

# CONSTRUCTION MATERIAL WASTAGE MINIMIZATION AND MANAGEMENT: REVIEW

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**Abstract** - Construction industry has been developing rapidly throughout the world. The development has led to serious problem in generation of construction wastes in many developing countries and expectation of the natural resources to large extend. The construction wastes have greater impact to environment, economy and social of each world country. With the advancement of science and technology, a wide range of new building construction materials has been developed for the construction of civil engineering structures. Depending upon the type of the structure, the cost of construction materials may be up to 65% or more of the total cost. Utilization of appropriate construction materials coupled with effective management of these construction materials largely help successful completion of the structure. A large quantity of different types of construction wastes with different characteristics is generated every day throughout the world. However, this environmental problem may be minimized by introducing a systematic planning and management of construction wastes.

**Key Words:** Construction material, Construction Wastes, Waste management, waste minimization, 3R (reduce, reuse, recycle), and Environment.

## 1. Introduction

Construction plays an important role in developing the infrastructure of the country. But the problem faced by the industry is the construction material waste. Construction activities generate more waste materials compared to other industries. All the materials used in the construction activities gets wasted, which in turn increases or boosting the cost of the project, reduces the profitability for contractor and gives a negative impact to the environment.

Although construction waste occurs during the actual construction activities, there is an understanding that it is caused by activities and actions at design, materials procurement handling and construction stages of project delivery processes. Construction industry is one of the highly growing economies in India. Accordingly, introduction of appropriate management and planning system in terms of construction materials and organizational set up may be beneficial to not only the construction companies but also the society and environment. The success of a construction company is substantially dependent upon the implementation of an effective management and planning system of the construction material. Construction materials constitute a major cost component of a civil engineering structure. The cost of construction materials may be up to

65% of the total cost incurred in the construction of a civil engineering structure. However, it is dependent upon the type of project, and the construction technique and plant used [1].

Appropriate planning and construction management reduces wastage of construction materials substantially. This in turn improves or increases the performance and economy of the organization. Material management functions in coordination with planning and control of material flow. Poor progress of construction may in majority of cases be due to poor planning and management of construction material. Management is concerned with planning, procuring, receiving, stacking and distribution of construction materials at appropriate time and place. The main objective of material management and planning is to make available the right construction materials are in the right place, in the right quantities when needed.

### 1.1 Construction waste definition

Construction waste has been defined in various ways. As the different researcher defined waste is difference between materials ordered and those placed for fixing on building projects. In 1981 another definition emerged about waste stating that waste is any material apart from earth materials, which needed to be transported elsewhere from the construction site or used on the site itself. Construction wastes in any project are in the form of building debris form demolition activities, rubble, earth material, concrete wastes, steel wastes and timber etc.

### 1.2 Sources of material waste in construction

Different factors contribute to the generation of material waste. These factors have been grouped by Ekanayake & Ofori [2] under four categories: (1) design; (2) procurement; (3) handling of materials; and operation (4). As I think that the process of waste minimization must be started at the early stages of the project. The most frequent measures practiced to minimize and reduce material waste are staff training, adequate storage and just- in time delivery of materials are one of the most important.

### 1.3 Material waste minimization measures

Waste mitigation, minimization and prevention management are sometimes used, interchangeably. Jacobsen and Kristofferson [3] in their report on waste minimization and reduction practices in Europe gave a clear distinction

between the three R concepts and defined waste minimization in three options prioritized according to the waste hierarchy. The first major priority is waste prevention, the second is waste re-use and the third priority is waste recycle. Reducing the waste generated at source is considered as the first option out of 3R concept to be implemented for better protection of the environment and economic saving.

## 2. Construction Material Management

An essential factor which adversely affects the performance of construction projects is the improper planning and management of construction materials during the execution of construction activities. Construction industry contributes important portion of the global economy and employs large amount population across the world. It accounts for 13% of the global economy and contributes annual amount of \$12trillion, which is projected to reach \$15trillion in 2025, according to a year 2013 analysis by Global Construction Perspectives [4].

As such, apart from environmental sustainability, reduced resource excavation and prevention of several environmental hazards as likely results of waste reduction [5], proper waste minimization technique has considerable economic benefits. Costs associated with waste include cost of materials purchased, cost of storage, removal, transportation and, eventually, the cost of waste disposal and associated penalties [6]. So, if the flow of construction materials is not planned and managed properly it may result in a major variation in project cost. Studies by the Construction Industry Institute (CII) have shown that construction materials and installed equipment can make up to 50–60% of the total project cost. Ineffective management of projects causes considerable waste in time and money. Material management and planning system in any project ensure that the right quality of material and quantity of construction materials are appropriately selected, effectively purchased, properly delivered and safely handled on construction by reasonable cost. Any organization needs to put their efforts for proper construction materials management and planning systems for the effectiveness of project execution. There must be a centralized material management team co-ordination between the construction site and the organization so that effective and efficient material management strategies can be applied and monitored.

