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Analyzing Importance of Waste Management Technique in Construction Industry

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Abstract: ***Construction waste is generated throughout construction operation. Construction waste is one the largest issue of construction industry. It increases overall cost overrun of the project. Different stages of construction process produced different types of waste such as rework, material waste, process waste, substitution waste, negligence waste etc. It is important to reduce or eliminate construction waste for efficiency of the project and to reduce its harsh effect on environment through implementing good waste management technique. This paper will critically review various literatures on construction waste to know about different types of waste, reasons for waste generation and to find their probable solution. Based on study decision will be made which type of construction management technique suitable for Indian construction industry.***
Keywords: Construction, Waste, Management, Recycle, Building

I. INTRODUCTION

Construction industry has noteworthy economic importance in India. It accounts for 11% of India's GDP and employs approximately 33 million people, making it second biggest industry of the country after agriculture. Construction Industry provides large amount of employment for the people of india. Construction industry harms the environment by inefficient use of natural resources. Gathering of pollutants in atmosphere causes irreparable damage to the environment. Large number of nonrenewable energy sources and minerals are consumed by Construction Industry. The Construction wastes comprising of concrete, brick, metal, ceramics, roofing, gypsum, and wood. These wastes can be classified into two categories: recyclable and nonrecyclable wastes. Here, point to be noted is that not all recycled waste are treated major portion of them are used in landfills. European country's adopts efficient construction waste management techniques and recycle up to 90% construction waste thus natural resources used efficiently and financial loss due to wastage can be reduced. India is little behind in terms of adaptation of construction waste management technique.

II. WASTE IN CONSTRUCTION INDUSTRY

"Construction waste is generated whenever any construction and demolition activity is initiated."
There are many types of waste are being generated on site. Such as Excess inventory and scrap waste are parts of material wastage, poor quality leads to waste in terms of rework. Labour and material generate similar type of wastes; such as waiting waste, labour or equipment sitting idle, transportation waste, excess processing and excess movement. Implementation of efficient waste reduction technique may reduce generation rate on site.

III. TECHNIQUES USED TO REDUCE CONSTRUCTION WASTE

1) *3R:* 3R involves Reduce, Reuse and Recycle of construction waste
2) *Reduce:* Reduce aims at potential areas of waste generation in construction projects and it reduces waste generation.
3) *Reuse:* material can be directly recycled into the same product for reuse.
4) *Recycle:* waste can be reconstituted into other usable products.
5) *Lean Technique:* It was founded by Toyota Company for their motor cars. The aim of lean technique is to maximize production with minimum damage. The same principal can be used for construction site too. Toyota has identified seven important sources of waste in manufacturing: the process, movement, method, product defects, waiting time, overproduction, Inventory.
6) *6 Sigma:* It is tools and techniques for process improvement. 6 Sigma is used to improve the Quality and the output of a process by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. 6 Sigma aims to produce 99.99966% defect free production.
7) *Just In Time:* Firms use this technique increase efficiency and reduce waste by ordering goods only when they need them for production process, which reduces cost.
8) *Total Quality Management (TQM):* This approach focuses on improvement on how firm work and customer satisfaction. TQM involves participation of all the member of the firms in improving processes, products, services.

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IV. NEED FOR STUDY

Construction industry has very high demand for natural resources but statistics shows that they are not used efficiently making large percentage of materials wastes which could have prevented large finances of developer. Construction project management deals with effective use of time, cost and quality of the project. By reducing waste total cost of the project could be minimized. Construction waste increases due to faulty design, lake of proper planning and lake of proper execution. In construction industry over head cost increases due to wastage of different construction wastes which is the main concern of investor who have invested in industry.

V. OBJECTIVES

A. To study construction site waste and its types and its impact on overall construction project cost and performance
B. To study construction waste management techniques practices now a day practiced in project.

