

Discussion on the construction quality control points of bridge concrete

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Abstract: Bridge engineering is China's infrastructure construction engineering, related to the national economic development, is an important link to maintain contact. Concrete construction is an important construction link in bridge engineering. The quality of concrete construction affects the overall construction level of bridge engineering. In order to ensure the construction quality of bridge engineering, the quality control of concrete construction should be strengthened. This paper analyzes the main problems of bridge concrete construction quality control and discusses the key points of bridge concrete construction.

1. INTRODUCTION

With the development of society, more and more Bridges are built, and people put forward new requirements for the quality of bridge engineering. The quality control of bridge engineering concrete construction affects the construction level of the whole bridge engineering. In the construction, we should strictly control the key points and difficulties of concrete engineering construction technology, improve the overall construction quality of bridge concrete, and extend the service life of the bridge. This paper discusses the key points of concrete quality control from the perspective of bridge concrete design, preparation and reinforcement to improve the quality of concrete construction.

2. Main problems of concrete quality control in bridge construction

2.1. Raw materials for construction

Material is the main factor affecting the quality of bridge concrete, most of the main reasons of bridge concrete quality accidents are inseparable from the material problem, the first performance is that the material is not up to standard, improper quality control[1]. Second, there is no use of high-quality materials in the construction stage, and there is the phenomenon of cutting corners. Inferior materials are difficult to meet the bearing capacity of the bridge, resulting in quality problems and reducing the safety factor of the bridge.

2.2. The quality problem of the construction personnel

The construction personnel include not only the first-line construction personnel, but also the personnel involved in the whole project, such as designers, management personnel and technical personnel. The problems of the construction personnel are manifested in: the comprehensive quality of the first-line construction personnel is low, the technical personnel and management personnel participate in the construction time is less, and the supervision strength is insufficient, so it is difficult to play a management role. It is difficult to play a key role.

2.3. Construction technical problems

Bridge engineering construction is difficult, the construction cycle is long, the investment is large, it is a systematic project, it is easy to face more problems in the construction, the common problems include the optimization of the design, dealing with the potential safety problems in the construction. Bridge is the key to maintain the daily traffic operation, so the technical support of bridge construction is helpful to improve the quality of bridge concrete construction. Therefore, we should strengthen the construction technology of the construction personnel and do a good job of technical supervision.

2.4. Construction management problems

In the bridge construction of China, the lack of foresight and improper construction management are common problems in bridge concrete construction, which affect the quality of bridge construction. Most bridge projects lack of organization and management, leading to the

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failure of supervision, or not to strengthen the control, leading to the construction site is not systematic[2]. The whole process quality monitoring awareness of managers is very weak, can not play a good leading role for the front-line construction personnel, the construction quality is difficult to improve.

3. Bridge concrete construction quality control, key points research

3.1. Template design

Formwork construction is an important part of the bridge concrete construction. During the formwork design, the construction personnel should ensure the convenient installation and disassembly of the formwork, complete the construction of the formwork support structure, and increase the firmness and stability of the formwork. Before the formwork design, it is necessary to choose the formwork with good flatness and high strength to measure the stiffness of the template to avoid the deformation of concrete and bridge after construction in the later period[3]. At the same time, the sealing degree of the template should be carefully considered, and the rice plate with high density should be selected to avoid slurry leakage. Template materials should be selected with strong corrosion resistance and other water absorption template materials, and the surface needs to choose clean and flat materials, can be selected according to the specific shape of different components of the bridge engineering template specifications, select the template material. For example, when the bridge member is circular, the steel formwork can be selected. When the shape of some components is more complex, such as E-shaped and T-shaped components, bamboo plywood can be selected. Choosing the most suitable template can effectively improve the quality of concrete construction. If the project chooses the template for the steel template, in the construction can arrange the staff to polish the template and concrete processing, can effectively enhance the finish of the concrete, facilitate the later construction[4].

