Construction Key Technology of Cast-In-Place Prestressed Box Girder for Bridge Engineering

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Abstract. Research topics: Based on the working platform of school-enterprise Cooperation Council, the exploration and research on the path of school-enterprise cultural inheritance and co-construction. Cast-in-place prestressed box girder construction in bridge engineering can reflect the continuous development of construction materials, box girder for higher strength concrete and steel composition, the construction process, the need to first raise the structure and apply the corresponding compressive stress, so as to make the structure work to withstand the tensile stress to be offset, to achieve the effective application of the tensile strength of steel, in this case, can promote the overall structural durability and stiffness to improve, so that the structure of the self-weight has been significantly reduced.

1. Introduction
In the process of continuous social and economic development, engineering construction, both in terms of speed and scale, has gained a certain degree of improvement, and the advantages of construction technology related to cast-in-place prestressed box girder are relatively obvious and often used in the construction of bridge engineering. To make effective use of the prestressed box girder, it is necessary to understand its key technology and fully apply the key technology in the bridge engineering, which is of great practical significance for the continuous development of the bridge engineering and can make the bridge structure quality as well as integrity be fully guaranteed. The use of this technique promotes the improvement of concrete materials in terms of crack resistance and also promotes the hardness of the members to ensure the durability of the structure [1].

2. Construction preparation of cast-in-place prestressed box girder for bridge engineering
For bridge engineering, the use of cast-in-place pre-stressed box girder construction technology can make the quality of the construction of the project is more fully guaranteed, in strengthening the overall strength of the bridge building based on the aesthetics of the bridge in the shape, so it has received more and more extensive attention [2]. bridge engineering belongs to large projects, there are high requirements for engineering construction safety, and no mistakes can be made, so key technologies should be prepared when they are used, and thus construction safety is more fully guaranteed.

2.1. Be prepared and planned
The actual situation of the bridge engineering will show some variability under different geographical locations, so the bridge engineering needs to be scouted and explored for the construction site before the
official construction [3]. Technical staff need to fully consider the specific topography of the construction site, equipment conditions, etc., on the basis of which to determine the technical use of the program, which mainly contains the thickness of the formwork, the depth of the foundation, the actual treatment of the foundation, material models, construction methods, etc., the technical staff in the case of good preparation, need to make it into a written program, so that the written program in concrete form, and thus enable the cast-in-place prestressed box beam in the construction of the technology can be based.

2.2. Quality assurance of materials
When the bridge engineering is under construction, the actual quality of construction materials will have an important impact on the overall quality of the construction project and is the most important factor affecting the quality of the project. The overall quality of the bridge engineering can be ensured by ensuring the quality of the project materials when the preparatory work will be done properly [4]. Therefore, before the bridge engineering uses the technology related to cast-in-place prestressed box girder for formal construction, it is necessary to set up a professional material collection team and material audit team, and the staff who conducts material purchase needs information to understand the specific quantity of sand, gravel, sand and gravel used in the bridge engineering, and also needs to understand the model of steel bars that need to be used, so as to avoid excessive purchase and purchase error problems and prevent the material from having adverse effects on the engineering construction process. The materials used in the project are checked and audited by professional staff, and the materials are stored properly so that the bridge engineering can be carried out in an orderly manner during construction.

2.3. Keeping track of engineering details
The construction of the bridge engineering, for the details of the problem, can reduce the probability of engineering problems. For the bridge engineering, to ensure the quality of the project, engineering safety, belongs to the building construction personnel, building operators in the work of the important content, any one detail of the project negligence, may have to appear major losses, or even produce irreparable consequences. Before the formal construction of the bridge engineering, the details need to be prepared, such as determining the quantity of materials, material quality, steel type, erection of warning signs and so on, but also need to pay attention to the allocation of construction equipment and planning, on this basis, in order to ensure that the bridge engineering construction work in an orderly manner, to prevent the progress of the project is affected, the preparatory work will be done, in order to cast-in-place prestressed box girder construction key technology effectively used in the bridge engineering.

3. Key technologies for the construction of cast-in-place prestressed box girder for bridge engineering

3.1. Good foundation treatment
In the actual construction of the bridge engineering, the more important link is the foundation construction, site construction through the prestressed box girder structure for support is very important, so need to pay attention to the application of relevant technology. When carrying out basic construction, attention should be paid to foundation treatment, in the case of foundation solidity cannot be fully guaranteed, will affect the bridge solidity, resulting in bridge collapse problems, and then safety accidents, so people's lives are threatened, so need to give full attention to foundation treatment, in the process of foundation treatment, need to be combined with cast-in-place prestressed box girder technology, but also need to combine the actual geological situation at the time of construction [5]. For the geological condition of the ground and road surface, the foundation reinforcement beam can be appropriately reduced, for the geological condition of the poor area, in the rare earth more, ground silt more situation, need to increase the foundation treatment related workload, when carrying out the relevant work, need to use the solidity of the stronger stone or gravel, and then the ground for effective paving, the formation of solid foundation, to ensure that the bridge is fully supported [6]. At the same
time, the drainage work and maintenance work need to be done properly in the process, which in turn will make the later construction convenient.

