International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 05 | May -2017 www.irjet.net p-ISSN: 2395-0072

Scenario of Construction material waste and its effects on cost Wastage in Nasik

Mahajan A.P.[1], Aher P.D.[2]

[1] PG Student, Department of Civil Engineering, NDMVPS's KBT COE, Nashik. M.E-Civil (Construction and Management), Maharashtra, India.
[2] Assistant Professor, Department of Civil Engineering, NDMVPS's KBT COE, Nashik. M.E-Civil (Construction and Management), Maharashtra, India.

Abstract - *Construction and demolition waste is defined as a mixture of surplus materials arising from any excavation, civil or building construction, site clearance, demolition activities, and road works and building renovation. With the technological advancement and rapid development of new areas, the cities are facing a lot issues relating with construction and demolition waste. Also increasing amount of waste contributes to increase in overall cost of the project. A detailed study is made on such scenario of construction material waste generation and its effect on cost, for residential projects in consideration of the city Nasik. This paper overviewed the same scenario for 5 small scale residential construction projects in Nasik where chances of waste generation are more due to lack of proper management. Also regulatory framework is suggested to overcome the problem.*

Keywords:
Construction waste, Demolition, Management, Cost saving

1. INTRODUCTION

1.1General

Indian construction industry is one of the largest in terms of economic expenditure, volume of raw materials/natural resources consumed, volume of materials and products manufactured, employment generated, environmental impacts, etc. (1) Waste in the construction industry is important not only from the perspective of efficiency, but also concern has been growing in recent years about the adverse effect of the waste of building materials on the environment. During new construction, Construction & Demolition (C & D) Waste is produced by refurbishment or renovation of building. The characteristics of the demolition waste may vary depending on the types of structures demolished and the demolition technique used. It has been established that materials and components recovered from demolished buildings are being reused for new construction works as well as renovation projects, especially by low-income communities in developing countries.

It is estimated that the construction industry in India generates about 10-12 million tons of waste annually. (5). These numbers clearly shows that it is a matter of concern to look upon for environmental safety and to avoid cost overrun of projects. The main objectives of today's researchers are: 1.Quantification of the wastage in commonly used construction materials, 2.Finding out the root causes of waste generation 3. Invention of new techniques to reduce or recycle or reuse the generated waste.

1.2 Need of the study

Construction industry is a global industry. Nasik is one of the fastest growing metropolises in India. Construction waste occupies considerable storage space either on the road, road side, adjacent open spaces etc. Since construction projects are going-on in most parts of the city including re-development projects in old limits of NMC and new projects in peripheral areas, increased amount of construction waste dumped randomly is evident. City has to face many problems related to waste generation which effects on overall project cost. By proper construction waste management we can achieve our goal in a minimization of overall project cost. To ascertain the remedies it is necessary to forecast waste generation and its effects on cost.

2. OVERVIEW OF CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

Construction waste is produced in large quantity by infrastructure projects, renovation or demolition of structures, roadway etc. Nasik is commercial and industrial center with an average rate of GDP of around 1% per year from 1993 to 2009.Waste is generated during site preparation, material use, and material damage during handling, material non-use, excess procurement and human error etc. All the issues related to material waste

and its effect on overall cost of a project need be identified for waste management. Literature founds following amount of waste and its constituents in Indian Construction industry.

Table-2.1: Constituents of Waste arising from Construction Industry in India

Constituents	Quantity generated in Million Tonnes
Soil, Sand and Gravel	4.20 to 5.14
Bricks And Masonary	3.60 to 4.40
Concrete	2.40 to 3.67
Wood	0.60 to 0.73
Metal	0.25 to 0.30
Other	0.10 to 0.15

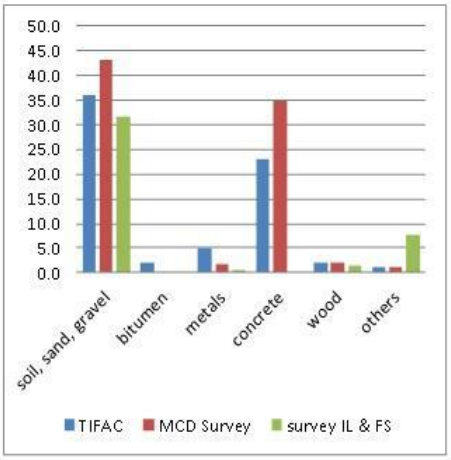

Chart-1: Typical Composition of Indian Construction Waste

2.1 Objectives of the study

1) To study the construction material waste scenario in 5 construction sites of Nasik.
2) To assess the practical data of material wastage and its management using questionnaire survey, rating and literature review.
3) To show the implications and effect of cost on construction project arising due to construction material wastage.

