IMPORTANCE OF BIM IN FORMWORK DESIGN

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Abstract - *BIM characteristics like quick access to the knowledge, visualization, and simulation capabilities also facilitate the event of an interactive knowledge repository, which in turn can foster a conducive learning environment. The results show that the proposed method provides the precise quantities of concrete formwork as compared to the quantities from the 3D model that the surfaces represented the formworks were selected manually. The time spent on manual calculation or creating formwork models is saved and the human errors are reduced. The drafting of formwork systems for concrete structures is one of the most complex tasks in the formwork construction than the design and selection of the formwork systems. This research comprises of creating 3D BIM and converting it into a wire-frame model and set as reference for the impartibility of the already created 3D BIM family files of the concrete formwork systems to perform the parametric change characteristics of the 3D BIM formwork family files so on verify the automated construction layout and simulation characteristics. A detailed exploration of the 4D time scheduling and 5D cost also are scrutinized for the profitability of the formwork construction.*

Key Words: formwork, design of formwork, shuttering, software, formwork design using software.

1. INTRODUCTION

The drafting of formwork systems for concrete structure is one of the most complex and important task in construction. Drafting is done manually or by using 2D drafting software. Then in AutoCAD 3D models are used to visualize in a better way but this system is much more complex and time consuming.
In recent years, Building Information Modelling [BIM] has been widely adopted by the designers and contractors during the early stage of construction projects. BIM has changed the way of buildings are designed, constructed and operated. BIM facilitates fast access to the information stored in a single centralized database or in different databases held at various locations. The 3D model gives the complex details in an easy way to visualize better than 2D drawings. BIM also helps to find out the quantity of temporary structures like scaffolding, formwork, etc. The temporary structure also plays a vital role in estimation of construction. In addition to formwork design, BIM based data could be used to estimate labour productivity in formwork operation and determine required consumption of formwork systems.

A customizable system which was developed using a visual programming environment to extract data of cast-in-place concrete elements form BIM model and then designs a formwork system using a database of modular formworks from different suppliers

2. LITERATURE REVIEW

The system can improve productivity (reduction of workload and work time) and economic efficiency (reduction of formwork types and rational form dimension selection).using the BIM technique to rationalize the formwork layout, incorporating the particular site characteristics and imparting the parametric change during construction. It also provides the background concepts and techniques required to adopt the BIM as a simplified and intriguing tool to carry out the 4D Schedule and 5D Cost of the concrete formwork systems. [1]

The major factors in layout planning were: cost, constructability, safety, quality, and characteristics of the building and therefore the site. BIM (Building Information Modelling) to provide more precise information about the shape, dimensions, and the structure of the buildings that can be found on the existing 2D-based drawings. [2]

The study proposes a framework to incorporate the concrete formwork design process and safety rules with BIM authoring tools for designers when designing and planning temporary structures. A Revit plug-in aimed at utilizing the existing data from BIM models to design timber slab formwork systems was developed. Applying the proposed plug-in on a case study with a 3D BIM model. [3]

Concrete formwork is a temporary component that usually absent from a BIM model and hence it is impossible to directly extract its quantity from the model. They presented a method to automatically calculate the quantities of concrete formwork from the surfaces of the RC elements that touch the concrete formwork. The proposed method imports RC elements from a BIM model and filters out the elements that are not cast-in-place concrete. [4]

It is finished up from the above information examination that Mivan development require less time and cost to finish development. Right now is no prerequisite of putting dividers, aluminum formwork will give better surface completion. [5]

The problem of choosing optimal formwork systems has been extensively studied. While the formwork layout is as important as formwork selection in improving productivity, there are few studies on formwork layout. [8]

3. METHODOLOGY

This study focuses only on the RC elements that are cast-in-situ concrete elements, which require concrete formworks on a site. The possible RC elements that can be cast-in-situ concrete elements are foundations, columns, beams, slabs, walls, and consequently they number have been determined utilizing exceed expectations sheet. With the help of Microsoft venture programming the time required and cost is determined. Additionally formwork's cost Productive, fast development, better completed quality, low support is studied. Afterwards to decide the implication of choice of formwork.

Creation of 3D BIM formwork in-place family files
The formwork components are drafted and saved as Revit in-place family files (.rfa files) using the Revit of any version. The 2D drawing of the building should be drafted and validated in greater detail to get the 3D BIM model within the Revit.

Impartation of 3D BIM formwork family files into the 3D BIM
to incorporate formwork systems within the 3D BIM Model, the procedures adopted includes conversion of the solid 3D BIM Model into a 3D BIM wireframe model, which acts as a reference for insertion of created formwork family files.

Computerized Building Replication of Concrete Formwork Systems
The dynamic in-place formwork family files have the capabilities to adjust itself to the confined structural

component .The parametric change characteristics of the formwork systems are verified earlier in greater detail. However the BIM has additional advantage that's the generation of automatic simulation of the concrete systems.

The 3D formwork family files incorporated within the entire floor of the 3D BIM structural model is that the basis for conducting the simulation. Since formwork are temporary structures and there rise a problem of repetition of formwork systems, thus the incorporation of 3D formwork family files incorporated within the whole floor of the 3D BIM structural model is small subtle, however when this model from Revit gets exported to .dwf file and imported in Navisworks, the masking of the various floors is possible so on provide a sequencial progress of the formwork construction from the beginning to end. It is also wont to consider the repetition characteristics of formwork systems also within the model during simulation. Once the scheduling of the formwork construction is completed using any scheduling software like oracle Primavera, Microsoft Project 2010, etc., the schedule data is imported into the Navisworks 2012 and the automated simulation is done so as to obtain the 4D time and 5D cost values of the formwork systems in Microsoft Excel.

4. RESULTS AND DISCUSSIONS

The 3D BIM model with all the 3D formwork families incorporated in it are an excellent tool within the layout of formwork systems. Nevertheless, its importance could be also enhanced by the further parameters like parametric change characteristics, automated layout and simulation of concrete formwork systems. Generally, the quicker you can complete a structure's construction, the less money you will spend on the project overall. Also, concluding a project on time or early speeds up your subsequent return on investment.

5. CONCLUSION

Formwork systems are essential part of cast-in-place concrete construction and automated design of formwork systems could improve this design process by saving time, and enhanced visualization and documentation. In traditional formwork system mainly wood and steel are being used as a material for formwork system. In wooden formwork system, time delay and fewer accuracy are main constrained. Installation and dismantling period is very high in wooden system. In steel formwork system accuracy is in work are often achieved but due to its heavy weight it requires crane for

lifting purpose as a result it proves to be time consuming. They also offers the contextual concepts and methods to adopt the BIM as a simplified and intriguing tool to hold out the 4D Schedule and 5D Cost of the concrete formwork systems.

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