International Journal of Trend in Research and Development, Volume 10(1), ISSN: 2394-9333
www.ijtrd.com

Construction Technology Analysis of Bridge Expansion Joint

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Abstract: With the rapid development of our traffic construction, Bridges have accelerated the pace of construction in recent years. As an important part of bridge structure, expansion joint device in bridge construction is also a difficult place for bridge construction. Under the influence of temperature, vehicle load, driving braking force and other aspects, expansion joint has a series of problems, which has a great impact on the safety of bridge. This article from the highway bridge expansion joint role, existing problems, construction technology and other aspects of analysis, and combined with the construction site to talk about their own experience.

Keywords: *Construction technology; Expansion joint; bridge; Quality control*

I. INTRODUCTION

In the construction of bridge engineering, expansion joint is an important part of bridge structure. Combined with the particularity of bridge engineering, the temperature change in the outside will cause concrete shrinkage, vehicle passing will increase the bridge load, increase the bridge impact force, resulting in pier settlement, resulting in a certain amount of displacement of the bridge. In order to avoid such problems and maintain the patency of vehicle driving, it is necessary to set up expansion joints at the end of the bridge beam and the back of the abutment. The construction quality of the bridge expansion joint will directly affect the service life and driving safety of the bridge, which requires a comprehensive grasp of the key points of the construction process of the expansion joint, strengthen the quality control of each construction link, and ensure the smooth completion of the bridge project.

II. RELEVANT DESCRIPTION OF EXPANSION JOINTS

Expansion joint refers to a structural joint set along the direction of the construction joint in order to avoid the thermal expansion and cold contraction of the engineering members caused by the temperature change, which can make the building structure extend in the direction of horizontal expansion. For bridge engineering, according to its installation form, application object, structural characteristics of the difference, the expansion joint is divided into modulus type, (asphalt) filling type, comb steel plate type. Its main manifestations are as follows:

A. Modular expansion joint

As a new expansion joint setting scheme, modular expansion joint has the advantages of strong reliability and simple construction. The application of modular expansion joints in road and bridge engineering can effectively meet the requirements of bridge expansion joints. Normally, the modular expansion joint is made of the whole special-shaped steel, so the integrity is very high, bending resistance and raw resistance is strong, the use of modular expansion joint can effectively improve the comfort of driving, so it is widely used in road and bridge engineering. Moreover, in the design of the displacement of the modular expansion joint, it is necessary to design according to the modular planning standard combined with the actual situation, and there should be no mismatch and other problems.

B. Filled expansion joint

The main material of the filled expansion joint is asphalt. The elastic characteristics of the asphalt material can also make the expansion joint have higher elastic recovery performance, which can have an effect on the complex load displacement of the bridge, and can effectively meet the complex climate environment. Filling construction joints are widely used in bridge engineering, and the process implementation is particularly simple. Usually, the bridge can be opened to traffic 2 hours after the asphalt mixture is filled.

C. Expansion joints of the comb steel plate

The surface layer of the comb steel plate expansion joint adopts the comb tooth chute splicing steel plate, that is, the left and right ends can extend the gap between the bridge panel, and the support structure can be completed through the mesh of the comb teeth. This kind of expansion joint can effectively break the displacement limit and reduce the horizontal displacement of the bridge to the greatest extent.

III. CONSTRUCTION TECHNOLOGY OF BRIDGE EXPANSION JOINT

A. Construction Preparation

There are two main locations for the bridge expansion joint: (1) the gap between the back wall of the abutment and the beam body; (2) The joint position of the fixed support and movable support between the bridge spans. The position of the construction joint is determined by measuring the usage ruler, and the width and depth of the construction joint are marked with a marker. After determining the location of the construction joint, it is necessary to prepare for construction. Most of the road and bridge projects in our country use asphalt concrete pavement structure, in order to ensure the quality of construction joints, the bridge surface connection is smooth enough, usually after the bridge surface asphalt concrete paving is set up construction joints. Before construction, we should check the quality of construction joint materials. According to the quality requirements of construction joint, we should do a good job in loading and unloading, placing and transportation. We should avoid direct sunlight for a long time, and the expansion joints generated by bending and twisting deformation should not be used. Many construction teams do not pay enough attention to the installation of expansion joints. Usually, the embedded tendons are anchored in the asphalt concrete layer of the bridge deck before the construction of expansion joints. If the asphalt concrete paving of the bridge deck is thin, the anchoring members are easy to fall off under the impact of vehicle load, resulting in the collapse of the construction joint,

which requires checking whether the embedded parts of the beam body are complete and missing before construction. If the number is insufficient, the embedded reinforcement must be added in time to maintain the stability of the construction joint.

B. Construction Technology

After several decades of development of Chinese bridge construction technology, construction technology has been relatively mature, but it is necessary to pay attention to the quality of each construction link, including cutting, slot, installation, pouring, etc., only the quality of each construction link is up to standard, can meet the overall construction standard.

