [anjungtuluscorporation@yahoo.com](mailto:anjungtuluscorporation@yahoo.com)

### **2.2.2 Professional adviser's corporation**

Company Secretary : S Nor Management & Trading  
(Siti Nor Bt Ismail - LS 0007921)  
Auditors of the Company : S Nor Management & Trading  
Accounts : Am Islamic Bank Berhad

### **2.2.3 Company objective**

The main objective Anjung Tulus business is to provide affordable housing to Bumiputera and non-Bumiputera particularly. In addition, Anjung Tulus is responsible to fulfilling the requirements of the customer from the medium level up to the professionals. All works carried out lead by the guidelines and timelines set in order to always achieve a high standard of workmanship.

### **2.2.4 Company vision**

Anjung Tulus aspire to be a company that will dominate the housing market in every state in Malaysia began in Kelantan, Terengganu and Pahang. Anjung Tulus also intends to step forward to become a limited company in 2018 and with a culture of professional, high ability to develop strategic cooperation among employees and business partners based on the genuine entrepreneurship. Anjung Tulus also aspires to be an organization with a staff of efficient and highly skilled in all areas of expertise construction, event management and others.

### **2.2.5 Company mission**

Anjung Tulus will stay focused on providing quality service on an ongoing basis through a variety of processes and value-added innovation and commitment to increase customer satisfaction.

### **2.2.6 Company motto**

“KHIDMAT PELANGGAN DIDAHULUKAN, PERKHIDMATAN TERBAIK DIUTAMAKAN”.

## 2.2.7 Company quality policy

To satisfy the needs and demands of customers both in the public and private sectors, Anjung Tulus will always try and highly-disciplined in keeping the competitive spirit, make continuous improvement and stay focused on the pursuit of excellence. Anjung Tulus also aims to realize a new look in the form of business services to instill a culture of ethics and professionalism to perform analysis services from time to time.

## 2.2.8 Basic company flyer

**ANJUNG TULUS**  
GROUP HOLDING SDN. BHD.

HEAD OFFICE : ALAMAT : TERENGGANU BRANCH  
PT 2043, TINGKU AIRS, 163 3, TINGKU 2, JETTY 3/400  
TAMAN SRI PURNA, 62500, JALAN PINK PULAU, PEROD  
BESSE BUKAN HANGAP TUNJUK, KUALA DANG, NABU, TERENGGANU DARUL IMAH

*"Berita Profesional Developer"*

- ✓ PELAN DAN DESAIN MENGIKUT CITRASA PEMBELI
- ✓ PEMBINAAN DI ATAS TANAH SENDIRI
- ✓ LOKASI DI RELANTAN, TERENGGANU & PAHANG
- ✓ PENCILASA & BANGUNAN PERILAKU & ARKITEK

**promosi : "1 Keluarga 1 Rumah"** *Jadikan diri anda HERO kepada keluarga anda*

TYPE	KELUASAN	HARGA
PRIMA A	1264 kps	RM 157,000
PRIMA B	1414 kps	RM 184,000
PRIMA C	1504 kps	RM 209,000

Figure 2.2 ATGH Sdn. Bhd. PRIMA flyer.

Sources: ATGH Sdn. Bhd. (2014).



**ANJUNG TULUS GROUP HOLDING SDN.BHD.**  
 PT 2043, TINGKAT ATAS, TAMAN SRI PUTRA, 1ERSU, PASIR PEKAN, WAKAF BIHARU, KELANTAN  
 TERENGGANU BRANCH : NO 3, TINGKAT 2, LOT PT 345B, JALAN PAYA KELADI, 20000 KUALA TERENGGANU  
 EMAIL : anjungtulusa@operationterengganu.com FACEBOOK : ANJUNG TULUS

**House "4" ALL**

**TYPE : MIRZA**  
**HARGA : RM 76,500**  
**KELUASAN : 804 KPS**




**TYPE : QHALEEF**  
**HARGA : RM 97,000**  
**KELUASAN : 1017 KPS**




**TYPE : AMSYAR**  
**HARGA : RM 114,000**  
**KELUASAN : 1201 KPS**




Figure 2.3 ATGH Sdn. Bhd. House “4” ALL flyer.

Sources: ATGH Sdn. Bhd. (2014).

