

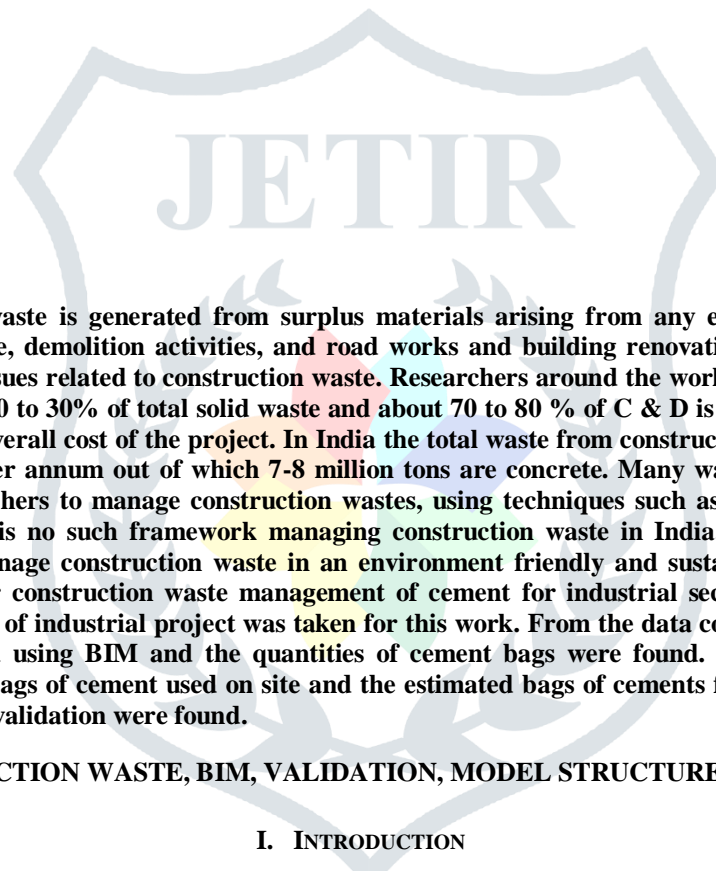
“PREVENTION OF ON-SITE CONSTRUCTION WASTAGE OF CEMENT GENERATED DURING CONSTRUCTION PHASE OF INDUSTRIAL BUILDING, USING BIM”

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Abstract— Construction waste is generated from surplus materials arising from any excavation, civil or building construction, site clearance, demolition activities, and road works and building renovation. Many cities around the world are facing a lot of issues related to construction waste. Researchers around the world have reported that C & D waste constitutes around 20 to 30% of total solid waste and about 70 to 80 % of C & D is concrete. These wastes also contribute to increase in overall cost of the project. In India the total waste from construction industry is estimated to be 12 to 15 million tons per annum out of which 7-8 million tons are concrete. Many waste management tools have been developed by researchers to manage construction wastes, using techniques such as 3R principal, smart-waste, BIM, etc. However there is no such framework managing construction waste in India. Hence there is a need for developing a model to manage construction waste in an environment friendly and sustainable manner. This paper aims to develop model for construction waste management of cement for industrial sector in India based on BIM technology. The case study of industrial project was taken for this work. From the data collected a model structure of the project was developed using BIM and the quantities of cement bags were found. This quantities found were validated with the actual bags of cement used on site and the estimated bags of cements found by using conventional method. Results from this validation were found.

Keywords—CONSTRUCTION WASTE, BIM, VALIDATION, MODEL STRUCTURE

I. INTRODUCTION

Construction waste can be 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.

During new construction, Construction Waste is produced by refurbishment or renovation of building. In India , around 30% of the total municipal solid waste generated in the country comprises of C&D waste. TIFAC has conducted a techno-market survey on 'Utilization of Waste from Construction Industry' targeting housing/building and road segment. The total quantum of waste from construction industry is estimated to be 12 to 15 million tons per annum out of which 7-8 million tons are concrete and brick waste.

