

# **Application of Concrete Construction Technology in Road and Bridge Engineering Construction**

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## **Abstract**

The application of concrete technology in bridge construction has strong plasticity and low cost, which is the most concerned problem of construction units. Based on this, when applying concrete technology in bridge engineering construction, the material ratio of concrete should be strictly controlled to improve the quality of concrete, and the concrete construction technology should be continuously optimized, and the maintenance work of road and bridge should be strengthened, so as to improve the process quality of road and bridge, and finally ensure that the overall quality of construction meets the national or industry standards, and promote the sustainable and stable development of road and bridge engineering in China.

## **Keywords**

Concrete Construction Technology; Road and Bridge Engineering; Construction.

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## **1. Application Status of Concrete Technology in Road and Bridge Construction**

### **1.1 Material Structure is Unstable**

Because the concrete contains a variety of materials such as water, cement and additives, the construction personnel often cause the imbalance of the material ratio due to the operation error when carrying out the concrete ratio work, thus reducing the stability of the concrete material. In this way, not only will the road and bridge engineering construction not get the expected effect ; it will also cause the tensile strength and adhesion of concrete materials to be relatively poor. If the external pressure is large, it will lead to the destruction of road and bridge structures, thus posing a safety threat to passing vehicles and pedestrians.

### **1.2 Temperature Changes have an Impact**

Temperature is the direct factor causing concrete material deformation, cracks and other problems. Therefore, if the construction personnel do not control the temperature scientifically, it will cause the lack of stability of road and bridge engineering. In general, cement in concrete materials is the most affected by temperature. Because cement has a strengthened hydration heat reaction, if the internal temperature of concrete materials rises sharply, resulting in a large gap with the external environment, it will lead to cracking of concrete materials. If the road and bridge is in a relatively humid environment for a long time, the concrete material will cause damage to the surface of the road and bridge due to expansion.

### **1.3 Large Load Pressure**

As the infrastructure of the city, the main task of road and bridge is to undertake the transportation of pedestrians and vehicles, so it has great load pressure. Based on this, if the quality of concrete materials used in the construction of road and bridge engineering is poor, it is easy to cause problems such as deformation, fracture and sinking of road and bridge due to the inability to withstand load

pressure, which greatly improves the safety risk of passers-by and vehicles. In addition, the instability of roads and bridges will also bring greater obstacles to urban traffic management.

### **1.4 Lower Shrinkage of Concrete**

The shrinkage of concrete material is poor, because the concrete material has a strong thermal expansion and cold contraction effect, coupled with the overall volume of the road and bridge is larger, so once the thermal expansion and cold contraction phenomenon occurs, it will have a great impact on the road and bridge. In this way, due to the poor shrinkage of concrete, coupled with the influence of temperature factors, hardening, deformation, cracking and other problems often occur, which fundamentally increases the risk of unstable factors in road and bridge, and reduces the construction quality of road and bridge engineering.

## **2. Application Strategy of Concrete Technology in Road and Bridge Engineering Construction**

### **2.1 Prepare before Construction**

First of all, it is necessary to strictly review the design of engineering drawings. Based on the level of construction enterprises, it is necessary to coordinate the work between owners and construction units, and put the design inspection of drawings in the first place. As far as the problems occurring during the construction of road and bridge engineering are concerned, they must be dealt with appropriately according to the specific situation of the problems. Secondly, the relevant contents of the project construction are refined, and the projects that may be included during the construction period are deeply understood. Overall, it mainly involves the waterproof requirements during the construction period, and attaches great importance to the steel bar layer to ensure the scientific nature of the engineering design. Then, we should pay enough attention to the construction technology. For the staff of the construction enterprise, we must fully understand the core content and requirements of the construction technology, reasonably determine the construction process, and carry out the project construction in strict accordance with the prescribed process. Moreover, it is also necessary to ensure that the construction personnel have a comprehensive understanding and flexible grasp of the construction quality of each construction stage. Finally, in the construction of road and bridge engineering, concrete, as one of the irreplaceable construction materials, has many advantages in application, not only the operation technology is very simple, but also the raw materials are very rich, so its application field is very extensive.