3.2. Concrete preparation

3.2.1 Cement selection

Bridge engineering has different traffic grades, and the selection of materials is quite different, so it is necessary to choose the cement type according to the actual operation requirements of the bridge. When the bridge needs to bear the heavy traffic grade, the choice of cement folding strength and compressive strength requirement is higher, 3d age, can choose the folding strength of 4.5MPa, and compressive strength of 25.5MPa, cement, if it is 28d age, folding strength should reach 7.5MPa, compressive strength should reach 57.5MPa, can choose Portland cement. When the bridge needs to bear the heavy traffic volume level, the antifolding strength should reach 4.0 PMA and the

compressive strength should reach 22.0MPa within 3d of age. During 28d of age, the antifolding strength should reach 7.0MPa, and the compressive strength should reach 52.5MPa. The cement can choose ordinary cement or Portland cement[5]. In addition, attention should be paid to control the physical indicators and chemical composition of cement, shown in Table 1 for details.

Table 1. Control of the chemical composition and physical indexes of cement

		control criterion
Chemical composition index%	tricalcium aluminate	<7
	Iron aluminum acid tetracalcium	<12
	free calcium oxide	<5
	magnesium oxide	<5
	sulfur anhydride	<3.5
physical index	Cement specific surface area / (m ² /kg)	> 300, and <450
	Initial setting time of cement at / h	> 1.5h
	Cement final setting time / h	> 10h
	Cement wear resistance / (km / m ²)	<3.6

3.2.2 Selection of coarse aggregate

In the preparation of concrete, in order to control the quality of concrete, it is necessary to reasonably control the technical indexes of coarse aggregate, in which the mud content, apparent density, needle sheet particle content and void ratio should be controlled. If the coarse aggregate of concrete is igneous rock, its compressive strength should not be <100MPa. However, if the coarse aggregate is a metamorphic rock, the compressive strength should be guaranteed to be > 80MPa.

3.2.3 The admixture selection

The type of admixture affects the procurement cost, so the construction personnel need to focus on understanding the differentiation of technical indicators, to understand the technical indicators of different admixtures during the construction of bridge concrete, and to choose the most suitable admixture in combination with the actual standards of road and bridge project construction. Common admixtures are common water reducing agent, early strong water reducing agent, high efficiency water reducing agent, slow setting and efficient water reducing agent and gas diversion water reducing agent, different water reducing agent tax reduction, Qinshui rate with different gas content, bridge construction should be selected according to the specific construction situation.

3.2.4 Concrete mix ratio

If the bridge project belongs to the highway or the first class highway, the amount of concrete cement should be less than 310kg / m³ > 300kg/m³, While maintaining the water to ash ratio at approximately 0.44%. But if the bridge project is built in the secondary highway, the

water-cement ratio of concrete should be reasonably controlled at about 0.46%.

4. Pouring and vibration

Concrete pouring and vibration are the most critical link of bridge concrete construction, which affect the overall construction level of bridge engineering construction. In the process of bridge concrete pouring, the construction personnel should strictly control the feeding time of concrete in accordance with the relevant requirements, to avoid too long transportation time, leading to the initial setting phenomenon of concrete. In addition, relevant personnel are arranged to measure the concrete slump in detail, as shown in Figure 1 and Figure 2. Provide a guarantee for the comprehensive control of concrete construction quality.

In strict accordance with the principle of layered pouring, ensure that the specific thickness of the thick

layer is lower than the height of the vibrator. After the color matching again is qualified, arrange the relevant construction personnel to carry out the follow-up operations. Vibrating mode can be divided into artificial vibration and mechanical vibration, bridge engineering concrete has higher plastic requirements, less actual engineering, at this time can be completed by the artificial form of vibration, but if the bridge concrete construction does not explain the requirements, machinery can be used for vibration. According to the concrete construction requirements of bridge engineering as a vibration selection basis, determine the vibration model, and control the vibration, the concrete vibration process strictly implement "fast plug slow pull" vibration principle, can effectively avoid the problem of vibrating strength too, and can effectively improve the uniformity of concrete vibrating, when vibration is finished, can be vibration again in the subsequent construction, can effectively remove the concrete in vibration bubbles[6].

