Application of BIM Technology in Nanjing Honeycomb Hotel

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Abstract. Based on Nanjing honeycomb hotel, the management for the whole construction process was carried out through BIM technology and the project management cloud platform. The issues of the project were analyzed by modular design method, especially honeycomb curtain wall. The project from technology level was managed based on BIM models[1]. Cooperative work could be achieved through the project management cloud platform, so as to manage the project from the level of organization. And then, project management platform was integrated with BIM, to achieve the goals of meticulous management of the construction process.

1. Introduction

With a total construction area of 85,000 square meters, Nanjing honeycomb hotel has two towers A and B. There are three floors of podium buildings, underground banquet halls and reception centers, among which the highest height is 94.9m. Relying on the excellent natural ecology of laoshan, the concept of mountain cliff and honeycomb was combined to create the world legend of the hotel with the unique design concept and the super five-star hotel standard.

Figure 1. Nanjing honeycomb hotel

2. Project difficult points

2.1Technical difficulties

Complicated geological conditions, peculiarly shaped, numerous specialties, novel hardcover and complex surface of curtain wall were the technical difficulties of this project.

2.2 Management difficulties

Many participating companies, high quality requirements, strong professionalism, limited construction site and tight construction period were the project management difficulties.

3. BIM implementation guarantee of project

3.1 Organization system

The project manager was responsible for BIM implementation. Technical support was provided by BIM team. The staff of all departments and the BIM team were integrated to realize the exchange of knowledge and experience and jointly promote the application of BIM.

3.2 Implementation standard of BIM

According to the actual requirements of the project, the BIM implementation plan and BIM implementation standards were prepared at all stages of design and construction, and the complete and feasible BIM work flow was established.

3.3 Audit system of BIM

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3.4 Technical training of BIM

According to the project characteristics and application requirements, a comprehensive software and hardware plan was formulated in the early stage to provide resources guarantee for the follow-up work. At the same time, by organizing collective training, the project training was carried out at different levels according to the software and platform, and adjusted according to the feedback opinions, so that BIM could be applied in this project.

4. Application of BIM technology in design

4.1 Geologic survey analysis

Based on the data of geomorphologic analysis, an intuitive 3d site analysis model was generated by BIM technology to provide reliable data of comparative analysis for the scheme design. Accurate value of the height of each coordinate point and the amount of excavation and filling in the corresponding area was extracted to achieve the earthwork cost decision.

4.2 Design of honeycomb curtain wall

By means of parametric and VR technology to generate a variety of curtain wall project overall and important node, the final plan of building facade and curtain wall was determined based on the factors of site environment, building lighting, structure and interior space.

Figure 2. Comparison of design options by VR technology

According to the modular design method of honeycomb curtain wall, the design efficiency was improved by means of modeling, rapid prototyping and overall design. By cutting, extracting and re-generating the BIM model, the two-dimensional plan and elevation drawings of the building curtain wall were generated. The efficiency and quality of our work was greatly improved by the overall parametric

design of curtain wall.

5. Application of BIM technology in deepen design

5.1 Deepen design of electromechanical system

Generator room, fire-pump room, refrigeration plant room and other kinds of machine rooms were deepened design in all directions[2]. Site construction was guided by generating equipment location map, professional plan, section map and other deepen drawing.

More than 300 deepen drawings has been drawn in this project, including mechanical and electrical sectional details, planar plans, elevation plans, support and hanger details.

A system, two planning, three deepening, four institutional mechanisms were formed by electromechanical deepening. BIM has been successfully applied in electromechanical engineering.
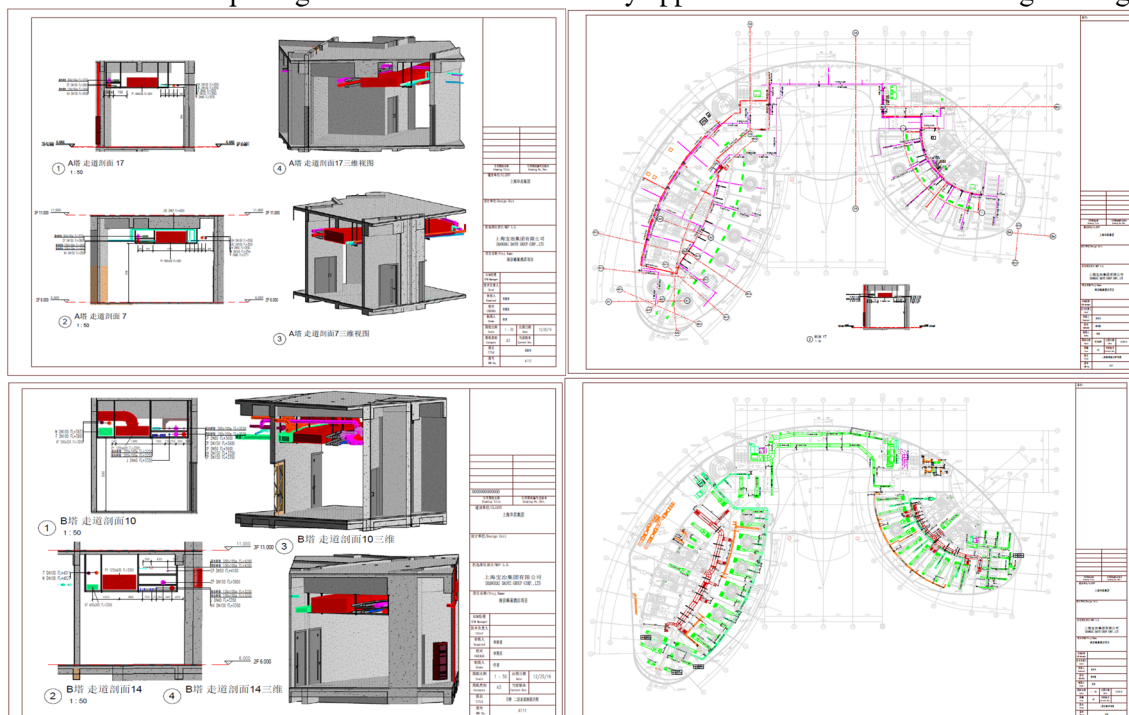

Figure 3. Deepen design of electromechanical system

5.2 Deepen design of detail nodes

More than 20 complex detail nodes, such as bearing platform and post-pouring belt, were arranged in 3d to solve the problem of technology practice of complex joints, realized the process standardization and give guidance to on-site construction.

