

Study of Management and Control of Waste Construction Materials in Civil Construction Project

Karrar Raof Kareem, R.K. Pandey

Abstract- Now days, the increased economic growth as well as urbanization in developing countries have led into extensive construction activities that generate large amounts of wastes. Material wastage in construction projects resulted into huge financial setbacks to builders and contractors. In addition to this, it may also cause significant effects over aesthetics, health, and the general environment. These wastes needs to be managed as well as their impacts needs to be ascertained to pave way for their proper management, however in many cities of India wastes materials management is still a problem. In this research work we are discussing the method for the management and control of waste construction materials. The main objective of this work is present the waste control procedures included as part of particular site management in general based on pull learning process and focusing process transparency principle based on qualitative and quantitative data collection techniques. Additionally we are presenting the literature survey study over waste management system as well as construction waste management.

I. INTRODUCTION

This analysis work is predicated on material waste management in building construction through the treatise work, try is created to search out reasons of wastage in industry and the way it will be reduced. In construction, 4-M (Material, Manpower, Money and Machine) play crucial role. Reckoning on the sort of a public housing, building materials account for sixty to seventieth of the project value. Through material waste management operate; we are able to scale back the general project value by waste minimisation or most utilization of resources (Material) [1]. In general, a really high level of waste is assumed to exist in construction. Though it's troublesome to consistently live all those wastes in construction, partial studies from numerous countries have confirmed that waste represents a comparatively giant share of production prices. A large vary of measures are used for watching waste, like excess consumption of materials [2]. Responsible management of waste is an important facet of property building. During this context, managing waste means that eliminating waste wherever possible; minimizing waste wherever feasible; and reusing materials which could otherwise become waste. Solid waste management practices have known the reduction, recycling, and utilise of wastes as essential for property management of resources.

Most construction and demolition waste presently generated within the U.S. is lawfully destined for disposal in landfills regulated underneath Code of Federal rules (CFR) forty, subtitles D and C. In some areas all or a part of construction and demolition waste stream is unlawfully deposited ashore, or in natural drainages as well as water, contrary to rules to guard human health, commerce and therefore the surroundings. Businesses and voters of the U.S. wrongfully eliminate various plenty of building-related waste in solid waste landfills annually [3, 4]. Progressively, important volumes of construction connected waste are aloof from the waste stream through a method known as diversion. Entertained materials are sorted for later employment, and in some cases reused. Volumes of building-related waste generated are considerably influenced by economics conditions touching construction, social group consumption trends, and natural and anthropogenesis hazards. In recent years, industry awareness of disposal and utilise problems has been recognized to minimize volumes of construction and demolition waste disposed in landfills [5]. Many opportunities exist for the useful reduction and recovery of materials that will preferably be destined for disposal as waste. Industry professionals and building homeowners will educate and be educated concerning problems like useful utilise, effective methods for identification and separation of wastes, and economically viable means that of promoting environmentally and socially applicable means that of reducing total waste disposed. Organizations and governments will assume billet responsibilities for the orderly, reasonable, and effective disposal of building-related waste, promotion of public and trade awareness of disposal problems, and providing stable business-friendly environments for collection, processing, and repurposing of wastes. Businesses will produce price through the comeback of wastes back to producing processes, promoting and seeking out opportunities for incorporation of recycled materials into merchandise, and prioritizing reduction of building-related wastes through economical jobsite practices [5]. Effective management of building-related waste needs coordinated action of governmental, business, and skilled teams and their activities. Many non-governmental organizations and societies within the America promote coordinated action, and have known best management practices within the interest of public health and welfare (see resources.) Absent coordinated rules, realistic business opportunities, and therefore the commitment of style and construction professionals and their purchasers for continual improvement of trade practices, consistent and stable markets for recovered materials cannot be achieved or sustained.

Manuscript published on 28 February 2013.

* Correspondence Author (s)

Karrar Raof Kareem, M.Tech (Civil Eng.), Construction and Management, Civil Engineer at Republic of Iraq, Ministry of Electricity, IRAQ.

R.K. Pandey, M.Tech (Civil Eng.), Construction and Management, Civil Engineer at Republic of Iraq, Ministry of Electricity, IRAQ.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](http://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

Study of Management and Control of Waste Construction Materials in Civil Construction Project

Management of building-related waste is pricey and sometimes presents unintended consequences. However, logic suggests that failure to minimize, utilise and recycle social group wastes is unsustainable. It stands to reason that economical and effective elimination and minimisation of waste and utilise of materials are essential aspects of style and construction activity. Creativity, persistence, information of accessible markets and businesses, and understanding of applicable rules are vital skills for style and construction professionals [5].