### 2.3 Organisational Chart

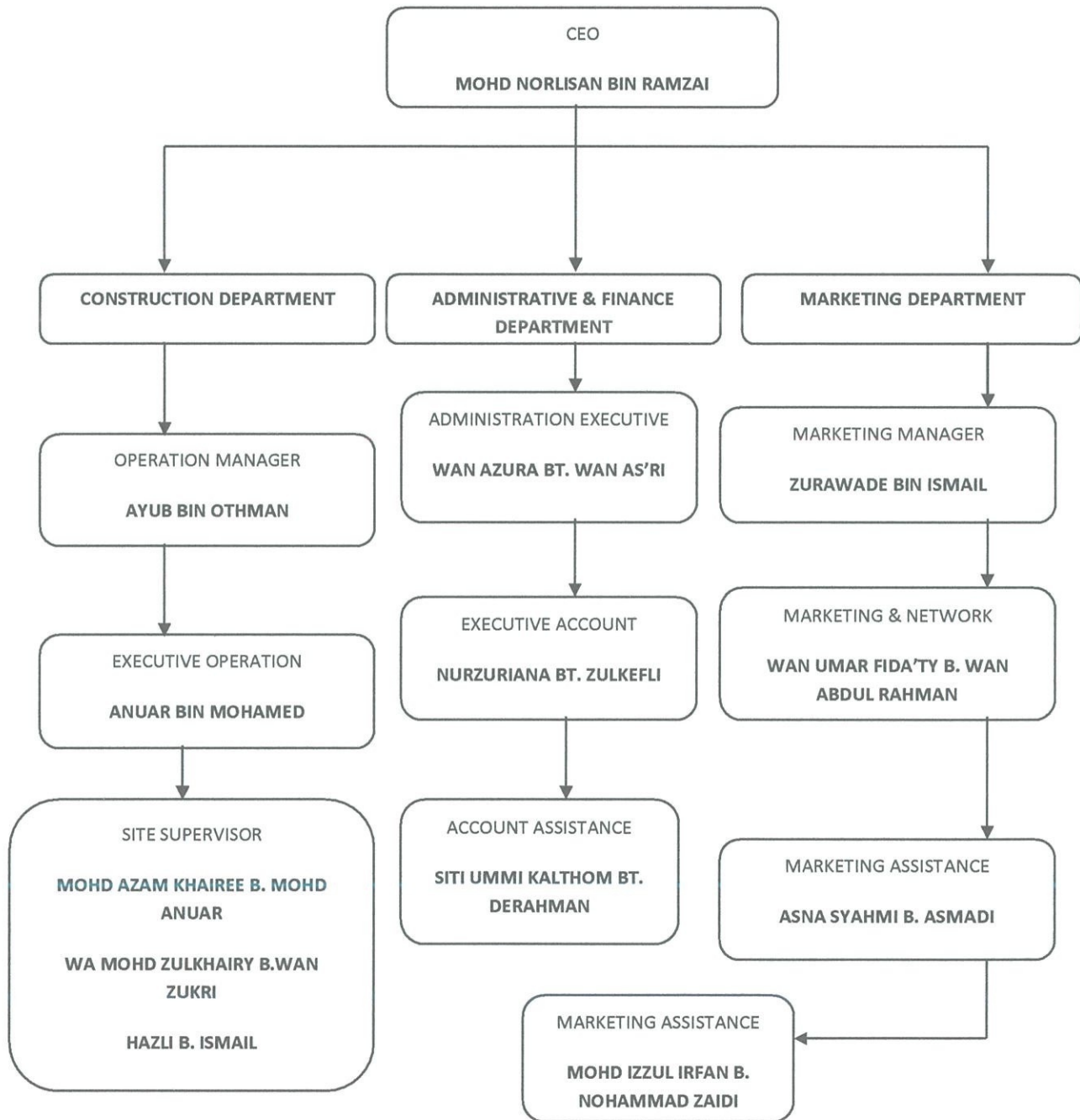


Figure 2.4 Organisational Chart Anjung Tulus Group Holdings Sdn. Bhd.

Source: ATGH Sdn. Bhd. (2014).

## 2.4 List of Project

### 2.4.1 Completed project

Table 2.1 List of ATGH Sdn .Bhd completed project.

No	Project	Construction Cost	Completion Date
1.	<b>PROJEK DI CHENDERONG BATU</b> Cadangan Membina Satu Unit Banglo Satu Tingkat Di Atas Lot 1120 Mukim Chenderong Batu, Daerah Kebakat, Jajahan Tumpat, Kelantan.	RM 188,000	20.09.2011
2.	<b>PROJEK DI KEMUBU, MACHANG</b> Cadangan Membina Satu Unit Rumah Kos Rendah Di PT 370, Kg Lubok Mak Udang, Kelantan.	RM 1 84,000	13.07. 2012
3.	<b>PROJEK DI PEROL</b> Cadangan Membina Dan Menyiapkan 1 Unit Rumah Banglo Satu Tingkat Di Mukim Perol, Daerah Kadok, Jajahan Kota Bharu, Kelantan.	RM 209,000	20.11.2012



Photo 2.2: 1 Unit Banglo Satu Tingkat Di Atas Lot 1120 Mukim Chenderong Batu, Daerah Kebakat, Jajahan Tumpat, Kelantan.

Source: ATGHS dn. Bhd. (2014).



Photo 2.3: Cadangan Membina Satu Unit Rumah Kos Rendah Di PT 370, Kg Lubok Mak Udang, Kelantan.

Source: ATGH Sdn. Bhd. (2014).



