

# Research on construction technology of road subgrade and bridge engineering

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**Abstract:** In recent years, China's economic level has made rapid progress. The construction industry occupies a large proportion in the overall economy, and people pay more and more attention to the construction of various projects. The quality of construction projects is directly related to the safety of people's lives and property, which puts forward higher and higher requirements for the construction technology level. As we all know, road subgrade and bridge engineering have certain complexity, and construction takes time and construction environment is bad. In recent years, with the increase in the number of relevant projects, more and more problems have emerged. This article analyzes the construction technology of road subgrade and bridge engineering, focuses on the key technologies in construction, and makes the project construction as much as possible to meet the needs of human production and living.

**Keywords:** Road and bridge; construction technology; quality inspection

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## 1. Summary of construction technology of subgrade engineering and bridge engineering

With the remarkable improvement of various technical levels, human resources have been liberated, people can rely on large-scale equipment for various operations, not only improve the efficiency of the work, but also improve the accuracy of the construction of various projects. For road subgrade and bridge engineering construction, its quality is directly related to the quality of the whole project. In the course of vehicle operation, the roadbed is seriously stressed. Therefore, in order to ensure the quality of roadbed, it is necessary to fully meet the needs of vehicle load. In addition, we must fully grasp the key points of the entire construction project, combine the experience of previous road construction, improve the quality issues through scientific methods, guarantee the quality of the project, and provide a safety guarantee for the future use of the road<sup>[1]</sup>. Generally speaking, the road subgrade construction should have the following three characteristics: First, the subgrade should have sufficient stability, which is to avoid the overall instability or deformation of the subgrade structure. Second, the embankment should have sufficient strength to ensure that the embankment does not deform beyond the allowable range. Finally, the roadbed should also have sufficient water temperature stability, and the roads should be exposed outdoors for a long time and subject to turmoil. It must ensure that the strength of the roadbed will not be significantly reduced under adverse water temperature conditions. In addition, the construction process of subgrade is also more complex, including excavation, transportation, filling, compaction and so on. Not only is the construction difficult and great change, but also the construction of the highway is usually large, and the subgrade in the soft soil area, the subgrade in the frozen soil area and the subgrade in the saline soil area may also be encountered. Therefore, ensuring the quality of highway roadbed is both necessary and difficult.

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It is worth noting that, in the construction of road subgrade and bridge construction, it is easy to be easily counterproductive by relying on mechanical technology, which brings security risks for the construction of the project. In many cases, the construction unit has neglected the quality of the project in order to ensure the construction efficiency. In addition, there are still many problems to be solved in the construction industry in China, such as the lack of construction technology, the specific operation of the construction, the poor comprehensive quality of the builders, the lack of a perfect supervision system for the construction units and so on<sup>[2]</sup>. This series of factors will cause hidden dangers for construction safety. Both road subgrade and bridge engineering belong to basic construction projects. As an indispensable part of modern human life, it has been in the process of development. That is to say, if we want to do well in the construction of road subgrade and bridge project, we still need to explore continuously.

## **2. Preparation of subgrade construction**

The preparation of the early stage is the first stage in the construction of the subgrade. First, a sufficient number of staff should be arranged, and the equipment and materials should be fully prepared. The preparatory work seems simple, but in fact it is laying the groundwork for the later roadbed construction. Specifically, in the preparatory stage, we should do the following: First of all, we should carefully analyze and plan well. It is necessary to carry out surveys on the geology of the construction site, to master the elements such as soil quality, and then carefully record and compare the information obtained to determine whether the site complies with the relevant provisions of the road construction. However, at present, many construction companies do not make serious surveys on the geological conditions. They only analyze the surface by simple means. There are many unreasonable factors and it is difficult for such a road to meet the construction regulations. In addition, coordination should also be actively conducted for specific activities. The time and amount of activities of the project should be clarified, and the next step of planning and design should be based on these. Not only should the weather, environment and other factors be taken into account, but also the manpower and related materials that are spent on the day are needed to determine whether there is a problem, whether the machinery has reached the highest efficiency, and whether the staffing arrangement is proper. Once a problem is discovered, it will take the first time to deal with the problem. Second, set up a comprehensive quality assurance system. Once a problem is discovered, it will take the first time to deal with the problem. Second, set up a comprehensive quality assurance system. The quality of the project is determined by the quality assurance system. The lack of a quality assurance system may affect the quality of the building, even the problem of rework. Not only the quality of the project will be affected, but the progress of the project will be disturbed, and the unnecessary waste of resources will be wasted. Therefore, it is very important to build an effective quality assurance system, not only to ensure the interests of the time, but also to ensure that the follow-up development activities of the unit in the industry can be carried out smoothly. Third, the determination of the maximum dry density of the soil. Compaction degree is one of the most important quality indicators for subgrade engineering<sup>[3]</sup>. The degree of compaction is directly related to the stability and durability of the roadbed. The road foundation needs to withstand the repeated loading of the vehicle, and it also needs to withstand many external factors. These all have a direct impact on the maximum dry density of the soil, which requires us to determine the soil distribution section and the soil category, and more need to be determined according to the specific conditions of each backfill layer. Of course, the soil quality changes little, the maximum dry density change is small, the impact on the quality of the project is small, the maximum dry density is easy to determine.