3. METHODOLOGY

To achieve the objectives of present investigation, extensive data collection and comprehensive work is carried out. It is divided in two phases as mentioned below:

1. **Identification of Scope and Need of the study -** Rising disposal costs and reduction in number of landfills create a need to search for alternatives to reduce, reuse, recycle and refuse of construction waste being generated. For this asset, implementation of construction waste management can be one of the apparent solutions for the industry to minimize waste and waste disposal, ultimately reducing costs incurred during the process and contributing to the global "Environmental-friendly "movement.
2. **Preparation of Questionnaire Data-**Questionnaire is prepared and responses are taken from 20 respondents in order to assess the construction material waste management scenario. Management authority, site engineer, site supervisor and workers are included in this process for responses. Questionnaire data includes the simple questions related with importance of waste management, benefit achieved, highly appreciable methods for waste reduction etc.
3. **Development of Simple Grading /Rating System-**A simple rating system in the form of agreeness and order of importance is developed to get the responses. The level of responding is achieved by comparing rating with numerical values. So that respondent replies immediately and in view with first option striking to their mind.
4. **Site selection and analyzing the factors of waste material management -** Four small to medium construction sites are selected for assessment and to find out the cost analysis data. 1. Bliss builders and developers-Bliss Central 2. SM Properties- Avadhoot Park 3. SM Buildcon- Yogiraj 4. Shree Ganesh Construction- Shree Ganesh Residency 5.Bharat Constructions-Bharat Blossom
5. **Cost Implications due to construction waste using MS-Excel -** Material Reconciliation was carried out by comparing the difference between the purchase records and the actual requirement of the material and stocked records according to the Bill of Quantities work items. Norms of the Building Schedule of Rates (BSR) were taken as the basis for analyzing the work items of Bill of Quantities. This is justifiable as most contractors use BSR for estimating and material requisition.MS Excel is used for the cost analysis.
6. **Analyzing questionnaire data and Reports using IBM Statistics SPSS 24.0 software -** IBM SPSS Statistics 24.0 is the statistical software used to solve business and research problems by means of ad-hoc analysis, hypothesis testing, and predictive analytics. Organizations use IBM SPSS Statistics to understand data, analyzation, and forecast and plan to validate assumptions and drive accurate conclusions.
   Along with the questionnaire survey following requisite data is also collected for the project work to investigate

the cost implications arising due to material wastage. These quantities are taken from bill of quantities.

- Material Purchase Quantity for project
- Material used quantity for construction activities

The 10 material which contributes majorly to construction waste are identified from the recent literature referred considered for the study. Those materials are enlisted as below.

1. Cement

2. Crush sand

3. River Sand

4. Aggregate

5. Steel

6. Masonary Bricks

7. Tiles

8. Electric conduit

9. Plumbing Conduits

10. POP Bags

The construction sites performances are then rated based on waste management policies, implementation programed and site scenarios through 5 main factors enlisted as below:

1. Manpower

2. Material

3. Method

4. Management

5. Policy

All these factors are further enlisted into numerous assessment questionnaires which deliberately focus on the topic and give prescribed results. Herein the main focus is on to achieve the correct results for material wastage study based on actual field condition.

Table -3.1: Performance Rating Index

SR NO.	RATING	DESCRIPTION
1	Excellent	Waste management performance in this site is very effective in decreasing wastes and increasing recycling.
2	Good	Waste management performance in this site is a little effective in decreasing wastes and increasing recycling.
3	Poor	Waste management performance in this site is ineffective in decreasing wastes and increasing recycling.
4	Bad	Waste management performance in this site is very ineffective in decreasing wastes and increasing recycling.

3.1 Material Wastage Calculation

Material Reconciliation was carried out by comparing the difference between the purchase records and the actual requirement of the material and stocked records according to the Bill of Quantities work items. Norms of the Building Schedule of Rates (BSR) were taken as the basis for analyzing the work items of Bill of Quantities. This is justifiable as most contractors use BSR for estimating and material requisition. Wastage allowances are expressed usually in proportion to the actual quantity of work. Accordingly, this study considers wastage as proportionate to the actual work, as shown below.

- Material Waste Quantity = Purchase Records-(Used Quantity Records + Stocked Records)
- Material Wastage (%) = Material Waste Quantity Purchase Records

4. RESULTS AND DISCUSSION:

1. The result of the study shows the average material wastage of considered sites in the following proportion—

Table No- 4.1: % Wastages of materials

SR NO.	Material	Material Wastage (%)
1	Cement	5.02
2	Crush Sand	9.62
3	River Sand	11.95
4	Aggregate	12.98
5	Steel	4.72
6	Masonary Bricks	5.95
7	Tiles	11.07
8	Electric Conduit	6.06
9	Plumbing Conduit	6.90
10	POP Bags	14.06

2. The result of the study shows that with proper construction material waste management the average material cost saving can be up to 8.80%.
3. Site performances rating system shows that most of the sites considered for analysis found to have a poor waste management scenario and need improvement.