II. PROBLEM STATEMENT

Construction website waste contributes to the massive quantities of construction and demolition waste that are generated by the development business every year. It's calculable that on the average construction and demolition waste constitutes 15-30% of the entire quantity of waste that winds up in lowland sites in several countries. At project level, the waste generated on website has been calculable to be regarding 100% of the materials originally purchased. Several builders understand that a lot of materials that are wasted on the jobsite end in 2 value factors i.e. the fabric acquisition value and therefore the waste disposal value. though the waste disposal prices of construction website waste kind as very little as 0.5% of the entire budget of a typical home, contractors realizes that this value will considerably have an effect on their profit since contractors usually operate inside a good five-hitter margin of profit [4]. In this analysis work we've a bent to stand live presenting the plan of action for the management and management of waste construction materials. the key focus of technique logy this system this technique is propose waste management procedures as an area of specific internet site management usually supported pull learning methodology and focusing method transparency principle supported qualitative and quantitative information assortment techniques. The study together intends to make some contributions for the consolidation of the Lean Construction theory, through the applying of variety of its principles in apply. Most of this waste is avoided by strict direction and management of cloth. The foremost causes of waste and necessary suggestion for deflate waste unit mentioned on throughout this study [6].

III. RESEARCH OBJECTIVES

The aim of this analysis is to check the impact on minimize, reuse, recycle and recovery technique on building construction industry. On paper, it supposes to offer a sway towards the construction building industry, however will it very provide a sway towards the waste manufacture. Moreover, many problems concerning current native trade issues are going to be mentioned to spot the basis causes that affected the waste management [6].

During this analysis studies we have following main objectives are list out accordance to the matter statement that has been known.

1. To detect foremost used minimize, reuse, recycle and recovery technique at construction project.
2. To detect the connection between reduce; recycle, reuse and recovery technique and therefore the waste manufacture in construction projects.
3. To detect the variations among minimize, reuse, recycle and recovery technique.

In the first objective, investigation will be done on reduce, reuse, recycle and recovery technique used in the waste

management system on-site to identify the most used 4R techniques

Second objective can see whether or not minimize, reuse, recycle and recovery technique used provides an important impact on the accumulative waste manufacture on website. During this objective, the finding can confirm whether or not the technique used on site website web website will minimize or manufacture additional waste on site.

In third objective that is to spot variations among minimize, reuse, recycle and recovery technique used, are going to confirm that of the techniques are economical or not in manufacturing less waste.

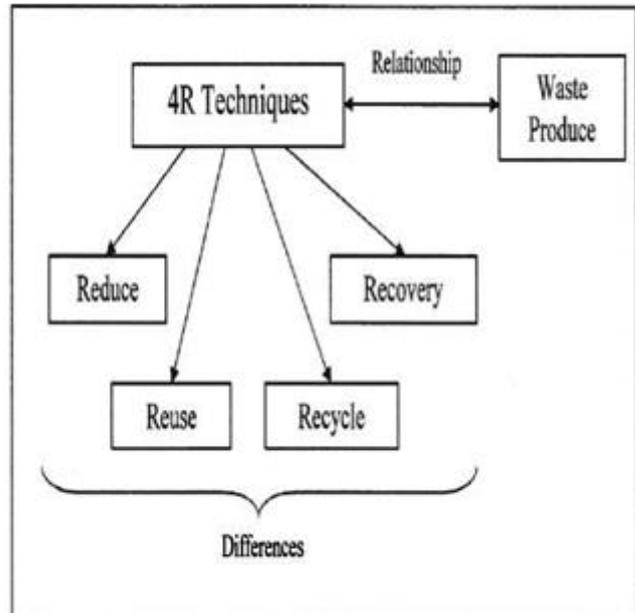


Figure 1 : Research Conceptual Framework

Based on the figure 1, researcher has identified both the dependent and independent variable. 4R techniques are the independent variable where as all the testing will be done onto the dependent variable which is the waste produce.

IV. LITERATURE SURVEY

4.1 Introduction to Waste Management System

Waste management system differs for developed and developing nations, for urban and rural areas, and for residential and industrial, producers. Management for non-hazardous residential and institutional waste in metropolitan areas is typically the responsibility of authorities, whereas management for non-hazardous industrial and industrial waste is typically the responsibility of the generator (firm whose activities prove the waste).