Photo 2.4: 1Unit Rumah Banglo Satu Tingkat di Mukim Perol, Daerah Kadok, Jajahan Kota Bharu, Kelantan.

Source: ATGH Sdn. Bhd. (2014).

## 2.4.2 Ongoing project

Table 2.2 List of on-going project ATGH Sdn. Bhd.

No.	Project	Start	End	Construction Cost (Rm)
1.	<b>BECHAH SEMAK</b> Cadangan Membina & Menyiapkan 1 Unit Banglo Satu Tingkat Di Mukim Bechah Semak, Daerah Bunut Susu, Pasir Mas, Kelantan.	16.04.2014	15.10.2014	209,000.00
2.	<b>TAMAN AMSYAR KETEREH</b> Cadangan Membina Dan Menyiapkan 4 Unit Banglo Satu Tingkat, 5 Unit Teres Satu Tingkat & 2 Unit Semi D Satu Tingkat Di Mukim Badak, Daerah Keterah, Jajahan Kota Bharu, Kelantan.	16.02.2013	15.02.2015	840,000.00
3.	<b>PANTAI CAHAYA BULAN</b> Cadangan Membina Dan Menyiapkan 1 unit Banglo Setingkat, Mukim Badang, Daerah Badang, Kelantan.	16.9.2014	15.03.2015	300,000.00



## CHAPTER 3

### MATERIAL WASTAGE AT CONSTRUCTION SITE

#### 3.1 Introduction

In a construction industry, building material is most important matter that should give attention in ensuring project run smoothly. This is because building material has enormous influence in generating national development economics and required one management that is systematic to ensure quality and building material quantity. Furthermore, in construction project, material used consist of various types of which involves quantity and cost that are different between one another.

Cost increase for raw material, workforce, transport and so on since recent portentous that building material and component will increase much more expensive. Hence, involvement for all party in controlling construction material usage that is excess most welcomed to avoid wastage from uncontrolled material in construction site.

“Has become matter that is common in most construction site, building material thrown all over until can cause view on site build become haphazard and unscattered. Much of the material that unused is like wood, reinforcement iron, concrete and cement” (Formoso et al,1999).

There one building material that still applicable but also thrown away by thinking still a lot more material that is same on site. The matter can invite danger especially to staff because accident can come about when time alone. Party that is responsible should ensure and take action that is strict so that building material that not used grouped to one part so that easy to be carried out from site build.

Building material wastage percentage to a project also rely on amount of substance needed when designing project (Skoyles, 1976, Pinto 1989, Hong Kong Polytechnic and Hong Kong Construction Association, 1993). If a project costing millions of ringgit of course wastage cost also rising. Material waste not just detrimental contractor in fact wastage also resulted image an affected companies from building material consumption side.

Material management that is effective and good on site, had play important role in ensuring success a construction project. This material management process start from early project more that is when process project planning until the project finished implementing. Capacity in saving costs of construction materials through waste rate reduction will increase a project profit (Chung, 2000).

Building material wastage which occurred in construction industry is different between one site build with site build others. Building material cost increase compared to labour cost cause either important building wastage control on site build and not on site build.



Material	Wastage Allowance
Concrete	7%
Rebar up to 16mm	8%
Rebar more than 16mm	15%
BMC	15%
Formwork	12%
Cement screed	30%
Red bricks wall	12%
Metal roofing	5%
Tiling	8%

Figure 3.1 The Allowance of Construction Material Wastage.

Sources: Skoyles (1976).

### 3.2 Project Background



Photo 3.1 Front elevation of Bechah Semak project.

The reason of the choose a house because this house is under writer site supervisor and has a little uniqueness. The uniqueness for this house when happen a problem on this house that can cause wastage to building material because writer has choose that topic to do as a practical report. On the other hand, this house has been taken from another site supervisor because the old site supervisor is resign before writer start the practical training at ATGH Sdn. Bhd. Apart from that, this house also near from office and enable to writer always visit this house. This house is owned by a woman that works as medical assistants. Owner stays at Kuala Lumpur while her house is completed. This house also already delays for 3 month because there is fraud by old subcontractor which presently has thrown away. Many things had broken down by weather and many thefts had occurred during this project is interrupted and has make this site is one of most site that have a higher wastage in ATGH Sdn. Bhd project in this year.

**Type of project:** Prima 'A'

**Owner:** Ros Haniah Binti Loman

**Address:** Lot 205 Mukim Bechah Semak, Daerah Bunut Susu, Jajahan Pasir Mas,  
Negeri Kelantan.

**Sub-contractor:** En. Suffian Bin Mustafa

**Project Cost:** RM 150,000.00

**Project start:** January 2014

**Expected finish:** January 2015

### 3.3 Type of Wastage

Among wastage type identified is wastage that avoid, wastage cannot avoid and wastage by replacement.

