

Analysis of Asphalt Concrete Highway Construction Technology in Highway Engineering

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Abstract: *In recent years, asphalt concrete has been commonly used for construction in highway engineering in China. In actual construction, asphalt concrete construction technology has a serious impact on the quality of highway engineering. Therefore, in order to strictly control quality and effectively avoid safety accidents during highway engineering construction. This requires relevant personnel to strengthen the analysis and research of asphalt concrete road construction technology, in order to meet the latest requirements for the quality of concrete pavement construction in the context of rapid urbanization in China. The following article will analyze the construction technology of asphalt concrete engineering in highway engineering, hoping to have a certain effect on improving the quality of highway engineering construction in China.*

Keywords: Highway engineering; Asphalt concrete; Construction technology; branch.

1. INTRODUCTION

In recent years, asphalt concrete has been widely used in the construction process of highway engineering in China. With the continuous advancement of urbanization construction and the continuous improvement of people's living standards, the number of private cars is gradually increasing. Therefore, it is necessary to effectively improve the bearing capacity of highways. In order to ensure the effective improvement of the construction quality of highways, So relevant personnel need to strengthen the analysis work of asphalt concrete construction technology, in order to provide strong guarantee for the actual construction quality of highway engineering, and also ensure that the safety of the highway can be effectively improved.

Chinese primary school art education is currently in its most favorable development period since the founding of the People's Republic of China. However, this does not mean that there are no issues or that the development of primary school art education is without problems or challenges. The trends of informatization, digitization, and intelligence in society provide new historical opportunities and pathways for the development of art education, but they also introduce new development issues. The examination and reflection on both old and new problems are fundamental to the study of the development of primary school art education and are crucial for discussing the current state and development direction of art education assessment. Guided by the concept of "dynamic quality art education assessment," this paper conducts investigations through methods such as social surveys, educational observations, and literature research. It finds that there are numerous issues in the current development of Chinese primary school art education, affecting both teachers and students. The research primarily takes the form of surveys, using questionnaires to understand the factors influencing students' art literacy development from three main dimensions: the family, the school, and the community.

2. ENGINEERING OVERVIEW ANALYSIS

The driving speed is 80 meters per hour, with 4 lanes in both directions. The full width of the roadbed is 28.5 meters, and the road surface is constructed with asphalt concrete. The amount of soil and stone filling for the roadbed is measured and calculated to be 653.74 km³ and 786.77 km³, respectively. The highway is located in an industrial park in a certain city, with a total length of 48.5 kilometers. During the construction process, it strictly follows the standards of high-grade highways. Conduct construction operations with 6 lanes in both directions and a driving speed of 60 kilometers.

In this research process, Engineering I and Engineering II will be selected as the research objects to analyze the concrete construction technology in the project.

3. TECHNICAL ANALYSIS ON THE SELECTION OF RAW MATERIALS FOR ASPHALT CONCRETE CONSTRUCTION PAVEMENT

In the process of selecting asphalt concrete materials, the quality of materials will have a serious impact on the construction quality, which requires the construction unit to pay attention to this in the process of selecting asphalt materials to ensure that when selecting materials, the expected traffic volume should be fully considered, including the large traffic volume of first-class highway or expressway in the later application process, This requires selecting asphalt materials with high viscosity as much as possible to effectively meet the requirements of highway traffic flow. The second point is that in the selection of materials, it is necessary to fully consider the natural and climatic conditions of the construction site. Therefore, when selecting materials, it is necessary to fully consider the effects of temperature, humidity, rainfall, and wind factors on the materials, in order to achieve the water permeability of asphalt materials from the perspective of the construction site environment Viscosity and Persistence

After comprehensive consideration, it is necessary to ensure that asphalt materials can meet the actual construction requirements. The third point is that after selecting materials, corresponding placement and storage methods need to be selected according to the different types and types of asphalt materials. This includes the construction unit setting up a dedicated storage department as much as possible to store asphalt materials reasonably, ensuring that corresponding waterproof measures are taken during the storage process, Avoid affecting the construction quality due to moisture on the materials.