Waste management systems vary wide between areas for several reasons, beside kind of waste, near land uses, and together the realm out there. Disposal ways in which within which embody lowland that involves concealing waste to eliminate it, and this remains a customary apply in most countries. but if not properly managed a lowland will prove variety of adverse environmental impacts like wind-blown litter, attraction of vermin (pests), generation of liquid leach ate, gas (mostly composed of aliphatic compound and carbon dioxide).



This gas will prove odor issues, kill surface vegetation and can be a gas. Burning, (sometimes aforesaid as thermal treatment) may perhaps be a disposal technique that involves combustion (burning) of waste. The strategy converts waste into heat, gas, steam and ash.

It's a sensible technique of removing risky waste materials like chemical-based waste. It's a controversial technique of waste disposal as a results of it emits perform pollutants. Specific concern has targeted on extremely persistent organics like dioxins which can have serious environmental consequences at intervals the realm directly round the chamber. It's common in developed countries wherever land is scarcer. Waste-to-energy (WtE) or energy-from-waste (EfW) is common terms for facilities that burn waste to come back up with heat, steam and or electricity.

The maneuver of extracting resources or price from waste is typically remarked as utilization. There unit of measuring some ways within which by that waste is recycled: reprocessing of raw materials of high hot content to form electricity; assortment and recycle of everyday waste materials like empty drinkable containers. Material for utilization unit of measuring higher collected one by one from general waste exploitation dedicated bins or sorted directly from the sources. Common product recycled embodies element, steel, and aerosol (spray) cans, plastic, glass and paper. bar of waste materials, additionally aforesaid as waste reduction employs ways in which within which like recycle of second-hand product, repairing broken things rather than shopping for new, turning out with product to be refillable or reusable and exciting shoppers to avoid exploitation disposable product [8].

4.2 Introduction to Construction Waste Management

Waste management is that the assortment, transportation, processing, exercise or disposal of waste materials. The term waste is typically relates to materials made by act, and are usually managed to minimize their result on health, the setting or aesthetics (beauty). Waste management is additionally disbursed to recover resources from it [9]. Waste comes in forms like solid, liquid, vaporize or radioactive substances, thus management imply totally different ways and fields of experience. In term of this analysis, the waste is going to be the solid waste that's manufacture by the development activities.

Waste isn't simply garbage; it's additionally energy, water, food, air, transportation, landscaping, time and money. Waste Management works toward reduction, apply and exercise of all resources. It encourages the reduction of energy consumption, conservation, the acquisition of reused and recycled product, and alternate transportation ways [9].

4.2.1 Construction Waste

Construction waste is written as comparatively clean, heterogeneous unit generated from the varied construction activities. Doable sources of generating construction waste are aiming to be classified below six main classes, namely:

- i. vogue supply
- ii. Procurance supply
- iii. Handling of fabric supply
- iv. Operation supply
- v. Residual supply
- vi. Utterly completely different sources

Waste are aiming to be either venturous or non venturous. Construction comes typically generate many non venturous wastes than venturous wastes. sort of the categories of

wastes found at a typical construction electronic computer unit of measure construction waste, domestic waste and regular waste.

Construction waste unit of measure solid inert waste that typically consists of building dirt however may additionally embrace demolition material, concrete, bricks, timber, plastic, glass, metals, bitumen, trees and cut tires. Such wastes need to be reused, recycled, or disposed of to associate approved lowland. Disposal ways adopted depend upon the character of the fabric. Improper disposal will finish within the incidence of diseases like infection, dengue fever and infection, transmitted by mosquitoes and snails.

Domestic waste is aiming to be found on construction sites that have shut base camps for the staff. Domestic wastes have to be compelled to be properly disposed of to avoid the infestation of rodents, roaches and utterly completely different pests. These pests bring with them vector borne diseases like cholera and hydrophobia [10].

The contractor is additionally in charge for the correct handling, storing, transporting and/or doing away with regular wastes. samples of normal or venturous wastes unit of measure used oil, hydraulic fluid, fuel, soil contaminated with toxic or venturous pollutants, waste paints, varnish, solvents, sealers, thinners, resins, roofing cement and lots of. it's the responsibility of the contractor to satisfy the regular Waste rules below the Environmental Quality Act 1974. The responsibility covers the correct handling, storing, transporting and disposal of those wastes.