- I. Wastage can avoid *Avoided wastage.*
- II. Wastage cannot avoid *Unavoided wastage*
- III. Wastage by replacement *Replaced wastage (debris).*

#### 3.3.1 Wastage can avoid

This category of wastage is wastage that can be controlled effectively systematic penalty from construction. Wastage may be attributable from building material management weakness due to careless in early stage. Among wastage can avoid is like wastage due to theft, damage, accident, misuse, surplus that permitted and surplus that potential.

Apart from that, wastage also happen on materials that are excess in final stage of project otherwise shipped to site build others. If material management allow that material to destroyed, so this condition named wastage permitted. This method because transfer cost extra material is more expensive than cost to destroy that material. Compensation wastage can avoid when material ordered to one particular purpose only used for other purpose.

### **3.3.2 Wastage cannot avoid**

Sometimes some of wastage on site build cannot avoid due to weather factor, project site condition, concrete works in difficult part and so on. This condition also happens when that work is outside the contractor control like reinforcement bar cutting and wood in end part due to material supplied by manufacturer or distributor not same criteria like company has order.

On the other hand practical wastage cannot avoid because this wastage can be accept in construction project because it is important to ensure work progress can go on like what has be planned.

### **3.3.3 Wastage by replacement**

Wastage by replacement happen when building material ordered for one purpose or certain activity has been used in another purpose. This matter occur perhaps due to contractor that is unwise or in condition that is desperate and had to exercise building material the rest alternately for particular job. For example red brick usage for wall replaced with concrete brick.

Usually material waste rate also found higher than what really happened. Wastage by replacement mean construction materials usage carried out in place that not planned. This condition occur because of weak of planning by contractor.

Sometimes when material stock revision made, material found utilisation total had exceeded from what estimated. This problem happened because extra building material that not use cannot be returned to supplier. Apart from that, many building accumulation material at one location nearby construction site could lead to loss to certain parties in contractual. At the same time, if low quality material worn and created problems to other structural it's also can created wastage by replacement.



### 3.4 Building Material Often To Wastage

Among building material which often wasted is like concrete, aggregate, red brick, reinforcement bar and so on.

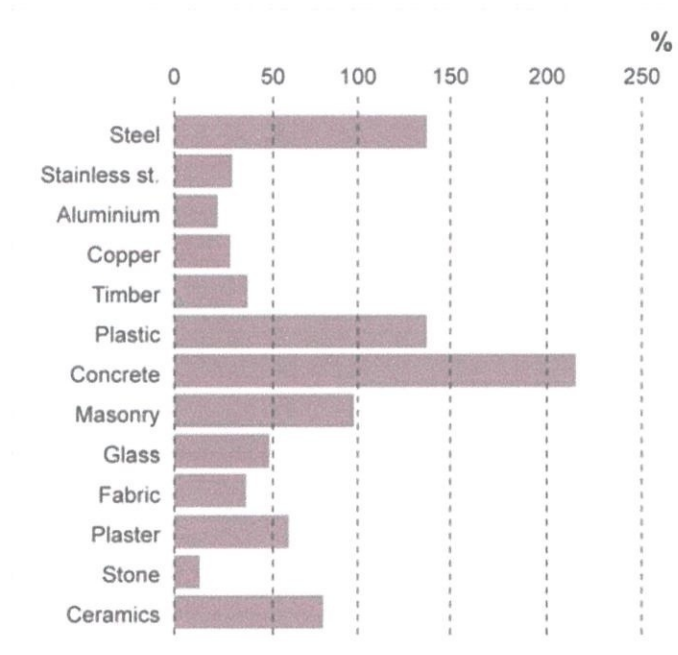


Figure 3.2 Percentage Of Construction Material Wastage.

Sources: Chung, J.K.O. (2000).

### 3.4.1 Concrete

Concrete is one of building material that often to waste. Concrete wastage can happened when quantity ordered to site build had exceeded from quantity needed. This condition normally occurred due to quantity calculation mistake which resulted concrete that is excess forced to be thrown straight to site build whereas it still usable for other work. This problem can be clearly seen anywhere construction site filled concretely discarded.

Wastage also occur during filled and more concrete spilled outside mould prepared. Apart from that extra concrete needed when excavation is excess and subsoil condition that does not produce flat form during basic boring work, excavation for substructure and so on.

Besides that, concrete wastage also happens when concrete poured into unprovided mould. Apart from that, tools usage transport concrete like wheelbarrow also resulted concrete wastage if worker not use carefully.



Photo3.2 Concrete transport by wheelbarrow.



Photo 3.3 Concrete have to be broken up.



Photo 3.4 Cement mixing place on soil can cause wastage to quantity of mortar.

### 3.4.2 Aggregate

Aggregate wastage can be viewed on way of the storage whether placed far or near the sand at site build. Aggregate that already mixed is difficult to be segregated and this will cause it ignored by contractor.



Photo 3.5 Aggregate mixed with sand.



Photo 3.6 Aggregate mixed with mud.