VI. LITERATURE REVIEW

A. Quantification of Waste in Conventional Construction

Study: Paper describes, large amount of non renewable resources are used by construction industry. It generates chemical and solid waste which is the primary source of pollution on the construction site. Exact quantity of waste generated during 24 to 36 month duration construction project is difficult to identify. In Various stages of construction different types of material wastes occurs like Steel, Cement, Aggregates, Sand, Brick, Bituminous material, Timber, Concrete. Reasons for waste in construction industry are material damage, material non use, excess procurement, human error. Quantification of waste gives additional information on waste generation rate and trend.

B. Material Waste in Building Industry: Main Causes and Prevention.

Study: This study describes that many studies have suggested that construction waste represent large number of construction expenditure. Some measures are used to monitor waste such as excess use of materials, poor quality failure expenditure, repair and maintenance costs, accidents and non productive time.

Two main consequence of high level of waste are decreasing the future accessibility of the material and energy in creating unnecessary demand on transportation. Types of waste as per this paper are Material waste, non-productive time waste, reworks waste, inefficient human work, debris, indirect waste. Reasons for wastes are defects in construction structure, unnecessary capital investment, scrap generated from cutting such as bricks, concrete blocks, timber; mismanagement of material at site, inadequate transportation equipment, unsuitable packing material and storage, poor handling of materials in transportation. Waste can be minimized by appointing inspector of inventories, implementing lean techniques, improving control systems can reduce the waste and makes it easier to eliminate.

C. Study of the Causes and Magnitude of Wastage of Materials on Construction Sites in Jordan.

Study: The objective of this paper is to identify material waste of the construction site on the basis of reviews of contractor, owner and consultant of the construction site.

There are six sources of waste where waste can generate such as design, procurement, handling of material, operation, residual, and others classified by Bossink and Brouwers. Some reasons for wastes are repeated design and clients changes, Rework due to human error, Poor contract documents, Incorrect and lack of storage of materials, poor policy waste minimization, Shortage and lack of experience of skilled workers, Poor site conditions, Damage during transportation, Theft and vandalism, error in quantity surveying, , Waste resulting from poor packaging, improper handling of materials, leftover material on site, complicated design, long duration of project.

Probable solution according to this paper

1) Enhance the standard of contract document.
2) Implementing batter policies for resource management, waste minimization.
3) Preparing better storage facilities.
4) Employing skilled and qualified staff.
5) Superior security system to fight theft and vandalism.

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D. Material Waste Management in Construction Industry

Study: Paper describes, there is very little awareness among builders and contractor regarding 3R(Reduce, Reuse, Recycle) concept of waste minimization. Most significant method for waste reduction is Reduce. There are two types of construction waste direct waste and indirect waste

Indirect waste: substitution waste, production waste, negligence waste, operational waste.

Direct wastes: delivery waste, cutting and conventional waste, fixing waste, application and residue waste, management waste.

Probable solution for waste minimization according to this paper is SWMP. SWMP is called Site Waste Management Plan it helps to manage the resources(materials) and provide motivation to waste reduction. A SWMP decides how waste and resources will be controlled and managed at all stages of construction.

E. Quantification of Material Wastage in Construction Industry of Pakistan: An Analytical Relationship between Building Types and Waste Generation.

Study: Building infrastructure is one of the biggest reasons behind economic development of any country. Construction industry produces large number of waste which causes huge losses to economy and environment. Increasing cost of project and competitive pricing have made it essential for developers to take serious action to reduce waste. In many cases project manager and construction team failed to identify main root cause which causes construction waste on site due to absence of proper tools and techniques. Eliminating of construction waste helps in increasing profit of developer. Efficient planning and execution of project can reduce construction waste. However what cannot be measured cannot be managed. This paper focuses on quantification of waste in construction industry.

F. Professionals' Views of Material Wastage on Construction Sites and Cost Overruns

Study: This paper suggests that In many construction projects Material waste is the main reason for cost overruns. By enhancing building material management cost overrun can be minimized. In many constructions site mortar is the most wasteful material during plastering/rendering. Construction waste management has greater potential to increase performance construction industry with cost saving benefit.