The button-type steel tube support system was adopted and BIM technology was used to simulate the feasibility and construction technology of the measures[3]. Besides, the amount of work was counted to ensure smooth construction.

5.3 Deepen design of honeycomb curtain wall

Based on the epidermal model of scheme stage, different curtain wall systems of the model were distinguished by color, which were mainly divided into three curtain wall styles: metal ribbon, honeycomb and roof grille.

The partial positioning node of honeycomb part and the coordinate of segmentation node were extracted, the location information was transferred to the downstream nodes for further design.

Based on catia software, the specifications, cutting angles and dimensions of each section of honeycomb were exported in batches, which was convenient for subsequent processing and producing.

According to the different cutting angles of curtain keels of honeycomb, the cutting Angle data and positioning coordinate information of each frame keel were automatically exported in batches, which was convenient for field keel processing.

For the ribbon of the curved aluminum curtain wall, the hyperboloid is optimized into a flat surface and a single surface in the allowed error range by analyzing the surface characteristics. And then the corresponding expansion drawing was generated in batch.

On the condition of the material plate meets the requirements of specification, force calculation and machinability. The module of the plates was minimized. The regularity of plates was improved. The maximum utilization rate of materials was ensured and cost was saved.

For the main and secondary keel of the metal ribbon curtain wall system, the arrangement of keel was optimized when the design requirements were met. The positioning data was quickly picked up, and the corresponding keel planar positioning drawing and keel material drawing were generated.

Based on BIM technology, the construction process was realized to dynamically being simulated by simplifying the analysis process for technical difficulties[4] such as curtain wall installation.

For curtain wall installation and other nodes, disclosure of visual construction technology was realized by BIM model. Construction quality and project management was improved.

The 3d scanning equipment was used to map the building. Point cloud data was processed to generate an intuitive 3d entity model. And then the 3d entity model was integrated with the design model. The error between the actual construction plate edge line and the design model plate edge line was checked, and the corresponding analysis report was issued. Subsequent curtain wall deepen and construction was guided.
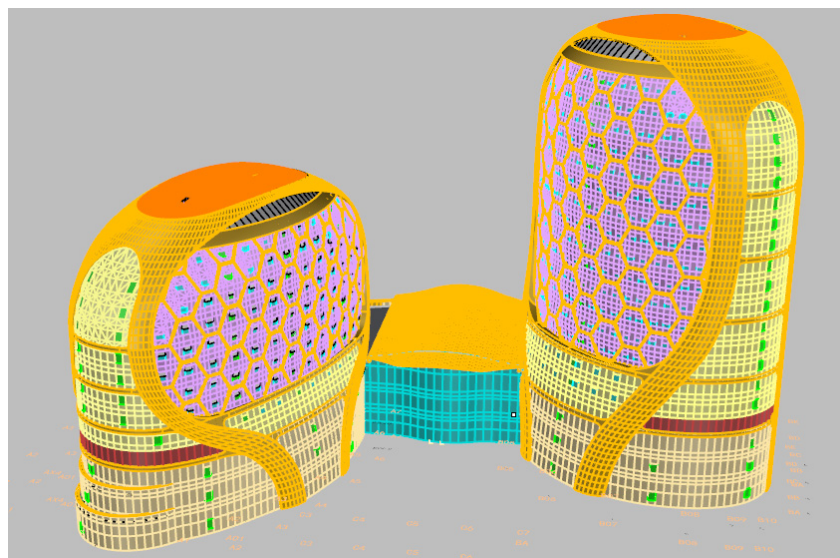

Figure 4. Curtain wall systems were distinguished by color

6. Application of the project management cloud platform

Through the client and mobile terminal of the platform, the online browsing of lightweight models such as roaming, review, cutting and measurement was completed[5]. The application threshold of the model was lower and the fast use of all staff was realized.

Combined with the progress plan, the planned progress video was rapidly generated and analyzed through the mobile terminal[6]. The actual site progress was feedback in real time and quickly demonstrated.

Based on the management platform, the material status was tracked in real time. And then on-site material situation was quickly extracted to achieve material control.

Based on the platform, 2d codes including BIM model components, video process, drawings, construction plans, etc. can be generated quickly. Consequently, site staff can quickly and easily view and learn, improve the breadth and depth of disclosure. More than 20 sample nodes of project quality

safety have been set up in accordance with the group's process standardization specifications and the sample first. Visual inspection and disclosure was used by site manager.

All participating units participated in the collaborative updating of the work process. Quality and safety inspection management was carried out. The control efficiency was improved. The control effect was enhanced and the late traceability and information project management was realized.

7. Conclusion

In total, 564 in-depth drawings and model reviews were completed, and the number of generated process models exceeded 80GB. More than 800 coordinate problems were solved. Curtain wall deepen saved 5 million yuan.

Taking the project as the carrier, the standard management as the grasp, and the training and learning as the method, the project department has won four kinds of scientific and technological achievements. Six curtain wall deepening BIM technical talents have been trained for the company. The management level of general contracting projects was improved.

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