

A Study on Quality Control of Highway Construction Supervision Based on Dynamic Management

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Abstract. This article chosen the highway engineering supervision on quality control of subgrade and pavement as study points, discussed the main points, main contents and specific methods in highway construction supervision during Preparation stage, Implementation stage and Acceptance stage of the highway construction based on the dynamic management anthology, and demonstrated the feasibility of the dynamic management anthology by using an illustrative example.

Keywords: dynamic control, highway supervision, construction procedure, quality control for subgrade, quality control for pavement.

1. Introduction

Quality is the key factor in the construction of highway project, so it is important to make sure that cost and schedule management are both on the premise of construction quality, meanwhile the construction stage occupies the key link of the whole process of highway construction, and therefore the project managers should highlight the quality control in the construction stage. Since Construction Supervisory System have been established and promoted in china, there are remarkable effects in quality, cost and schedule control, which make the study on content and process in highway construction supervision be with great importance. This paper obtained the main points and methods about construction quality control based on dynamic management in highway supervision through the study on quality control of highway subgrade and pavement in highway project and used the anthology effectively in a practical perspective.

2. Methods of Analyzing

The influence factors of highway quality problem are the main contents that need to be analysis in highway construction supervision, the common methods to analysis highway construction quality can be classified as following seven methods:

(1) Management chart method: means control chart method. It is a dynamical method used to analysis the change of construction quality during the construction process and take measures immediately. Thus making the process kept a good stabilization so that the rate of qualified service of the separated parts of a project can be guaranteed.

(2) Scatter diagram method: means correlation diagram method. It mainly used to analyze the relationship as well as correlated close degree between various quality characteristics and between various influence factors. By using this method, the complete rationality of quality control can be guaranteed.

(3) Quality distributed method: means histogram method. By collecting quality data and bring them into different group, this method proposed a frequency distribution histogram from which can be analyzed the quality fluctuation and estimated the nonconforming rate in the process of construction, so as to evaluate a process of construction.

(4) Primary-secondary factor analysis method: means Pareto chart method. Through the cumulative frequency, it determined the main factors and secondary factors that influenced the quality.

(5) Survey analysis: means the questionnaire method. According to the survey, designed the corresponding statistic tables and filled in collected data, then analyzed the quality status and reasons briefly. This method used to combine with analytic hierarchy process.

(6) Classification method: means stratification. According to different purposes and requirements, classified the collected original data by the nature so as to analysis the quality problem and the influence factor during the construction stage.

(7) Features factor method: means Causality Graph method. It is a kind of effective method in systematically analyzing and settling the relationship between one quality problem and its causes.

In practice applying, a highway supervision engineer should consider the condition of construction site and use integrated modern statistical methods of quality management. To analysis the major factors that influence the quality of highway construction, the use of Scatter diagram method, Quality distributed method and Features factor method should be highlighted.

3. Methods and Contents of Quality Control in Highway Construction Supervision

3.1 Methods in Construction Control

(1) Active Control: it refers to the quality control of preparatory work in construction, that is to say pre-control. It is a control measure started before the beginning of the construction, mainly to minimize the possibility of deviation between the actual facts and programed objectives, play the role of nip in the bud.

(2) Process control: It refers to a full range of quality supervision, control and inspection carry out by highway supervisors during the construction. As a mode of the combination of active control and passive control, process control not only used to correct the deviation which already occurred in the early stage of the project, but also develop preventive measures for quality risks in the coming stage.

(3) Passive control: it is used to check the quality of intermediate products and final product in the construction process, which means to figure out the quality acceptance of sub-project, division project and unit project, and this mode belong to ex post control mode. This process of control is mainly about rectify the quality of substandard product in the quality acceptance process, to ensure the quality of final product.

3.2 Content of Construction Quality Control

(1) Preparation stage: mainly to review the qualifications of subcontractors, construction organization design and construction plans submitted by constructors. Check every engineering materials, semi-finished products and construction machinery that required for the construction whether it is in good quality level, and organized technical disclosure as well as drawing reviewing.

(2) Mid-term implementation phase: primarily to assist contractors to establish and improve process control system to monitor the implementation process of the transfer of censorship, be prepared to handle engineering changes, organizational coordination field quality meeting, adhere to prepare quality supervision diary.