Construction industry consumes 3 billion tons of raw materials every year. While one quarter of worlds timber is used in construction industry. Most of these materials will end up as construction and demolition waste.

Here are some reasons waste generations like Poor supervision, design related errors, inadequate workers skill, inappropriate specification, and construction related errors, theft and vandalism, absence of site waste manager

G. A study on basic material waste: main causes and prevention.

Study: Paper describes 4-M (Material, Manpower, Money and Machine) plays deciding role in construction industry. Material waste is one of the biggest problems of construction industry. Based on building type waste is accountable for 60-70% of total project cost. Construction industry produces very large amount of waste but it is very difficult to systematically measure it. Problem of waste must be treated not for its efficiency concern but because of its harmful effect on the nature. Measuring is effective way of enhancing performance through improvement in waste management.

Some of the types of waste according to this paper are Overproduction of material than required, substitution, unnecessary inventories leads to material waste.

1) Reason for waste

General

a) Absence of material waste management plan.
b) Inefficient housekeeping & storage condition
c) Bad quality control
d) Adhoc procurement
e) Untrained labour
f) Theft and pilferage
g) Loss during transit and application.

2) Particular

a) Improper cutting of steel
b) Mishandling of cement bags

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c) Non utilization of cut piece of steel
d) Project delay
3) Lack of planning
a) Informative delay
b) Change in material, design and specification
c) Unrealistic labour planning
d) Lack of finance
e) Non availability of water ,power and other
f) Personal interest
g) Poor coordination of activities of contractors and consultants.

H. Waste Minimization in Construction Industry

Study: Paper gives information about types of waste:

Process Waste: The waste generates in the process of construction activities, called as process waste. There are various types of waste are occurred during process of construction activities. Such as steel, bricks, equipment's, etc.

Demolition Waste: The waste generates in the demolition activity is called demolition waste. Types of Construction Process Waste: Natural waste, direct waste, indirect waste, Consequential waste.

Probable solutions according to this paper are good operating practices, material substitution, recycling of material, sorting of site waste.

I. Economic Aspect of Construction Waste Materials In Terms Of Cost Savings – A Case Of Indian Construction Industry

1) *Study:* This paper focuses on economic aspect of waste generation on construction industry.
a) Reason for Wastage
i) Absence of awareness among clients and contractors
ii) Lack of skilled labor
iii) Deficiency of proper training and education
iv) Minimal Government interventions
v) Lack of market competitions
vi) Lack of interest from client
vii) Lack of waste reduction approach by architect
b) Probable solution: Government should encourage developer by providing incentive like tax credit for developer who uses recycle materials, implementing subsidy for recycled construction projects and reducing waste by introducing land fill tax for those who dump waste on land. Not just government private intuition should too spread awareness about waste reduction techniques and its economical benefits to construction firms; Firms should provide training to the unskilled labours and indicate them right way to minimize construction wastage.

J. Waste In Indian Building Construction Projects

Study: This paper investigates the occurrence of waste generated on Indian construction site focusing mainly on residential or commercial sites. A process has been developed for quantifying waste categories identified such as material scrap waste, excess inventory, rework, waiting, idle, transportation, excess processing, and excess movement. Quantification of waste will provide information about cost overrun of the project. Labours productivity can be measured through work sampling technique.

VII. CONCLUSION

Construction industry produces large amount of waste which leads to overall cost overrun of the project. Material waste, rework, overproduction, theft and vandalism all are types of construction waste. It can be minimized by knowing about different types of construction waste and their causing factors. This helps in focusing on areas where efficient waste management is required. Using waste management techniques such as 3R, lean, just in time and TQM (Total Quality Management) helps to control or eliminate construction waste. Based on Research paper studied, this paper proposes use of 3R (Reduce, Reuse and Recycle) for Construction industry in india for reduction of waste. This could benefit people working in construction industry like contractor, builder and consultant etc.