## **3. Construction method of subgrade**

During the construction phase, the construction team shall strictly follow the construction plan and construction plan formulated during the construction preparation stage to implement the organization. Specifically, we need to grasp the following key aspects. The first is the construction of the subgrade test section. Before the comprehensive construction of highway subgrade, it is necessary to carry out the test section construction for the subgrade foundation, soft soil subgrade and pit and pond sections. Through these experimental constructions, it is possible to test and determine whether the construction plan formulated in the preparation stage is feasible and effective. Moreover, it is

necessary to carry out compacting tests by different kinds of machines to determine whether the suitable thickness, the best water content, the best machinery matching and the construction organization, the completion time of the work have reached the requirement of the construction schedule, and the most practical and reasonable construction plan is determined. While ensuring quality, we must also protect the economy, and then carry out comprehensive construction work according to the final plan. Then the subgrade construction quality control. Quality control is very important throughout the construction of the subgrade. The construction team needs to carry out a series of constructions according to the construction requirements and construction plans summarized in the test section of the roadbed, and it is necessary to conduct strict self-inspection according to the construction requirements. If any operation that does not meet the engineering requirements is found during the process, it must be remedied or reworked the first time. If it is necessary to work for rework, it is necessary to find the cause of this phenomenon before reworking. It is assumed that it is a human cause, that the responsibility should be investigated according to the related requirements in the quality assurance system, and the punishment should be given when necessary. If it is caused by objective reasons, the construction plan needs to be adjusted so as to ensure that each process meets the construction quality requirements. Third, it is the problem of subgrade drainage. For highway construction, drainage is a serious problem. If the drainage is difficult, there will be a lot of water accumulation in the construction of the roadbed, which will bring great trouble to the project. Therefore, drainage work is very important during the construction of highway subgrade. For example, if there is a lot of water content in the reclaimed layer, it cannot be compacted and compacted when it is being rolled, which poses a hidden danger for roadbed diseases. It will not only affect the construction progress of the subgrade, but also may pose a threat to the personal safety of the construction personnel when serious. Specifically, the roadbed drainage facilities mainly have the following three aspects. First of all, it is a drainage facility for the ground. Under normal circumstances, the more common surface drainage facilities are side ditch, intercepting ditch, distribution ditch, and rapids. The type of drainage facilities to be used, and how the cross-sectional dimensions should be determined in accordance with the local hydrological conditions can be determined. Then there is the underground drainage facility. The common underground drainage facilities are seepage trenches, infiltration wells, inspection wells, and underdrain. The main purpose of using underground drainage facilities is to drain underground water from the roadbed, so as not to erode the roadbed and cause slope collapse. Finally, the subgrade of the special section is drained. Different treatment plans should be set up according to the different characteristics of the special section. Specifically, the subgrade of the special section includes the subgrade of the frozen soil area, the subgrade of the expansive land, the subgrade of the loess area, the subgrade of the salt dissolving area and the subgrade in the saline soil area, which should have different drainage measures because of the different soil quality.

## **4. Organization and quality control of subgrade compaction construction**

### **4.1 Organization of compacted construction**

It is equivalent to the preparation of compacting construction. First, the choice of compactor should be combined with the soil condition of the construction site. The second is the determination of the number of roller compacting times, which should be determined according to the thickness and quality of the soil. It is completely wrong to remember that the more compaction times the more compaction is higher. Thirdly, the principle of rolling is to follow the order of light weight and heavy weight as much as possible. When rolling, it should be from both sides to the middle, and the speed should be from slow to fast. For super high road sections, rolling should be low to high. In order to avoid rolling compaction, the rolling parts can be slightly overlapped to ensure the smoothness of the edges as far as possible. Finally, it is a rolling supplement. This part mainly deals with the corners of the leakage pressure of the roller compaction machinery, which can be carried out using small machinery. When necessary, professional personnel are required to perform manual operations.

During the entire rolling process, the moisture content and degree of compaction of the road surface must be inspected in a timely manner, and problems should be found at the first time so that the degree of compaction of the

road surface can meet the engineering needs.

## 4.2 The main quality problems of lime soil construction

In recent years, lime soil has become one of the main raw materials in the construction of various projects in China. The composition of lime soil is simple. As the name suggests, it is mainly composed of lime and soil and some other fine elements. The use of lime soil in road and bridge construction has the following advantages: First, the raw materials are simple and easy to configure. Second, the strength is high, and the stability is good. Third, the price is low. However, the use of lime soil as a raw material in the construction of the project, no matter which one of the two main materials in the lime soil, will have an impact on the function of the lime soil. For example, if the water content of lime soil is low, the chap problem is likely to occur. Conversely, if the water content of the mixture is too high, there will be a spring phenomenon. If the lime soil is mixed, the mixing is not uniform enough, then the material of the lime soil will be more rough. If the lime soil is used to lay the pavement, after a period of use, the pavement or the bridge surface will be affected by the gravity of the vehicle, the surface will collapse or rise. Not only the appearance of the situation has been affected, but also the service life of the road surface has been damaged. Therefore, in the process of mixing the lime soil, the ratio can not be regarded as a small problem which is easy to be realized. It is necessary to pay attention to the influence of its ratio quality to the construction of the project.

In the process of roadbed construction, limestone with the same quality and the same proportion shall be used as far as possible for the infrastructure construction of the same road section, and the basic properties of lime soil shall be preserved and utilized. This requires the relevant proportioning personnel to strictly follow the relevant proportioning standards when carrying out the ratio of lime soil to ensure the quality of lime soil to the greatest extent.

## 5. Conclusion

To sum up, in the concrete construction process of subgrade and bridge engineering, the quality of the project is affected by multiple factors, whether it is construction environment, workers level, engineering technology or raw material ratio, each step is closely related to the quality of the construction project. With the continuous improvement of construction technology, new requirements have also been put forward for related construction workers. In the future development process, the relevant construction personnel must continue to fully grasp the construction process and improve the construction efficiency through exploration and exploration, and play a benign promotion role for all basic construction projects in China.

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