Hence there is need for construction waste management, by using the techniques like 3R principal or the innovative tools for minimization of waste produced during the project life cycle.. Current construction waste management (CWM) approaches mainly focus on strategic vision forethoughts related to design, logistic and supply chain, and on-site waste issues. Current CWM techniques developed by the industry are mainly concerned with on onsite, off-site, and logistic waste minimization issues. Current CWM tools, such as SMART Waste, are related waste audit and better on-site practices to comply with waste regulations, such as Site Waste Management Plans (SWMPs) (WRAP 2011). The use of BIM is also done as tool for waste management.

BIM is a technological platform to facilitate the decision making processes. Based on BIM, a designer ponders different design options, which are formed by various 3D parametric models stored in the BIM component library. In this case, the 3D models are linked to a particular database indicating state-of-the-art average waste generation levels if the models are adopted. BIM act as framework for waste management and optimization.

In India there is deficiency of such techniques and framework for waste management. Thus there is a need to develop a framework for construction waste management. This will help to reduce the wastage of material on the project and effects on environment.

II. LITERATURE REVIEW

Evaluation on the expectations of stakeholders on how BIM could be employed for CDW management. The results of this study improve the understanding of BIM functionalities and how they could be employed to improve the effectiveness of existing CDW management tools, and the understanding of the industry expectation on the use of BIM for CDW management will improve the implementation of BIM-based software prototypes for CDW management. (Akinadea O.O., et al (2018))

The potential of BIM applications in preventing/reducing wastes in the construction process was found that the construction waste that is generated during the construction process can be minimized by the possibilities of technology. (Salgın B. , Akgun A., et al (2017))

BIM can be a possible solution for eliminating major causes of construction waste arising during both the design and construction stages. (Won J, Jack C.P. , Cheng, et al (2016))

III. MATERIALS AND METHODS

- 1) Research objectives
 - a) To analyse Cement waste generation on construction sites.
 - b) To develop construction waste management model based on BIM.
 - c) Comparative study
- 2) Data collection

An industrial site was taken as the case study for collecting the data. The data in the form of working drawing , actual quantity of usage of cement on the site was taken. The site was industrial building of area 82661.01sq.ft. From the working drawing the quantities of the cement bag were found by using the constants. These quantities of the cement bags were analysed with the actual usage of cement bags on site. It was found that actual usage of cement bags on site was excessive then the estimated . With the help of working drawing a BIM model was prepared using Autodesk Revit through the model developed the quantities generated by the model was found these quantities was then compared with actual consumed and estimated quantities.

IV. DATA ANALYSIS

According to data collected the cement bags required for Rcc work were estimated and it was compared with values found from BIM Model. The following are the observations:-

Table 1 : Estimation Results

| WORK | ESTIMATE D VALUE | ACT UAL VAL UE | BIM |
|------|---------------------|-------------------------|----------------|
| RCC | 7688.46 (BAGS) | 8720 (BAG S) | 4893 (BAGS) |

From the data analysis it was found that the estimated value of cement bag was 7688.46 and the value of cement bags used actually on-site was 8720. BIM Model value of cement bags were 4893.

V. CONCLUSION

It is found that the conventional estimated value is higher than the value which is found by using BIM model. Hence it suggest that usage of BIM can minimize the wastage of cement bags required for RCC work.

REFERENCES

- [1] Kumar V. A. , Varghese S, [2018], “BIM based 3D Model for Construction Waste Quantification”, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 05 Issue: 05 |
- [2] Akinade O. O. , Oyedele L.O , Ajayi S. O. , Bilal .M , Alaka H.A , Owolabi H.A , Arawomo O.O, (2018) “Designing out construction waste using BIM technology: Stakeholder ‘s expectations for industry deployment” Journal of Cleaner Production .
- [3] Salgın B, Akgun A, Coşgun N, Agyekum K, [2017] “Construction Waste Reduction Through BIM-Based Site Management Approach”, International Journal of Engineering Technologies-IJET, Vol.3, No.3,.
- [4] Bosch-Sijtsema. P and Buser M, [2017] “Construction and Demolition Waste Management on the Building Site: A Literature Review, 33rd Annual ARCOM Conference, Cambridge,UK, Association of Researchers in Construction Management, 269-278.
- [5] Won J. , Jack C.P. ,Cheng A. , Lee G , (2016) “Quantification of construction waste prevented by BIM-based design validation: Case studies in South Korea”, Waste Management 49 170–180.