1. Cutting seams

Hit the cutting line on the construction position of the expansion joint, use the concrete cutting machine to cut the asphalt concrete, strictly control the cutting width, usually in 30-50cm, according to the actual situation of the project can be properly adjusted the width of the cutting joint. During the cutting process, the incision must be kept straight and neat enough. After the cutting is completed, it must be washed with a high-pressure water gun to avoid environmental pollution caused by dust generated during the cutting.

2. Grooving

After the completion of the slit work, the use of air pick will be the bridge deck concrete pavement layer chisel, chisel in the process shall not damage the cutting seam, if the cutting seam edge is damaged, to cut the seam on the basis of a second time (the damaged part of the cutting), the width shall not exceed 5cm.

3. Installation

In the process of setting the expansion joint device, the embedded reinforcement will be removed according to the displacement protection box of the expansion joint device. If there is no displacement box, there is no need to consider this problem, only installation and adjustment are required. In the installation of the expansion joint, according to the elevation of the asphalt concrete of the bridge surface, the 80mm channel steel hanger is positioned, the interval is 3m, the channel steel is used to press the expansion joint, so that the top surface of the expansion joint and the elevation of the asphalt concrete surface are consistent, the U-shaped buckle is connected with the channel steel, and then it is welded with the pre-buried steel bar of the beam body, so that the channel steel and the asphalt surface are closely fitted. The top expansion joint is supported by the steel support, so that the top surface of the expansion joint and the bottom surface of the channel steel can be closely fitted, the welded steel support and embedded parts, maintain the expansion center line, so that the center line of the expansion joint is coincident with it, the elevation of the top surface is maintained and the elevation of the asphalt surface is consistent, the elevation error is controlled at ± 2mm, and the horizontal flatness is measured with 3m straightener. The error should not exceed 3mm.

4. Casting

Before the formal pouring work, it is necessary to do a good job of gap filling work, to avoid blocking the gap in concrete pouring, but also to surface concrete sputtering into the seal rubber belt gap, if this phenomenon must be removed immediately. The concrete can be poured after the completion of the preliminary work. The C50 steel fiber high-strength concrete is used. In the vibration process, work must be carried out on both sides at the same time, and the surface of the concrete after the vibration must be done well, and the top surface of the expansion joint must be kept flat.

IV. KEY POINTS OF EXPANSION JOINT CONSTRUCTION QUALITY CONTROL

A. Strict control of concrete vibration

Because the concrete material under the influence of temperature will produce internal stress changes, and the vibration quality will directly affect the overall performance of concrete, so it is necessary to strengthen the vibration control work. High strength steel fiber concrete with qualified quality should be poured according to engineering design standards, and the work should be carried out in strict accordance with technical standards. The vibrator should be inserted quickly and drawn slowly, and should not touch the reinforcing bars inside the structure. The layers should be fully compacted, and the insertion depth of each layer of vibrator should be 5-10cm. Vibrate the concrete without bubbles or segregation, and slowly pull out the vibrator rod.

B. Reasonable selection of expansion joint devices

The construction process quality of expansion joints is directly affected by the expansion joint device. If the expansion joint device is improperly selected, the stiffness of the expansion joint will be directly reduced. Therefore, in the purchase of expansion joint device, it is necessary to focus on whether the product quality can meet the design standards. When transporting to the construction site, check whether the appearance and material meet the quality standards of the product specification. If the construction standards of expansion joint are not met, it should be returned immediately and not transported to the construction site. In addition, it is also necessary to fully consider the construction requirements of the expansion joint between the beam and the beam and the platform, to ensure that the vehicle is comfortable and smooth enough, and to consider the seepage resistance and durability of the expansion joint. Only if all the joints meet the construction standards, they can be transported to the construction site for use.

C. Strengthen the control of construction process

Before the formal installation of the expansion joint, the embedded parts of the beam body must be reserved to ensure that the installation of the extension joint is accurate enough and the welding is firm enough. Also remove the debris in the gap of the bridge end, wash the notch. In the fixing of the expansion joint, attention should be paid to the welding sequence, and the welding length must meet the construction standards to maintain the firmness and durability of the expansion joint. After the slotting construction, the embedded steel bar should be tested, including the distribution, strength and firmness of the steel bar. If there is corrosion of the embedded steel bar, the iron brush will clean the surface corroded parts until the steel bar body is exposed, and then brush a layer of rust inhibitor, check whether the anchorage position of the embedded steel bar and expansion joint meets the connection standard, there is a deviation problem need to do a good job of adjustment. After the expansion joint is installed, the concrete maintenance work should be done to ensure the overall fastening effect, especially after the

completion of the pouring must be covered with geotextile moisturizing, thermal insulation maintenance, if the weather is hot to regularly sprinkle moisture, reduce the probability of concrete cracks, until the expansion joint strength reaches the specified standard, the bridge can be opened to traffic.

CONCLUSION

To sum up, road and bridge engineering is an important part of the highway traffic system. Due to the particularity of bridge engineering, the consequences of quality accidents cannot be imagined. Therefore, in order to ensure the stability of bridge engineering, we must do a comprehensive job in the construction joint setting, strengthen the quality control of the construction process such as cutting, slotting, installation and pouring, master the quality control points of the process, and ensure the overall quality from the details, so as to play the final benefit of the construction joint.

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