### 3.4.3 Bricks

Usually bricks will experience to damage during delivery stage and wrong management on site build. During delivery, wastage can happened if bricks are poured directly from lorry and location of storage not suitable. Bricks will also break and lose when it is poured at the muddy place. For example low area of storage and likely muddy large probability will cause lost or damaged bricks. On the other hand, bricks that not wrapped well can give high humidity problem will inconvenience to works tie brick wall. At the same time, extra bricks permitted planted underground when the quantity is small to avoid additional cost to move it to different site.



Photo 3.7 Brick left too long.



#### 3.4.4 Sand

Sand is building material that always wasted. This problem visible during sand delivery to site build where lorry which bring excess sand load will cause sand spilled during delivery process to site build. Then, usually sand will be poured at unlined where it will mix with soil and other sand which will cause the quantity of sand is decrease. Apart from that, sand placed nearby work area can complicate measuring because sand can experience process expansion.



Photo 3.8 Sand placed near with work area.



Photo 3.9 Sand mixed with soil on unlined area.



### 3.4.5 Wood

Most wooden wastage happening during cutting and storage process. Wastage due to cutting cannot avoid because woods size not obtained as to how determined. Woods storage way is wrong when it kept in place that not hidden than sunlight which will cause distortion like crooked, warped and so on. Wooden defect also happens due to fluid issued by some hardwood when compilation space between woods not prepared well. Apart from that, woods that unused will burned after ending a project because it is simplest management.



Photo 3.10 Wood on open area.

### 3.4.6 Reinforcement

Reinforcement has various type and the usage set through construction specification a building. Steel reinforcement which normally used are made up some type with distinctive size namely high stress steel, mild steel or usual fabric. Among reinforcements type that commonly used is R10, R12, R16, R20, R25, T10, T12, T16, T20, and T25.

Besides that, wastage also happens when reinforcement booking is bent when it's delivered at site build. This case will cause reinforcement useless if bar bending equipment are not provided by contractor. So, that reinforcements will throw without think material like this often lost because of theft activity on site build. If this situation always happened in any site build, it will add more individual wish that want to steal and also including workers in construction site.

Fabric reinforcement placement and both high and soft stress steel type should give attention more because it influences the strength of reinforcement. Reinforcement should be separated from subsoil, humidity and machinery route. Small reinforcement quantity can be stored at site build but when great amount is not practiced to store at site. For unused reinforcement, it must be returned to suitable placed to avoid occurrence congestion on site build and damage by weather factor, wind and so on which can cause reinforcement rusty.



Photo3.11 Reinforcement bar on open area.



Photo3.12 Reinforcement for roof beam not be placed at right place.

### **3.5 Causes of Building Material Wastage on Site**

Usually wastage happened start from delivery stage until installation stage. Therefore building material wastage can be happened variously and certain reasons. Analysis on wastage cause require a study on responsibility and wastage cause key factor.

Every individual involved in construction industry is responsible in this problem. For example in design stage, architect or engineer may be could prevent material utilisation that does not require like cutting on building material consisting of wood and reinforcement, if 'coordination dimension' better adaptable in their design. Some building material dimension not always can be used in market and could not be filled and building material have to be adapted according to consultant design. Contractor management also responsible in this problem because their estimation usually focused to prefix works only (Bernold and Gavilan, 1994).

For supplier failed to supply suitable building material from delivery aspect, further will change that often made by owners during building process cause wholesaler have to change work that have been completed and this cause wastage happen.



Causes of materials wastage	N	Level Of Contributions					MIS	Rank
		1	2	3	4	5		
Poor supervision	40	-	1	4	16	19	4.33	1
Design error	40	1	1	3	18	17	4.22	2
Defective materials	40	-	2	4	22	12	4.10	3
Unskilled labour	40	1	1	6	20	12	4.03	4
Wrong quality materials	40	1	1	7	19	12	4.00	5.5
Changes in design	40	2	2	5	16	15	4.00	5.5
Specification errors	40	1	1	7	22	9	3.93	7
Poor storage facilities	40	1	4	4	21	9	3.85	8
Poor handling process	40	1	6	8	18	7	3.60	9
Poor material scheduling	40	1	3	12	21	4	3.58	10
Poor product information	40	1	4	16	14	5	3.45	11
Wrong suppliers advice	40	1	8	11	13	7	3.43	12
Bulk purchase which leads to excess	40	-	9	15	12	4	3.28	13

*N = Number of respondents 1 = Very low 2 = Low 3 = Average 4 = High 5 = Very high*

Figure 3.3 Source Evaluation of Solid Waste in Building Construction

Sources: Bernold, L.E. and Gavilan, R.M. (1994).

### 3.5.1 Building material management is not effective

Building material management will cause those materials are damaged and lost. Weak building material management will cause occurrence of wastage and created building material waste. Contractor that not update delivery record and materials production from time to time will cause actual material quantities kept in reserve unknown until cause problems overbuilding material in reserve from needed.

Besides that, failed to record type and material damaged quantity, broken will increase waste rated. If material store guardian not provided that is responsible manage and safeguarding safety of ingredients and control the activity go in and out building material will cause material kept in unsafe situation because it facilitate further theft problem happen.