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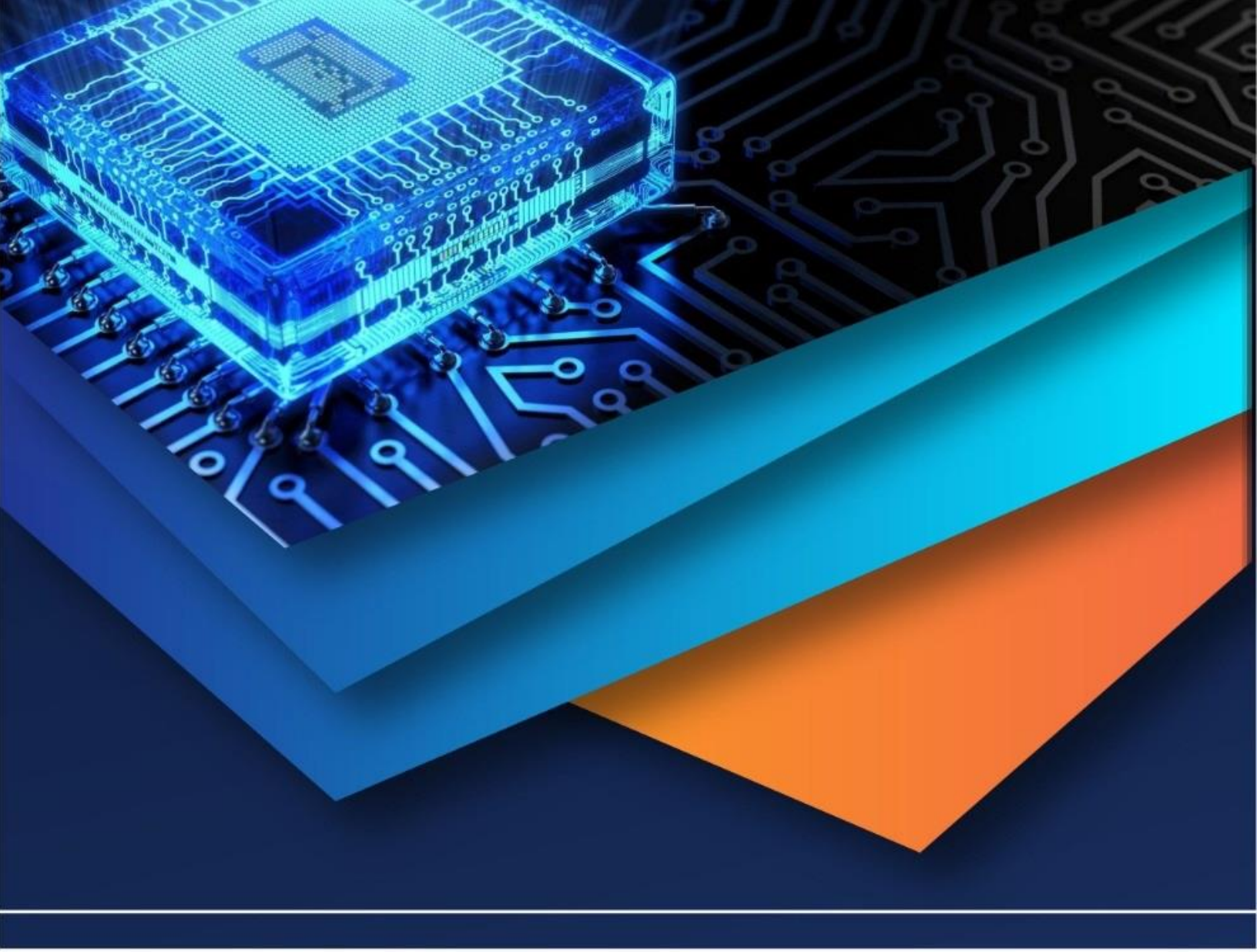

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