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Study of Site's Construction Waste in Batu Pahat, Johor

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Abstract

Rapid growth in construction industry has increased the problems of construction waste around the world. In Malaysia, the construction industry plays a significant role both in the infrastructure development and economic sectors. The construction industry is been regarded as one of the major contributors of negative impact to the environment. To reduce these negative impacts, it needs a comprehensive understanding of the construction waste generation and management. Hence, the objective of this research are to identify the construction waste generation on site, to quantify the physical wastes that are generated at the construction site and to determine the construction waste management plan that have been applied in project. This research involves two ways of data collection which are by interviews and site observation. This study was conducted at three site's projects around Batu Pahat, Johor. The data collection were taken weekly in two month duration. The finding shows that, there were six types of waste produce on the three sites which are timber, metal, concrete, mortar, packaging waste and bricks. Throughout the quantifying data of the construction wastes, it shows that timber wastes were the largest contributor to the construction wastes which then followed by bricks, packaging waste and concrete. Study on construction Waste Management Plan (WMP) at sites had showed that, they were not fully applied of WMP. Hence, to minimize the waste, WMP should be fully applied on site. The finding will be an input to authorities in shaping better policy of construction waste management.

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1. Introduction

In recent years, the numbers of construction project have increased dramatically due to 'Malaysian Plan 2020'. Unfortunately, while meeting the needs of the present developments a lot of harmful and negative impact on the ecosystem of the environment were occurs. Waste management in the building industry in Malaysia has become a major environmental issue in recent years. Malaysian greater concern is the increasing amount of construction and demolition waste. In Malaysia, disposal of solid waste onto lands or landfill is still the most common method[1].

Although this issue has been playing around the media for quite some time, but there are little action taken to control the waste generation. According to Lee Heng Keng, the number of illegal dumping cases detected by the Board of Engineering Department in last five years seems to be an increase from 3 cases in 2001 to 31 cases in 2005 [2]. The study stated that the reason for illegal dumping was lack of awareness, accountability, responsibility and greed for maximum profit. In addition, contractors tend to allow considerable amount of material loss or wastage on site.

Currently in Malaysia, there is very limited research being conducted on the issue of construction waste. Hence there are very few data available on the current construction waste flows by source of generation, type of waste, amount of raisings generated and disposed [3]. Therefore, this research was studied on the construction waste generation and construction waste management at three project sites.

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2. Demography of construction sites

Three sites of construction projects in Batu Pahat District had been selected for this study. Two sites were residential housing and the other one was swimming pool building. All the sites were under construction phase during the survey works. For confidential purposes, the entire sites are labeled as Site A, Site B and Site C.

2.1 Site A

Site A is a construction project for residential house as in Figure 1. This development is confined in an area about 2 acres and had a contract period of 17 months. About 20 units of semi D houses, 7 units of low cost houses and 2 units of bungalow house will be build in site A. This development project is constructed by the contractor Class B which was already established for about 12 years. The project development had started on 2011 and expected to finish the project on 2013. The project manager of this project had 11 years of construction experience.

Fig. 1. Construction Site A

2.2 Site B

Site B is a construction project for residential house as in Figure 2. This development confined of 4 acres and had a contract period of 17 months. This development project is constructed by the contractor Class B. This project development had started on 2011 and expected to finish the project on 2013. Project site B comprised of 49 units of terraces house and 10 units of double storey house. The project manager for this site is same person who in charge at site A.

Fig. 2. Construction Site B

2.3 Site C

Site C is a construction of building project which is constructed by contractor Class A. The size of the development is about 10,000 acre which comprises of 2 swimming pools and one administration block. The contract duration is 18 month period which started from 2009 and supposes to be completed in 2010. However, until now the project is still incomplete due to financial problems. Two persons are in-charges at this site which is project manager and site supervisor. The project manager had 10 years experience in construction field. The construction Site C is shows as in Figure 3.

Fig. 3. Construction Site C

3. Classification of Construction Waste

Construction waste can be divided into two principal categories namely physical and nonphysical waste [4]. However, according to Ekanayake and Ofori, physical waste is given more concern because most of the raw materials used in the construction are come from non renewable resource[5].

To determine the types waste occurred at the sites, regular site visits were carried out for 2 months period starting from 30 March 2012 till the end of June 2012. During the visits, it was noticed that the types of construction wastes found on each of the sites were almost similar in nature. There were 6 types of construction wastes namely timber, metal, bricks, concrete, packaging and mortar. The pictures of these wastes were captured during the visits and as shown in the Figure 4.