In the selection process of coarse and fine aggregates, the selection and combination of coarse and fine aggregates can also affect the construction quality. This requires that relevant personnel pay close attention to the cleanliness of coarse and fine aggregates in the selection process, and also need to treat the sediment in the coarse and fine aggregates before use, in order to effectively avoid the impact of external substances on the quality of coarse and fine aggregates. In the selection of materials, not only the surface of the materials should be smooth, but also the quality of the stones should meet the relevant requirements of the relevant regulations. This requires the relevant personnel to select the corresponding stones according to the level of the road, including the construction of the expressway and first-class highway. The road construction has high requirements for fine stones, so it requires the construction unit to, Reasonably select materials according to the construction standards of different highways.

4. ANALYSIS OF ASPHALT CONCRETE HIGHWAY CONSTRUCTION TECHNOLOGY

First, the internal and external environment of primary school art education is in a "suboptimal" state. Analyzing the overall state of current primary school art education from the perspective of educational ecology, it is evident that it exhibits "unhealthy" educational phenomena in terms of social and educational environments. On one hand, at the societal level, art curriculum has been marginalized among numerous subjects and considered a negligible "subsidiary subject," a situation that remains unchanged. Consequently, art curriculum lacks the respect and status it deserves, and art teachers lack the social respect and professional dignity they deserve. Furthermore, under the influence of the exam-oriented education system in China, where the curriculum is tailored to what is tested, the concept of "teach what is tested" and "learn what is tested" has become a general consensus, exacerbating peculiar educational phenomena such as the absence of primary school art courses, arbitrary suspension of art classes, and prioritizing exam preparation over art education. On the other hand, from the perspective of the art education environment, there are issues related to uneven distribution of educational resources, educational inequality, inadequate educational management, and an imperfect educational culture in art education. Additionally, with limited class hours, primary school art teachers are burdened with heavy responsibilities. They are also tasked with campus visual culture development and art activity planning and organization, resulting in substantial workloads. However, many schools consider the workload of art classes to be equivalent to only about 60% of subjects like language and mathematics in terms of evaluation for benefits, professional recognition, promotions, and housing arrangements. This highlights that art teachers receive lower salaries and benefits, their energy is dispersed across multiple responsibilities, making it challenging for them to dedicate time and enthusiasm to delve into art education.

Second, the professional development of art teachers lacks continuity and depth. Firstly, art teachers have long been deprived of high-quality professional development and training opportunities, leading to a lack of comprehensive, targeted, and effective training. There is significant overlap among available training programs, making it difficult for teachers to grow effectively. Secondly, art teachers do not have a strong enough awareness

of lifelong learning. This is evident in their limited attention to academic research in the field of art, developments in educational policies, and related outcomes. For example, many teachers have not made substantial transitions from the "two basics" stage to the "three dimensions" stage, and they do not have a high level of understanding or focus on the core competencies of art subjects. Thirdly, art teachers lack sufficient awareness and capacity for educational research. Their participation in activities such as publishing papers, conducting research projects, and school-based development needs improvement. For instance, some education researchers have indicated that "few teachers of art and music subjects have the opportunity to participate in research projects, and they have never considered conducting subject-related research themselves." Lastly, teachers often have an inadequate understanding of the essence of art education and hold various misconceptions. This is particularly evident in their failure to recognize that art education is a pluralistic discipline. They tend to emphasize the intrinsic value of artistic techniques and knowledge while downplaying or neglecting the educational significance and value of art education. This imbalance in the development of "art" and "education" as two pillars is a significant concern.

Third, the development and implementation of art courses lack a concept of disciplinary culture. The specific manifestation is that the situation of art courses in primary schools is far from ideal. Many schools either do not offer art classes, fail to allocate sufficient class hours for art, or offer art courses that have never been taught by art teachers. Some schools even face the dilemma of art courses being sidelined by other subjects and sacrificing art education for the sake of exam preparation and academic achievement. This reflects a lack of understanding and emphasis on the art discipline by both teachers and students. The construction and implementation of art courses lack standards and order, resulting in a limited variety of content and a low rate of course offerings. On one hand, previous research has shown that under the context of the new curriculum standards, art teachers often tend to choose and design teaching content that avoids complexity, leans towards easy topics, and emphasizes skills over theory. For example, some teachers have reported that they have attended over 30 art classes in various locations like Beijing, Shenzhen, Hangzhou, and Guangzhou. Among these, nearly half were appreciation classes, and the others were "modeling and expression" or design classes, with no mention of "comprehensive exploration" classes. This is not an isolated case but a prevalent phenomenon in primary school art education after the curriculum reform. When faced with the four learning domains of "modeling and expression," "appreciation and evaluation," "design and application," and "comprehensive exploration," art teachers tend to choose activities related to "modeling and expression" and "appreciation and evaluation." These activities are closer to the traditional "two basics" style of art education, which focuses on teaching and learning basic knowledge and skills. They also have lower difficulty and complexity levels, making them easier to design, control, and evaluate.