However, amount and quality of construction waste generated from any specific project would vary counting on the project's circumstances and forms of materials use. The annual production rate of construction and demolition waste from the general planet is around three billion tons (Elliot, 2000). A doable technique of breakdown this cringe is to develop and implement a comprehensive and wise property waste management strategy that manages the number and forms of construction waste. Property development for the event trade are aiming to be develop through the total life cycle of the building from to cradle, in conjunction with the first designing section, the study and structural vogue section, the event section and within the use section.

4.2.2 Waste Rate Estimation

A construction company always valued a project by its profit and loss. In order to ensure that the contractors get the maximum profit out of the project, it is hard to ensure that the method used will succeed. Thus this estimation rate will serve as a guidance to help the management to improve the method of handling material, reduce the waste rate and improve productivity.

Theoretically, performances of waste management in construction site are depending on the quantity surveyor decision on site. They will record all the material used on-site and all the material sent to site. It is important for the quantity surveyor to estimate material waste for all the material that has been purchase, but many of them seldom utilize previous project data to estimate the percentage of material used. The value that usually used is 2.5 %, 5 %, 7.5 %, 10 % and 12.5 %.

Any loss of material is usually shown in percentage form without analyzing the factors that contributing towards those percentages.

It is important for the quantity surveyor to evaluate the factors involved, the material used and type of project for future reference so that waste rate can be reduced and create more sustainable construction. The use of waste rate estimation from other sectors are not practical and less accurate due to the diversity of work and the dynamics of the sector [11].

4.2.3 Source of Construction Waste

Based on past analysis, the supply of fabric waste will exist throughout the development project, whether or not within the initial stage, style stage, construction stage until the operation. Gavilian and Bernold (1994) and Craven et al. have divided the supply of waste into 5 classes that are:

- i. style part
- ii. Procurement stage
- iii. Material management
- iv. Operation stage
- v. Excessive material
- vi. Other

4.2.3.1 Design Stage

In the early stage of construction, style's thought to apply a design that's property. Before the designers know the materials that need to be used, designer can take into account many aspects of it and its sources, however guaranteed to the manufacturer that been acknowledged solely. Supported this manufacturer, the designer can select the fabric victimization catalogue equipped to them. However, the catalogue provided is sometimes not often updated and therefore, can arouse complication once works need to start out at website [11].

Designers have to be compelled to embody rationalization of specification in every material and element that's required within the contract. However typically, they solely submit nation commonplace code that's ordinarily used together with the final comment. Sometimes, ordered material cannot attain the location on time, forcing them to use substitute material terribly very short time. With a restricted time, designers are susceptible to opt for material that's low in quality rather than the initial demand. The method of selecting material and element is vital besides the planning itself and smart work talent so as to realize the simplest result. If the fabric opt for doesn't meet the need of the designers, this may eventually cause a conflict between the rapturous worth and sensible demand. This facet is vital and wishes to be stress to new designers.

If the designers need to minimize waste to the optimum level, designers have to be compelled to take into account the development method for every component. Once work has begun, style's have to be compelled to make sure that there'll solely be a minimum amendment of design and every one the knowledge required for the development have to be compelled to be end from the first stage of the project. Material utilization and low waste made is depends to a decent style and description.

4.2.3.2 Procurement Stage

Material waste additionally cause by the look demand and specification. As an example, brick size isn't thought of for the elevation style for masonry works. Over purchase thanks to failure in observation the fabric amount additionally causes waste. Generally it's additionally cause by the manufacturer thanks to communication failure between the contractor and provider.

Failure in designing material schedule can end in failure of providing adequate and correct order of fabric. Wyatt (1991) declared that, contractor continually taken without any consideration the importance of fabric schedule. Though it's thought of as an important element in material management, it continually being neglected thanks to the dearth or inadequate of knowledge within the early stage of construction. Moreover, different issue like ignorance material computer hardware, incomplete contract drawing and unknown amount affected the method of creating the fabric schedule. A whole waste schedule that has all the essential data will make sure the step-down of waste throughout procurement.