Fig. 4. Constructions waste found at the sites

4. Quantification of Waste

The quantification process of construction waste done on the sites was using method adopted from Lau et al, 2008[6]. The quantification is based on volume (Vs) of stockpiled waste. It is determined either on rectangular prism and pyramidal shape as shown in Figure 5 and 6. For pyramidal shape, the volume, Vs = 1/3 (B x L x H) and for rectangular prism form, the calculated volume is Vg = L x B x H. Where L is the length, B is the base and H is the height[6].

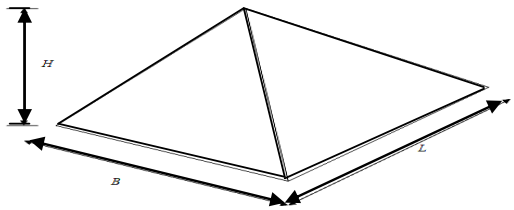

Fig. 5. The volume method of pyramidal shape (Vs)

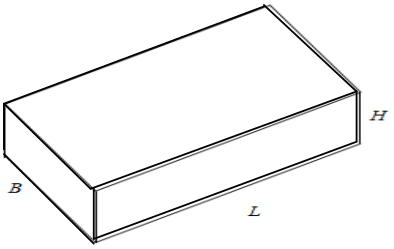

Fig. 6. The volume method of rectangular shape (Vg)

The quantification process was carried out at sites with the help of the project manager. It was found that the timber waste was the dominant waste produced at three sites which was about 46 % (19.69 m^3) of total waste produced at site A, 50 % (39.54 m^3) at site B and 80 % (241.43 m^3) at site C. The second highest waste produced at site A was packaging waste which was 26 % (11.33 m^3) and followed by brick waste 15 % (1.54 m^3). However, the second highest contributor of construction waste produce at site B was brick which was 22 % (17.27 m^3) from the total waste production. Then, this followed by packaging which contribute 16 % (12.43 m^3) from the total waste production at site B. At site C, the second highest waste production was brick and metal which both contribute 5 % of total waste followed by mortar which contributes 4 % (10.85 m^3). The amount and the types of construction wastes produced in sites A, B and C are as illustrated in Table I.

Table 1. Amount of construction waste produced in site A, B and C.

Types of waste	**Quantities measurement in cubic meter (m^3) or percentages (%)**					
	A		B		C	
	m^3	%	m^3	%	m^3	%
Timber	19.69	46	39.54	50	241.43	80
Metals	1.54	4	0.44	1	13.49	5
Bricks	6.48	15	17.27	22	16.50	5
Concrete	1.44	3	7.44	9	9.14	3
Mortar	2.48	6	1.38	2	10.85	4
Packaging	11.33	26	12.43	16	10.03	3
Total	42.96	100	78.5	100	301.44	100

There are several causes of waste generation identified and mentioned by the project managers of the three sites. The causes are as follow:

- Wrong material storage
- Poor materials handling
- Poor quality of materials
- Ordering errors
- Mistakes in quantity surveys
- Poor attitudes of workers
- Poor supervision
- Lack of waste management plans

These factors also supported by researches in many studies as in[4] [7][8][9].

5. Waste Management Strategy

Waste Management Plan (WMP) is the basis for successful waste management practices in construction projects. It is a comprehensive plan needed on site to understand and to achieve the waste management goals for the project. it is also known as a living document used by workers as a day-to-day reference like blueprints and specifications[10].

For this study, investigation visits were carried out to identify whether WMP were implemented at the sites project. Two approaches were used in determining the implementation of WMP that are by regular monitoring and interview with

the project manager. All the sites were identified implementing partial WMP in their construction waste management strategy. They applied on-site sorting and also recycled and reused certain construction materials such as timber and metal. Despite of that, site A and B tend burn all waste material that cannot be reused or recycled and whereas site C dumped these unwanted waste at temporary dumpsite which is located near to it. It was also observed that at site C, they dumped soil waste illegally at nearby area. Thus, it can be summarized that the methods adopted by the three sites are not sustainable which causes negative impact to the environment.

6. Conclusion

There are three major findings from this study. The findings are as follows:-

i) Six types of construction wastes found at the sites were timber, metal, bricks, concrete, packaging waste and mortar.

ii) Timber waste was the dominant waste at all of the sites. About 46 % (19.69 m^3) of total waste produce at site A was timber waste and follows with 50 % (39.54 m^3) at site B and 80 % (241.43 m^3) at site C.

iii) Waste Management Plan (WMP) implemented at the sites are not fully enforced and has resulted to negative impact to environment.

These findings hopefully can be an eye opener to state's authorities and country's policy maker. The generation of these wastes needs to be reduced and managed for achieving a sustainability nation.

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