Fourth, there is a lack of a systematic and effective Chinese-style art education assessment method and culture. Currently, the construction and development of the assessment system and culture in Chinese primary school art education are in their early stages, shaping the direction and development of art education assessment in China. Research indicates that primary school art teachers and education researchers in China, as a whole, lack an understanding of art education assessment and quality monitoring. This is especially true when it comes to assessment thinking and assessment culture in art curriculum teaching. The reasons for this are primarily as follows. Firstly, there is a lack of awareness. Many teachers have not fully recognized the importance of art education assessment and are not clear about its integral role in art education. Secondly, there is a lack of capability. Most art teachers with backgrounds in the humanities do not possess the literacy and skills for mathematical and statistical research. They may not have received formal education in subjects such as statistics, educational statistics, and educational and psychological measurement. Therefore, they lack confidence in conducting research and practice in art education assessment, and also lack effective assessment methods and tools. Assessments often exhibit characteristics such as exaggerated language, standardization, artificiality, and ineffectiveness. Encouraging only positive evaluations and excessive rewards make art education appear filled with "flattery" and "bribery," deviating from the essence of art education. Thirdly, there is a strong utilitarian mindset. Art teachers are often reluctant to invest too much time in art education assessment, especially when it is seen as challenging and complex. Fourthly, the predominant method of results-based evaluation, centered on student assignments and artworks, still prevails. From the perspective of educational significance, students' learning processes, both within and outside the art curriculum, should hold more exploratory and meaningful value than the outcomes. However, most art teachers focus more on results in their teaching design, content, and evaluation criteria, neglecting the process performance and effort of students in and out of art courses. Only by incorporating the entire process of students' learning in art classes into the perspective of evaluation can evaluation have a truly meaningful reform; otherwise, it is fundamentally no different from the previous 'grading homework' assessment approach."

Fifth, students' awareness of and engagement in art courses need improvement. Firstly, students often lack a positive attitude and mindset towards learning art, leading to tendencies of not wanting to learn or not enjoying the

subject. Secondly, as primary school art is not a subject assessed in standardized tests, students often do not perceive the importance of art education in the broader context of exam-oriented education. They may consider it less significant or even dispensable. Despite insights from experts in cognitive psychology and neuroscience highlighting the importance of art education for individual development, the phenomenon of underestimating art education persists. Thirdly, there are limited opportunities and platforms provided by schools or society for students to engage in related art activities. On the one hand, the development of campus art culture in schools may be lacking in richness and substance, making it challenging for students to appreciate the cultural and aesthetic value that art brings to their lives and surroundings. On the other hand, schools in rural and remote areas often struggle to provide adequate educational resources, resulting in significant urban-rural disparities. For instance, students from local schools in such areas have fewer opportunities to participate in online or offline museum-based art education activities compared to students in first-tier cities or provincial capitals. Fourthly, there is a lack of synergy and relevance between home-based art education, community-based art education, and school-based art education. This fragmented approach to art learning results in a lack of continuity and comprehensiveness in students' art education. Therefore, creating a conducive environment and culture for home-based art education is also an important dimension of researching primary school art education.

In summary, optimizing art education assessment methods and thinking can help art teachers gain a comprehensive understanding of the internal and external environment and the current state of Chinese primary school art education. It can also help identify directions and key areas for adjustment and improvement.

4.1 Technical Analysis of Preparation Stage for Asphalt Concrete Highway Construction

In the process of asphalt concrete construction in highway engineering, the preparation work before construction is of great value to the construction quality of the highway engineering. This requires relevant personnel to carefully audit the design drawings during the preparation stage of construction, to ensure proficiency in the content of the drawings. If any problems are found during the drawing reading process, they need to discuss and solve them with the design unit in a timely manner. Before construction, it is necessary to scientifically mix the raw materials of the previous concrete, which requires the option of completing the mixing of asphalt mixtures with the assistance of professional personnel. The construction unit also needs to strictly inspect the construction equipment before construction, including carefully checking the quality of equipment such as the paver conveyor, valves, and feeding system. Before construction, it is necessary to plan the construction scope and clean the road base to avoid adding impurities to the mixture during the asphalt concrete construction process, which may have a negative impact on the quality and aesthetics of the road surface. Finally, it is necessary to conduct experiments on the construction environment, starting from factors such as laying speed, construction difficulty, and road surface temperature at each stage, in order to establish a construction risk plan. Only in this way can emergency plans be adopted to solve problems in a timely manner during the construction process.