### **2.2 Strictly Control the Ratio of Materials**

Strictly controlling the composition ratio of concrete materials is an important way to improve the stability of concrete structures. Scientific and reasonable concrete material ratio can ensure that concrete has better performance, thus increasing the quality of road and bridge engineering. First of all, the construction personnel should control the initial solidification time of concrete. Generally, the initial solidification time of concrete is about 7 to 8 hours. Secondly, the construction personnel should accurately control the degree of concrete slump to keep it at about 1cm. Finally, it is necessary to strengthen the control of air content in concrete. Usually, the air content in qualified concrete materials is maintained at about 1.7 %. In addition, in the process of road and bridge engineering construction, it is necessary to fully consider the quality, performance and economic cost of raw materials, so as to select the best materials.

### **2.3 Concrete Production**

Concrete production plays an important role in the pouring construction of road and bridge engineering. Construction personnel should cooperate with designers and managers to do a good job in technical disclosure, accept corresponding supervision and management, and comprehensively improve the stability and safety of concrete structures. When making concrete, the construction personnel should prepare it according to the proportion of various raw materials to ensure that the concrete production meets the engineering design specifications, reflects the nature of the concrete,

and provides a reliable guarantee for the quality control of pouring construction. The construction personnel need to make a clear analysis of the proportion of water, sand, cement and admixture. Before the formal production of concrete, relevant experiments need to be carried out to ensure that the concrete prepared meets the actual needs of road and bridge construction and meets the structural quality requirements. The construction personnel should make clear the order of adding concrete raw materials and do a good job of concrete mixing. In the process of concrete production, it is easy to be affected by weather factors, resulting in poor performance of components. Therefore, the construction personnel should predict the on-site construction environment, especially pay attention to the water content in the air, so as to prevent it from affecting the performance of concrete.

## **2.4 Concrete Transportation**

The stability of concrete transportation will directly affect the construction effect of concrete pouring. When the construction personnel carry out the construction operation of the project, they need to pay attention to the concrete transportation to prevent the loss during transportation and reduce the utilization rate of resources. In general, after the completion of concrete mixing construction, the construction personnel need to transport it to the construction site, so that the construction personnel can complete the corresponding operation in the on-site construction environment. However, the quality of concrete in the actual transportation will be affected by many factors, so it is necessary to control the transportation mode of concrete and do the corresponding work to deal with the possible problems in the transportation of concrete. The construction unit should shorten the transportation time of concrete as much as possible to prevent excessive collapse. It is also necessary to ensure the quality of the transportation pump, ensure the firmness of the connection, and prevent slurry leakage. Before transportation, it is also necessary to clean the transportation pump to ensure that it does not contain sediment and other residues, so as to ensure the smoothness of concrete transportation.

## **2.5 Concrete Pouring Construction**

The concrete pouring of the surface layer of the pavement constitutes the key construction points of the road and bridge engineering. The construction of a project enhances the control of the construction link of the pouring pavement through continuous pouring, effectively avoiding the collapse or hole inside the concrete material. At the same time, construction personnel are required not to walk on the surface of the concrete, and it is prohibited to place the support structure or other large construction machinery on the surface of the concrete at will. The basic implementation point of pouring pavement concrete is to strictly control the pouring speed and comprehensively detect the concrete performance of the pavement surface and the pavement base. Therefore, construction technicians should carry out strict tests on various concrete members to determine whether they meet the engineering safety standards, and focus on monitoring key parts to improve the integrity of concrete members, so that the project can be completed with quality and quantity within the specified time.