Material planning considers construction materials in the order of requirement at construction site [7]. Material procurement and storage on construction sites need to be properly managed, planned and executed to avoid the negative impacts of material on environments and shortage or excessive material inventory on-construction site deficiencies in the supply and flow of construction material. There should be awareness about material planning & scheduling at every stage of material management [8].

### 2.1 Techniques of construction material management

Construction materials management is categorized to 5 processes these processes are majorly followed on construction site they are namely 1.Planning, 2. Procurement, 3. Logistics, 4. Handling and 5 Waste control processes. Construction materials planning include quantifying, ordering and scheduling. Construction materials handling encompasses virtually all aspects of various movements of raw construction materials, work in process, or finished goods within a construction site [9].

For effective material management the most important construction materials management functions are Primary Functions: the primary functions of the construction materials management are defined as construction materials requirements planning (MRP), purchasing, inventory planning and control, ascertaining and maintaining the flow and supply of construction materials, quality control of construction materials, departmental efficiency. Research has shown that construction materials and equipment may constitute more than 65% of the total cost for a typical construction project [9]. There should be awareness about material planning & scheduling at every stage of material management.

### 2.2 Construction Waste Management

Construction waste consists of unwanted material produced directly or incidentally by the construction or industries. Construction and demolition waste is generated whenever any construction/demolition activity takes place [10]. Construction wastes in any project are in the form of building debris from demolition activities, rubble, earth material, concrete wastes, steel wastes, timber wastes, and construction site clearance construction materials, arising from different construction activities of project including land excavation or formation on construction site, civil and building construction materials, construction site clearance waste, and building renovation waste. Material waste has been recognized as a major problem in the construction industry that has important implications both for the efficiency of the industry and for the environmental impact of construction projects [11]. For managing the waste there must be efficient waste management system which can control the waste at source and manage the waste at every stage or phase of construction project [9].

### 2.3 Control of Construction Waste

Reduction and minimization of waste can be done by practicing attitude towards Zero wastage, proper decisions at design stage, procurement, construction site management, and proper standardization of construction materials, and Codification of the same [9]. Construction waste can also be reduced by using waste management practice on construction project. The construction project activities are to be planned at every stage by every construction personnel, who are involved, in minimizing and mitigating the overall waste generation at project [12].

Concept of 3R can be also beneficial to reduce the wastage of construction materials, which includes reduce, reuse, recycle, and recovery. These can be applied to the entire lifecycles of products and services of construction project [12]. One way of control of construction waste use of environmental friendly construction methods has been encouraged, such as using clear specification as per the contract, large panel system on any construction project prefabrication components for enhancing effectiveness, and reducing the application of waste trade.

#### 2.4 Present Situation of Construction Wastes

Due to least priority given to appropriate construction site waste minimization and management systems in Indian construction industries leads to generation of huge or large quantities of material waste every year. Presently, awareness of resource efficient construction practices is lacking in most countries [13]. Currently, existence of national policies as well as the regional policies, laws and regulations governing reuse and recycle principles for construction waste is minimal as far as India is consent [14]. At present, private contractors remove this waste to privately owned construction site, low lying land for a price purpose, or more commonly dumping it in unauthorized locations along roads or other public land or the region [10]. Central Pollution Control Board has estimated current amount of solid waste generation in India to the tune of 48 million tons per annum of which waste from Construction Industry accounts for 25% [10]. Recent studies as in pointed out the waste generated in China are around 40% and 39.27 million tons in Spain. Today, in most European countries use recycled materials up to 80–90% of the total amount of construction wastes and most advanced demolition and recycling technologies are generally implemented [11].

#### 2.5 Waste Minimization & Recycling aim

Starting with an aim will help guide the decision-making process, as well as provide direction for subcontractors and suppliers. It is also provides a baseline for measuring how well the project succeeded with waste minimization, prevention, mitigation and recycling. This provides you with “boasting rights.” As will be discussed in the review of this document, in addition to the cost savings and environmental good that is achieved through waste minimization and recycling, it positions your business in a unique niche that can benefit your overall business development environments.

#### 2.6 Waste Minimization Strategies

Minimizing what you need to buy and planning to use these materials efficiently and effectively is the first step to avoid waste in construction. There are many effective strategies to achieve or gain this all of which also lead to cost savings and increased profitability.

### 3. Conclusion

Construction waste management is required for a country to develop in a sustainable manner. It helps to address issues related to environment, social and economy. Once the causes of waste generation are identified, it can either be avoided or minimized to benefit the globe for better future. This study has identified significant factors contributing to waste in construction projects. By identifying the significant factors in construction process, construction players are able to notice the best ways to apply new practice for reducing material waste and cost in any project. Based on the results and findings of the paper the following recommendations are made to reduce the construction waste generation in any construction projects. The aim of this study is to investigate the waste recycling and reuse in the construction industry.

#### Summary

Finally, I have recommended that in the planning stage of any construction project, larger efforts should be exerted on the planning preparation, scheduling and cost evaluation to reduce the risk of waste and cost of the project implementation. Similarly, during the construction stage of projects careful organization and management processes should be applied to fulfill the requirements of the projects' plans.

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