3.2. Focus on bracing construction
When applying cast-in-place prestressed box girder technology to bridge engineering, portal brackets as well as bowl buckle brackets are widely used in bridge engineering because of their convenience and flexibility [7]. During the construction process, it is necessary to use a special formula for the derivation of the height of the bracket, and then for the box girder base plate to carry out pre-pressure, and then the overall safety of the bridge bracket and the stability of the nature of the test, the testing process, the need to strictly implement the relevant standards, acceptance of the bridge focus on stability, this way of transport can be the bridge foundation for the actual support role of the bridge detection, to avoid accidents at the end of the bridge construction. At the same time, the arch of the bracket should be designed to ensure that the arch of the bracket is reasonable and scientific in design, and then the arch design can ensure that the bracket supports the role of the bridge.

3.3. Ensure safe formwork production
After the end of the bracket erection, need to pay attention to formwork safety issues, so that the safety of the formwork is fully guaranteed, the specific implementation can be carried out from these aspects, first of all, need to predict the formwork around the basket, for the box beam formwork scientific design and reasonable production, combined with the results of the bracket pre-pressure for the relevant preparatory work, to ensure that the box beam side mold and the inner membrane in height, width and the actual requirements, in this case, in order to provide convenience for the next implementation of the concrete placement, which needs to pay attention to the issue is not simply to achieve beautiful to stability and safety neglected, fully ensure the safety of the formwork.

3.4. Reinforcement pre-burial work
For the bridge engineering, the bridge as a whole need to get steel support, so the cast-in-place prestressed box girder construction is a more important part of the overall construction, in this process, the steel prefabrication needs to be done, especially the problem that needs to be paid attention to is that in order to make the bracket stability is fully guaranteed, in general, the installation and undermining of steel prefabrication is required for the steel, and at the same time, it is necessary to avoid the implementatio n of steel joints in one cross section, on this basis, in order to make the bridge stability is more fully guaran ted, and the steel can be welded if necessary [8]. When the implementation of pre-buried steel, the choice of steel used needs to be combined with the packaging properties, and in the pre-buried steel need to use concrete grouting, grouting needs to ensure continuity, as far as possible during the concrete is more concentrated pouring, transportation of concrete, will generally use the transfer pump, but in the case of a relatively long distance, there are often interruptions. Therefore, when transporting concrete, it is necessary to ensure that the distance between the transfer pump and the box girder is relatively close, so that the continuity of the transfer can be fully ensured, and it is also necessary to avoid the situation that the transfer is too fast or too slow. After pouring, attention needs to be paid to concrete conditioning to ensure that the concrete strength is in the standard range.

3.5. Control the quality of concrete
Concrete makes the quality of box girder construction closely related to the use of concrete for pouring before the use of water fans, so that the debris in the formwork is removed, and then a comprehensive inspection of reinforcement, support formwork, pre-built parts, etc., also need to check the mixing plant, cranes, generators, tankers and other machinery and equipment to ensure the smooth implementation of subsequent work. The pouring work needs to be carried out in such a way as to ensure symmetry in the longitudinal centre line, by pouring from the middle part and then to both sides, reflecting the symmetry of the pour. For concrete, the layered thickness should be less than thirty centimetres, and the concrete slump should be checked at all times during pouring. When carrying out vibratory work, a distance of
five to ten centimetres needs to be formed with the side moulds to prevent the vibrating bar from contacting the formwork or affecting the prestressing pipes. When filling the concrete, a specialist is required to follow up and check the supports and formwork, and to draw vertical lines under the formwork before formally carrying out the concrete placement. Below the vertical line, reinforcement needs to be embedded in the floor at the appropriate location and marker lines drawn for the location of the reinforcement to facilitate observation of the floor setting when pouring concrete. In the case of concrete placement networks, structural connections will be made and, in general, the concrete height needs to be one centimetre higher than the top of the design network, while the loose mortar and top mortar needs to be removed and cleaning work started using rough surface water. When the concrete has been driven twice in the box, the reinforcement needs to be placed at five millimeters inside the L/4 and L/2 piers and the reinforcement is welded from above, and by applying this method, the upper beam slope and height of can be controlled. The concrete surface can be divided into two parts, the first concrete is identical in height and the secondary surface is in an impermeable state.

3.6. Test prestress and carry out tensioning work
In the case of concrete at the end of the casting work and curing work, it is necessary to test its pre-stress, and then understand the effect of concrete casting and the results of casting, while the length of the steel strand needs to be further determined before the material is placed to ensure the accuracy of the data, in this case, to create good conditions for the smooth implementation of the work. As far as tensioning is concerned, a double control is required, and the strand needs to be concerned with the sequence of tensioning in different types of cases. Through structural improvements in the tensioning process and the use of intelligent devices in tensioning, an increase in safety is achieved and the overall quality of the prestressed box girder is also ensured. Before formal placement of the concrete, the prestressing reinforcement needs to be stretched so that the tension ribs are secured to the steel membrane or base, all the time allowing the poured concrete to harden so that the concrete strength value reaches seventy-five percent, or more than seventy-five percent. The prestressing tendons relax as the concrete coalesces, and this pre-tensioning method is more applicable in the production of stationary precast equipment and in small and medium-sized components on construction sites.

4. Conclusion:
In short, in bridge engineering construction, the advantages of application of cast-in-place prestressed box girder related construction technology are relatively obvious, which can make the bridge engineering safety nature as well as stability to a great extent to ensure that the overall construction quality of the bridge engineering, in the process of application, it is also necessary to actively carry out explorative work, do a good job of all the work involved in the prestressed box girder technology, the effectiveness and continuity of the work during the development, so as to promote the continuous improvement of this technical level, and the bridge engineering will be better served.

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