4.2 The technical analysis of the mixing treatment stage in asphalt concrete highway construction needs to be carried out before the actual application of asphalt concrete in highway engineering

Professional mixing treatment can be completed in a professional mixing plant in actual construction. In the mixing process of asphalt concrete, it is necessary to start from the use standard of asphalt mixture, so as to achieve reasonable control of the mixing time and temperature of the mixture, so as to ensure that the mixture performance after mixing can be consistent with the Roadworks standard. When conducting actual mixing, relevant personnel should use the ingredient list as a reference to pay attention to the combination of multiple materials, so as to carry out the mixing process in a scientific way. At the same time, it is necessary to ensure uniform mixing during the mixing process, in order to effectively avoid the phenomenon of asphalt and stone separation in the subsequent laying process. During the mixing process, the construction unit also needs professional personnel to conduct sampling inspections in order to effectively ensure the material performance of asphalt concrete [2].

4.3 Technical analysis of asphalt concrete during transportation stage

After the mixing of asphalt concrete materials, due to the strong coagulability of the mixed materials, it is required to timely transport the mixed materials to the construction site for construction after the mixing process is completed. In order to effectively ensure the quality of asphalt concrete and avoid being affected during the transportation process, the following requirements need to be met during the transportation of asphalt concrete. Firstly, after completing the mixing of asphalt concrete, effective measures need to be taken to cover and block it, in order to effectively prevent external dust from affecting the quality of asphalt concrete mixture. At the same

time, it is necessary to effectively ensure the temperature of the asphalt concrete mixture during transportation, ensuring that the minimum laying temperature during the laying of asphalt concrete is not less than 145 °C. Secondly, before transporting asphalt concrete, a layer of cleaning agent needs to be applied to the front groove of the transportation vehicle to effectively avoid the problem of mixed materials sticking to the vehicle floor. Third, in the process of selecting transport vehicles, it is usually necessary to select 10-15 ton Dump truck as transport vehicles. At that time, the number of vehicles also needs to be strictly calculated to effectively ensure the continuous paving of asphalt concrete. Require vehicle drivers to ensure a uniform and stable speed during transportation, which is of great help in avoiding segregation of asphalt mixtures. At the same time, it is necessary to contact the management personnel of the construction site in advance before coming into contact with vehicles to ensure that the construction site personnel can prepare for the unloading of the mixture. During the unloading process of the mixture, it is necessary to arrange professional personnel to command and use professional temperature measuring tools to measure the average temperature of the mixture, Only in this way can the quality of asphalt mixture be effectively guaranteed [3].

4.4 Technical analysis of asphalt concrete during the laying stage

In order to effectively ensure the laying quality of asphalt concrete, it is necessary to effectively solve the following problems before starting the laying work. The first issue is that the relevant construction technicians need to thoroughly remove the dust and dirt from the road base before laying the mixture. At the same time, after the water has completely evaporated, emulsified asphalt needs to be sprayed on the road base, with a spraying amount of 0.25 kilograms per square meter. This is of great help in improving the adhesion ability of the interface. The second issue is that during the laying process of the design, it is necessary to adjust the laying speed appropriately based on indicators such as transportation time, transportation frequency, production capacity of the construction site, and rolling capacity of the rolling equipment, in order to ensure continuous construction of the road surface during the actual construction process, and to effectively ensure the smoothness of the road surface. It is best to choose to lay it all in one go. During the laying process, it is also necessary to minimize the impact of external factors such as dust on the quality of asphalt concrete laying, effectively improving the aesthetics of the road surface. The third issue is that before starting the actual laying work, the paving equipment needs to be started 15 minutes in advance to ensure that the ironing panel can be fully preheated. At the same time, during the normal construction process, it is necessary to ensure that the minimum temperature of the ironing panel is controlled at 130 degrees. In the actual laying process, in order to effectively improve the laying speed, multiple pavers can be used for joint operation. In order to effectively ensure the continuity of the laying work, equipment operators who are laying at the same time need to adjust the paving speed reasonably based on the specific situation of the laying site. Usually, during the paving process of highways and upper layers, the speed needs to be maintained at 3 meters per minute, During the paving process of the middle and lower layers, the speed should not exceed 4 meters per minute During the actual paving process, strict attention needs to be paid to the flatness of the road base layer. In the actual road construction process, the sled paving method can be used for paving, which is of great help in ensuring the smoothness of the road surface and improving the paving speed.

