A summary of bim cases based on paihekou pump station

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Abstract: BIM technology has been widely used in ordinary residential buildings, but the use of REVIT for water projects is still very little. Aiming at the fast and accurate modeling of pump station in BIM design, design the first built after emptying the method as a whole. The drawing of the curved channel is studied, and a complete splicing design scheme for pump station is proposed. The whole pumping station is divided into blocks, separately modeled and supplemented with details, and then joined together to form a complete building model. The complex problem of pump station design has been solved. In this paper, the feasibility and efficiency of the scheme are verified by the analysis of specific examples.

1 Background

Pump station is a very important project in water conservancy engineering. Its existence is of great significance to river management and urban water supply. However, the construction is directly compared with the CAD drawings on the construction site, which is unstable for the construction process, and the construction personnel cannot have a definite concept of space model, so they can only construct according to their own imagination in the traditional construction process. At present, BIM (building information model) can make the required project to be more visual for the designers and builders by using 3D modeling of each different part and unit in the plane drawing. So, we can use it to master the construction process more detailed, reduce the construction risk. It is conducive to the dynamic management and operation of the whole construction process and the whole project. This article carries on the concrete analysis of the modeling design on the concrete example

2 Related concepts of BIM technology

BIM, which stands for Building Information Modeling, is a technology, a platform, and a variety of software, such as Revit, Bentley, and Tekla. They are one of the methods to help solve planar drawing can only rely on the brain boring imagine to solve the problem. BIM can make drawings materialization, visualization, liberate thinking. It is easier for builders and designers to intuitively see problems in the buildings, the danger and difficulties in construction process. In this way, a lot of time and labor costs are saved. In the specific construction, many construction safety problems are solved for the construction side. These can be solved

before the specific construction to ensure the completion of the project within the time limit and reduce the waste of manpower and material resources.

3 Project overview

The main task of the river - huaihe diversion project is to supply water and develop river - huaihe river shipping. Combining irrigation to replenish water and improve the ecological environment of chaohu lake and huaihe river. The grade of the engineering is I. The scale of the engineering is large. The river-huaihe diversion project includes three parts: river-chaohu diversion project, river communication project, and send river to north. The construction contents include river diversion project, key building project, dike-piercing and cross-crossing building project, bridge project and general impact treatment project. The total investment of the project is about 91.271 billion yuan, including 84.204 billion yuan for the anhui section. The total planned period is six years.

The Paihekou pump station hub is located in the Paihekou, the starting point of the communication section of the river and Huaihe river diversion line, which is composed of the pump station, ship lock and control gate. The ship lock is of grade 2000t, and the designed flood discharge of the control gate is determined to be 1000m³/s according to the standard of the flood that happens to the river once in 50 years. The main building of the hub is a grade 1 building. The design flood standard is 100 years, the check flood standard is 300 years.

4 modeling ideas

REVIT modeling can be used to design individual beams, columns, doors, Windows, walls, boards and other components. You can design different families for a project and then load them. For example: structural foundation, structural columns, structural reinforcement, pipelines, these components together to form a complete model. The material definition of different components was carried out by REVIT software to make the structure model more clear.

4.1 this modeling chooses the method of first dividing into blocks and then integrating, because this pump station is large in scale, which can reduce the pressure of direct overall modeling. In addition, in some areas, a method of hollowing out after the whole was designed.

4.2 Figure a pool before the entrance gate, for example, to set a good first axis line and the corresponding level, and then modeling, with the corresponding, building structural command, when modeling, choosing the appropriate positioning line will help to promote the efficiency of drawing, when the need to change the wall thickness through property panel, has drawn a good wall before will be according to the specific location has set a good positioning line needed to change into a form. In addition, the front pool of the entrance gate is built and sloped by floor group, and finally fitted to the original terrain. As shown in figure two, you can see the specific parameters of the model, elevation, thickness and so on through the property panel. If there are any changes, they can be made directly through the properties panel. This is also a way of parameterization.

FIG. 1: the pool in front of the intake gate

FIG. 2: the wing wall of the intake gate

FIG.3: the intake gate

FIG. 4: the cross sectional view of intake gate access bridge

For the intake wing wall shown in Figure two, two types of retaining walls can be seen clearly from the three-dimensional drawing. In this project, the retaining wall is modeled by the wall family in the family, for loadable, system, and in place families in REVIT. If the specification REVIT required in the drawing is not available, the designer shall rebuild it, use of in place families, Can only be used for specific objects of this project. Through the built model, It can be observed what kind of internal retaining wall is the wing wall of intake gate, how to protect the link.

4.3 The pool of the intake gate in front that is connected with the intake gate shown in Figure

It is mainly make up form lock chamber, generator room, empty container structure, supporting structure and passage way.

Figure four shoes. In this part, we mainly use families to build models, and using elevation command to design, it's will reduce the workload.

FIG. 5: the wing wall of empty tank

4.4 Just as figure five, it's the front pool of pumping station. This part of the structure is connected to the intake gate, it's mainly composed of wing wall of empty tank and base plate of pool in front. The base plate of pool is also the family floor. From the perspective of 3D model, the structure display is very three-dimensional and intuitive. Figure five is the stereoscopic section diagram. The 3D section in REVIT can clearly see the internal structure and specific style. The specific operation of this part is similar to that of the intake gate.

FIG. 6: the station section

FIG. 7: Longitudinal sectional view of station

4.5 Just as figure six shows the three-dimensional model of station section, figure eleven is a vertical section view. This part structure of standing position is connected with the front pool. The operation is very obvious in the standing position, it's necessary putting pump in the standing position, but it shows a hollow pattern in the REVIT. It's first to build a whole rectangular, and then empty it step by step.

FIG. 8: the vertical section of the station section

Just as figure eight, it's a vertical section of the station section, it's very clear to see the internal structure through the three-dimensional map, which is very accurate, eliminating the simple imagination of looking at the plane map and relying on the human brain. For the passage in the station, we create a solid integral model firstly and cut with the hollow shape, and finally build the platform floor and stair section with the floor group or wall group.

FIG. 9: the water control segment

4.6 Figure nine shows a three-dimensional view of the water control segment, which is connected to the pump room. Figure fourteen shows a longitudinal section view. Because REVIT can choose the material properties, the model can be visually seen what kind of material the part uses, and the outer side looks more natural.

FIG. 10: outlet of the pump station

4.7 Figure ten is outlet of the pump station, which is connected to the water supply control section. Figure sixteen is the wing wall at the outlet of the pump station. As shown in Figure sixteen, according to the elevation on the CAD plan, in REVIT according to the first set up the whole and then hollowing the operation steps will create a three-dimensional wing wall structure. Compared with the plan, this structure is very direct, and the internal space and shape are displayed more clearly.

5 Conclusion

This paper mainly analyzes the specific modeling ideas in the process of BIM design of pumping stations.

By using the method of building the whole and then hollowing out step by step, the basic idea of modeling in water conservancy for Revit is solved. For the situation of complicated terrain and difficult construction in water conservancy project, it can be solved smoothly by the model first, and the difficulty of the whole project can be caught. This will form a set of system design and solution. It will greatly reduce the design and production time of the pumping station model, and provide reliable reference in the specific construction.

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