4.2.3.3 Material Management

Material waste also can happen once the fabric don't seem to be been handled properly. Material handlings are continually handled victimization mechanical instrumentality Associate in nursing typically by an unskilled employee. Fashionable material and element is often harming throughout material handling and installation of the fabric. Typically the fabric is repaired if the harm is tokenize, however a number of the fabric are twenty irreparable once harm. Waste rate are totally different completely different on different project. Several of its cause throughout construction section wherever time is important and work got to be done quick. This is often once the standard management is difficult to watch. However the most reason of waste turn out is cause from weak management and observation, angle and no adequate incentive. Throughout storage, material ought to be hold on in correct method as an example material ought to be hold on higher than soil level and guarded from the tough climate to forestall the fabric from spoil and harm. Waste and loss of fabric occurred owing to improper material management and administration. Material management and management will become a lot of difficult in larger comes. Contractors got to manage the element and material that are needed on web site. Once the fabric found out web site, those material and element got to be blank pass around, or being held on. The aim is to minimize the danger of thieving, harm and loss of fabric.

4.2.3.4 Material Storage Area

Storage are sometimes not properly prepare and dangerous and generally the fabric are hold on in many completely different places. Material that expose to wet condition and unsuitable places whereas machineries and vehicle continually pass can injury the fabric can cause the fabric to deteriorate and eventually are going to be injury. This may raise the proportion of loss and waste as a result of the injury material. This type of state of affairs required to be prevented to minimize waste turn out on web site.

4.3 Concept of 4R

The "4R" concept which refers to reduce, reuse, recycle and replace, particularly in the context of production and consumption, is well-known today. It is something like using recyclable materials in more than actual practice, reusing of raw materials if possible and reducing use of resources and energy. These can be applied to the entire lifecycles of products and services - starting from design and extraction of raw materials to transport, manufacture, use, dismantling and disposal. "4R" can be expressed as:

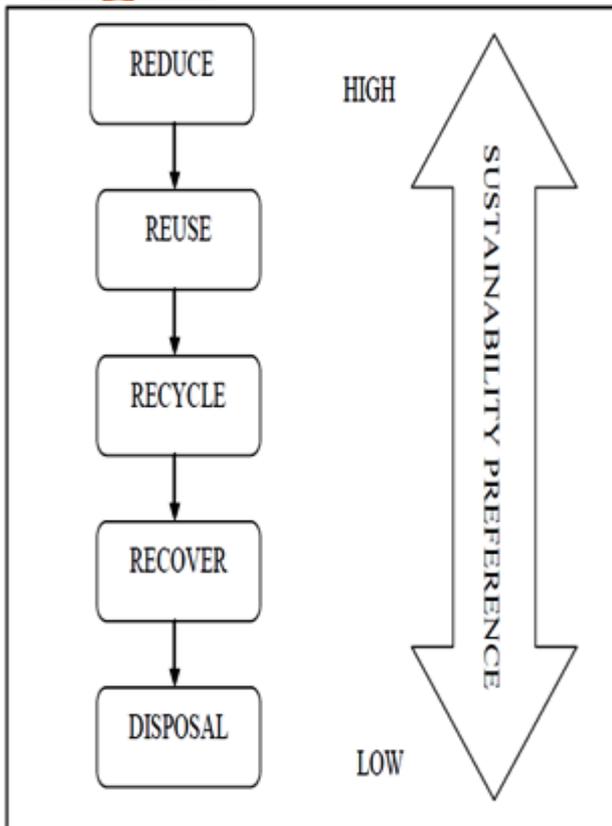


Figure 2 : 4Rs Golden Rule of Waste Management Hierarchy

V. RESEARCH METHODOLOGY

This study are going to be conducted following planned arrange that provides direction to search out the solution of the study queries. All required info and knowledge can even be obtained through a well-organized arrange or methodology that outlines varied stages in assembling info and knowledge.

Usually a study methodology is planned by stage in step with their priorities perform and performance and function so as to assure the effectiveness of the work. The analysis work is going to be divided into 5 stages in logical and coherent order and supply answer below the scope of analysis. The 5 stages embrace preliminary stage, reviewing literature, assembling knowledge and knowledge, analyzing knowledge and drawing conclusion.

Analysis methodology is that the procedure and therefore the management of the information to resolve and answer the analysis question together with hypothesis testing. Analysis methodology perform is as a tenet in corporal punishment this analysis. This chapter can justify on the analysis style and analysis methodologies that are accustomed complete the analysis. Following are totally different phases that are used for the analysis study over this topic:

- i. analysis style
- ii. Analysis location, population and sampling.
- iii. Analysis instrument.
- iv. Analysis procedure.
- v. knowledge analysis,

In the next section we'll gift in brief the analysis location, population furthermore as sampling utilized in this analysis works.