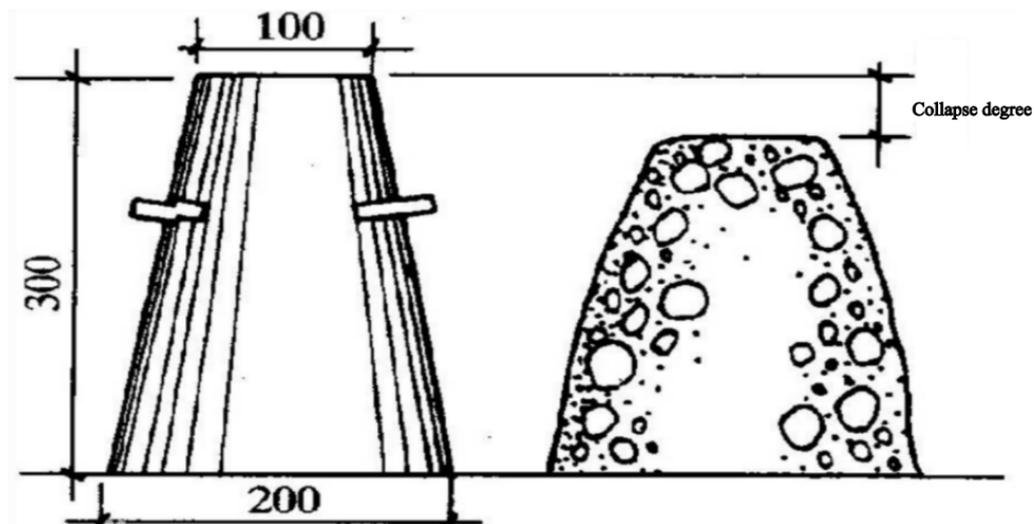


Figure 1 Schematic diagram of measuring concrete slump

5. Concrete reinforcement

Bridge concrete reinforcement should pay attention to the application of support technology and fracture repair technology, can ensure the quality of concrete reinforcement. First is to pay attention to in technology, the technology has strong comprehensive performance, can be used in multiple in construction, for example can be used in the beam column, beam column and beam column construction, can have the effect of good reinforcement concrete performance, engineering will be in technology used in the bridge, can effectively improve the stability of the bridge. And the application range of the technology is very wide, can be continuously used with force, with good reinforcement effect, the technology can be used to strengthen the instability of the bridge structure, improve the force uniformity of the bridge structure, to ensure the stability of the bridge. In addition, pay attention to the crack repair technology,

this technology can improve the construction quality of concrete construction, is the best way to reduce the bridge to avoid cracks, can give full play to the value of the bridge concrete construction, extend the service life of the bridge. If cracks are found in the concrete frame during the construction, it is necessary to arrange professional staff to analyze the specific causes of cracks, analyze whether there will be greater harm to the project, according to the construction of the bridge to develop crack repair scheme, can ensure the stable and safe operation of the bridge. Crack repair technology is a very wide range of applications, used in bridge engineering can obtain a good treatment effect, than the rest of the crack repair technology cost is lower, the operation is more simple.

6. Concrete curing

In the process of bridge engineering, concrete construction, the concrete may appear cracks, in order to

avoid producing cracks, the need to ensure that the concrete structure has sufficient moisture, can enhance the overall stability of the bridge concrete, extend the use time of the bridge. Before this, the bridge construction should strengthen the maintenance of concrete. At present, the most common means of maintenance in bridge engineering construction are temperature difference control and early maintenance. Among them, the temperature difference curing to bridge structure of section components and the specific performance as maintenance basis, provide scientific basis for bridge concrete curing, formulate effective protective measures, can be done by installing water maintenance cooling pipe and cover protective film measures such as curing, can effectively control the concrete surface and internal temperature, minimize temperature difference, can control the quality of concrete[7]. In addition, the outer mold can be removed in the early concrete curing, and the full wet concrete curing work can be carried out, which can effectively resist the natural environment and sunlight of the external environment and sunlight, and avoid the adverse impact of temperature difference on the concrete structure[8]. The concrete maintenance of the bridge is maintained for 2 weeks in the early stage, but the conventional maintenance work needs at least 3 weeks to ensure the overall durability of the concrete[9].

In addition, the construction management should be strengthened, improve the construction quality of the construction personnel through training and other ways, choose advanced science and technology, improve the awareness of full quality monitoring, and lay the foundation for ensuring the bridge construction[10].

7. CONCLUSION

To sum up, in order to improve the safety and reliability of bridge engineering, it is very important to strengthen the quality control of concrete, choose the appropriate construction technology, control every construction detail of concrete, scientific and reasonable control of concrete pouring, mixing, matching and ratio, raw material quality links, to ensure the construction quality. At the same time, strengthening the construction supervision and improving the construction quality of the construction workers is also an important measure to improve the quality of the bridge construction.

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