Research on BIM Application in Construction Based on the Green Building Idea

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ABSTRACT

BIM has set off a revolution in the building sector. Maximally, it saves resources, reduces pollution, cuts the cost, and increases the profit via precious data analysis and effectively optimized management strategy. Green construction is an important step during the full life circle. Using the BIM could save land, water, energy and materials to realize further integration and optimization of resources. Then, aims of green construction is going to be achieved.¹

KEYWORDS

Green construction, BIM, participation, cost decreasing and benefit increasing.

COMPATIBILITY BETWEEN GREEN BUILDING AND BIM

The sustainable development of green building (GB) needs scientific decision management and overall solution from BIM. First, from the angle of the full life-circle, environmental GB has two purposes, one is to cut the cost and increase the profit; the other is to protect the eco-environment. It advocates running through the idea of green in the full life-circle of building and needs various of information. BIM is able of the Omni bearing management, cooperation and optimize process of full life-circle of building, thus it can provide construction and project management with scientific basis for decision. Second, from the angle of construction, whole

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construction duration includes several parts, such as water and HAVC, where information may be lost or incompletely transmitted during traditional construction process. Via visualized operations and professional information summering, BIM exhibits inside and outside of buildings, locates issues, improves information integration, provides optimal solution [1].

Rapid development of GB provided BIM an opportunity to show its powerful functions and advantages. Along with the process of GB, the idea of green is not limited within environmental materials and the extent has been enlarged to multiple dimensions, for example, reduction of waste, time saving, reduction of energy consumption and scientific management. BIM is a new and open platform, where series of parameters for GB project could be imported to compare with objective reference in real time, accurately and quantitatively. Then the data interaction and sharing come true and the real green construction accomplishes. Besides, all information of the building project is integrated in BIM. Based on the idea of green, BIM can track and monitor every status, detect and locate issues in time, provide quick maintenance and solutions, and finally realize diversified and Omni bearing management. Application of BIM has formed rapid linkage effect in the building sector. The environment protection and resource intensiveness of it could promote transformation and upgrading of the whole construction industry by making the idea of green and goals of environment protection come true.

STEP OF BIM IN GREEN BUILDINGS

The idea of green the BIM shows is through the whole life-circle of buildings. In decision and design, BIM collects all information of inside and outside and constructs BIM libraries. Via multi-collaboration, the 2-dimension data is converted to 3-dimension model. Along with procedures, the BIM library is completed and the model is revised continually. It is convenient to coordinate and communicate effectively, saving much time and resource [2]. BIM plays a role as participant and experiential aided-management in construction and operation. It integrates and amends quality of information by collision detection in decision and design, effectively. It also controls the cost, quality and process and enhances the efficiency of construction precisely via a 4-dimension simulation. Besides, the efficiency of GB projects is increased by a powerful information management of BIM, such as coordinating.

APPLICATION OF BIM IN GREEN CONSTRUCTION

Application of BIM is mature in decision and design. But in construction and operation it is at the very beginning. The application of BIM in green construction was focused in this article. The construction of GB project involves land, water resource, energy and materials.
Application of BIM in Land Saving

Land saving in design of GB project needs integrate BIM and GIS to plan the ideal site conditions. Land use situation changes with the progress in construction sites. By applying the 4-dimension simulation at this moment, it is precise to predict the progress of construction for every phase and it allows to adjust the site layout as needed. BIM arranges a reasonable construction, a dynamic and a complex process. Consequently, it concludes simplified process, shorted construction period, maximal utilization of site, and reduced negative environmental effects [3]. For example, during the process of earth excavation, the argue point is the project volume calculation. BIM could make it simple; it saves time and achieves the anticipation that it controls the cost, via following steps: combining the data of site and the model, comparing the blueprint and original topographic map, using “Revit” to calculate the earthwork precisely, which makes it possible to observe a specific day status of excavation and backfilling intuitively.

Application of BIM in Water Saving

Based on the idea of green, construction needs use and save water rationally to deduce loss and waste. During virtual reality in BIM construction, waste of water is avoided by simulating the arrangement and construction of water pipes to find the pipeline cross interference and leakage in time. Also, it decreases unnecessary loss and effectively saves water in pipes via reasonable arrangement of pipelines. By using the Navisworks simulation, it is clear to know the diurnal water consumption of buildings, find the reason for water waste, and provide the solution for reasonable water utilization. In addition, water saving includes non-traditional water resource utilization [4]. For example, by using “Revit” in BIM, precipitation can be used to the maximum extent to save water, via multiway and calculation.

Application of BIM in Energy Saving

Energy saving is not only demand in GB design, it also needs in construction and long-term operation. BIM obtains energy consumption analysis by simulation, accurately and fast; it completely eradicates energy waste. Moreover, it integrates information at the construction stage to calculate and analyze the thermal environment and energy flux in buildings. Then it could adjust model parameters and verify that if the construction meets the GB requirements or not. BIM could save construction period effectively to realize energy saving and efficiency improvement of buildings [5]. For example, using Revit to simulate the illumination in BIM can constantly to optimize the lighting layout. As result, electric energy is saved.
Application of BIM in Material Saving

BIM optimizes the scheme and manages materials information uniformly. It tracks material consumption and calculates material requirement for the next phase. All of these is used to implement material limitation, storage space activation, and material waste elimination. For complex construction in BIM, material is controlled precisely and the manage information is updated in time. Thus, BIM implements the aim of saving man power and cost control. Also, construction waste is reduced at the source via reasonable distribution of material [6].

CONCLUSIONS

The introduction of BIM into the whole life-circle of buildings triggered a series of technical revolution. From the concept, BIM and green building both focus on cost decreasing and benefit increasing in the whole life-circle of building. On one hand, BIM provides green building with analysis and management; on the other hand, green building offer BIM an extensive platform. Both of BIM and green support each other and promote common development. Green construction is a very important component of green building. Although it is the very beginning for the application of BIM in green construction, the advantage of it has appeared in site layout real time adjustment, water resource saving, energy saving and efficiency improvement, and material tracking and allocation. In the future, BIM is going to make green construction more effective, environmental and stable.

REFERENCES