Population may be a complete set of teams that fulfill the specification (Kenneth D. Bailey, 1992). The analysis populations are all the development company in city (INDIA) space. Man of science takes four sorts of constructions project from associate a categories company that is

- High rise building project
- Industrial building project
- Commercialize building project
- Housing building project

Sample may be a portion of population while not taking thought whether or not it will represent the population or not (Salkind, 1997). Man of science has taken regarding p.c of sample out of all the population. This is often as a result of, out of a hundred and twenty sets of form, solely forty sets of form are came back by the respondent.

The samples are selected supported their accountable and add the construction project. Owing to the quantity of employee within the construction project is large, man of science use the easy sampling to slim down the sample. Easy sampling ensures that each unit within the population has an equivalent likelihood to be chosen as sample.

Respondent during this analysis is that the employee of the development project from a distinct construction website. Random systematic sampling is employed during this analysis. A note is being developed to urge the quantity X. each respondent are divided to their own field of labor to urge the balance of every cluster. Name of respondent WHO get X, X1, X2 are going to be opt for as a respondent. This step is going to be continuous till the entire of respondent is a hundred and twenty. This easy sampling methodology ensures that each unit within the population can get an equivalent likelihood to be chosen as a sample and every subject chosen is freelance and not dependent with alternative chosen subject.

This analysis is finished in city (India) space wherever as category an organization is going to be chosen. Johor Bahru is selected as a result of the world is almost about UTM and this may save time and value of the analysis. Category an organization is chosen as a result of they typically develop comes with price on top of RM one million. This is often essential as a result of they need the power and may afford to use a lot of systematic waste management system.

VII. CONCLUSION

As to conclude, the primary objective has been achieved whereas the foremost used 4 techniques are known that is waste reduction. Through this result the scientist will conclude that our native construction industries have place lots of effort in making ready and designing for the waste management system however from implementation wise it's still off from effective. There are still several problems that require being resolved like correct and relevant laws and tips. The law supporter ought to play their role additional more and more so as to form this work. In term of relationship, waste scale back, waste recycle and waste recycle gave no important relationships with the waste manufacture on website.



Study of Management and Control of Waste Construction Materials in Civil Construction Project

Though on paper they must have given some variety of relationships whether or not positive or negative however it looks in metropolitan space they are doing not have any relationship.

REFERENCES

- [1] Abd. Majid, M. Z. and McCafer R. (1997), Discussion of Assessment of labor Performance of Maintenance Contractors in Asian nation. *Journal of Management in Engineering*, ASCE. Vol. 13, No. 5, pp91
- [2] Addis, B. Talbot, R (2002). *property Construction procedural : A Guide to Delivering Environmentally responsible comes*. CIRIA, London, CIRIA C571
- [3] Azizi Yahya, Shahrin Hashim, Jamaludin Ramli, Yusof Boon, Abd. Rahim Hamdan (2007). *Menuasai Penyelidikan Dalam Pendidikan*. PTS delicate
- [4] Christini G., Micheal F., Chris H (2004). Environmental Management systems and ISO 14001 Certification for Construction corporations. *Journal of Construction Engineering and Management*. 330 - 336
- [5] hired Institute of Building (CIOB) (1989). *Project Management in Building*. hired Institute of Building
- [6] leased Institute of Building (CIOB) (1989). *decide to Reducing Building Waste*. UK: hired Institute of Building.
- [7] City of Burnaby (n.d.). *Management and disposal of construction waste*. out there at: WWW.city.burnaby.bc.ca/cityhalldepartmentsdepartments_building_bldng_artcls_mnmnt.html. (Accessed 01/08/08)
- [8] CIRIA (1994). *Environmental reference for Building and technology Projects- Construction section*. London: CIRIA Special Publication.
- [9] Conway H. (1990). *setting ought to modification the angle*. Transport
- [10] Department of setting (1987). *Environmental Impact Assessment (EIA), Procedure and requirements in Asian country*. Minister of Science, Technology and conjointly the setting.
- [11] Electrical and Mechanical Services Department (2006). *observe Agreement No. CAOL013 – observe Study on Life Cycle Energy Analysis of Building Construction : Final Report*. Ove Arup & Partners metropolis Ltd.
- [12] Formoso, C.T., Isatto, E.L., Hirota, E.H. (1999). *technique for Waste management at intervals the Building business*. *Proceedings IGLC-7, seventh Conference of the International cluster for Lean Construction*, Berkeley, CA, 26-28 July.