## **2.6 Do A Good Job of Pavement Compaction**

Before carrying out the specific construction, we must make a pre-judgment on the actual situation of the road and bridge, make a plan for its possible situation and how to deal with the unexpected situation, and choose different schemes for different road conditions for construction. We must make a concrete analysis according to the specific problems. In the concrete pouring work, we must compact it. In order to avoid the occurrence of leakage pressure, the relevant technical personnel must carefully and fully do the research work on the road and bridge, fully understand the actual situation of the project, make analysis according to the specific situation and select the appropriate method to carry out the construction work. After the irrigation work is completed, the road surface needs to be compacted, so as to ensure the smoothness of the road surface and avoid the occurrence of various traffic accidents caused by the uneven road surface. After all the above work is done, it is also necessary to cool the road surface, set aside for a period of time, block roads and bridges, and wait until its strength meets the standard to ensure the smoothness and safety of roads and bridges.

## **2.7 Strengthen the Maintenance Work**

In order to avoid the influence of temperature on the road and bridge process to the greatest extent, it is necessary for the construction personnel to do the follow-up maintenance and maintenance work. On the one hand, the concrete material is easy to form shrinkage in a dry and high temperature environment, which causes cracks on the surface of the road and bridge. Based on this, the construction personnel can carry out certain maintenance of the road and bridge. For example : regular watering on the surface of the road and bridge to keep the concrete material moist, and spray some curing agent on the surface of the road and bridge to prevent it from cracking ; on the other hand, if the road and bridge are in a humid environment for a long time, the concrete material will expand, resulting in problems such as deformation and rupture on the surface of the road and bridge. At this time, the construction personnel can cover the road and bridge, for example, the use of plastic film, straw mats, sponges and other materials to cover, to prevent the road and bridge from being washed by rain or eroded by water in the air.

## **3. Road and Bridge Concrete Construction Technology Quality Management Measures**

### **3.1 Improve the Construction Process**

One of the key and difficult points in the construction technology of road and bridge concrete structure is the improvement of construction technology. Because different types of concrete have their own characteristics, they need to adopt different construction technologies. If the feeding sequence is wrong, the problem of agglomeration and uneven mixing may occur. If powder admixture is used, in order to ensure uniform mixing, it is necessary to extend the mixing time appropriately. If the mixing time is short, it may reduce the workability and strength of concrete materials. If the mixing time is too long, it will reduce the construction efficiency to a certain extent, and may also cause segregation problems, which will ultimately affect the quality of concrete raw materials. In the whole transportation, bumpy routes, long transportation time, and sun exposure will reduce the quality of concrete materials. Therefore, the project strictly implements the technical requirements in many aspects such as concrete mixing, transportation and pouring, improves the construction technology, and constantly improves the construction technology level to ensure the construction quality level of concrete structure.

### **3.2 Strengthen the Construction Process Control**

The distribution and size of unbalanced load in the construction process should be strictly controlled, and the pre-camber deviation value should be adjusted in time. Strictly control the strength of concrete during tension, ensure that the strength of concrete can be maintained under the same conditions as the beam section, and the construction personnel also need to control the elastic modulus of concrete in time during beam making. The beam storage time should not be too long and the age of different prefabricated beams should not be too different. In addition, the corresponding position of prestressed tendons in the beam structure is strictly controlled, and the stress value during tension is controlled.

## **4. Conclusion**

In summary, the development of concrete construction technology needs to meet the actual requirements of road and bridge construction. In the process of implementing various operations, construction personnel need to clarify the influencing factors and master the application methods of construction technology. In the preliminary work, it is necessary to do the corresponding material preparation work to ensure that its working ability can meet the construction requirements. During the concrete construction period, the vibration time and frequency should be strictly controlled. In the later maintenance process, it is necessary to ensure the implementation of maintenance measures, scientifically increase the time and maintenance methods of control maintenance, improve the overall life of concrete, ensure the quality of road and bridge construction, and produce higher social and economic benefits.

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