Photo 3.13 Messy layout at site build.



### 3.5.2 Accident at site construction

Most accidents occurred at site builds due to employee's negligence itself. For example, does not wear security apparatus, negligent when conducting work and ignore direction from contractor. Compilation procedure that is irregular and not systematic will cause accident if building material like red brick dropped. This will cause that material cannot be used anymore.



Photo 3.14 Staging not tough enough.

### 3.5.3 Low attitude and employee competence

Employee or construction labourer are important factors that will move and complete a certain construction project. Attitude and labour skills should give attention in ensuring quality of construction and is one of the causes of material wastage at site build. Labour is person will manage and use building material to complete work on site build. Material waste can avoid if labour placement for a job regard skill owned by those. There also a few labour that do not follow direction given and do the job without guidance from contractor or site supervisor also will contribute to wastage. Profligate and labour negligence that wanted to expedite work also became cause to wastage.

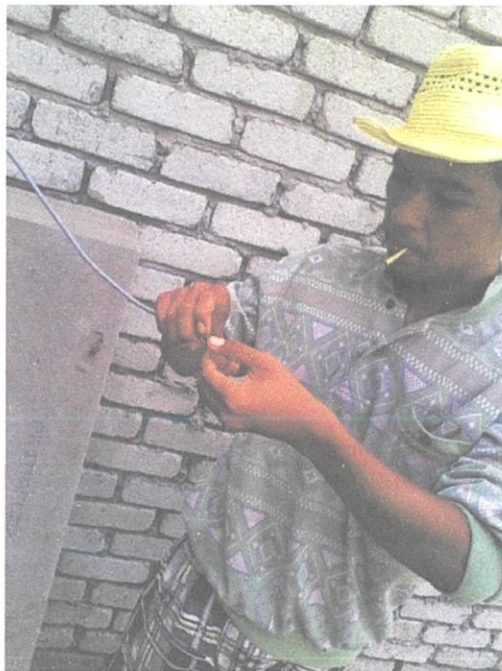


Photo3.15 Smoking when do wiring work.

### 3.5.4 Weather factor and natural disaster

Weather problem and natural disaster is a problem that is inevitable. Factor weather and natural disaster like heavy rain, flood, and thunderstorm is problem that often beset in our country. For example cement hit with water will cause cement become hard, damaged and may not be reused. On the other hand reinforcement can become rusty and wood will break down like become bent, warped and so on.

Besides that, storms could also cause bad impact on building structure. For example, storm able to damage foil aluminium which are being installed and fly roof were installed in building. Therefore, contractor have to cough up expenses that more to repair construction was completed.



Photo3.16Site builds flooded.

### 3.5.5 Misuse material on site build

Misuse material happen when material exist in site build used for other purpose the due to control and building material storage that are not good enough. Building material that not kept favourably will cause workers use material without control.

Misuse material also can occur because material ordering mistake that do not follow client's wish. This mistake contributed to wastage. For example, Bangladeshi worker always use plywood, foil aluminium, staging and other construction material to build their accommodation.



Photo3.17 Wrong equipment used.

### **3.5.6 Negligent and less skilled employee attitude when run building material**

Skilled worker is very important asset in construction project. Project with many skilled manpower will accelerate building process project. However, employee competence in do something activity in construction site inadequate if attitude and their behaviour less cautious when manning building material. Material waste happened a lot due to their negligence in handling respective work. Many employee sable do their work quickly however at the same time also those ignoring wastage carried out during works carried out.

### **3.5.7 Storage area not suitable**

Once arrived at site build, every building material must be kept in most suitable place according types of material. However, contractor and building material operator not considerate on matter like this. Failure make systematic planning while making building material storage always causes these substances suffer damage, lost or broken.



Photo3.18 Cement not over cover.



### 3.5.8 Inaccurate When Do Material Cutting

Building material cutting also associated with main cause of building material wastage on site build. Wrong cutting often occur in material like reinforcement and wooden. Cutting mistake often happens due to mistake when designing project and could also happen due to material ordering that not made meticulously.



Photo3.19 Not accurate when cutting material.



Photo3.20 Wood cannot be used because wrong when cutting work.



### **3.6 Wastage Effect In Construction Industry**

Wastage in construction industry can give negative effect to all parties involved and building material source. Wastage also will cause effect to users in future. If all parties involved still cannot considerate on matter like this, they had to accept consequences in the future.

#### **3.6.1 Contractor**

Contractor will get many adverse impact due to wastage like have to bear wastage cost, not enough building material problem, likely incur loss in construction project and so on. When higher wastage occurred so building material cost also increase. In other hand, this case will cause profit achieved by contractors will decline.

#### **3.6.2 Worker**

When wastage occurred on site build also able give adverse impact to workers. Their security can affected by bricks that in heap, broken glass, nail that is scattered and erect reinforcement will cause condition on site build become dangerous to users especially on construction labourer.