4.5 Technical Analysis of Asphalt Concrete Rolling Work

In the construction process of highway concrete, in order to effectively ensure the stability of the upper, middle, and lower layers of the highway, it is necessary to strengthen the rolling operation during the construction process of pavement engineering. In order to effectively ensure the quality of the rolling operation, construction personnel need to have a detailed understanding of the construction and paving situation before carrying out the rolling operation, To ensure that the number of rolling operations can be determined based on the specific construction situation of the highway, and usually the number of rolling operations should not be less than 3. At the same time, in the process of determining the frequency of rolling operations, it is also necessary to determine the frequency based on the specific paving situation. In the process of road compaction, there are usually three stages involved. The first stage is the initial compaction stage, which requires close cooperation between construction and technical personnel to effectively ensure that the design, planning, and control of the compaction operation can be scientifically and reasonably carried out. At the same time, after completing the initial compaction stage.

After rolling, it is necessary to strictly inspect the rolling condition of the road surface. During the actual rolling process, two steel wheel rollers can be used to roll the asphalt mixture pavement twice. During the rolling process, it is also necessary to effectively control the temperature during the process to ensure that the temperature is controlled within the temperature is above 135 °C, during the initial rolling, the rolling speed needs to be strictly controlled to ensure that the speed cannot exceed 3 Kilometres per hour. At the same time, during the actual rolling

work, the rolling personnel and the paving personnel need to maintain communication at all times, so that the paving personnel can contact the rolling personnel in time to carry out the rolling work after the completion of the paving operation, so that the rolling personnel can make full preparations at all times. The second stage is the repeated rolling process. In this stage, the rolling personnel need to determine the number of repeated rolling based on the specific situation of the initial rolling, usually 2-3 times. During the rolling process, strict temperature control is also required to ensure that the minimum temperature is above 110 °C. The third step is this rolling process, in which the temperature needs to be controlled above 90 °C and at least two rolling operations are required.

4.6 Technical analysis of concrete joint operation

In the construction process of asphalt concrete engineering, as the construction process is composed of multiple links, it requires relevant construction personnel to pay attention to the joint operation of different links. If problems occur during the joint operation of a certain link, it will lead to the problem of diagonal cracks on the asphalt road surface. If relevant personnel do not handle the cracks in a timely and effective manner, it will cause the crack problem to become more serious. Finally, it leads to the collapse of the road surface, which causes serious safety hazards in Roadworks. And it is difficult to prevent construction joints in advance during the actual construction process, which requires construction personnel to take effective measures to deal with construction joint problems in a timely manner. In the actual rolling operation, the paver needs to provide sufficient construction space for the rolling operation, and the distance between two pavers should be ensured to be within the range of 5-10 meters. And in the treatment of construction joints, in order to effectively ensure the accuracy of the connection, manual connection can be used to select the paving wood that matches the thickness of the roller manually. After completing the rolling operation, the board needs to be strictly inspected by professional personnel to ensure the smoothness and uniformity of the road surface. If insufficient thickness is found at the end of the highway during the inspection process, it is necessary for relevant personnel to remove the asphalt mixture before it fully solidifies. At the same time, during the joint operation, heating can be used to effectively increase the adhesion at the joint, which can be achieved by covering the hot mixture and baking the pot lamp [6].

5. CONCLUSION

In summary, asphalt concrete construction technology is one of the most common technologies in highway construction in China. In order to effectively ensure the overall quality of highway construction, construction units need to start from the actual situation of highway engineering, make sufficient preparations, and strictly manage the selection of asphalt concrete materials, proportion configuration, mixing, transportation, paving, rolling, and other aspects. It is also necessary to fully consider the adverse effects that the construction environment may have on the construction quality, and ensure that construction personnel can strengthen the management and control of the construction site, in order to effectively ensure construction efficiency and quality, and gradually improve the smoothness and aesthetics of asphalt concrete pavement.

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