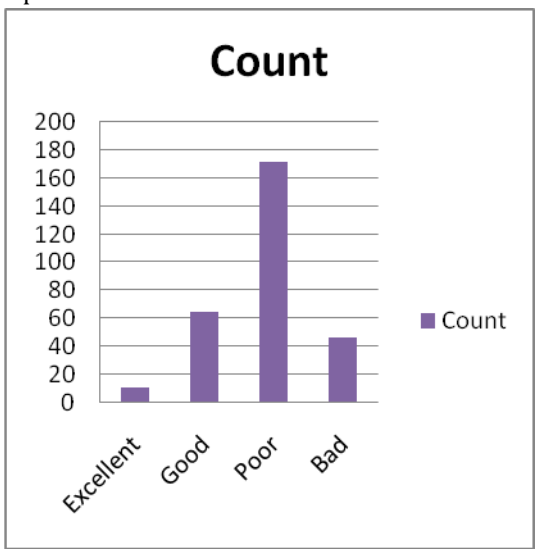

Fig-4.1: Site Performance Rating

5. CONCLUSION

The present research on the construction material waste management arrived at following conclusions after all data analysis.

The construction material waste scenario of all 5 residential, medium to small construction sites found to be considerable in cost effectiveness and needs management. Questionnaire survey, rating and literature review provides correct assessment for needed things and barriers in construction. The implications of rising cost on construction project arising due to construction material wastage ranges between 5% to 10 % for considered projects. The management policies for material waste reduction on site explore ways to avoid or reduce material wastage and zero waste for future building projects.

5.1 Limitations of the study

1) The scope of the research is limited to studying of actual site waste management policies for sites in consideration.
2) The material wastage varies with site to site
3) Cost implications are approximate as the correct estimation is difficult due to varying uncertain factors.

5.2 Future Scope

1) Study of activity wise construction waste generation and representing it using MSP.
2) Identification of sources of waste generation
3) Use of 4R technique to deal with problem of waste generation

REFERENCES

1) Mansi Jain, "Economic Aspects of Construction Waste Materials in terms of cost savings – A case of Indian construction Industry", International Journal of Scientific and Research Publications, Volume 2, Issue 10, October 2012 1 ISSN 2250-3153
2) DharatiSote – Wankhade, Dinesh Bhonde, Rahul Nawle, VaishaliAnagal, "Optimizing energy through on-site reuse and recycle construction waste in residential project – A Case Study of Pune", 30th INTERNATIONAL PLEA CONFERENCE,16-18 December 2014, CEPT University, Ahmedabad
3) Vivian W. Y. Tam, "Rate of Reusable and Recyclable Waste in Construction",Coventry7 university and University of Wisconsin Milwoukee Centre for by products utilization, Second international Conference on Sustainable Construction Materials and Technologies, June 28-June 30,2010, ,ISBN 978-1-4507-1488-4, Ancona, Italy
4) R.K.Kolisetty, H.S.Chore, "utilization of waste materials in construction activities: a green concept "International conference on Green Computing and Technology, 2013, International Journal of Computer Applications (0975 – 8887)
5) JayashriPatil, Prof.Dr.M.Husain, "Working Paper on Construction Waste Recycling and Its Reuse in Jalgaon City", International Journal of Engineering Trends and Technology (IJETT) – Volume X Issue – JANUARY2015, ISSN: 2231-5381
6) Markandeya Raju Ponnada ,Kameswari, "Construction and Demolition Waste

Management – A Review", International Journal of Advanced Science and Technology Vol.84 (2015), pp.19-46, ISSN: 2005-4238 IJAST

7) Abioye A. Oyenuga, Rao Bhamidiarri, "Considering Appropriate Decision Support Models for Construction and Demolition Waste Management Optimization : Possibilities sand Limitations", SSRG International Journal of Economics and Management Studies (SSRG-IJEMS) – volume2 issue5 Sep to Oct 2015, ISSN: 2393 – 9125
8) A.K. KASTHURBA, K.R. REDDY , D. VENKAT REDDY, " Sustainable Approaches for Utilizing Waste in Building Construction: Two Case Studies in India", International journal of Earth Science And Engineering, June 2014, P.P.838-844, Volume 07, No. 03, ISSN 0974-5904
9) SiddharthPatel, AnupPansuria, ViralShaha, Sahil Patel, "Construction and Demolition Waste Recycling", IJIRST –International Journal for Innovative Research in Science & Technology| Volume 1 | Issue 7 | December 2014 ISSN (online): 2349-6010