### **3.6.3 Owner**

As an owner of house, they must be desirous to have residence that is beautiful and perfect. So, when wastage occurred due to works plaster, concrete, and so on will cause work quality not good enough. Owner will receive low work quality on project that will be owned. Therefore owner have to spend an amount of certain allocation to improve construction quality.

### 3.7 Method of Prevention Building Material Wastage

Contractor, site supervisor, employee and every individual involved under construction need to together in carrying out responsible in tackling wastage problem in construction site. Cooperation from all of parties is very important to ensure wastage problem can be reduced.

#### 3.7.1 Prevention from theft

Theft problem on site build is normal it happens due lack of supervision in construction site. Among of steps that need to be considered to give protection to building material is:-

- i. Building material that is valuable must be kept in locked store.
- ii. Preparing area light that is sufficient on site build so that lamp can light construction site.
- iii. Made examination to reserve material to make sure materials is safe kept.



Photo 3.21 Locked store.

### **3.7.2 Systematic construction waste management**

There a few levels major in systematic construction waste management are:

In building material waste production level, building waste produced when material cannot reuse because of due to employee's negligence and machine. Most contractor states that many construction waste produced due to employee's negligence in project site.

In order turn is collection and isolation, all building material waste produced will be pooled in a place by pile waste in area that was set. After that, waste will be separated according to type and determined whether waste could be reused or not. Any substance that can reusable will be separated and consequently brought to construction site. For material that cannot be used, it can be recycled by dispatching remnants to recycling centres.

Next level is collection level; remnants that was collected and segregated will be gleaned by contractor to be carried to disposal centre. Meanwhile, recycled materials in case already cannot reuse further, it will also be collected to be carried to disposal site as a final stage.

Result from view accepted from party that involved like contractor and local authority, found that outstanding problems is cooperation factor. Respectively blame between one party and other and this problem of course will inconvenience waste management carried out. Right cooperation issue between parties contactor with city council need not arise because every parties especially city council as the powers that

be must be respected by contractor to every decision made. Meanwhile on behalf of council, they need more concerned on problem faced by contractor (Chung, 2000).

Key Materials	Re-Use	Recycle	Reduction
Timber	<p>If reusing timber on site one should always check it first to ensure it is of suitable quality and fit for purpose for intended use.</p> <p>Timber can be reclaimed from numerous sources on site including floorboards, rafters, doors, window frames and fencing.</p> <p>Temporary formworks can be reused several times before disposal.</p>	<p>Any timber which cannot first be reused on site should be sent to a recycling depot for cleaning, de-nailing and re-sizing.</p> <p>Timber can be recycled into among other things landscaping pellets, mulching and chipboard to create new kitchen units.</p>	<p>Timber can be substituted with other materials e.g. Using bamboo for formworks;</p> <p>Prefabricated building components, drywall partition and standard wooden panels can be adopted;</p> <p>Alternative construction Methods can also be adopted.</p>
Cement/ Mortar	Developing plans for an on-site reuse, recovery and recycling systems for cement/mortar wastes; and Instructing workers to adopt the reuse and recycling of cement/mortar wastes on site		Using purchase management, material control and material management
concrete	Concrete waste can be reused for temporary work	Concrete can be recycled as aggregate for concrete production	<p>Accurately calculating and ordering the right quantity of concrete;</p> <p>Using prefabricated building components; and</p> <p>Using alternative construction methods</p>
Blocks	<p>Offer the customer left over (full) blocks;</p> <p>Take block left-overs away to use as aggregate or landscaping cover:</p>	Include a clean-up payment in the scope of the block layer's subcontract to assist recycling and to discourage wasteful site practices	<p>Order blocks more accurately using best take-off practice;</p> <p>Ensure bottom layers of blocks remain useable by preventing soil contamination;</p> <p>Store blocks in a stable flat area to avoid breakages from fall overs;</p> <p>Determine a means for cutting blocks more accurately so that both halves can be used and breakages avoided</p>

Figure 3.4 The Step To Reduce Material Wastage.

Sources: Chung, J.K.O. (2000).



### 3.7.3 Layout and storage of building material

Contractor, site engineer and site supervisor should plan in terms of layout on site build and building material quantity that is suitable before making message to supplier. Apart from that, material storage site must be raised in most suitable place where it is easy guarded from storage aspect, usage and care. Product compilation must be made systematic so that product is kept undamaged and broken. Cement especially must be kept in place that high and hidden than rain water.



Photo 3.22 Cement lined to avoid contact with water.



Photo 3.23 Tiles fully cover.

## CHAPTER 4

### CONCLUSION AND RECOMENDATION

#### 4.1 Conclusion

In conclusion, every party in construction project is responsible especially developer and contractor necessary implement all steps to reduce wastage problem in this construction industry. From studies made, it can be said that wastage in construction industry is one very important aspect and should give attention by all parties especially to every individual involved in this industry such as contractor and site supervisor. On behalf of that responsible in managing construction site namely contractor necessary think of negative effect if they are always wasting on building material.