(3) Acceptance stage: contractors mainly in accordance with the prescribed quality inspection standard, conducted the inspection and acceptance of the separated parts of a project that already have completed, reviewed completion data and as-built drawings submitted by contractors, cooperated with the construction company to conduct the completion acceptance.

4. Applying and Analysis

A highway project in Gansu Province, soil features along its route area showed to be silty soil, pavement is asphalt. According to the location and construction features of this project, it is the quality of the subgrade and pavement that should be the most important part in the quality control management, in addition that specific control methods and corresponding contents of subgrade and pavement be developed, so that the quality of the whole project can be guaranteed.

4.1 Active Control Contents

Active Control of Subgrade Project. It is mainly carried out as a pre-control in the preparation stage of subgrade construction, and it included a review of the establishment and improvement of contractor's self-checking system. According to the design documents and technical disclosure marched a construction survey and lofting. Conducted detailed examination of subgrade construction equipment which contractor had applied for inspection, and it cannot be used before the chief supervision engineer have made an examination and approval. The pre-arrival raw materials must be inspected before using on the project. Determined the soil digging and discarding places and constructed access roads. Conduct sample test on subgrade embankment at regular intervals. Choose the most typical section as test road at pre-construction period. Predicted potential problems by the construction process of the road test, make preparations for the construction.

Active Control of Pavement Construction. It is mainly carried out as a process control in the preparation stage of asphalt pavement construction, and it included the test of physical nature and graded situation of raw materials which must be conducted by contractors and get the approval of supervision engineer before the construction of pavement started. Only with the test certification can these raw materials be used on the project. Before the construction of asphalt pavement, supervision engineers should examine and approve the mix proportion of asphalt mixture reported by contractor, conduct the examination of the pavement construction equipment that contractor have applied for inspection, re-check and approve the construction lofting conducted by contractors and require contractors to take an examination of sub-layer.

4.2 Content of Process Control

Process Control of Subgrade Project. It is mainly used to make a quality control of important working procedure such as subgrade cutting and filling, subgrade drainage and retaining structure, and it included to pay attention to the compaction before filling, to keep strict control on loose laying depth, to roll and examined compaction thickness and evaluated subgrade compactness. When dealing with cutting subgrade procedure, followed the requirement of cross-sectional and slope gradient and dig from up to down. When coping with the disadvantage slope situation, it is necessary to set protection works. During the procedure of subgrade drainage, the scale of drainage system should be controlled according to the design drawings, mortar mix ratio should be controlled tightly. While subgrade retaining structure construction process.

Process Control of Pavement Project. It is mainly used to ensure the asphalt pavement was in solid and flat condition, as well as sufficient mechanical strength, slip resistance and durability, meanwhile with good stability in under high temperature and crack resistance under low temperature. During the procedure of mixing asphalt mixture, the mixing quality of asphalt mixture must be tested and inspected and the construction temperature of asphalt mixture must be controlled in strict accordance with the prescribed scope. During the procedure of asphalt mixture compaction, whether the compaction thickness of asphalt layer meets the design requirements or the compaction degree of asphalt pavement achieve the specified compaction standard must be inspected. While during the smoothness control process of asphalt pavement, flatness of sub-layer, loose laying thickness of paving layer and rolling compaction of asphalt mixture must be guaranteed.

4.3 Content of Acceptance Control

Quality Acceptance Control of Subgrade. It is a quality control in the acceptance stage of subgrade construction, and it include a test on the width and elevation of subgrade, position of subgrade surface and slope gradient, an examination of the arrangement of drainage facilities, the compaction of filling construction and the records of concealed works. Checked out the position of soil digging and discarding places, berms and the intercepting drain, and inspected the acceptance records of concealed works.

Quality Acceptance Control of Pavement. It refers to the quality control of asphalt pavement engineering at acceptance stage, and it mainly included an inspection of the situation of cleaning up grassroots as well as the ratio of asphalt mixture, the procedure of mixing and paving compaction, find out whether the acceptance procedures are in place. Checked the dimensions and appearances

such as thickness, width, flatness, cross-slope and midline elevation of asphalt surface. If qualified, Intermediate certificate of completion should be signed and issued.

5. Conclusion

Quality control effect of highway supervision that came in construction stage plays a decisive role on forming the final quality, therefore, highway supervision must associate with the characteristics and nature of highway project to get an excellent quality control in the pre-construction stage, the construction stage and the acceptance stage with nether active control, process control or passive control, which could finally ensure the achievement of quality objectives in the construction stage of highway project.

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