Apart from that, construction materials usage that is well-mannered need to be practiced in everywhere construction site. It encompasses material reservation aspect that is accurate, systematic material storage, care and protection on building material. Matters related to constraint that capable of creating problems in building material management necessary overcome properly for be able building material management feasible maybe once. Job and responsibility to overcome this problem not only placed in contractor only. However all parties necessary play role so that this problem can be overcome result of cooperation that is formed.

## 4.2 Recommendation

The observation results demonstrate that different types of construction projects have different levels of waste generation. Private housing projects are found generating the highest wastage levels when compared with other types of projects. The reason may be resulted from the fact that the private housing projects normally are of non-standardized building structures.

As a result, different sizes and shapes of building components such as formwork, reinforcement and brickwork are required that results in higher wastage levels. Wastage minimization should be integrated into the construction processes and planned at the tender stage. The selection of sub-contractors needs to consider their wastage reduction plan as part of assessment criteria. Provision of waste reduction training to on-site staff is also considered important in raising environmental awareness and helping site staff generating a better working procedure to reduce generation of materials wastage. A waste control system is suggested as part of site management functions, which collects waste generation data, identifies the major areas of waste generation, analyses the causes for the waste generation, and produces solutions for mitigating waste and feedbacks the decision-making to the working staff who work on those key areas. The waste control system can also present dynamic information to the senior management who can coordinate among various subcontractors and departments for implementing the system effectively.

## REFERENCES

- Bernold, L.E. and Gavilan, R.M. (1994). Source Evaluation of Solid Waste in Building Construction. *Journal of Construction Engineering and Management* **120**, 536-552.
- Chung, J.K.O. (2000), Monitoring of solid waste in Hong Kong 1998, Environment Protection Department, Hong Kong Government.
- Evaluation of Causes Of Construction Material Waste - Case Of Rivers State, Nigeria. (2002).12 July 2013. Retrieved from <http://dx.doi.org/10.4314/ejesm.v6i6.5S>
- Formoso, C. T., Isatto, E. L., and Hirota, E. H. (1999). "Method for waste control in the building industry", In Proceedings IGLC (Vol. 7, p. 325).
- Skoyles, E. R., and Skoyles, J. R. (1987). Waste prevention on site. Mitchell Publishing Company Limited. London.
- O. J. Ameh , and E. I. Daniel (2013). Professional' views of material wastage on construction sites and cost overruns.

# APPENDICES



## Rank Order of Material Wastage on Construction Site

Building materials	N	Mean response	Rank
Mortar from plastering /rendering	56	3.32	1
Timber formworks	56	3.23	2
Sandcrete blocks	56	3.16	3
Concrete	56	2.79	4
Ceramic/Vitrified tiles	56	2.70	5
Clay tiles	56	2.66	6
Wood used for flooring	56	2.52	7
PVC tiles	56	2.36	8
Bricks	56	2.27	9
Fibre- cement roofing sheets	56	2.21	10
Paints	56	2.16	11
Iron bars	56	2.14	12
Long span aluminum roofing sheets	56	1.88	13
Steel formworks	56	1.50	14

Table 2 Rank order of material wastage on construction site

## Percentage Contributions of Material Wastage to Cost Overrun

Building materials	Percentage N	Contribution	Mean	Rank
Concrete	56	31-40	3.0	1
Mortar from plastering /rendering	56	31-40	2.6	2
Sandcrete blocks	56	31-40	2.5	3
Timber formwork	56	31-40	2.5	3
Iron bars	56	21-30	2.4	5
Ceramic/Vitrified tiles	56	21-30	2.3	6
Clay tiles	56	21-30	2.1	7
Fibre- cement roofing sheets	56	21-30	2.1	7
Wood used for flooring	56	21-30	2.1	7
Bricks	56	21-30	2.1	7
PVC	56	21-30	1.0	11
Paints	56	21-30	1.9	12
Long span aluminum roofing sheets	56	21-30	1.9	13
Steel formworks	56	21-30	1.7	14

Table 3 Percentage Contributions of material wastage to cost overrun

## Factor That Contributes to Material Wastage on Construction Site

Material wastage Contributory factors	N	Mean response	Rank
Poor supervision	56	3.79	1
Re-work	56	3.75	2
Poor material handling	56	3.71	3
Design related errors	56	3.59	4
Inadequate workers' skill	56	3.54	5
Inappropriate specification	56	3.29	6
Buildability problems	56	3.27	7
Improper packaging	56	3.25	8
Lack of management of the design process	56	3.14	9
Construction related error/omission	56	3.12	10
Theft and vandalism	56	3.11	11
Lack of integration of waste reduction- plan in the design and construction proces	56	3.09	12
Negligence and care free attitude of management	56	3.04	13
Lack of waste management plan	56	2.79	14
Absence of site waste manager	56	2.68	15

Table 4 Factors that Contributes to material Wastage on Construction site

